Impact of Tax Harmonization with EU on Economies of Central European Countries during the Pre-Accession Period

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Abstract

The article deals with the issue of the impact of harmonization of indirect taxes which took place in four Central Europe countries in the pre-accession period to the European Union. In this period Central Europe countries had to increase indirect taxes on fuels, tobacco products and energy due to requirements of European Union. Harmonization significantly increased prices of harmonized products and inflation in general what was a rationale for the hypothesis on the negative impact of harmonization on main economic aggregates like GDP, consumption, gross capital formation, exports and positive impact on imports. To estimate the impact of harmonization on prices, a concept of Net Harmonization Indices (NHI) was set up. The indices were tested through incorporation to demand equations (transformed income balance identities) and verified by autoregressive ones. The procedure confirmed mostly negative impact of tax harmonization on main macroeconomic aggregates in Poland, Slovakia, Czech Republic and Hungary. It also showed that harmonization friendly policy may result in more negative effects for the country using such a policy.

Key words: tax harmonization, Central Europe

1. Introduction

On 1 May 2004, four Central European countries: Poland, the Czech Republic, Hungary and Slovakia, as well as six other countries, acceded to the European Union. In the mid-1990s those countries (excluding Slovakia) entered into association agreements with the European Communities intending to accede to that integration group. One of the significant requirements for the EC, and subsequently the EU, members was harmonization of indirect taxes. Harmonization, in contrast to the literal meaning of the word, did not mean the liquidation of extreme solutions in indirect taxation in the EC countries by e.g. reducing the highest and increasing the lowest tax rates. In the EC and EU, harmonization meant only the introduction of a certain minimum level of taxation in the countries of the Community. Such an approach was motivated by the need to avoid a sudden increase in cross-border movement of goods caused by indirect taxes differences, the excise tax differences in particular.

Indeed, the term “tax harmonization” in the EU context means the introduction of the minimum taxation of goods by increasing the tax in countries with lower tax rates. The basic thesis of this paper is that the harmonization of indirect taxes conducted in the Central European countries, as the requirement of EU accession, could strongly affect the economies of those countries by restricting the rate of growth of GDP, consumption, investments, and exports and by favouring the growth of imports. The harmonization of indirect taxes, understood as increasing those taxes, suppressed economic development.

There is a logical explanation for that thesis. The four Central European countries analysed, which acceded to the EU in 2004, were characterised by income per capita several times lower than the EU average. If those countries were forced to accept minimum levels of indirect taxes, the final burden of those taxes in relation to per-capita income could be much higher than in the EU countries, even those with the lowest income. The harmonization increased final prices for consumers and decelerated consumption. The relative level of increase in tax burden resulted mainly from the initial volume of those rates and depended on foreign exchange rates. Thus, countries with the lowest initial rates of indirect taxes could be subject to unfavourable effects of harmonization. The increasing of indirect tax rates to the minimum level determined by the EU always had to result in an increase of consumer prices. If price increases resulting from the harmonization of indirect taxes were associated with high increases of raw materials prices used for production of harmonized goods, then harmonization could enhance unfavourable effects of price and supply shocks.

The above presented explanation of possible harmonization effects is based on main stream economics theory but it does not determine whether the harmonization of indirect taxes had any impact on the reduction of basic economic aggregates at all, what the direction of that impact was, and what its force was. It is also possible that some effects of tax harmonization of certain goods could cancel each other out. For example, the harmonization of indirect taxes on tobacco products could lead to the reduction of disease incidence among Central European societies, which in turn resulted in higher productivity. On the other hand, the increase in prices of liquid fuels resulting to a certain degree from the harmonization of indirect taxes could restrict the transport operations and purchases of automotive products. Without measuring those phenomena, it is difficult to make any normative judgements.

2. Selected results of research on tax harmonization

The problems of tax harmonization, so important for the current European Union, are not a new issue. One may even say that it has extensive historical background. The work of Carsten Pallas: *Tax Harmonization: The Case of Germany At the Beginning of the Nineteenth Century Lessons for the Twenty First Century?* [C. Pallas, 2002] should be quoted as an example of this type of research work. The paper concerns tax harmonization problems in the process of unification of the German state at the beginning of the 19th century. As the author states, at the end of the 18th century there were 324 tax regimes in the German territory, out of which only 41 remained after the Vienna Congress in 1815.

According to the author, during the period of 1790-1815, the tax harmonization process was forced by the French occupant. In the years 1815-1871, the tax harmonization process continued, but was slower. After the unification of Germany in 1871 under the leadership of Prussia, the administration of part of taxes (mainly indirect) was transferred to the central government which, due to the huge budgetary requirements, increased them quickly, although tax competition between individual parts of Germany still prevailed. Tax harmonization took place mainly through adjusting to the level of Prussia which had lower level of tax rates than other states of Germany. However, further increases of taxes in Prussia forced increases also in other German states.

The author emphasises the decisive role of external forces in tax harmonization: French occupation during the Napoleonic times and, currently – the wish to avoid a war in Europe. In the conclusion of his article the author points out the lesson which may be learnt by the EU from the harmonization in Germany in the 19th century: avoid the convergence of tax rates forced from grass-roots through the tax harmonization undertaken voluntarily and harmonization in other areas of economy [C. Pallas, 2002, p. 15]. Pallas's article illustrates the deep conviction of numerous authors that the grass-roots convergence of taxes has negative effects, and that there is a need for close coordination of fiscal policy in the face of growing public expenditure requirements.

D. Mitchell from the Cato Institute, in his paper [D. Mitchell, 2004] indicates that tax competition forces governments to adopt tax solutions which are beneficial for the taxpayer. The author mentions the initiative of the European Commission from 1975 concerning the introduction of the minimum CIT rate at 45%. However, that idea fell through and in 2000 the average rate in the EU dropped below 30%. The author refers to the capital export neutrality (CEN) theory which postulates the liquidation of benefits from the exporting of capital resulting from tax differences. According to this theory various tax rates distort the optimum allocation of resources, including particularly capital. The weakness of this theory is the adoption of assumptions on full mobility of all resources. As the author claims, paradoxically, tax competition is the best way towards downwards tax harmonization.

C. Blackordy and C. Brutt in their paper [C. Blackordy, C. Brutt, 1999] turned attention to the distribution effects of tax harmonization. Those effects may affect the flow of goods between countries and may influence the government revenue generated. If there is no mechanism to neutralise those effects, additional flexibility of tax systems may be required in order to maintain balance both in the state budget and in the balance of payments. The authors thesis may be understood in the way that losses on harmonization e.g. of indirect taxes may be compensated by increasing competitiveness of indirect taxes.

R.E. Baldwin and P. Krugmann in their work entitled *Agglomeration, Integration and Tax Harmonization* [R.E. Baldwin, P. Krugmann, 2002] state that simple tax harmonization – understood as the adoption of a common tax rate – in the model developed by them harms always at least one country. It seems that the adoption of a rate between the two initial rates in both countries may be disadvantageous for both countries.

As regards examinations of harmonization costs it is worth indicating the paper of E. Mendoza [E. Mendoza, 2001]. The author evaluated the potential attempt at harmonizing capital gains taxation policy[1] in the European Union Member States. The author developed a dynamic model of general equilibrium of two countries in order to assess the potential effects of the harmonization of taxes on capital gains in Europe using the previously assessed effective tax rates: for UK 47%, France, Germany and Italy – almost 28% for 1996.

As Mendoza's research has shown, the introduction of the harmonization of taxation of capital by introducing British rates (highest) would increase consumption per capita by 1.3 % in the United Kingdom and by only 0.1% in Continental Europe [E. Mendoza, 2001,p. 5,6]. The harmonization strategies of capital income taxes, consisting in the planning of taxes below the UK level would result in losses in the welfare in Continental Europe. "In the case where harmonized rates were at an average between the United Kingdom and Continental Europe, the welfare of the United Kingdom would increase by 2%, and Continental Europe would lose 2.7%" [E. Mendoza, 2001, p.6]. The results of Mendoza's research illustrate a typical economic choice in which the implementation of common solutions will lead to a situation in which some countries gain and other lose. One may even put forward a thesis that tax harmonization leads to tax increases in countries which are the cheapest to the business in terms of taxes, which reduces their competitive advantages and, as Mendoza's research shows, reduces the welfare. The issue of reduction of welfare becomes even more obvious in the case of indirect taxes. Large increases of the excise tax and VAT significantly affect the prices of goods and the volume of their consumption.

In 2004, the authors of the German Institute of Economic Research (DIW) from Berlin developed a simulation of the impact of harmonization of taxes on power sector products on GDP and Terms of Trade with regard to EU Directive 2003/96/EC. The directive is on the introduction of minimum taxation rates on power sector products and electricity adopted in October 2003 [M. Kohlhaus et alia, 2004]. The Directive described rates in force from 2004 and rates in force from 2010. In the simulation, performed on the basis of CEG models, three scenarios have been adopted: of minimum tax harmonization MTH (countries introduce at least a minimum rate), full tax harmonization FTH (besides the acceptance of the minimum rate, countries with higher rates reduce their rates to the level of the minimum rate) and harmonization according to the proposal of the European Commission of 1997 (increases of minimum rates, but also maintenance of higher rates). The results of the simulation have been presented in the table below.

Table 1. Changes in the real GDP and in the Terms of Trade (%) in the 2004 DIW simulation

Country	Change in the real GDP			Changes in the Terms of Trade		
	FTH	MTH	MTH97	FTH	MTH	MTH97
FRA	0,56	0,00	0,00	-0,10	0,00	-0,03
DEU	0,57	0,00	0,01	-0,10	0,00	0,02
GBR	0,87	0,00	0,00	0,17	0,00	-0,03

[1] In practice this refers to effective taxation of capital investments with CIT

ITA	0,87	0,00	0,01	-0,10	0,00	0,02
CZE	-0,19	-0,13	-0,58	-0,14	-0,10	-0,35
HUN	0,12	-0,01	-0,44	-0,03	0,00	-0,02
POL	-0,11	-0,06	-0,40	-0,17	-0,06	-0,24
XAC	-0,22	-0,18	-0,57	0,07	0,03	0,00
XEU	0,23	0,00	-0,18	-0,03	0,00	0,03
XOECD	-0,02	0,00	0,00	-0,16	0,00	0,04

Source: *Economic…*, quoted edition, page 18

As the DIW simulations indicate, tax harmonization in the area of power sector products is beneficial or neutral for large EU countries with higher present tax rates and unfavourable for three Central European countries. The strongest negative effects concern the Czech Republic. The results of the model suggest that indirect taxes harmonization cost in the scope of power sector products is relatively high for Central Europe.

3. Proposed concept of measurement of the impact of harmonization of indirect taxes on economies of the Central European countries

3.1. Index concept of measurement of impact of tax harmonization on price changes

The essence of the proposed concept of measurement of impact of the harmonization of indirect taxes on prices is the use of information provided by statistical offices in the Central European countries on price indices in individual product groups which were subject to harmonization in order to build a specific index which would show the impact of tax increases on prices in those product groups. Another element of the concept is eliminating from this index the effects of the growth of prices resulting from general inflationary tendencies and impact of price and supply shocks, e.g. in the liquid fuel market (hereinafter referred to as price shocks for simplification). One may assume, to put it simply, that if the relatively fixed element (general increase of prices) and the variable element depending on price shocks are taken away from the general change of prices in the particular product group covered by harmonization, in the remaining part of price changes the dominant factor will be the change of indirect taxes. It was also assumed that changes of indirect taxes in product groups covered by harmonization resulted directly from the necessity to adapt to the EU requirements in this area by Central Europe Countries. Therefore, we pass over the possibility that the changes of taxes resulted from the internal policy of individual countries of Central Europe. Unfortunately, we are incapable of eliminating the element of overzealousness, i.e. raising the rates of indirect taxes at a rate quicker than required by the European Commission. Even if such situation took place it was rather a rational expectation of Central Europe country towards EU policy in this area.

The scheme of relations discussed above may be described in the following way:

$$\Delta P_{total} = \Delta P_{const} + \Delta P_{shock} + \Delta P_{harm}$$

$$\Delta P_{harm} = \Delta P_{total} - \Delta P_{const} - \Delta P_{shock}$$

where:

ΔP_{total} – change of the general price index in the particular group of goods
ΔP_{harm} = change of the level of prices as a result of harmonization
ΔP_{const} – change of the price index as a result of general inflationary tendencies in economy
ΔP_{shock} – change of the price index as a result of price shocks

It may be assumed that there are three basic groups of harmonized goods:

- alcohol and tobacco products, and this product group will be marked as AL
- liquid fuels for transport industry, and this product group will be marked as FU
- electricity, gas and solid fuels for heating, and this product group will be marked as EL.

Let us also assume that there are CPI values in the above groups of goods with a constant base (growing cumulatively) from the year 1995 for individual Central European countries[2] and the average index for the EU. There are also available general CPIs for Central European countries and the average CPI index for the EU. Thus, one may calculate an index which describes to what degree changes of prices in the particular product group subject to harmonization exceed the average price index. This index may be in the form of a ratio: CPI_{al}/CPI with regard to the first group of goods. This index eliminates the impact of the general change of prices on the changes of prices of goods subject to harmonization. This index shows the combined influence on changes of harmonized goods of both the harmonization itself, but also of price shocks.

The basic research problem is the isolation of the changes of prices of harmonized goods caused by harmonization and the impact caused by price shocks. Such isolation could be done if we accept that price shocks influenced simultaneously in the same size and manner the inflation in Central Europe countries and in the EU15.

A similar index to that described above, e.g. for Poland and Slovakia (CPI_{al}/CPI) may be constructed for the fifteen EU countries jointly (calling them "EU15"). This index will show us to what extent price shocks and tax increases (caused by harmonization) influenced changes of prices in particular product ranges in EU15. If we divide the index for the particular Central European country e.g. $CPI_{al}/CPI(PL)$ by the same index for EU15 CPI_{al}/CPI (EU15), we will obtain a new index which will indicate the excess of price changes caused by harmonization and price shocks in the Central European country over changes caused by price shocks and, possibly, slight harmonization inside the EU15.

If we accept the assumption that the impact of price shocks was the same in the Central European countries and in the EU15 countries this new index of indices will show the impact of differences in the strength of harmonization of indirect taxes between individual Central European countries and EU15 countries on changes of prices, i.e. impact of net harmonization on price changes. Therefore, we shall call this new index the Net Harmonization Index in the given product group and mark it (in alcohol product group) as $NHI_{al.}$

The mathematical formulation of the index for Poland $NHI_{al(PL)}$ would be as follows:

$$NHI_{al(PL)} = \frac{CPI_{al(PL)}/CPI_{(PL)}}{CPI_{al(EU15)}/CPI_{(EU15)}} *100 \qquad (1)$$

[2] The complete set of those indices has been collected for Poland and Slovakia.

This index also eliminates the impact of differences in the inflation rate between the particular Central European country and EU15 because:

$$NHI_{al(PL)} = \frac{CPI_{al(PL)}/CPI_{al(EU15)}}{CPI_{(PL)}/CPI_{(EU15)}} *100 \quad (2)$$

Similarly as in (1), the formulation of the Net Harmonization Index may be used with regard to fuels and electricity. Thus:

$$NHI_{fu(PL)} = \frac{CPI_{fu(PL)}/CPI_{(PL)}}{CPI_{fu(EU15)}/CPI_{(EU15)}} *100 \quad (3)$$

and

$$NHI_{el(PL)} = \frac{CPI_{el(PL)}/CPI_{(PL)}}{CPI_{el(EU15)}/CPI_{(EU15)}} *100 \quad (4)$$

The methodology of net harmonization indices allowed for the separation of a price index showing the impact of net harmonization on the levels of prices in the Central European countries in relation to fifteen EU countries, provided that the impact of price shocks on the level of prices was the same in the Central European countries as in EU15.

The indices constructed above (1, 3, 4) could be applied directly to Poland and Slovakia due to the availability of data under the European national accounts system ESA 95. Statistical offices of the Czech Republic and Hungary did not provide data on price indices in product groups of liquid fuels and electricity, that is why instead of indices 2 and 3, substitute indices concerning data which are available were proposed. They covered the following product groups indirectly influenced by harmonization of indirect taxes:

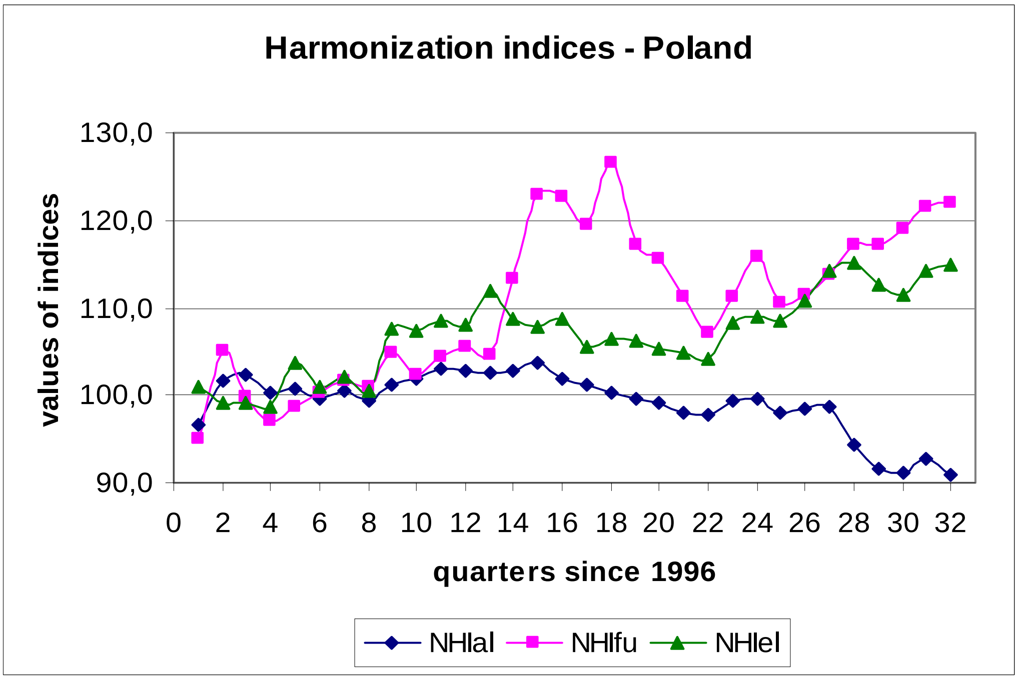
1. Housing, water, electricity, gas and other fuels – this index may be called the Net Harmonization Index concerning the Household Maintenance and mark it as:
NHI_{hm}

2.Transport – This may reflect changes in prices of liquid fuels, automotive products, insurance, etc. stronger. In this group transport may show indirectly the influence of changes in the prices of liquid fuels which were subject to tax harmonization. However, one may expect that this would be a much weaker index the one mentioned before. This index may be called the Net Harmonization Index concerning Transport and mark it as NHI_{tr}.

It has been assumed that the construction of those indices is the same as indices (1), (3), (4) in relation to Poland and Slovakia. In the charts below, the values of harmonization indices in individual Central European countries have been presented.

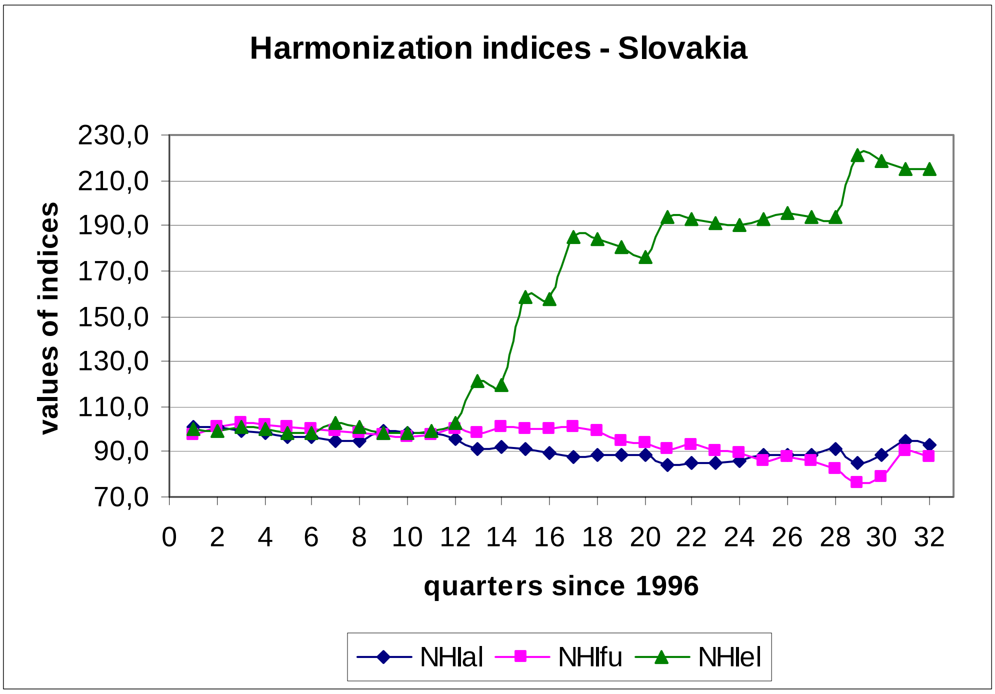
It is worth to mention that net harmonization indices have clear economic interpretation. Index equal to 100 means that there were no differences in harmonization between CE country and EU15. Indices above 100 show the extent in which harmonization in the given CE country was higher than the average harmonization for EU15. For example index value = 160 means that net tax harmonization in the given CE country exceeded the average for EU15 by 60 percentage points in the given quarter, etc.

Chart 1



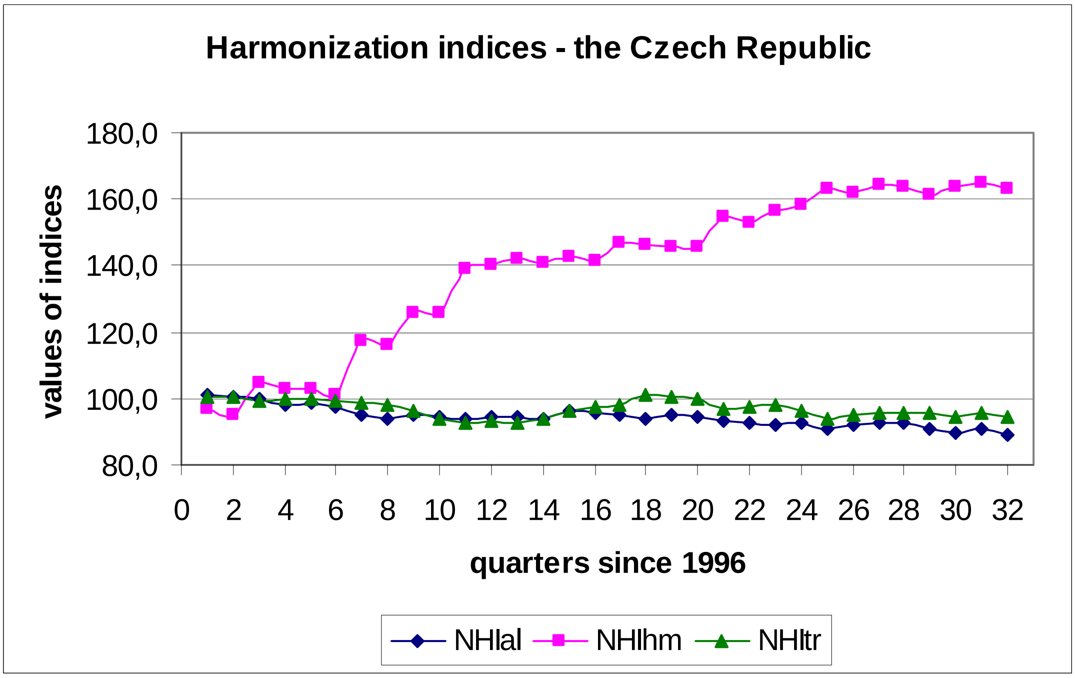
Source: own study based on the Eurostat data

Chart 2



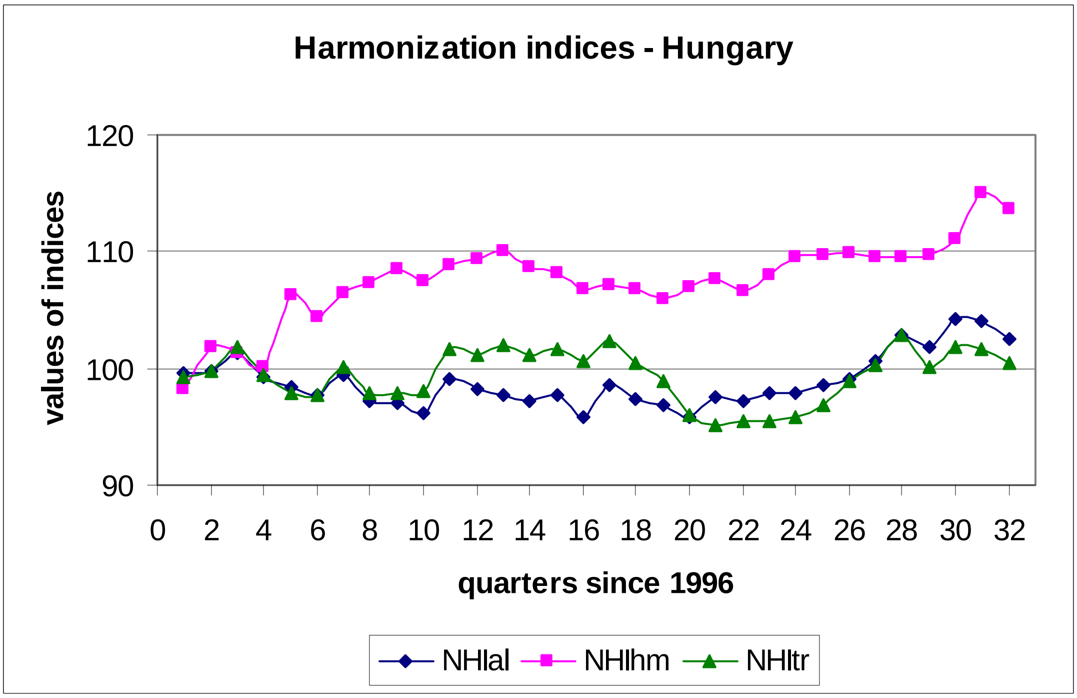
Source: own study based on the Eurostat data

Chart 3



Source: own study based on the Eurostat data

Chart 4



Source: own study based on the Eurostat data

4. Hypotheses on the influence of harmonization of indirect taxes on basic economic values in the Central European countries

4.1. Research procedure

In order to determine the impact of tax harmonization on basic economic aggregates, the fundamental income balance equation has been applied as the starting point, supplemented with additional elements in the form of harmonization indices. This equation has been used only as the starting point and has been re-shaped and transformed in accordance with econometric methodology. This approach is based on demand modelling methodology accepted by W and A. Welfe [W. and A. Welfe, 2004, p. 91-92]. Accordingly to mentioned authors, identity equation is realized only ex post and balance equation variables can be modelled. Therefore it was accepted that there is not a pure functional interdependence between variables, what would mean multlicollinearity (with correlation equal to 1,0), and this assumption was confirmed by the correlation matrix of variables from examined countries. There was none correlation between different variables equal to 1, or very close to 1.

In order to justify results received from equations which were estimated using balance identity as the starting point, autoregressive equations for each examined dependent variable were estimated. The purpose was to check if the direction of interdependence between regressor and dependent variable is maintained. If the coefficient sign (+/-) was maintained, the equation results could be interpreted. If not, the interpretation was considered as doubtful and therefore rejected. Five dependent variables were accepted, estimations were counted in relation to four Central Europe Countries and there were three harmonization variables – all together there should be 60 estimated values of harmonization variables (regressors). Using balance equations 47 variables were estimated in very good or at least fair condition. Autoregressive equations revealed that out of 47 estimated regressors, 32 had the same direction of impact (+/-) as regressors estimated through balance equations. Autoregressive equations confirmed 2/3 of estimated interrelations between harmonization indices and macroeconomic aggregates (dependent variables). It shows that using balance equations as the starting point was a proper solution.

The time series for four Central European countries in constant prices were used, as well as data for EU 15, both groups provided by Eurostat under the national accounts system ESA 95. The national accounts system covers mainly balance aggregates of the national economy. It has been assumed that regression models will accurately present time interrelations between component variables of the national income account on the basis of time series, whereas the set of harmonization indices will be added to balance equations. If the quality of the model deteriorates significantly, this may mean that the indices are not a very good approximation of the harmonization phenomenon which could be applied in regression models. If, however, the inclusion of harmonization indices provides models which explain the interrelations between variables to a considerable degree, such operation will be permitted.

It has also been assumed that the procedure of supplementation or elimination of model variables will be applied if thanks to this procedure the quality of estimation of the model were to improve. Variables which have been taken into consideration as supplementary variables were indirect taxes and proceeds from excise taxes. The latter data were available only on an annual basis, that is why the decomposition of the time series of proceeds from excise taxes was performed on the basis of the distribution of indirect taxes. The excise tax revenues variable was nevertheless used in very few cases.

The procedure applied was aimed at determining whether:
l. There is any interrelation between harmonization indices and the explained variable (e.g. GDP) at all,
2. If the interrelation is observed, how accurately is it presented by the model,
3. What is the direction of that interrelation: positive or negative
4. What is the strength of that interrelation
5. If the interrelation observed in the discussed equation (balance based) was confirmed by different form of equation (e.g. autoregressive).

4.2. Drawing conclusions and interpretation

We do not claim the right to state that the interrelations studied constitute cause and effect relationships in each case. Therefore, we do not permit categorical judgements that harmonization has absolute effect e.g. on the level of GDP. This is the consequence of the weakness of verification of statistical hypotheses which should verify the reliability of data from the sample, and time series are not samples from the statistical point of view. Discussions on regressions, including the so-called spurious or false regressions, make us inclined to maintain a lot of caution in the formulation of final conclusions. We admit a situation in which some estimations will not be ideal from the econometric point of view (or even that they will be faulty), but at least to some extent they will show us the nature of the interrelation. We are treating the econometric and statistical tools as an additional instrument to make some theses, which may be arrived at on the grounds of the economics theory, more probable.

4.3. Formulation of basic hypotheses

Our basic hypotheses are:

1) Harmonization of indirect taxes decreases GDP (GDP)
2) Harmonization of indirect taxes decreases consumption (C),
3) Harmonization of indirect taxes decreases investments (I)
4) Harmonization of indirect taxes increases imports (Im)
5) Harmonization of indirect taxes decreases exports (Ex)

The above hypotheses concern the Central European countries with a lower level of indirect taxes than the minimum rates of taxes on harmonized goods. One should also note that the term ‘harmonization of indirect taxes’ means actually an increase in taxes for those countries without any movements on the part of countries with high taxes in the form of reduction of taxes, i.e. true tax harmonization, consisting in the mutual decreasing of differences in relation to the target rate. If we replaced the word ‘harmonization’ in the hypotheses presented above with the word ‘increase’, then those hypotheses could be proven on the basis of almost any economic theory.

Those hypotheses may be presented in the simplified form of linear equations:
1) $GDP = a_1U + a_2FC + a_3GCF + a_4Ex - a_5Im - a_7NHI_{al} - a_8NHI_{fu} - a_9NHI_{el}$
2) $FC = a_1U + a_2GDP - a_3GCF - a_4Ex + a_5Im - a_7NHI_{al} - a_8NHI_{fu} - a_9NHI_{el}$
3) $GCF = a_1U + a_2GDP - a_3FC + a_4Ex + a_5Im - a_7NHI_{al} - a_8NHI_{fu} - a_9NHI_{el}$

4) $Im = a_1U + a_2GDP + a_3FC + a_4GCF + a_5Ex + a_7NHI_{al} + a_8NHI_{fu} + a_9NHI_{el}$
5) $Ex = a_1U + a_2GDP + a_3FC + a_4GCF + a_5Im - a_7NHI_{al} - a_8NHI_{fu} - a_9NHI_{el}$

where:
GDP – Gross Domestic Product
U – residual value
FC – consumption by households, government and non-profit organisations
GFC – investment expenditure
Ex – exports
Im – imports
NHI_{al} , NHI_{fu} NHI_{el} – net harmonization indices explained above (Poland and Slovakia)
a_i – direction coefficients with variables
ET – excise taxes

In the presented hypotheses typical variable for balance equation "T' – taxes, was substituted by harmonization indices, what transformed balance equations. As occurred from preliminary simulations variable Tlsp – indirect taxes disturbed estimation of regressions when harmonization indices were included. Therefore it was necessary to eliminate taxes form the most of regressions where harmonization indices were included. The above hypotheses does not contain time factor (t) because it was accepted that different lags were allowed.

In the version of hypotheses for the Czech Republic and Hungary there are two other elements at the end which replace two final elements for Poland and Slovakia: NHI_{hm} NHI_{tr} – net harmonization indices for household maintenance and transport (as discussed above).

In the equations presented, + and – signs show the probable direction of the relationship (positive or negative).

We have accepted as possible solution, the transformation of linear functions presented in the above hypotheses into exponential functions in which, instead of nominal variables, their natural logarithms appear. In order to achieve stationarity of time series, we have also admitted the transformation of logarithms of tested variables into first differences of logarithms of tested variables which are interpreted as quarterly rates of growth of the particular variable. This issue will be discussed more extensively in the further part of the paper.

In consequence, for each of the Central European countries, five hypotheses have been formulated and tested within time series including the data from the first quarter of 1996 until the last quarter of 2003. Unfortunately, full time series of all variables had to be shortened at the beginning or at the end of this period due to the lack of data. We also accepted lagged variables in both types of models: balance based and autoregressive. As a result, quarterly time series included between 20 and 30 periods. All data were calculated in fixed prices which was automatically ensured by the Eurostat internet database. Seasonal dummies were not used as unnecessary due to the nature of transformed variables.

4.4. Further conduct of the research

The estimations based on transformed balance identities resulted in regressions which had relatively very good qualities of fundamental econometric features. Estimations of main diagnostic tests showed very good or at least good econometric qualities of estimations (appendix). As mentioned above, a special procedure for confirming the stability of the regressors' impact direction was adopted.

To confirm the stability of estimated interrelations between harmonization regressors and dependent variable, autoregressive models were built. They had the following forms:

1) $GDP_t = a_1 GDP_{t-1} - a_2 NHI_{al} - a_3 NHI_{fu} - a_4 NHI_{el} + a_5 U$
2) $GDP_t = a_1 GDP_{t-1} + a_2 GDP_{t-2} - a_3 NHI_{al} - a_4 NHI_{fu} - a_5 NHI_{el} + a_6 U$

The same forms were used for confirming the stability of estimations of harmonization variables in relation to the other dependent variables (FC, GCF, Ex, Im). When usage of two basic forms of autoregressive equations did not produced any results, three autoregressive variables (up to three lags) were accepted. There were also situations that one or two autoregressive variables in the equation had the other number of lags (no more than 3, e.g. 1,3; 2,3 etc.) than in the presented above forms of equations.

It was possible to estimate autoregressive equations for all dependent variables, but their econometric qualities (especially R^2) were significantly worse than equations based on transformed balance identities.

The critical for confirmation of the stability of harmonization variables impact was conformity of signs (+/-) ahead of coefficients of harmonization regressors. When the conformity was observed (two types of equations confirmed the same direction of impact) – it was assumed that better econometrically estimated equation presents highly probable dependence between variables. In the opposite situation such impact was not interpreted as not confirmed.

5. Research results

5.1. Impact of harmonization on Gross Domestic Product

In order to estimate the impact of harmonization on GDP the procedure described in item 4 was used. Due to the non-stationarity of the data, the variables were subjected to logarithmic analysis, after which first differences between natural logarithms of variables and their quarterly lags were calculated. As a result new, already stationary variables were created, which may be recorded in the following way:

$DLGDP_t = \ln GDP_t - \ln GDP_{(t-1)}$

Using the properties of logarithms, the DLGDP variable may be easily converted, in the following manner:

$DLGDP_t = \ln(GDP_t / GDP_{(t-1)})$

The $DLGDP_t$ variable means therefore an index showing the value of the logarithm of the quotient of the particular variable by its quarterly lag. This index may be called a quarterly growth index of the particular data in relation to the value of that variable lagged by a quarter. Values of new variables were put into linear equations presenting hypotheses shown in item 4 and the estimation of regression models was conducted. The nature of $DLGDP_t$ variable as quarterly growth index caused that seasonal dummies were not necessary for improving the quality of estimations. It is also worth emphasising here that the estimations correspond with the value of the exponential-power function in the case of which indicators next to variables denote the value of elasticity of that variable with regard to the explained variable.

The following estimations have been obtained:

1. Poland

1.1. Poland. Equation basing on transformed balance identity

$$DLGDP_t = \underset{(4,3779)}{0,44473}\ DLFC_t + \underset{(9,6491)}{0,095524}\ DLGCF_t + \underset{(5,5874)}{0,052638}\ DLEx_{t-1} + \underset{(3,5537)}{0,086026}\ DLIm_t$$

$$- \underset{(-2,5326)}{0.63618}\ DLNHIal_t\ \underset{(-3,0233)}{-0.13517}\ DLNHIfu_{t-3} + \underset{(0,68817)}{.0013855}\ U_t$$

$R^2 = 0,99066$, $DW = 1,9853$

1.2. Poland. Autoregressive equation

$$DLGDP_t = \underset{(-1,9527)}{-\ 0,36160}DLGDP_{t-1} - \underset{(-2,4802)}{0,47043}DLGDP_{t-2} - \underset{(-2,3400)}{2,5474}DLNHIal_{t-2}$$

$$- \underset{(-1,2311)}{0,31698}DLNHIfu_{t-3} + \underset{(1,9967)}{0,81083}DLNHIel_{t-3} + \underset{(1,1504)}{0,011723}U_t$$

$R2 = 0,60034$ $DW = 2,3701$

2. Slovakia

2.1. Slovakia. Equation basing on transformed balance identity

$$DLGDPt = \underset{(28,3888)}{0,69953}\ DLFC_t + \underset{(29,6076)}{0,29441}\ DLGCF_t + \underset{(18,7241)}{0,72973}\ DLEx_t - \underset{(-25,0964)}{0,71580}DLIm_t$$

$$+ \underset{(2,0650)}{0,13315}\ DLNHIal_{t-4} - \underset{(-4,3241)}{0,14716}\ DLNHIfu_t + \underset{(1,8569)}{0,031420}\ DLNHIel_{t-1} - \underset{(-1,0406)}{0,0015183}\ U_t$$

$R2= 0,99152$ $DW = 2,4594$

2.2. Slovakia. Autoregressive equation

$$DLGDP_t = \underset{(-1,7100)}{-0,17449}DLGDP_{t-1} - \underset{(-8,4618)}{0,86364}DLGDP_{t-2} - \underset{(-1,4046)}{0,28155}DLNHIal_{t-1}$$

$$- \underset{(-3,3082)}{0,79886}DLNHIfu_{t-3} + \underset{(1,9289)}{0,14835}DLNHIel_{t-3} + \underset{(1,0510)}{0,0065689}U_t$$

$R^2 = 0,80320$ $DW = 2,3388$

3. Czech Republic

3.1. Czech Republic. Equation basing on transformed balance identity

$$DLGDP_t = \underset{(29,6483)}{0,76208}\ DLFC_t + \underset{(35,3929)}{0,28706}\ DLGCF_t + \underset{(15,9475)}{0,52078}\ DLEx_t - \underset{(-15,5353)}{0,58912}DLIm_t$$

$$\underset{(-1,4848)}{-0,11077}DLNHIal_t + \underset{(1,4115)}{0,089678}DLNHItr_t - \underset{(0,5565)}{0,4799E-3}\ U_t$$

$R^2 = 0,99231$ $DW = 1,9637$

3.2. Czech Republic. Autoregressive equation

$$DLGDP_t = \underset{(-5,9059)}{-0,60902}DLGDP_{t-1} - \underset{(-11,1032)}{0,95857}DLGDP_{t-2} - \underset{(-6,5855)}{0,69464}DLGDP_{t-3}$$

$- 0{,}31377 DLNHIhm_t + 0{,}49561 DLNHItr_{t-2} + 0{,}018484\ U_t$
(-3,8945) (2,3187) (6,0028)
$R^2 = 0{,}88121 \qquad DW = 1{,}3213$

4. Hungary

4.1.a. Hungary. Equation basing on transformed balance identity. Two equations were estimated

$DLGDP_t = 0{,}81893 DLFC_t + 0{,}28505\ DLGCF_t + 0{,}65818\ DLEx_t – 0{,}77569\ DLIm_t$
(18,1451) (24,5019) (27,1005) (-17,5574)
$-0{,}37585\ DLNHIal_t + 0{,}0027078\ U_t$
(-4,6573) (2,1952)
R2 = 0,99114 DW = 2,2439

4.1.b. Hungary. Equation basing on transformed balance identity. Second version

$DLGDP_t = 0{,}80698\ DLFC_t + 0{,}28554\ DLGCF_t + 0{,}65966\ DLEx_t – 0{,}75707\ DLIm_t$
(15,9618) (20,5714) (23,6723) (-15,3878)
$-0{,}28284\ DLNHItr_t + 0{,}0017913\ U_t$
(-3,5555) (1,3428)
R2 = 0,98925 DW = 1,8384

4.2. Hungary. Autoregressive equation

$DLGDP_t = 1{,}0094 DLGDP_{t-4} -0{,}19609 DLNHIal_{t-1} -0{,}37370 NHIal_{t-2}$
(29,4291) (-1,6819) (-3,0159)
$+ 0{,}15970 DLNHItr_{t-4} + 0{,}4745E\text{-}3 U_t$
(1,5978) (0,33091)
R2 = 0,98672 DW = 1,2980

For the research purposes, the most important from the above equations, are values and directions (+/-) of coefficients standing ahead of harmonization variables. They present the value of dependence between regressors and dependent variable (ceteris paribus). Because all variables have logarithmic form, coefficients present elasticity of regressors in relation to dependent variable. More detailed estimations and diagnostic tests of the equations are included in the appendix.

The presentation of fundamental dependencies between dependent variable and harmonization regressors, based on transformed balance identity equations, is included in the table 2. Dependencies which direction was confirmed by autoregressive equations were bolded.

Table 2
Comparison of dependence between harmonization indices and GDP in 4 Central European countries based on balance identity equations and data confirmed by autoregressive equations (bolded)

Country and dependent variable	Existence of dependence [probability of rejection of the hypothesis on the significance of the variable]	Direction of the variable	Strength of the dependence
Poland -DLGDP	**DLNHIal – clear exists [0.025]** **DLNHIfu – clear exists [0.019]** DLNHIel – not assessed	**Negative** **Negative**	**-0.63618** **-0.13517**
Slovakia – DLGDP	DLNHIal – less accurate exists [0.053] **DLNHIfu – accurate exists [0.000]** **DLNHIel – less accurate exists [0.079]**	Positive **Negative** **Positive**	0.13315 **-0.14716** **0.31420**
The Czech Republic –DLGDP	DLNHIal – not very accurate exists [0.155] DLNHIhm – not assessed **DLNHItr – not very accurate exists [0.173]**	Negative **Positive**	-0.11077 **0.089678**

Hungary –DLGDP	**DLNHIal – accurate exists [0.000]** DLNHIhm – not assessed DLNHItr – accurate exists [0.002]	**Negative** Negative	**-0.37585** -0.28284

Source: own study based on estimations of regression models

The data contained in the table indicate that the quite clear interrelations between quarterly increases of harmonization indices and increases of GDP have been observed in relation to Poland and Slovakia. In those countries two out of each three indices showed reliable interrelations with GDP. In the Czech Republic and Hungary only one balance based regressor's impact in each country was confirmed by autoregressive models, however in the Czech Republic it was not very precise estimation. Interrelations between the harmonization variables and GDP were differentiated among the Central European countries. In Slovakia, a positive dependence was observed between $DLNHI_{el}$ and DLGDP and negative between $DLNHI_{fu}$ and DLGDP. In Poland and Slovakia the strength of impact of $DLNHI_{fu}$ on DLGDP was nearly the same and amounted to -0,13517 and -0,14716 respectively. It is highly probable that harmonization of indirect taxes in those countries negatively affected the growth rate of GDP. In Poland and Hungary there was a negative impact of $DLNHI_{al}$ on DLGDP observed, however in Poland it was two times stronger than in Hungary. It may mean that the policy of alcohol and tobacco products negatively affected GDP growth.

Out of 6 impacts of harmonization regressors on GDP, which were confirmed by two types of equations four were negative and two positive. It seems worth underlining negative impacts of fuel taxes harmonization on GDP in Poland and Slovakia. When we compare estimations of fuel harmonization variables with chart 1 and 2 it seems that in Poland net harmonization was always over the EU15 level while in Slovakia for the most of examined period 1996-2003 it was below the EU15 level. Despite of it both harmonizations affected negatively the GDP growth rate. It may mean that Slovakia was very sensitive for even very small harmonization, below EU level, and even such harmonization could negatively affect GDP growth. In Poland achieving nearly the same negative impact required serious tax increases what is visible form chart 1.

To sum up, it should be said that there are clear interrelations between the harmonization of indirect taxes and GDP. Those interrelations are negative in most of the models estimated. The strongest interrelations between the harmonization and GDP occur in Slovakia and in Poland. Quite strong interrelations are observed in Hungary. In the Czech Republic the interrelations observed are both the weakest and the least precise.

5.2. Influence of harmonization of indirect taxes on Final Consumption Expenditure

In order to estimate the influence of harmonization on final consumption expenditure (FC), the procedure described in chapter 5.1. was used. Due to the non-stationarity of data, a differentiated procedure was used for Poland and Slovakia and for the Czech Republic and Hungary. For Poland the values of natural logarithms were estimated for the largest number of variables possible in balance based equations, and only if they were not stationary the procedure of calculation of differences between natural logarithms of the variable and its quarterly lagged value was applied, which provided very clear interpretations. With regard to harmonization indices, in all cases first differences of logarithms were estimated. With regard to Slovakia, the Czech Republic and Hungary difference variables besides the residual element have always been used in estimations.

The interpretation of the logarithmic-difference variable is the same as in the case of DLGDP but with regard to final consumption. The interpretation of the exclusively logarithmic variable is simpler because coefficients next to independent variables denote their elasticity in relation to the dependent variable.

The final consumption variable shows the volume of consumption by households, government, and non-profit organisations. This is an aggregate which appears in the ESA 95 system and which shows the entire value of consumption in the economy, and not only private consumption as it used to be presented in the economics. In the case where a reliable model could not be estimated for all variables simultaneously, it was estimated separately for each of the variables.

The following estimations have been obtained:

1. Poland

1.1.a. Poland, Equation basing on transformed balance identity (1)

$LFC_t = 0{,}70607\ LGDP_{t-1} - 0{,}045701\ LGCF_{t-1} + 0{,}036668\ LEx_{t-2} + 0{,}14894\ LET_t$

(14,8171) (-4,1507) (4,2366) (7,3836)

$- 0{,}65574\ DLNHIal_t + 0{,}20875\ DLHIfu_t + 1{,}9706\ U_t$

(-4,0348) (4,8112) (5,2229)

$R^2=0{,}99276$ DW=2,2073

1.1.b. Poland, Equation basing on transformed balance identity (2)

$LFC_t = 0{,}75995\ LGDP_{t-1} - 0{,}041959\ LGCF_{t-1} + 0{,}030618 Lex_{t-2} + 0{,}11847 LET_t$

(21,5140) (-4,3552) (3,6308) (6,0048)

$+19128\ DLNHIfu_t - 0{,}24631\ DLNHIel_t + 1{,}6318\ U_t$

(5,3886) (-4,1760) (5,6365)

$R^2=0{,}99294$ DW=1,8509

1.2. Poland, autoregressive,

$DLFC_t=0{,}17786 DLFC_{t-1} -0{,}97983 DLFC_{t-2} +0{,}70177 DLNHIal_t +0{,}42927 DLNHIal_{t-4}$

(3,1298) (-19,7311) (3,1427) (3,8223)

$+0{,}057238 DLNHIfu_{t-1} -1{,}5456 DLNHIel_t +0{,}016218 U_t$

(1,3836) (-1,8575) (10,1527)

$R^2=0{,}97519$ DW=2,3290

2. Slovakia

2.1 Slovakia, Equation basing on transformed balance identity

$DLFC_t = 1{,}3966\ DLGDP_t - 0{,}41338\ DLGCF_t - 1{,}0224\ DLEx_t + 1{,}0168\ DLIm_t$

(28,3888) (-23,4355) (-16,2268) (31,4246)

$-0{,}16540\ DLNHIal_{t-4} + 0{,}21099\ DLXNHIfu_t -0{,}043078\ DLXNHIel_{t-1} + 0{,}0021886\ U_t$

(-1,7709) (4,4533) (-1,7924) (1,0629)

$R^2=0{,}99365$ DW=2,4255

2.2. Slovakia, autoregressive

$DLFC_t=0{,}17786 DLFC_{t-1} -0{,}97983 DLFC_{t-2} +0{,}70177 DLNHIal_t +0{,}42927 DLNHIal_{t-4}$

(3,1298) (-19,7311) (3,1427) (3,8223)

$+0{,}057238 DLNHIfu_{t-1} -0{,}15456 DLNHIel_t +0{,}016218 U_t$

(1,3836) (-1,8575) (10,1527)

R^2=0,97519 DW=2,3290

3. Czech Republic

3.1. Czech Republic, Equation basing on transformed balance identity

$$DLFC_t = 1{,}1806\, DLGDP_t - 0{,}34181\, DLGCF_t - 060071\, DLEx_t + 0{,}76220\, DLIm_t$$
$$\quad (23{,}9584) \quad (-22{,}8229) \quad (-13{,}7544) \quad (22{,}8359)$$

$$+ 012928\, DLNHIal_t - 0{,}084910\, DLNHIhm_{t-2} - 0{,}25903\, DLNHItr_{t-2} + 0{,}3436E\text{-}3\, U_t$$
$$\quad (1{,}3776) \quad (-2{,}2583) \quad (-2{,}2458) \quad (0{,}25995)$$

R^2=0,99709 DW=2,5618

3.2. Czech Republic, autoregressive

$$DLFC_t = -0{,}93162 DLFC_{t-1} - 0{,}91476 DLFC_{t-2} - 0{,}91341 DLFC_{t-3} + 0{,}43935 DLNHIal_{t-2}$$
$$\quad (-16{,}2428) \quad (-13{,}6707) \quad (-14{,}8599) \quad (1{,}8028)$$

$$+0{,}49611 DLNHIal_{t-3} - 0{,}42387 DLNHIhm_t - 0{,}30594 DLNHIhm_{t-1} - 0{,}28105 DLNHIhm_{t-2}$$
$$\quad (1{,}9174) \quad (-4{,}9408) \quad (-3{,}4914) \quad (-3{,}0289)$$

$$-0{,}20849 DLNHIhm_{t-3} - 0{,}50301 DLNItr_{t-2} - 0{,}51090 DLNHItr_{t-3} + 0{,}043181 U_t$$
$$\quad (-2{,}3151) \quad (-2{,}2433) \quad (-2{,}1539) \quad (11{,}5526)$$

R^2=0,98524 DW=2,6209

4. Hungary

4.1. Hungary, Equation basing on transformed balance identity (1)

$$DLFC_t = 1{,}1351\, DLGDP_t - 0{,}33491\, DLGCF_t - 0{,}75169\, DLEx_t + 0{,}93169\, DLIm_t$$
$$\quad (17{,}8554) \quad (-19{,}9693) \quad (-16{,}0789) \quad (23{,}0542)$$

$$+ 0{,}47754\, DLNHIal_t - 0{,}0034834\, U_t$$
$$\quad (4{,}9581) \quad (-2{,}4101)$$

R^2=0,97805 DW=2,1413

4.1. Hungary, Equation basing on transformed balance identity (2)

$$DLFC_t = 1{,}1366\, DLGDP_t - 0{,}33577\, DLGCF_t - 0{,}75791\, DLEx_t + 0{,}91626\, DLIm_t$$
$$\quad (15{,}9618) \quad (-17{,}6368) \quad (-14{,}4105) \quad (20{,}4575)$$

$$+ 0{,}35357\, DLNHItr_t - 0{,}0023998 U_t$$
$$\quad (3{,}8633) \quad (-1{,}5342)$$

R2=0,97246 DW=1,7884

4.2. Hungary, autoregressive

$$DLFC_t = 0{,}698 DLFC_{t-1} - 0{,}97913 DLFC_{t-2} - 0{,}72269 DLFC_{t-3} + 1{,}0628 DLNHIal_{t-1}$$
$$\quad (-5{,}8590) \quad (-9{,}0245) \quad (-7{,}0074) \quad (4{,}6100)$$

$$+0{,}45433 DLNHIal_{t-2} + 0{,}88749 DLNHIal_{t-3} - 0{,}53281\, DLNHIhm_t + 0{,}52334 DLNHItr_t$$
$$\quad (1{,}7434) \quad (3{,}1082) \quad (-1{,}6865) \quad (2{,}4107)$$

$$+0{,}041917 U_t$$
$$(10{,}0039)$$

R^2=0,89545 DW=1,2852

The presentation of fundamental dependencies between dependent variable and harmonization regressors, based on transformed balance identity equations, is included in the table 3. Dependencies which direction was confirmed by autoregressive equations were bolded.

Table 3

Comparison of impacts of harmonization variables on final consumption (FC) in 4 Central European countries, based on balance based equations, confirmed by autoregressive equations (bolded)

Country and dependent variable	Existence of dependence [probability of rejection of the hypothesis on the significance of the variable]	Direction of the variable	Strength of the dependence
Poland –LFC	DLNHIal – accurate exists [0.001] **DLNHIfu – accurate exists [0.000]** **DLNHIel – accurate exists [0.000]**	Negative **Positive** **Negative**	-0.65574 **0.20875 (0.19128)** **-0.24631**
Slovakia – DLFC	DLNHIal – not very accurate exists [0.093] **DLNHIfu – accurate exists [0.000]** **DLNHIel – less accurate exists [0.089]**	Negative **Positive** **Negative**	-0.16540 **0.21099** **-0.043078**
The Czech Republic –DLFC	**DLNHIal – not very accurate exists [0.184]** **DLNHIhm – quite accurate exists [0.036]** **DLNHItr – quite accurate exists [0.026]**	**Positive** **Negative** **Negative**	**0.12928** **-0.084910** **-0.25903**
Hungary –DLFC	**DLNHIal – accurate exists [0.000]** DLNHIhm – not assessed **DLNHItr – accurate exists [0.001]**	**Positive** **Positive**	**0.47754** **0.35357**

Source: own study based on estimations of regression models

The data presented in the table indicate that in the large majority of cases very accurate estimations of harmonization variables have been achieved. This refers to all countries covered by the analysis. Besides, out of 11 harmonization variables estimated with use of balance based equations 9 were confirmed by autoregressive ones. However, one should note the differences in the meaning of the dependent variables. For Poland this is the volume of consumer expenditure, for the remaining three countries this is the quarterly growth rate of consumer expenditure. Moreover, both in one and in the other case, the consumption includes private and government consumption.

The results of Poland's and Slovakia's estimations achieved indicate strong negative interrelations between the volume of consumer expenditures and the quarterly growth of the harmonization index. However negative impacts of DLNHIal were not confirmed by autoregressive equations in both countries. It is very characteristic that tax harmonization in fuels stimulates the growth of general consumption expenditure in Slovakia and in Poland and the strength of this impact is nearly the same in both countries. The harmonization of indirect taxes on energy in Poland and Slovakia had negative impact on final consumption expenditure. It may mean that increase of taxes in energy products stimulates economic use of them. However such observation it is not applicable for impacts of fuels harmonization variables on final consumption expenditures. Interrelations between $DLNHI_{fu}$ and LFC (Poland) and DLFC (Slovakia) are positive. In both countries the increase of the quarterly fuel index has been accompanied by an increase in consumer expenditures. This impact was three times stronger in Slovakia than in Poland.

As regards Hungary and the Czech Republic, it may be said that the harmonization of indirect taxes in alcohol/tobacco product group was accompanied by an increase of the quarterly growth rate of final consumption expenditures, and this interrelation was almost four times stronger in Hungary than in the Czech Republic. In the Czech Republic a negative interrelation between the quarterly growth of the NHI_{hm} and NHI_{tr} in relation to FC was observed, which may be the evidence that harmonization in those product groups has not resulted in any particular increase of consumer expenditures and stimulated economizing. It is worth emphasising that the negative interrelation between the aggregate NHI_{hm} index and consumer expenditures in the Czech Republic is very small. In Hungary, the quarterly growth of NHI_{tr} showed strong positive interrelation with the quarterly growth of consumer expenditures. This might mean that the increase in the prices of fuels was strongly reflected in the prices of transport in that country. To sum up, it should be said that in the majority of cases analysed there were positive interrelations between harmonization indices and the increase in consumer expenditures. This may be the evidence that the harmonization affected consumption expenditures strongly, stimulating the general growth of expenditures. There were also negative interrelations which showed that the harmonization of indirect taxes could influence the reduction of final consumption expenditures what is an evidence for economizing processes. Such situation could take place if the effect of reduction of consumption in physical units was stronger than the effect of the growth of consumption in terms of value.

5.3. Influence of harmonization of indirect taxes on gross capital formation (GFC)

To estimate the influence of harmonization on gross capital consumption, the procedure described in chapter 5.1. was used. Due to the non-stationarity of data, variables were subjected to logarithmic analysis, after which first differences between natural logarithms of variables and their quarterly lags were calculated. As a result new, already stationary variables were created, which may be recorded in the following way:

$DLGCF_t = \ln GCF_t - \ln GCF_{(t-1)}$

Using the properties of logarithms, the $DLGCF_t$ variable may be easily converted, in the following manner:

$DLGCF_t = \ln(GCF_t/GCF_{(t-1)})$

The $DLGCF_t$ variable is interpreted in the same manner as the $DLGDP_t$ variable, but it refers to investments. The gross capital consumption variable shows investment expenditure of all institutional sectors: private sector, government and non-profit organisations.

The following estimations have been obtained:

1. Poland

1.1. Poland, Equation basing on transformed balance identity

$$DLGCF_t = \underset{(20,7142)}{5,6405\ DLGDP_t} - \underset{(-4,5735)}{3,6686\ DLFC_t} - \underset{(-5,4055)}{0,40528\ DLEx_t} + \underset{(2,7431)}{4,7391\ DLNHIal_t}$$
$$+ \underset{(2,6939)}{1,0062\ DLNHIfu_{t-2}} + \underset{(0,091659)}{0,0015115\ U_t}$$

$R^2=0,97969 \qquad DW=2,2775$

1.2. Poland, autoregressive

$$DLGCF_t = \underset{(-4.1185)}{-0.68352 DLGCF_{t-1}} \underset{(-2.0970)}{-0.34678 DLGCF_{t-2}} + \underset{(2.0038)}{7.9020 DLNHIal_{t-1}}$$
$$+ \underset{(1.9220)}{2.7743 DLNHIfu_t} - \underset{(-1.4186)}{1.7681 DLNHIfu_{t-3}} + \underset{(1.9145)}{4.3234 DLNHIel_{t-3}} + \underset{(0.13406)}{0.0073634 U_t}$$

$R^2 = 0.65992 \qquad DW = 1.9408$

2. Slovakia

2.1. Slovakia, Equation basing on transformed balance identity

$$DLGCFt = \underset{(26,3165)}{3,3231\ DLGDP_t} - \underset{(-24,1680)}{2,4109\ DLFC_t} - \underset{(-13,8945)}{2,4728\ DLEx_t} + \underset{(19,3008)}{2,4676\ DLIm_t}$$

$$- 0{,}2441\ DLNHIal_{t-1} + 0{,}53557\ DLNHIfu_t - 0{,}14146\ DLNHIrl_{t-1} + 0{,}0079193\ U_t$$
(-1,1489) (4,4777) (-1,9021) (1,5286)

R^2=0,98168 DW=2,3351

2.2. Slovakia, autoregressive

$$DLGCF_t = -0.64349DLGCF_{t-2} + 1.2998DLNHIal_t + 2.1707DLNHIfu_{t-4}$$
(-4.6882) (2.1388) (2.4959)

$$+ 0.0075752U_t$$
(0.41693)

R^2 = 0.61330 DW = 1.5685

3. Czech Republic

3.1. Czech Republic, Equation basing on transformed balance identity

$$DLGCF_t=3{,}4472DLGDP_t-2{,}5901DLFC_t-1{,}7220DLEx_t+1{,}9746DLIm_t+0{,}30126DLNHIal_t$$
(35,2682) (-27,4082) (-13,9832) (13,4699) (1,0894)

$$+0{,}050605DLNHIhm_t-0{,}32183DLNHItr_t-0{,}011543U_t$$
(0,61467) (-1,3561) (-0,35657)

R^2= 0,99095 DW= 2,1672

3.2. Czech Republic, autoregressive

$$DLGCF_t = -0.51129DLGCF_{t-2} – 1.2015DLGDP_{t-2} + 1.8075DLNHIal_{t-1}$$
(-4.3566) (-2.5602) (1.4639)

$$+ 1.4052DLNHIhm_{t-2} + 2.7552DLNHItr_{t-3} – 0.0012527U_t$$
(3.4514) (2.6942) (-0.078174)

R^2 = 0.78513 DW = 2.0656

4. Hungary

4.1. Hungary, Equation basing on transformed balance identity

$$DLGCF_t=3{,}4205DLGDP_t-2{,}5590DLFC_t-2{,}3417DLEx_t+2{,}7139DLIm_t+0{,}98631DLNHIal_t-$$
(30,3837) (-19,6402) (-25,1716) (35,0856) (4,3005)

$$0{,}39080DLNHIhm_{t-3}-0{,}48731DLNHItr_{t-1}-0{,}0075421U_t$$
(-1,9211) (-2,4437) (-2,2457)

R^2=0,99469 DW=1,9873

4.2. Hungary, autoregressive

$$DLGCF_t = -0.60293DLGCF_{t-1} – 0.34965DLGCF_{t-2} – 0.66150DLGCF_{t-3}$$
(-3.9516) (-1.8707) (-4.2840)

$$- 2.3596DLNHIal_{t-1} + 2.7487DLNHItr_{t-3} + 0.030243U_t$$
(-1.9080) (2.5651) (1.7656)

R^2 = 0.76488 DW = 1.6658

The presentation of dependencies between dependent variable and harmonization regressors, based on transformed balance identity equations, is included in the table 4. Dependencies which direction was confirmed by autoregressive equations were bolded.

Table 4
Comparison of impacts of harmonization variables on Gross Capital Formation (GCF) in 4 Central European countries, based on balance based equations, confirmed by autoregressive equations (bolded)

Country and dependent variable	Existence of dependence [probability of rejection of the hypothesis on the significance of the variable]	Direction of the variable	Strength of the dependence
Poland –DLGCF	**DLNHIal – accurate exists [0.014]** **DLNHIfu – accurate exists [0.009]** DLNHIel – not assessed	**Positive** **Positive**	**4.7391** **1.0062**

Slovakia – DLGCF	DLNHIal – not very clear exists [0.265] **DLNHIfu – very accurate exists [0.000]** DLNHIel – less accurate exists [0.072]	Negative **Positive** Negative	-0.21441 **0.53557** -0.14146
The Czech Republic –DLGCF	**DLNHIal – not very clear [0.290]** DLNHIhm – not assessed more clearly DLNHItr – not very clear [0.191]	**Positive** Negative	**0.30126** -0.32183
Hungary –DLGCF	DLNHIal – accurate exists [0.000] DLNHIhm – close to accurate exists [0.069] DLNHItr – accurate exists [0.024]	Positive Negative Negative	0.98631 -0.39080 -0.48731

Source: own study based on estimations of regression models

Impact of consumer goods taxes harmonization on investment? The fact that harmonization variables have been included in the estimations may be a surprise. It is worth considering what the channels of influence of the harmonization on gross capital formation are. Indirect taxes are levied both on consumer and investment goods. VAT on the purchase of investment assets is subject to immediate deduction which may result in negative interrelations between indirect taxes and investments. Moreover, part of the harmonized goods, particularly fuel and energy, are elements used in production processes. Their prices may affect investments, e.g. pro-effectiveness or energy-saving ones. It seems to illogical that consumption affects the level of gross capital formation, but the consumption affects the level of consumption, and the level of consumption obviously affects the volume of investments. There may also be direct interrelations between the harmonization of indirect taxes for alcohol and tobacco products and e.g. the volume of gross capital formation in those industries (e.g. in the fast-developing brewing industry). Thus, a seemingly illogical study may provide rather interesting results.

The interrelations between harmonization indices and gross capital formation expenditure in income balance regression models indicate relatively weak interrelations in Slovakia and Czech Republic. In those countries only one impact directions of harmonization variables was confirmed by autoregressive models. In Poland two harmonization variables had confirmed impacts on GFC and in Hungary none.

The research indicated the existence of positive interrelations between $DLNHI_{fu}$ and DLGCF in Poland and Slovakia. In Poland it was two times stronger than in Slovakia. It is rather doubtful that harmonization of taxes imposed on fuels stimulated general growth of investment expenditures. Of course some investment could be stimulated by harmonization of taxes on fuels like investments in alternative fuels, investments in economizing fuels etc. It can be rather considered that the process of tax harmonization in fuels was accompanied by the process of investment growth in those countries.

It can be also explained in the different way. If the harmonization of indirect taxes means an increase of indirect levies on goods, then the use of those goods for investment and production processes means immediate deduction of those taxes. This increases the level of the relative benefit for the investor resulting from the use of the harmonized goods, e.g. for private purposes. Thus, if indirect taxes grow as a result of harmonization, then part of sales may be posted as “production” or “investment” and not private sales. This may probably be the one of the reasons for the existence of so clear interrelations between harmonization indices in fuels product group and investments in the economy .

To sum up, the interrelation between capital investments and harmonization indices in 4 countries covered by the study turned out to be unexpectedly strong in Poland and not strongly confirmed by alternative equations in other countries. Positive interrelations between gross capital formation and fuel indices may prove that harmonization may even promote investments through increasing the relative benefits for investors resulting from the deduction of indirect taxes.

5.4. Influence of harmonization of indirect taxes on Imports (Im)

In order to estimate the impact of harmonization on imports (Im), the procedure described in chapter 5.1. was used. Due to the non-stationarity of data a differentiated procedure has been used for Poland and Slovakia, the Czech Republic and Hungary. For Poland the values of natural logarithms were estimated for the largest number of variables possible, and only if they were not stationary the procedure of calculation of differences between natural logarithms of the variable and its quarterly lagged value was applied, which provided very clear interpretations. With regard to harmonization indices, in all cases first differences of logarithms were estimated. With regard to Slovakia, the Czech Republic and Hungary difference variables besides the residual element have always been used in estimations.

The interpretation of the logarithmic-difference variable is the same as in the case of DLGDP but with regard to imports. The interpretation of the exclusively logarithmic variable is simpler because coefficients next to independent variables denote their elasticity in relation to the dependent variable.

It has been assumed hypothetically that the harmonization of indirect taxes may promote imports as it reduces consumption in real terms, and this in turn reduces domestic production. The domestic production reducing factor may influence the growth of requirement for foreign production, i.e. imports. This interrelation does not necessarily have to take place if the harmonized goods are imported directly from abroad. In such a case harmonization may decrease imports.

The following estimations have been obtained:

1. Poland

1.1. Poland, Equation basing on transformed balance identity

$$LIm_t = \underset{(7,1245)}{0,24161LEx_t} + \underset{(11,3689)}{1,4016LFCH_{t-1}} - \underset{(-7,2595)}{1,2594LFCG_{t-1}} + \underset{(4,4318)}{0,19328LGCF_{t-3}}$$
$$+\underset{(3,4586)}{2,4438DLNHIal_t} + \underset{(2,9517)}{0,40203DLNHIfu_{t-3}} + \underset{(1,3327)}{0,34621DLNHIel_{t-1}} + \underset{(1,6806)}{2,6396U_t}$$

R^2=0,92329 DW=2,0636

1.2. Poland, autoregressive

$$DLIm_t = \underset{(-7.5711)}{-0.68787DLIm_{t-2}} + \underset{(4.1479)}{6.6687DLNHIal_t} - \underset{(-5.9258)}{10.5040DLNHLal_{t-1}} - \underset{(-2.2963)}{0.95453DLNHIfu_t}$$
$$+ \underset{(3.5121)}{1.3165DLNHIfu_{t-1}} + \underset{(3.0684)}{0.91904DLNHIfu_{t-3}} + \underset{(2.2471)}{1.5693DLNHIel_{t-1}} + \underset{(3.2778)}{1.9569DLNHIel_{t-2}}$$
$$+ \underset{(0.76146)}{0.011418U_t}$$

R^2 = 0.93393 DW = 2.5777

2. Slovakia

2.1. Slovakia, Equation basing on transformed balance identity

$$DLIm_t = \underset{(25,0964)}{-1,3561DLGDP_t} + \underset{(31,4246)}{0,96491DLFC_t} + \underset{(18,7453)}{0,39896DLGCF_t} + \underset{(26,0389)}{1,0171DLEx_t}$$

$+0{,}15504DLNHIal_{t-4}-0{,}20130DLNHIfu_t+0{,}041723DLNHIel_{t-1}-0{,}0024715U_t$
(1,6938) (-4,2716) (1,7803) (-1,2449)
$R^2=0{,}99543$ DW=2,4519

2.2. Slovakia, autoregressive
$DLIm_t = -0.64537DLIm_{t-1} - 0.58768DLIm_{t-3} - 1.1370DLNHIfu_{t-2} - 0.44753DLNHIel_{t-1}$
(-4.6614) (-4.1857) (-2.1424) (-2.3559)
$+ 0.048558U_t$
(3.6093)
$R^2 = 0.74367$ DW = 2.2039

3. Czech Republic
3.1.Czech Republic, Equation basing on transformed balance identity
$DLIm_t=0{,}63367DLEx_t+0{,}11434DLFCH_t+0{,}42631DLFCG_t+0{,}088353DLGCF_t$
(11,8589) (1,9095) (9,1910) (2,9130)
$-0{,}32510DLNHIhm_{t-1}-0{,}51249\ DLNHItr_t+0{,}0092594U_t$
(-4,1748) (-2,6569) (3,1389)
$R^2=0{,}97328$ DW=2,0420

3.2. Czech Republic, autoregressive
$DLIm_t = -0{,}53687DLIm_{t-1} - 0{,}31893DLIm_{t-3} - 0{,}39345DLNHIhm_{t-2}$
(-4,4880) (-2,4244) (-1,8338)
$+0{,}97075DLNHItr_{t-1} + 0{,}051259U_t$
(1,9265) (6,4993)
$R^2 = 0{,}78053$ DW = 1,8096

4.Hungary
4.1.a. Hungary, Equation basing on transformed balance identity (1)
$DLIm_t=-1{,}3101DLGDP_t+0{,}98032DLFC_t+0{,}36036DLGCF_t+0{,}91716DLEx_t$
(-17,2698) (17,8337) (24,9269) (22,3536)
$+0{,}29472DLNHIhm_{t-3}+0{,}2058E\text{-}3U_t$
(2,8800) (0,12296)
$R^2=0{,}99250$ DW=2,5827

4.1.b. Hungary, Equation basing on transformed balance identity (2)
$DLIm_t=-1{,}2168DLGDP_t+1{,}0085DLFC_t+0{,}35867DLGCF_t+0{,}85245DLEx_t-0{,}34271DLNHItr_t$
(-17,3348) (21,7526) (27,8311) (22,4899) (-4,0080)
$+0{,}0021982U_t$
(1,4721)
$R^2=0{,}99403$ DW=1,9158

4.2. Hungary, autoregressive
$DLIm_t = -0{,}33285DLIm_{t-1} - 0{,}46723DLIm_{t-3} + 0{,}95978DLNHIhm_{t-3}$
(-2,1266) (-3,0380) (1,2225)
$+ 0{,}052647U_t$
(4,2293)
R2 = 0,59701 DW = 1,5464

The presentation of relations between dependent variable and harmonization regressors, based on transformed balance identity equations, is included in the table 5. Dependencies which direction was confirmed by autoregressive equations were bolded.

Table 5
Comparison of impacts of harmonization variables on Imports (Im) in 4 Central European countries, based on balance based equations, confirmed by autoregressive equations (bolded)

Country and dependent variable	Existence of dependence [probability of rejection of the hypothesis on the significance of the variable]	Direction of the variable	Strength of the dependence
Poland –LIm	DLNHIal – accurate exists [0.004] **DLNHIfu – accurate exists [0.011]** **DLNHIel – not very clear exists [0.204]**	Positive **Positive** **Positive**	2.4438 **0.40203** **0.34621**
Slovakia – DLIm	DLNHIal – not very accurate exists [0.107] **DLNHIfu – accurate exists [0.000]** DLNHIel – less accurate exists [0.091]	Positive **Negative** Positive	0.15504 **-0.20130** 0.041723
The Czech Republic –DLIm	DLNHIal – not assessed **DLNHIhm – accurate exists [0.000]** DLNHItr – accurate exists [0.014]	 **Negative** Negative	 **-0.32510** -0.51249
Hungary –DLIm	DLNHIal – not confirmed **DLNHIhm – accurate exists [0.009]** DLNHItr – accurate exists [0.001]	 **Positive** Negative	 **0.29472** -0.34271

Source: own study based on estimations of regression models

The estimations presented in table 5 show that there are larger considerable differences between countries with regard to the nature and strength of the interrelation between imports and harmonization indices. In Poland all interrelations are positive, but two of them were confirmed by autoregressive models. This may mean that the quarterly increase of harmonization indices is accompanied by an increase in the level of imports. In relation to Poland the hypothesis on the positive impact of harmonization on imports is at most confirmed.

In other countries the confirmed interrelations between Harmonization variables and imports are diversified. It may be due to the size of the countries. In Slovakia there is confirmed negative interrelation between $DLNHI_{fu}$ and DLIm. Slovakia is a net exporter of processed fuels. The strength of fuel taxes harmonization in Slovakia was much weaker than on the average harmonization in EU (see chart 2). This "negative" harmonization could of course support local consumption but when indirect taxes are growing also trade margins grow in the oil industry. When fuel taxes grew slower than in surrounding countries there was not the stimuli for margins increase and therefore it negatively affected imports to Slovakia. Quite opposite was in Poland (see chart 1). The governments of Poland supported tax harmonization in the extent much higher than on the average in EU and it supported margins increase and positively affected imports. And it is visible in both balance based and autoregressive equations.

To sum up, it may be assumed that in Poland the harmonization of indirect taxes promoted imports (e.g. by reducing the domestic production), and in the Czech Republic the harmonization reduced imports. In Hungary and in Slovakia the situation was differentiated. Conclusions from estimations may be also justified by the sizes of countries in question. In Poland most of the harmonization goods are manufactured domestically, whereas in smaller countries such situation does not necessarily exist – that is why the influence of the harmonization of indirect taxes on the decrease in imports is possible. General conclusion is that harmonization of indirect taxes generally supports imports to larger countries while in smaller the situation can be differentiated.

5.5. Influence of harmonization of indirect taxes on Exports (Ex)

In order to estimate the impact of harmonization on exports (Ex) the procedure described in chapter 5.1. was used. Due to the non-stationarity of data a differentiated procedure has been used for Poland and Slovakia, the Czech Republic and Hungary. This procedure corresponded to the procedure applied in relation to imports.

It has been assumed hypothetically that the harmonization of indirect taxes may reduce exports as it reduces consumption in real terms, and this in turn reduces domestic production. The reduction of domestic product may restrict exports through supply interrelations. This interrelation does not necessarily have to take place if the harmonization of indirect taxes concerns mainly imported goods. Moreover, the harmonization of indirect taxes may promote exports if it "pushes out" the unsold domestic production to be exported (demand correlations).

In the research procedure the following estimations have been obtained:

1. Poland

1.1.Poland, Equation basing on transformed balance identity

$$\underset{}{LEx_t}=\underset{(7,2204)}{2,8708lIm_{t-1}}\underset{(-6,6312)}{-1,2306LGCF_t}\underset{(-4,4427)}{-4,2236LFC_t}\underset{(-5,4994)}{-22,7348DLNHIal_{t-1}}\underset{(2,3677)}{+1,9006DLNHIfu_t}$$

$$\underset{(2,2044)}{+3,4264DLNHIel_{t-1}}\underset{(4,6918)}{+40,1039U_t}$$

R^2=0,88403 DW=1,7626

1.2. Poland, autoregressive

$$DLEx_t=\underset{(-2,3868)}{-0,26396DLEx_{t-1}}\ \underset{(-6,3696)}{-0,78321DLEx_{t-2}}\ \underset{(2,8282)}{+15,0812DLNHIal_{t-1}}\ \underset{(-3,9162)}{-18,1985DLNHIal_{t-1}}$$

$$\underset{(-2,2507)}{-2,8150DLNHIfu_t}\ \underset{(2,9039)}{+3,7038DLNHIfu_{t-1}}\ \underset{(-3,2977)}{-6,1586DLNHIel_{t-3}}\ \underset{(1,2429)}{+0,052120U_t}$$

R^2=0,87241 DW=2,7869

2.Slovakia

2.1.a. Slovakia, Equation basing on transformed balance identity (1)

$$DLEx_t=\underset{(16,6061)}{1,2105DLGDP_t}\underset{(-13,1199)}{-0,83027DLFCt}\underset{(-12,5821)}{-0,34123DLGCF_t}\underset{(22,6353)}{+0,93435DLIm_t}\underset{(3,0664)}{+0,24315DLNHIal_{t-3}}$$

$$\underset{(1,7123)}{+0,0035927U_t}$$

R^2=0,98072 DW=0,0020982

2.1.b. Slovakia, Equation basing on transformed balance identity (2)

$$DLEx_t=\underset{(18,5626)}{1,2340DLGDP_t}\underset{(-15,2361)}{-0,88581DLFC_t}\underset{(-14,1108)}{-0,35641DLGCF_t}\underset{(25,1064)}{+0,94010DLIm_t}\underset{(3,9936)}{+0,19229DLNHIfu_t}$$

$$\underset{(1,7707)}{+0,0033366U_t}$$

R^2=0,98414 DW=2,5627

2.2.Slovakia, autoregressive

$$DLEx_t=-0{,}34513DLEx_{t-1} -0{,}60162DLNHIal_t +0{,}64548DLNHIfu_t -0{,}39546DLNHIel_t$$
(-2,0831) (-1,3346) (2,2805) (-2,3908)

$$+0{,}052513U_t$$
(5,1234)

R^2=0,50675 DW=1,7482

3. Czech Republic

3.1.Czech Republic, Equation basing on transformed balance identity

$$DLEx_t=1{,}2807DLIm_t-0{,}53420DLFCG_t-0{,}12645DLGCF_t-0{,}68009DLNHIal_t$$
(13,2578) (-6,1008) (-2,9536) (-2,2077)

$$+0{,}32863DLNHIhm_{t-1}+0{,}62776DLNHItr_t+-0{,}0093355U_t$$
(2,7633) (2,2745) (-2,0740)

R^2=0,93501 DW=2,2504

3.2. Czech Republic, autoregressive

$$DLEx_t = -0.39275DLEx_{t-1} -0.44329DLEx_{t-3} -1.1506DLNHIal_{t-2} + 0.56705DLNHIhm_t$$
(-2.9673) (-4.1894) (-1.9961) (2.8097)

$$+ 0.40481DLNHIhm_{t-3} + 2.2882DLNHItr_{t-2} + 0.23544U_t$$
(2.3869) (5.1904) (2.9378)

R^2 = 0.82513 DW = 1.9409

4.Hungary

4.1.a. Hungary, Equation basing on transformed balance identity (1)

$$DLEx_t=1{,}4745DLGDP_t-1{,}2217DLFC_t-0{,}42713DLGCF_t+1{,}1851DLIm_t+0{,}59711DLNHIal_t$$
(26,5248) (-16,0789) (-20,1259) (21,9088) (4,7671)

$$-0{,}0041148U_t$$
(-2,1944)

R^2=0,98987 DW=2,0448

4.1.b. Hungary, Equation basing on transformed balance identity (1)

$$DLEx_t=1{,}4237DLGDP_t-1{,}0162DLFC_t-0{,}37949DLGCF_t+1{,}0443DLIm_t-3{,}2456DLNHIhm_{t-3}$$
(24,9414) (-12,8638) (-18,6733) (22,3536) (-3,0093)

$$+0{,}5252E-2U_t$$
(0,29451)

R^2=0,99028 DW=2,3554

4.2. Hungary, autoregressive

$$DLEx_t = -3.3829DLEx_{t-2} + 0.75991DLlm_t – 0.77400DLNHIal_t + 0.65773DLNHIhm_{t-2}$$
(-4.1238) (9.9371) (-1.7712) (1.6597)

$$- 1.1159DLNHItr_{t-2} + 0.016417U_t$$
(-3.4758) (2.4776)

R^2 = 0.88859 DW = 1.9650

The presentation of relations between dependent variable and harmonization regressors, based on transformed balance identity equations, is included in the table 6. Dependencies which direction was confirmed by autoregressive equations were bolded.

Table 6
Comparison of impacts of harmonization variables on Exports (Ex) in 4 Central European countries, based on balance based equations, confirmed by autoregressive equations (bolded)

Country and dependent variable	Existence of dependence [probability of rejection of the hypothesis on the significance of the variable]	Direction of the variable	Strength of the dependence
Poland –LEx	**DLNHIal – very accurate exists [0.000]** **DLNHIfu – accurate exists [0.034]** DLNHIel – accurate exists [0.046]	**Negative** **Positive** Positive	**-22.7348** **1.9006** 3.4264
Slovakia – DLEx	DLNHIal – accurate exists [0.006] **DLNHIfu – accurate exists [0.001]** DLNHIel – not assessed	Positive **Positive**	0.24315 **0.19229**
The Czech Republic –DLEx	**DLNHIal – accurate exists [0.038]** **DLNHIhm – accurate exists [0.011]** **DLNHItr – accurate exists [0.033]**	**Negative** **Positive** **Positive**	**-0.68009** **0.32863** **0.62776**
Hungary –DLEx	DLNHIal – accurate exists [0.000] DLNHIhm – accurate exist[0.006] DLNHItr – accurate exists [0.002]	Positive Negative Positive	0.59711 -0.32456 0.35688

Source: own study based on estimations of regression models

The data from model estimations contained in table 6 indicate differentiated interrelations between harmonization variables and exports. The basic hypothesis was indicating negative impact of harmonization on exports. In two countries: Poland and the Czech Republic, a negative interrelation between exports and the NHI_{al} indices has been observed.

In Poland and in Slovakia the values of $DLNHI_{fu}$ show a positive interrelation with exports (LEx and DLEx respectively). When it is realized what conclusions were drawn from the previous paragraph: positive impact on imports in Poland and negative impacts in Slovakia it may mean that Polish model of harmonization policy supports both imports and exports but the Slovakian model supports the increase of trade surplus (supports exports and negatively affects imports). From the national interest and jobs policies “negative harmonization” is much more supporting economy than Poland’s harmonization friendly policy.

Differentiated interrelations between harmonization variables and exports were observed in the Czech Republic. In the Czech Republic the interrelation between exports and NHI_{hm} and NHI_{tr} indices is positive but as regards NHI_{al} - negative. Despite

To sum up, the lack of a dominant tendency between exports and harmonization variables is visible in the countries covered by the study. This may be the consequence of significant specificity of exports of individual Central European countries. However, it is worth noting that the model interrelations between exports and harmonization indices can be both negative (as assumed) and positive. However positive impacts are dominating: out of 6 double confirmed impacts 4 were positive and 2 negative. Out of all 11 estimated balance based impacts 8 were positive and 3 negative. Therefore the thesis that harmonization of indirect taxes negatively influenced exports in Central Europe countries should be rejected.

5. Final conclusions

The study conducted enable to draw the following conclusions:

1. There are clear interrelations between the harmonization indices and basic macroeconomic values. Using the regression equations of two types, very reliable estimations could be obtained for most of the relationships analysed. The harmonization of indirect taxes does have an impact on the economy. This impact is of a measurable nature.

2. The results obtained confirmed the hypotheses presented to a considerable extent, particularly the hypothesis on the negative influence of the harmonization of indirect taxes on GDP. Out of 6 double confirmed impacts of harmonization variables on GDP four were negative and two positive. Besides, the harmonization of indirect taxes of at least one group of goods in each of the Central European countries has a negative impact on the level of GDP basing on balance equations. The strongest negative interrelations were observed in Poland, next in Hungary. They were weaker in Slovakia and the weakest in the Czech Republic where only one negative impact was observed (once confirmed).

3. Rather unexpected results were achieved when studying the impact of the harmonization of indirect taxes on consumer expenditure. Out of 11 harmonization variables estimated with use of balance based equations 9 were confirmed by autoregressive ones. With regard to 6 estimated variables harmonization had negative influence on the value of general consumer expenditure, and with regard to 5, positive. Negative influence may mean that consumers reacted to the increase in prices by significantly reducing the consumption of goods subject to harmonization. This concerns mainly Poland, Slovakia and the Czech Republic, i.e. countries in which two negative interrelations were observed. However in Hungary there were none. In Hungary positive interrelations dominated. This means that harmonization was accompanied by an increase in consumer expenditure in fixed prices.

4. The harmonization of indirect taxes has an impact on capital investments (gross capital formation). With regard to half of the harmonization variables it was possible to estimate reliable interrelations. However, this impact is differentiated both between countries and inside them. The positive influence of the harmonization of indirect taxes on capital investments may be the consequence of growing benefits from the deduction of those taxes in the case of implementation of investments or in production operations. The higher the tax, the higher the benefit resulting from its deduction. On the other hand, the relatively infrequent and generally unclear negative interrelations between harmonization variables and capital investments may be demonstrated indirectly by influencing consumption and production (which was observed quite clearly in relation to GDP).

5. A positive interrelation between imports and the harmonization of indirect taxes was observed in Poland, a negative one in the Czech Republic and in Slovakia, and a differentiated one in Hungary. Those interrelations may result from the specificity of the production of harmonized goods in individual countries. The Polish economy, as a larger one, was exposed to a decrease of the domestic production of harmonized goods to a serious extent, which in turn increased the competitiveness of imports. Such interrelations were not observed in the Czech Republic and in Slovakia.

6. The hypothesis on the negative impacts of the harmonization variables on exports had to be rejected. The thesis was confirmed in relation to 3 variables and rejected with regard to 8. In

Poland and in Slovakia the values of $DLNHI_{fu}$ showed a positive interrelation with exports (LEx and DLEx respectively). When conclusions on impacts of $DLNHI_{fu}$ on imports were reflected it turned out that Polish model of harmonization policy (with high tax increases) supports both imports and exports but the Slovakian model (with moderate tax increases) supports the increase of trade surplus (supports exports and negatively affects imports). From the national interest and jobs policies "negative harmonization" is much more supporting economy than Poland's "harmonization friendly" policy.

7. The harmonization of indirect taxes in most cases meant costs for the Central European countries in the form of a drop in the GDP. The elasticity coefficients calculated are not a simulation but they reflect real processes during the pre-accession period. However, it is worth noting that those costs were higher than in the DIW simulation (covering the period after 2004). For example, in the regression models calculated for Poland the growth of the quarterly rate of harmonization of indirect taxes on fuels by 1 % was accompanied by a decrease of the quarterly rate of growth of GDP by 0.135%, and in the DIW model in an actually implemented minimum scenario, a decrease of GDP by 0.06% is foreseen (but with regard to all energy products harmonized). This means the decrease is much lower than in the regression models. If the DIW simulation is accurate, this may mean that the Central Europe has already paid most of the costs related to the harmonization of indirect taxes.

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Estimation Appendix

Results of Linear Regressions Estimations of Tax Harmonization Interrelations with Fundamental Macroeconomic Aggregates

Below, there have been presented results of linear regressions, conducted with use of the ordinary least squares (OLS) method, with the application of the Microfit 4.0 program, which generated result tables containing estimations of structural parameters and basic diagnostic tests deciding about the quality of estimated models. No formal verification of hypotheses deciding about the quality of models have been conducted because the values of diagnostic tests have been quoted in the tables. Assuming the level of alfa = 0.05, all those tests allow the verification of hypotheses about the fair quality of models. In few cases, mainly with regard to the autocorrelation of the random variable, the DW tests did not permit the rejection of the hypothesis on the lack of autocorrelation of the random variable, but they also did not permit the acceptance of the thesis about the existence of autocorrelation (no decision area). Because the models estimated are not foreseen as a prognostic tool and the optimum control tool, those issues are not the most important ones.

1.Impact of harmonization on GDP

1.1.Poland, balance identity based, DLGDP dependent variable, 20 observations from 1997Q3 to 2002Q2

Regressor	Coefficient	Standard Error	T-Ratio[Prob]
DLFC	. 44473	.10159	4.3779[.001]
DLGCF	.095524	.0098997	9.6491[.000]
DLEx(-1)	.052638	.0094208	5.5874[.000]
DLIm	.086026	.024208	3.5537[.004]
DLNHIal	-.63618	.25120	-2.5326[.025]
DLNHIfu(-3)	-.13517	.044710	-3.0233[.010]
U	.0013855	.0020133	.68817[.503]

R-Squared	.99066	R-Bar-Squared	.98634
S.E. of Regression	.0068722	F-stat. F(6, 13)	229.7194[.000]
Mean of Dependent Variable	.0073468	S.D. of Dependent Variable	.058807
Residual Sum of Squares	.6140E-3	Equation Log-likelihood	75.5345
Akaike Info. Criterion	68.5345	Schwarz Bayesian Criterion	65.0494
DW-statistic	1.9853		

Diagnostic Tests

Test Statistics	LM version	F Version
A:Serial Correlation	CHSQ(4)= 4.2180[.377]	*F(4, 9)= .60135[.671]
B:Functional Form	CHSQ(1)= 1.6418[.200]	*F(1, 12)= 1.0732[.321]
C:Normality	CHSQ(2)= .25070[.882]	* Not applicable
D:Heteroscedasticity:	CHSQ(1)= .082666[.774]	*F(1, 18)= .074708[.788]

A:Lagrange multiplier test of residual serial correlation , B:Ramsey's RESET test using the square of the fitted values, C:Based on a test of skewness and kurtosis of residuals, D:Based on the regression of squared residuals on squared fitted values[3]

1.1 Poland, autoregressive, DLGDP dependent variable, 20 observations used for estimation from 1997Q3 to 2002Q2

[3] The data obtained indicate good matching of variables assessed with the observed data. It can be said with huge probability that variables describe accurately the relations described. On the basis of those data one may positively verify most of the hypotheses deciding of the quality of regression.

Regressor	Coefficient	Standard Error	T-Ratio[Prob]
DLGDP(-1)	-.36160	.18518	-1.9527[.071]
DLGDP(-2)	-.47043	.18967	-2.4802[.026]
DLNHIal(-2)	-2.5474	1.0886	-2.3400[.035]
DLNHIfu(-3)	-.31698	.25749	-1.2311[.239]
DLNHIel(-3)	.81083	.40608	1.9967[.066]
U	.011723	.010191	1.1504[.269]
R-Squared	.60034	R-Bar-Squared	.45760
S.E. of Regression	.043310	F-stat. F(5, 14)	4.2059[.015]
Mean of Dependent Variable	.0073468	S.D. of Dependent Variable	.058807
Residual Sum of Squares	.026261	Equation Log-likelihood	37.9753
Akaike Info. Criterion	31.9753	Schwarz Bayesian Criterion	28.9881
DW-statistic	2.3701		
Diagnostic Tests			
Serial Correlation	*CHSQ(4)= 8.1400[.087]	*F(4, 10)= 1.7158[.223]	
Functional Form	*CHSQ(1)= .62678[.429]	*F(1, 13)= .42059[.528]	
Normality	*CHSQ(2)= 1.7172[.424]	* Not applicable	
Heteroscedasticity	*CHSQ(1)= 2.1783[.140]	*F(1, 18)= 2.2001[.155]	

1.2. Slovakia, balance identity based, DLGDP dependent variable, observations from 1997Q2 to 2003Q4

Regressor	Coefficient	Standard Error	T-Ratio[Prob]
DLFC	.69953	.024641	28.3888[.000]
DLGCF	.29441	.0099436	29.6076[.000]
DLEx	.72973	.038973	18.7241[.000]
DLIm	-.71580	.028522	–25.0964[.000]
DLNHIal(-4)	.13315	.064477	2.0650[.053]
DLNHIfu	-.14716	.034032	-4.3241[.000]
DLNHIel(-1)	.031420	.016920	1.8569[.079]
U	-.0015183	.0014590	–1.0406[.311]
R-Squared	.99152	R-Bar-Squared .98839	
S.E. of Regression	.0059110	F-stat. F(7, 19) 317.3414[.000]	
Mean of Dependent Variable	.010864	S.D. of Dependent Variable .054871	
Residual Sum of Squares	.6639E-3	Equation Log-likelihood 104.9677	
Akaike Info. Criterion	96.9677	Schwarz Bayesian Criterion 91.7844	
DW-statistic	2.4594		
Diagnostic Tests			
* Test Statistics	* LM Version	* F Version	
Serial Correlation	*CHSQ(4)= 6.3991[.171]	*F(4, 15)= 1.1648[.365]	
Functional Form	*CHSQ(1)= .13500[.713]	*F(1, 18)= .090450[.767]	
Normality	*CHSQ(2)= 1.4116[.494]	* Not applicable	
Heteroscedasticity	*CHSQ(1)= .24861[.618]	*F(1, 25)= .23233[.634]	

1.2. Slovakia, autoregressive, DLGDP dependent variable, 27 observations used for estimation from 1997Q2 to 2003Q4, OLS

Regressor	Coefficient	Standard Error	T-Ratio[Prob]
DLGDP(-1)	-.17449	.10204	-1.7100[.102]
DLGDP(-2)	-.86364	.10206	-8.4618[.000]
DLNHIal(-1)	-.28155	.20045	-1.4046[.175]
DLXNHIfu(-3)	-.79886	.24148	-3.3082[.003]
DLNHIel(-3)	.14835	.076910	1.9289[.067]
U	.0065689	.0062504	1.0510[.305]

R-Squared	.80320	R-Bar-Squared	.75634
S.E. of Regression	.027085	F-stat. F(5, 21)	17.1413[.000]
Mean of Dependent Variable	.010864	S.D. of Dependent Variable	.054871
Residual Sum of Squares	.015406	Equation Log-likelihood	62.5183
Akaike Info. Criterion	56.5183	Schwarz Bayesian Criterion	52.6307
DW-statistic	2.3388		

Diagnostic Tests		
* Test Statistics *	LM Version *	F Version
Serial Correlation	*CHSQ(4)= 8.3291[.080]	*F(4, 17)= 1.8959[.157]
Functional Form	*CHSQ(1)= .92637[.336]	*F(1, 20)= .71058[.409]
Normality	*CHSQ(2)= 1.0204[.600]	* Not applicable
Heteroscedasticity	*CHSQ(1)= .93049[.335]	*F(1, 25)= .89232[.354]

1.3. The Czech Republic, balance identity based, DLGDP dependent variable, 24 observations from 1997Q2 to 2003Q1

Regressor	Coefficient	Standard Error	T-Ratio[Prob]
DLFC	.76208	.025704	29.6483[.000]
DLGCF	.28706	.0081107	35.3929[.000]
DLEx	.52078	.032656	15.9475[.000]
DLIm	-.58912	.037921	-15.5353[.000]
DLNHIal	-.11077	.074401	-1.4888[.155]
DLNHIel	.089678	.063088	1.4215[.173]
U	-.4799E-3	.8637E-3	-.55565[.586]

R-Squared	.99231	R-Bar-Squared	.98960
S.E. of Regression	.0037134	F-stat. F(6, 17)	365.6755[.000]
Mean of Dependent Variable	.0038870	S.D. of Dependent Variable	.036409
Residual Sum of Squares	.2344E-3	Equation Log-likelihood	104.3828
Akaike Info. Criterion	97.3828	Schwarz Bayesian Criterion	93.2597
DW-statistic	1.9637		

Test Statistics *	LM Version *	F Version
A:Serial Correlation	CHSQ(4)= 5.8356[.212] *	F(4, 13)= 1.0441[.422]
B:Functional Form	CHSQ(1)= 1.2673[.260]	*F(1, 16)= .89199[.359]
C:Normality	CHSQ(2)= 1.2363[.539]	* Not applicable
D:Heteroscedasticity	CHSQ(1)= .034718[.852]	*F(1, 22)= .031871[.860]

1.3. Czech Republic, autoregressive, DLGDP dependent variable, 27 observations used for estimation from 1997Q2 to 2003Q4, OLS

Regressor	Coefficient	Standard Error	T-Ratio[Prob]
DLGDP(-1)	-.60902	.10312	-5.9059[.000]
DLGDP(-2)	-.95857	.086333	-11.1032[.000]
DLGDP(-3)	-.69464	.10548	-6.5855[.000]
DLNHIhm	-.31377	.080566	-3.8945[.001]
DLNHItr(-2)	.49561	.21374	2.3187[.031]
U	.018484	.0030793	6.0028[.000]

R-Squared	.88121	R-Bar-Squared	.85293
S.E. of Regression	.014111	F-stat. F(5, 21)	31.1570[.000]
Mean of Dependent Variable	.0049252	S.D. of Dependent Variable	.036796
Residual Sum of Squares	.0041816	Equation Log-likelihood	80.1229
Akaike Info. Criterion	74.1229	Schwarz Bayesian Criterion	70.2354
DW-statistic	1.3213		

Diagnostic Tests		
* Test Statistics *	LM Version *	F Version
Serial Correlation	*CHSQ(4)= 8.0082[.091]	*F(4, 17)= 1.7921[.177]
Functional Form	*CHSQ(1)= 3.5568[.059]	*F(1, 20)= 3.0344[.097]
Normality	*CHSQ(2)= .50165[.778]	* Not applicable
Heteroscedasticity	*CHSQ(1)= 1.2717[.259]	*F(1, 25)= 1.2357[.277]

1.4. Hungary, two estimations have been developed: separately for NHI_{al} and NHI_{el} .

1.4.1.Hungary, balance identity based (1), DLGDP dependent variable, 30 observations from 1996Q3 to 2003Q4

Regressor	Coefficient	Standard Error	T-Ratio[Prob]
DLFC	.81893	.045132	18.1451[.000]
DLGCF	.28505	.011634	24.5019[.000]
DLEx	.65818	.024287	27.1005[.000]
DLIm	-.77569	.044180	-17.5574[.000]
DLNHIal	-.37585	.080701	-4.6573[.000]
U	.0027078	.0012335	2.1952[.038]
R-Squared	.99114	R-Bar-Squared .98929	
S.E. of Regression	.0052705	F-stat. F(5, 24) 536.8177[.000]	
Mean of Dependent Variable	.011301	S.D. of Dependent Variable .050932	
Residual Sum of Squares	.6667E-3	Equation Log-likelihood 118.1477	
Akaike Info. Criterion	112.1477	Schwarz Bayesian Criterion 107.9441	
DW-statistic	2.2439		
Diagnostic Tests			
* Test Statistics *	LM Version *	F Version	
* A:Serial Correlation	*CHSQ(4)= 2.5556[.635]	*F(4, 20)= .46560[.760]	
* B:Functional Form	*CHSQ(1)= 1.5197[.218]	*F(1, 23)= 1.2273[.279]	
* C:Normality	*CHSQ(2)= .79925[.671]	* Not applicable	
* D:Heteroscedasticity	*CHSQ(1)= .29240[.589]	*F(1, 28)= .27560[.604]	

1.4.2. Hungary, balance identity based (2nd version), DLGDP dependent variable, 29 observations from 1997Q1 to 2003Q4

Regressor	Coefficient	Standard Error	T-Ratio[Prob]
DLFC	.80698	.050557	15.9618[.000]
DLGCF	.28554	.013881	20.5714[.000]
DLEx	.65966	.027866	23.6723[.000]
DLIm	-.75707	.049199	-15.3878[.000]
DLNHIel	-.28284	.079549	-3.5555[.002]
U	.0017913	.0013340	1.3428[.192]
R-Squared	.98925	R-Bar-Squared .98691	
S.E. of Regression	.0059297	F-stat. F(5, 23) 423.2963[.000]	
Mean of Dependent Variable	.011300	S.D. of Dependent Variable .051833	
Residual Sum of Squares	.8087E-3	Equation Log-likelihood 110.9176	
Akaike Info. Criterion	104.9176	Schwarz Bayesian Criterion 100.8157	
DW-statistic	1.8384		
Diagnostic Tests			
* Test Statistics	* LM Version	* F Version	
* A:Serial Correlation	* CHSQ(4)= 1.3668[.850]	* F(4, 19)= .23494[.915]	
* B:Functional Form	* CHSQ(1)= .97105[.324]	* F(1, 22)= .76218[.392]	
* C:Normality	* CHSQ(2)= .76544[.682]	* Not applicable	
* D:Heteroscedasticity	* CHSQ(1)= .88943[.346]	* F(1, 27)= .85429[.364]	

1.4. Hungary, autoregressive, DLGDP dependent variable, 24 observations used for estimation from 1997Q2 to 2003Q1

Regressor	Coefficient	Standard Error	T-Ratio[Prob]
DLGDP(-4)	1.0094	.034301	29.4291[.000]
DLNHIal(-1)	-.19609	.11659	-1.6819[.109]
DLNHIal(-2)	-.37370	.12391	-3.0159[.007]
DLNHItr(-4)	.15970	.099949	1.5978[.127]
U	.4745E-3	.0014340	.33091[.744]

R-Squared .98672	R-Bar-Squared .98392
S.E. of Regression .0068469	F-stat. F(4, 19) 352.8139[.000]
Mean of Dependent Variable .0099010	S.D. of Dependent Variable .053993
Residual Sum of Squares .8907E-3	Equation Log-likelihood 88.3639
Akaike Info. Criterion 83.3639	Schwarz Bayesian Criterion 80.4187
DW-statistic 1.2980	
Diagnostic Tests	
* Test Statistics * LM Version	* F Version
Serial Correlation *CHSQ(4)= 3.7669[.438]	*F(4, 15)= .69816[.605]
Functional Form *CHSQ(1)= 3.5532[.059]	*F(1, 18)= 3.1279[.094]
Normality *CHSQ(2)= 3.0247[.220]	* Not applicable
Heteroscedasticity *CHSQ(1)= .32670[.568]	*F(1, 22)= .30361[.587]

2.Impact of harmonization on consumption (FC)

2.1.1. Poland, balance identity based, dependent variable LFC, 21 observations from 1997Q1 to 2002Q1

Regressor	Coefficient	Standard Error	T-Ratio[Prob]
LGDP(-1)	.70607	.047652	14.8171[.000]
LGCF(-1)	-.045701	.011010	-4.1507[.001]
LEx(-2)	.036668	.0086551	4.2366[.001]
LET	.14894	.020172	7.3836[.000]
DLNHIal	-.65574	.16252	-4.0348[.001]
DLHIfu	.20875	.043389	4.8112[.000]
U	1.9706	.37730	5.2229[.000]

R-Squared .99276	R-Bar-Squared .98965
S.E. of Regression .0058958	F-stat. F(6, 14) 319.7302[.000]
Mean of Dependent Variable 11.2065	S.D. of Dependent Variable .057953
Residual Sum of Squares .4866E-3	Equation Log-likelihood 82.2634
Akaike Info. Criterion 75.2634	Schwarz Bayesian Criterion 71.6076
DW-statistic 2.2073	
Diagnostic Tests	
* Test Statistics * LM Version	* F Version
* A:Serial Correlation *CHSQ(4)= 8.2447[.083]	*F(4, 10)= 1.6159[.245]
* B:Functional Form *CHSQ(1)= 1.1523[.283]	*F(1, 13)= .75477[.401]
* C:Normality *CHSQ(2)= 1.0324[.597]	* Not applicable
* D:Heteroscedasticity *CHSQ(1)= .83669[.360]	*F(1, 19)= .78842[.386]
* E:Predictive Failure *CHSQ(1)= 1.0681[.301]	*F(1, 14)= 1.0681[.319]

ET – excise taxes

2.1.2. Poland, balance identity based, dependent variable LFC, 24 observations from 1996Q3 to 2002Q2

Regressor	Coefficient	Standard Error	T-Ratio[Prob]
LGDP (-1)	.75995	.035324	21.5140[.000]
LGCF(-1)	-.041959	.0096341	-4.3552[.000]
LEx(-2)	.030618	.0084329	3.6308[.002]
LET	.11847	.019730	6.0048[.000]
DLNHIfu	.19128	.035497	5.3886[.000]
DLNHIel	-.24631	.058982	-4.1760[.001]
U	1.6318	.28950	5.6365[.000]

R-Squared	.99294	R-Bar-Squared	.99045
S.E. of Regression	.0061036	F-stat. F(6, 17)	398.4768[.000]
Mean of Dependent Variable	11.1991	S.D. of Dependent Variable	.062451
Residual Sum of Squares	.6333E-3	Equation Log-likelihood	92.4564
Akaike Info. Criterion	85.4564	Schwarz Bayesian Criterion	81.3332
DW-statistic	1.8509		

Diagnostic Tests		
* Test Statistics	* LM Version	* F Version
* A:Serial Correlation	*CHSQ(4)= 6.6829[.154]	*F(4, 13)= 1.2542[.337]
* B:Functional Form	*CHSQ(1)= 1.3451[.246]	*F(1, 16)= .94998[.344]
* C:Normality	*CHSQ(2)= 1.2090[.546]	* Not applicable
* D:Heteroscedasticity	*CHSQ(1)= 1.7443[.187]	*F(1, 22)= 1.7242[.203]

2.1.3. Poland, autoregressive, dependent variable DLFC, 21 observations used for estimation from 1997Q2 to 2002Q2

Regressor	Coefficient	Standard Error	T-Ratio[Prob]
DLFC(-1)	.17786	.056829	3.1298[.007]
DLFC(-2)	-.97983	.049659	-19.7311[.000]
DLNHIal	.70177	.22330	3.1427[.007]
DLNHIal(-4)	.42927	.11231	3.8223[.002]
DLNHIfu(-1)	.057238	.041369	1.3836[.188]
DLNHIel	-.15456	.083207	-1.8575[.084]
U	.016218	.0015974	10.1527[.000]

R-Squared	.97519	R-Bar-Squared	.96456
S.E. of Regression	.0065969	F-stat. F(6, 14)	91.7273[.000]
Mean of Dependent Variable	.0063939	S.D. of Dependent Variable	.035043
Residual Sum of Squares	.6093E-3	Equation Log-likelihood	79.9040
Akaike Info. Criterion	72.9040	Schwarz Bayesian Criterion	69.2482
DW-statistic	2.3290		

Diagnostic Tests		
Test Statistics	LM Version	F Version
Serial Correlation	*CHSQ(4)= 1.0742[.898]*	F(4, 10)= .13478[.966]
Functional Form	*CHSQ(1)= 1.6498[.199]*	F(1, 13)= 1.1084[.312]
Normality	*CHSQ(2)= 4.1835[.123]*	Not applicable
Heteroscedasticity	*CHSQ(1)= .35752[.550]*	F(1, 19)= .32907[.573]

2.2.1. Slovakia, balance identity based, dependent variable DLFC, 27 observations from 1997Q2 to 2003Q4

Regressor	Coefficient	Standard Error	T-Ratio[Prob]
DLGDP	1.3966	.049195	28.3888[.000]
DLGCF	-.41338	.017639	-23.4355[.000]
DLEx	-1.0224	.063007	-16.2268[.000]
DLIm	1.0168	.032357	31.4246[.000]
DLNHIal(-4)	-.16540	.093397	-1.7709[.093]
DLXNHIfu	.21099	.047379	4.4533[.000]
DLXNHIel(-1)	-.043078	.024034	-1.7924[.089]
U	.0021886	.0020591	1.0629[.301]

R-Squared	.99365	R-Bar-Squared	.99132
S.E. of Regression	.0083521	F-stat. F(7, 19)	424.9841[.000]
Mean of Dependent Variable	.013122	S.D. of Dependent Variable	.089624
Residual Sum of Squares	.0013254	Equation Log-likelihood	95.6341
Akaike Info. Criterion	87.6341	Schwarz Bayesian Criterion	82.4508
DW-statistic	2.4255		

Diagnostic Tests		
* Test Statistics *	LM Version	* F Version
Serial Correlation	*CHSQ(4)= 5.7095[.222]	*F(4, 15)= 1.0056[.435]

Functional Form	*CHSQ(1)= .53056[.466]	*F(1, 18)= .36080[.556]
Normality	*CHSQ(2)= .81306[.666]	* Not applicable
Heteroscedasticity	*CHSQ(1)= 2.4465[.118]	*F(1, 25)= 2.4910[.127]

2.2.2. Slovakia, autoregressive, dependent variable DLFC, 21 observations used for estimation from 1997Q2 to 2002Q2

Regressor	Coefficient	Standard Error	T-Ratio[Prob]
DLFC(-1)	.17786	.056829	3.1298[.007]
DLFC(-2)	-.97983	.049659	-19.7311[.000]
DLNHIal	.70177	.22330	3.1427[.007]
DLNHIal(-4)	.42927	.11231	3.8223[.002]
DLNHIfu(-1)	.057238	.041369	1.3836[.188]
DLNHIel	-.15456	.083207	-1.8575[.084]
U	.016218	.0015974	10.1527[.000]
R-Squared	.97519	R-Bar-Squared	.96456
S.E. of Regression	.0065969	F-stat. F(6, 14)	91.7273[.000]
Mean of Dependent Variable	.0063939	S.D. of Dependent Variable	.035043
Residual Sum of Squares	.6093E-3	Equation Log-likelihood	79.9040
Akaike Info. Criterion	72.9040	Schwarz Bayesian Criterion	69.2482
DW-statistic	2.3290		
Diagnostic Tests			
Test Statistics	LM Version	F Version	
Serial Correlation	*CHSQ(4)= 1.0742[.898]*	F(4, 10)= .13478[.966]	
Functional Form	*CHSQ(1)= 1.6498[.199]*	F(1, 13)= 1.1084[.312]	
Normality	*CHSQ(2)= 4.1835[.123]*	Not applicable	
Heteroscedasticity	*CHSQ(1)= .35752[.550]*	F(1, 19)= .32907[.573]	

2.3.1. The Czech Republic, balance identity based, dependent variable DLFC, 27 observations from 1997Q1 to 2003Q3

Regressor	Coefficient	Standard Error	T-Ratio[Prob]
DLGDP	1.1806	.049277	23.9584[.000]
DLGCF	-.34181	.014977	-22.8229[.000]
DLEx	-.60071	.043674	-13.7544[.000]
DLIm	.76220	.033377	22.8359[.000]
DLNHIal	.12928	.093847	1.3776[.184]
DLNHIhm(-2)	-.084910	.037599	-2.2583[.036]
DLNHItr(-2)	-.25903	.10722	-2.4158[.026]
U	.3436E-3	.0013219	.25995[.798]
R-Squared	.99709	R-Bar-Squared	.99602
S.E. of Regression	.0047009	F-stat. F(7, 19)	929.7939[.000]
Mean of Dependent Variable	.0039888	S.D. of Dependent Variable	.074485
Residual Sum of Squares	.4199E-3	Equation Log-likelihood	111.1525
Akaike Info. Criterion	103.1525	Schwarz Bayesian Criterion	97.9692
DW-statistic	2.5618		
Diagnostic Tests			
* Test Statistics	* LM Version	* F Version	
* A:Serial Correlation	*CHSQ(4)= 7.2045[.125]	*F(4, 15)= 1.3648[.293]	
* B:Functional Form	*CHSQ(1)= .10615[.745]	*F(1, 18)= .071045[.793]	
* C:Normality	*CHSQ(2)= .059975[.970]	* Not applicable	
* D:Heteroscedasticity	*CHSQ(1)= 2.2290[.135]	*F(1, 25)= 2.2496[.146]	

2.3.2. The Czech Republic, autoregressive, dependent variable DLFC, 27 observations used for estimation from 1997Q2 to 2003Q4

Regressor	Coefficient	Standard Error	T-Ratio[Prob]
DLFC(-1)	-.93162	.057356	-16.2428[.000]
DLFC(-2)	-.91476	.066914	-13.6707[.000]
DLFC(-3)	-.91341	.061468	-14.8599[.000]

DLNHIal(-2)	.43935	.24371	1.8028[.092]
DLNHIal(-3)	.49611	.25874	1.9174[.074]
DLNHIhm	-.42387	.085789	-4.9408[.000]
DLNHIhm(-1)	-.30594	.087626	-3.4914[.003]
DLNHIhm(-2)	-.28105	.092790	-3.0289[.008]
DLNHIhm(-3)	-.20849	.090058	-2.3151[.035]
DLNHItr(-2)	-.50301	.22422	-2.2433[.040]
DLNHItr(-3)	-.51090	.23719	-2.1539[.048]
U	.043181	.0037378	11.5526[.000]
R-Squared	.98524	R-Bar-Squared	.97441
S.E. of Regression	.011539	F-stat. F(11, 15)	90.9948[.000]
Mean of Dependent Variable	.0093549	S.D. of Dependent Variable	.072131
Residual Sum of Squares	.0019973	Equation Log-likelihood	90.0979
Akaike Info. Criterion	78.0979	Schwarz Bayesian Criterion	70.3228
DW-statistic	2.6209		
Diagnostic Tests			
Test Statistics	LM Version	F Version	
Serial Correlation	*CHSQ(4)= 9.1177[.058]*	F(4, 11)= 1.4022[.296]	
Functional Form	*CHSQ(1)= 2.0612[.151]*	F(1, 14)= 1.1571[.300]	
Normality	*CHSQ(2)= 1.1370[.566]*	Not applicable	
Heteroscedasticity	*CHSQ(1)= .099596[.752]*	F(1, 25)= .092560[.763]	

2.4.1. Hungary, balance identity based (1), dependent variable DLFC, 29 observations from 1996Q4 to 2003Q4

Regressor	Coefficient	Standard Error	T-Ratio[Prob]
DLGDP	1.1351	.063574	17.8554[.000]
DLGCF	-.33491	.016771	-19.9693[.000]
DLEx	-.75169	.046750	-16.0789[.000]
DLIm	.93169	.040413	23.0542[.000]
DLNHIal	.47754	.096316	4.9581[.000]
U	-.0034834	.0014453	-2.4101[.024]
R-Squared	.97805	R-Bar-Squared	.97328
S.E. of Regression	.0062826	F-stat. F(5, 23)	204.9427[.000]
Mean of Dependent Variable	.014055	S.D. of Dependent Variable	.038431
Residual Sum of Squares	.9078E-3	Equation Log-likelihood	109.2409
Akaike Info. Criterion	103.2409	Schwarz Bayesian Criterion	99.1391
DW-statistic	2.1413		
Diagnostic Tests			
* Test Statistics	* LM Version	* F Version	
* A:Serial Correlation	*CHSQ(4)= 2.5315[.639]	*F(4, 19)= .45430[.768]	
* B:Functional Form	*CHSQ(1)= .052596[.819]	*F(1, 22)= .039973[.843]	
* C:Normality	*CHSQ(2)= 1.3031[.521]	* Not applicable	
* D:Heteroscedasticity	*CHSQ(1)= 2.2874[.130]	*F(1, 27)= 2.3120[.140]	

2.4.2. Hungary, balance identity based (2), dependent variable DLFC, 29 observations from 1996Q4 to 2003Q4

Regressor	Coefficient	Standard Error	T-Ratio[Prob]
DLGDP	1.1366	.071207	15.9618[.000]
DLGCF	-.33577	.019038	-17.6368[.000]
DLEx	-.75791	.052594	-14.4105[.000]
DLIm	.91626	.044788	20.4575[.000]
DLNHItr	.35357	.091521	3.8633[.001]
U	-.0023998	.0015661	-1.5324[.139]

R-Squared	.97246	R-Bar-Squared	.96647
S.E. of Regression	.0070372	F-stat. F(5, 23)	162.4137[.000]
Mean of Dependent Variable	.014055	S.D. of Dependent Variable	.038431
Residual Sum of Squares	.0011390	Equation Log-likelihood	105.9516
Akaike Info. Criterion	99.9516	Schwarz Bayesian Criterion	95.8497
DW-statistic	1.7884		

Diagnostic Tests		
* Test Statistics	* LM Version	* F Version
* A:Serial Correlation	*CHSQ(4)= 1.7640[.779]	*F(4, 19)= .30764[.869]
* B:Functional Form	*CHSQ(1)= .31977[.572]	*F(1, 22)= .24529[.625]
* C:Normality	*CHSQ(2)= .96452[.617]	* Not applicable
* D:Heteroscedasticity	*CHSQ(1)= .79342[.373]	*F(1, 27)= .75948[.391]

2.4.3. Hungary, autoregressive, dependent variable DLFC, 27 observations used for estimation from 1997Q2 to 2003Q4

Regressor	Coefficient	Standard Error	T-Ratio[Prob]
DLFC(-1)	-.69891	.11929	-5.8590[.000]
DLFC(-2)	-.97913	.10850	-9.0245[.000]
DLFC(-3)	-.72269	.10313	-7.0074[.000]
DLNHIal(-1)	1.0628	.23053	4.6100[.000]
DLNHIal (-2)	.45433	.26060	1.7434[.098]
DLNHIal (-3)	.88749	.28553	3.1082[.006]
DLNHIhm	-.53281	.31592	-1.6865[.109]
DLNHItr	.52334	.21710	2.4107[.027]
U	.041917	.0041901	10.0039[.000]

R-Squared	.89545	R-Bar-Squared	.84899
S.E. of Regression	.014610	F-stat. F(8, 18)	19.2712[.000]
Mean of Dependent Variable	.014500	S.D. of Dependent Variable	.037596
Residual Sum of Squares	.0038421	Equation Log-likelihood	81.2658
Akaike Info. Criterion	72.2658	Schwarz Bayesian Criterion	66.4345
DW-statistic	1.2852		

Diagnostic Tests		
Test Statistics	LM Version	F Version
Serial Correlation	*CHSQ(4)= 6.3367[.175]*	F(4, 14)= 1.0733[.406]
Functional Form	*CHSQ(1)= 1.2569[.262]*	F(1, 17)= .83005[.375]
Normality	*CHSQ(2)= .21839[.897]*	Not applicable
Heteroscedasticity	*CHSQ(1)= .20787[.648]*	F(1, 25)= .19397[.663]

3. Impact of harmonization on Gross Capital Formation (GCF)

3.1.1. Poland, balance based, dependent variable DLGCF, 23 observations from 1996Q4 to 2002Q2

Regressor	Coefficient	Standard Error	T-Ratio[Prob]
DLGDP	5.6405	.27230	20.7142[.000]
DLFC	-3.6686	.80213	-4.5735[.000]
DLEx	-.40528	.074975	-5.4055[.000]
DLNHIal	4.7391	1.7276	2.7431[.014]
DLNHIfu(-2)	1.0062	.33948	2.9639[.009]
U	.0015115	.016491	.091659[.928]

R-Squared	.97969	R-Bar-Squared	.97372
S.E. of Regression	.063069	F-stat. F(5, 17)	164.0140[.000]
Mean of Dependent Variable	.0078031	S.D. of Dependent Variable	.38903
Residual Sum of Squares	.067620	Equation Log-likelihood	34.4018
Akaike Info. Criterion	28.4018	Schwarz Bayesian Criterion	24.9954
DW-statistic	2.2775		

Diagnostic Tests		
* Test Statistics	* LM Version	* F Version
* A:Serial Correlation	CHSQ(4)= 1.6234[.805]	*F(4, 13)= .24681[.906]
* B:Functional Form	*CHSQ(1)= 3.2588[.071]	*F(1, 16)= 2.6412[.124]
* C:Normality	*CHSQ(2)= .86747[.648]	* Not applicable
* D:Heteroscedasticity	*CHSQ(1)= 2.5693[.109]	*F(1, 21)= 2.6409[.119]

3.1.2. Poland, autoregressive, dependent variable DLGCF , 27 observations used for estimation from 1997Q1 to 2003Q3

Regressor	Coefficient	Standard Error	T-Ratio[Prob]
DLGCF(-1)	-.68352	.16596	-4.1185[.001]
DLGCF(-2)	-.34678	.16537	-2.0970[.049]
DLNHIal(-1)	7.9020	3.9435	2.0038[.059]
DLNHIfu	2.7743	1.4435	1.9220[.069]
DLNHIfu(-3)	-1.7681	1.2464	-1.4186[.171]
DLNHIel(-3)	4.3234	2.2582	1.9145[.070]
U	.0073634	.054928	.13406[.895]
R-Squared	.65992	R-Bar-Squared	.55790
S.E. of Regression	.25270	F-stat. F(6, 20)	6.4684[.001]
Mean of Dependent Variable	.3556E-3	S.D. of Dependent Variable	.38005
Residual Sum of Squares	1.2771	Equation Log-likelihood	2.8805
Akaike Info. Criterion	-4.1195	Schwarz Bayesian Criterion	-8.6549
DW-statistic	1.9408		
Diagnostic Tests			
Test Statistics	LM Version	F Version	
Serial Correlation	*CHSQ(4)= 9.1018[.059]*	F(4, 16)= 2.0341[.138]	
Functional Form	*CHSQ(1)= .44469[.505]*	F(1, 19)= .31817[.579]	
Normality	*CHSQ(2)= 1.5511[.460]*	Not applicable	
Heteroscedasticity	*CHSQ(1)= .26171[.609]*	F(1, 25)= .24470[.625]	

3.2.1. Slovakia, balance based, dependent variable DLGCF, 27 observations from 1997Q2 to 2003Q4

Regressor	Coefficient	Standard Error	T-Ratio[Prob]
DLGDP	3.3231	.12628	26.3165[.000]
DLFC	-2.4109	.099758	-24.1680[.000]
DLEx	-2.4728	.17797	-13.8945[.000]
DLIm	2.4676	.12785	19.3008[.000]
DLNHIal(-1)	-.21441	.18661	-1.1489[.265]
DLNHIfu	.53557	.11961	4.4777[.000]
DLNHIel(-1)	-.14146	.074372	-1.9021[.072]
U	.0079193	.0051809	1.5286[.143]
R-Squared	.98168	R-Bar-Squared	.97494
S.E. of Regression	.021575	F-stat. F(7, 19)	145.4811[.000]
Mean of Dependent Variable	-.0086857	S.D. of Dependent Variable	.13628
Residual Sum of Squares	.0088438	Equation Log-likelihood	70.0110
Akaike Info. Criterion	62.0110	Schwarz Bayesian Criterion	56.8276
DW-statistic	2.3351		
Diagnostic Tests			
* Test Statistics *	LM Version *	F Version	
Serial Correlation	*CHSQ(4)= 2.7518[.600]	*F(4, 15)= .42556[.788]	
Functional Form	*CHSQ(1)= .6842E-3[.979]	*F(1, 18)= .4562E-3[.983]	
Normality	*CHSQ(2)= .17900[.914]	* Not applicable	
Heteroscedasticity	*CHSQ(1)= 1.1257[.289]	*F(1, 25)= 1.0877[.307]	

3.2.2. Slovakia, autoregressive, dependent variable DLGCF, 27 observations used for estimation from 1997Q2 to 2003Q4

Regressor	Coefficient	Standard Error	T-Ratio[Prob]
DLGCF(-2)	-.64349	.13726	-4.6882[.000]
DLNHIal	1.2998	.60772	2.1388[.043]
DLNHIfu(-4)	2.1707	.86969	2.4959[.020]
U	.0075752	.018169	.41693[.681]

R-Squared	.61330	R-Bar-Squared	.56286
S.E. of Regression	.090102	F-stat. F(3, 23)	12.1591[.000]
Mean of Dependent Variable	-.0086857	S.D. of Dependent Variable	.13628
Residual Sum of Squares	.18672	Equation Log-likelihood	28.8373
Akaike Info. Criterion	24.8373	Schwarz Bayesian Criterion	22.2456
DW-statistic	1.5685		

Diagnostic Tests

Test Statistics	LM Version	F Version
Serial Correlation	*CHSQ(4)= 3.5778[.466]*	F(4, 19)= .72557[.585]
Functional Form	*CHSQ(1)= .0050569[.943]*	F(1, 22)= .0041212[.949]
Normality	*CHSQ(2)= 1.3420[.511]*	Not applicable
Heteroscedasticity	*CHSQ(1)= .043645[.835]*	F(1, 25)= .040478[.842]

3.3.1. Czech Republic, balance based, dependent variable DLGCF, 27 observations from 1997Q1 to 2003Q3

Regressor	Coefficient	Standard Error	T-Ratio[Prob]
DLGDP	3.4472	.097741	35.2682[.000]
DLFC	-2.5901	.094502	-27.4082[.000]
DLEx	-1.7220	.12315	-13.9832[.000]
DLIm	1.9746	.14659	13.4699[.000]
DLNHIal	.30126	.27654	1.0894[.290]
DLNHIhm	.050605	.082328	.61467[.546]
DLNHItr	-.32183	.23731	-1.3561[.191]
U	-.0011543	.0032371	-.35657[.725]

R-Squared	.99095	R-Bar-Squared	.98762
S.E. of Regression	.013968	F-stat. F(7, 19)	297.3656[.000]
Mean of Dependent Variable	.0084630	S.D. of Dependent Variable	.12555
Residual Sum of Squares	.0037067	Equation Log-likelihood	81.7501
Akaike Info. Criterion	73.7501	Schwarz Bayesian Criterion	68.5668
DW-statistic	2.1672		

Diagnostic Tests

* Test Statistics	* LM Version	* F Version
* A:Serial Correlation	*CHSQ(4)= 3.9080[.419]	*F(4, 15)= .63463[.646]
* B:Functional Form	*CHSQ(1)= .15700[.692]	*F(1, 18)= .10528[.749]
* C:Normality	*CHSQ(2)= .32075[.852]	* Not applicable
* D:Heteroscedasticity	*CHSQ(1)= .13178[.717]	*F(1, 25)= .12262[.729]

3.3.2. Czech Republic, autoregressive, dependent variable DLGCF, 26 observations used for estimation from 1997Q3 to 2003Q4

Regressor	Coefficient	Standard Error	T-Ratio[Prob]
DLGCF(-2)	-.51129	.11736	-4.3566[.000]
DLGDP(-2)	-1.2015	.46930	-2.5602[.019]
DLNHIal(-1)	1.8075	1.2347	1.4639[.159]
DLNHIhm(-2)	1.4052	.40715	3.4514[.003]
DLNHItr(-3)	2.7552	1.0226	2.6942[.014]
U	-.0012527	.016025	-.078174[.938]

R-Squared	.78513	R-Bar-Squared	.73141
S.E. of Regression	.066549	F-stat. F(5, 20)	14.6155[.000]
Mean of Dependent Variable	.0029492	S.D. of Dependent Variable	.12841
Residual Sum of Squares	.088574	Equation Log-likelihood	36.9737
Akaike Info. Criterion	30.9737	Schwarz Bayesian Criterion	27.1994
DW-statistic	2.0656		
Diagnostic Tests			
Test Statistics	LM Version	F Version	
Serial Correlation	*CHSQ(4)= 5.5632[.234]*	F(4, 16)= 1.0888[.395]	
Functional Form	*CHSQ(1)= .95212[.329]*	F(1, 19)= .72223[.406]	
Normality	*CHSQ(2)= .51998[.771]*	Not applicable	
Heteroscedasticity	*CHSQ(1)= .60776[.436]*	F(1, 24)= .57443[.456]	

3.4.1. Hungary, balance based, dependent variable DLGCF, 28 observations from 1997Q1 to 2003Q4

Regressor	Coefficient	Standard Error	T-Ratio[Prob]
DLGDP	3.4205	.11258	30.3837[.000]
DLFC	-2.5590	.13030	-19.6402[.000]
DLEx	-2.3417	.093031	-25.1716[.000]
DLIm	2.7139	.077350	35.0856[.000]
DLNHIal	.98631	.22935	4.3005[.000]
DLNHIhm(-3)	-.39080	.20342	-1.9211[.069]
DLNHItr(-1)	-.48731	.19941	-2.4437[.024]
U	-.0075421	.0033585	-2.2457[.036]

R-Squared	.99469	R-Bar-Squared	.99284
S.E. of Regression	.013779	F-stat. F(7, 20)	535.7072[.000]
Mean of Dependent Variable	.011857	S.D. of Dependent Variable	.16282
Residual Sum of Squares	.0037975	Equation Log-likelihood	84.9484
Akaike Info. Criterion	76.9484	Schwarz Bayesian Criterion	71.6196
DW-statistic	1.9873		
Diagnostic Tests			
* Test Statistics	* LM Version	* F Version	
* A:Serial Correlation	*CHSQ(4)= 5.6843[.224]	*F(4, 16)= 1.0189[.427]	
* B:Functional Form	*CHSQ(1)= .40235[.526]	*F(1, 19)= .27700[.605]	
* C:Normality	*CHSQ(2)= 2.0593[.357]	* Not applicable	
* D:Heteroscedasticity	*CHSQ(1)= .44066[.507]	*F(1, 26)= .41572[.525]	

3.4.2. Hungary, autoregressive, dependent variable DLGCF, 28 observations used for estimation from 1997Q1 to 2003Q4

Regressor	Coefficient	Standard Error	T-Ratio[Prob]
DLGCF(-1)	-.60293	.15258	-3.9516[.001]
DLGCF(-2)	-.34965	.18691	-1.8707[.075]
DLGCF(-3)	-.66150	.15441	-4.2840[.000]
DLNHIal(-1)	-2.3596	1.2367	-1.9080[.070]
DLNHItr(-3)	2.7487	1.0716	2.5651[.018]
U	.030243	.017129	1.7656[.091]

R-Squared	.76488	R-Bar-Squared	.71144
S.E. of Regression	.087466	F-stat. F(5, 22)	14.3136[.000]
Mean of Dependent Variable	.011857	S.D. of Dependent Variable	.16282
Residual Sum of Squares	.16830	Equation Log-likelihood	31.8683
Akaike Info. Criterion	25.8683	Schwarz Bayesian Criterion	21.8717
DW-statistic	1.6658		
Diagnostic Tests			
Test Statistics	LM Version	F Version	
Serial Correlation	* CHSQ(4)= 8.3823[.079]*	F(4, 18)= 1.9228[.150]	
Functional Form	*CHSQ(1)= .23821[.626]*	F(1, 21)= .18019[.676]	
Normality	*CHSQ(2)= 1.3950[.498]*	Not applicable	

Heteroscedasticity	*CHSQ(1)= .64709[.421]*	F(1, 26)= .61508[.440]

4. Impact of harmonization on Imports (Im)

4.1.1. Poland, balance based, dependent variable LIm, 22 observations from 1997Q1 do 2002Q2

Regressor	Coefficient	Standard Error	T-Ratio[Prob]
LEx	.24161	.033912	7.1245[.000]
LFCH(-1)	1.4016	.12328	11.3689[.000]
LFCG(-1)	-1.2594	.17348	-7.2595[.000]
LGCF(-3)	.19328	.043612	4.4318[.001]
DLNHIal	2.4438	.70659	3.4586[.004]
DLNHIfu(-3)	.40203	.13620	2.9517[.011]
DLNHIel(-1)	.34621	.25978	1.3327[.204]
U	2.6396	1.5706	1.6806[.115]
R-Squared	.98329	R-Bar-Squared	.97493
S.E. of Regression	.025946	F-stat. F(7, 14)	117.6585[.000]
Mean of Dependent Variable	10.4579	S.D. of Dependent Variable	.16386
Residual Sum of Squares	.0094249	Equation Log-likelihood	54.0932
Akaike Info. Criterion	46.0932	Schwarz Bayesian Criterion	41.7290
DW-statistic	2.0636		
Diagnostic Tests			
* Test Statistics	* LM Version	* F Version	
* A:Serial Correlation	*CHSQ(4)= 4.9265[.295]	*F(4, 10)= .72137[.597]	
* B:Functional Form	*CHSQ(1)= .2191E-3[.988]	*F(1, 13)= .1295E-3[.991]	
* C:Normality	*CHSQ(2)= .95841[.619]	* Not applicable	
* D:Heteroscedasticity	*CHSQ(1)= 1.7639[.184]	*F(1, 20)= 1.7433[.202]	

4.1.2. Poland, autoregressive, dependent variable DLIm, 22 observations used for estimation from 1997Q1 to 2002Q2

Regressor	Coefficient	Standard Error	T-Ratio[Prob]
DLIm(-2)	-.68787	.090854	-7.5711[.000]
DLNHIal	6.6687	1.6077	4.1479[.001]
DLNHIal(-1)	-10.5040	1.7726	-5.9258[.000]
DLNHIfu	-.95453	.41569	-2.2963[.039]
DLNHIfu(-1)	1.3165	.37485	3.5121[.004]
DLNHIfu(-3)	.91904	.29952	3.0684[.009]
DLNHIel(-1)	1.5693	.69835	2.2471[.043]
DLNHIel(-2)	1.9569	.59702	3.2778[.006]
U	.011418	.014995	.76146[.460]
R-Squared	.93393	R-Bar-Squared	.89326
S.E. of Regression	.054190	F-stat. F(8, 13)	22.9684[.000]
Mean of Dependent Variable	.034305	S.D. of Dependent Variable	.16587
Residual Sum of Squares	.038175	Equation Log-likelihood	38.7061
Akaike Info. Criterion	29.7061	Schwarz Bayesian Criterion	24.7964
DW-statistic	2.5777		
Diagnostic Tests			
Test Statistics	LM Version	F Version	
Serial Correlation	*CHSQ(4)= 7.7118[.103]*	F(4, 9)= 1.2144[.370]	
Functional Form	*CHSQ(1)= 3.1995[.074]*	F(1, 12)= 2.0422[.178]	
Normality	*CHSQ(2)= 1.5038[.471]*	Not applicable	
Heteroscedasticity	*CHSQ(1)= 1.0030[.317]*	F(1, 20)= .95534[.340]	

4.2.1. Slovakia, balance based, dependent variable DLIm, 27 observations from 1997Q2 to 2003Q4

Regressor	Coefficient	Standard Error	T-Ratio[Prob]
DLGDP	-1.3561	.054037	-25.0964[.000]
DLFC	.96491	.030706	31.4246[.000]
DLGCF	.39896	.021283	18.7453[.000]
DLEx	1.0171	.039062	26.0389[.000]
DLNHIal(-4)	.15504	.091537	1.6938[.107]
DLNHIfu	-.20130	.047126	-4.2716[.000]
DLNHIel(-1)	.041723	.023436	1.7803[.091]
U	-.0024715	.0019853	-1.2449[.228]

R-Squared	.99543	R-Bar-Squared	.99374
S.E. of Regression	.0081362	F-stat. F(7, 19)	590.6107[.000]
Mean of Dependent Variable	.022750	S.D. of Dependent Variable	.10283
Residual Sum of Squares	.0012577	Equation Log-likelihood	96.3413
Akaike Info. Criterion	88.3413	Schwarz Bayesian Criterion	83.1579
DW-statistic	2.4519		

Diagnostic Tests

* Test Statistics *	LM Version	* F Version
Serial Correlation	*CHSQ(4)= 5.9592[.202]	*F(4, 15)= 1.0621[.409]
Functional Form	*CHSQ(1)= 1.1370[.286]	*F(1, 18)= .79133[.385]
Normality	*CHSQ(2)= .98872[.610]	* Not applicable
Heteroscedasticity	*CHSQ(1)= .057530[.810]	*F(1, 25)= .053382[.819]

4.2.2. Slovakia, autoregressive, dependent variable DLIm, 28 observations used for estimation from 1997Q1 to 2003Q4

Regressor	Coefficient	Standard Error	T-Ratio[Prob]
DLIm(-1)	-.64537	.13845	-4.6614[.000]
DLIm(-3)	-.58768	.14040	-4.1857[.000]
DLNHIfu(-2)	-1.1370	.53071	-2.1424[.043]
DLNHIel(-1)	-.44753	.18996	-2.3559[.027]
U	.048558	.013454	3.6093[.001]

R-Squared	.74367	R-Bar-Squared	.69909
S.E. of Regression	.055873	F-stat. F(4, 23)	16.6816[.000]
Mean of Dependent Variable	.020134	S.D. of Dependent Variable	.10186
Residual Sum of Squares	.071802	Equation Log-likelihood	43.7943
Akaike Info. Criterion	38.7943	Schwarz Bayesian Criterion	35.4638
DW-statistic	2.2039		

Diagnostic Tests

Test Statistics	LM Version	F Version
Serial Correlation	*CHSQ(4)= 2.1966[.700]*	F(4, 19)= .40435[.803]
Functional Form	*CHSQ(1)= .15606[.693]*	F(1, 22)= .12331[.729]
Normality	*CHSQ(2)= 4.2462[.120]*	Not applicable
Heteroscedasticity	*CHSQ(1)= .21220[.645]*	F(1, 26)= .19854[.660]

4.3.1. Czech Republic, balance based, dependent variable DLIm, 30 observations from 1996Q3 to 2003Q4

Regressor	Coefficient	Standard Error	T-Ratio[Prob]
DLEx	.63367	.053434	11.8589[.000]
DLFCH	.11434	.059878	1.9095[.069]
DLFCG	.42631	.046384	9.1910[.000]
DLGCF	.088353	.030331	2.9130[.008]
DLNHIhm(-1)	-.32510	.077872	-4.1748[.000]
DLNHItr	-.51249	.19289	-2.6569[.014]
U	.0092594	.0029499	3.1389[.005]

R-Squared	.97328	R-Bar-Squared	.96631
S.E. of Regression	.013302	F-stat. F(6, 23)	139.6501[.000]
Mean of Dependent Variable	.023061	S.D. of Dependent Variable	.072474
Residual Sum of Squares	.0040694	Equation Log-likelihood	91.0137
Akaike Info. Criterion	84.0137	Schwarz Bayesian Criterion	79.1095
DW-statistic	2.0420		

Diagnostic Tests		
* Test Statistics	* LM Version	* F Version
* A:Serial Correlation	*CHSQ(4)= 2.4970[.645]	*F(4, 19)= .43125[.784]
* B:Functional Form	*CHSQ(1)= .051568[.820]	*F(1, 22)= .037881[.847]
* C:Normality	*CHSQ(2)= 1.4711[.479]	* Not applicable
* D:Heteroscedasticity	*CHSQ(1)= 1.2747[.259]	*F(1, 28)= 1.2425[.274]

4.3.2. Czech Republic, autoregressive, dependent variable DLIm, 27 observations used for estimation from 1997Q2 to 2003Q4

Regressor	Coefficient	Standard Error	T-Ratio[Prob]
DLIm(-1)	-.53687	.11962	-4.4880[.000]
DLIm(-3)	-.31893	.13155	-2.4244[.024]
DLNHIhm(-2)	-.39345	.21456	-1.8338[.080]
DLNHItr(-1)	.97075	.50388	1.9265[.067]
U	.051259	.0078868	6.4993[.000]

R-Squared	.78053	R-Bar-Squared	.74063
S.E. of Regression	.036960	F-stat. F(4, 22)	19.5603[.000]
Mean of Dependent Variable	.026816	S.D. of Dependent Variable	.072572
Residual Sum of Squares	.030053	Equation Log-likelihood	53.4970
Akaike Info. Criterion	48.4970	Schwarz Bayesian Criterion	45.2574
DW-statistic	1.8096		

Diagnostic Tests		
* Test Statistics	* LM Version	* F Version
Serial Correlation	*CHSQ(4)= 3.7129[.446]	*F(4, 18)= .71748[.591]
Functional Form	*CHSQ(1)= .47922[.489]	*F(1, 21)= .37946[.545]
Normality	*CHSQ(2)= .41530[.812]	* Not applicable
Heteroscedasticity	*CHSQ(1)= 1.2293[.268]	*F(1, 25)= 1.1926[.285]

4.4.1.a . Hungary, balance based (1), dependent variable DLIm, 28 observations from 1997Q1 to 2003Q4

Regressor	Coefficient	Standard Error	T-Ratio[Prob]
DLGDP	-1.3101	.075860	-17.2698[.000]
DLFC	.98032	.054970	17.8337[.000]
DLGCF	.36036	.014457	24.9269[.000]
DLEx	.91716	.041030	22.3536[.000]
DLNHIhm(-3)	.29472	.10234	2.8800[.009]
U	.2058E-3	.0016738	.12296[.903]

R-Squared	.99250	R-Bar-Squared	.99080
S.E. of Regression	.0075013	F-stat. F(5, 22)	582.3496[.000]
Mean of Dependent Variable	.032759	S.D. of Dependent Variable	.078193
Residual Sum of Squares	.0012379	Equation Log-likelihood	100.6410
Akaike Info. Criterion	94.6410	Schwarz Bayesian Criterion	90.6444
DW-statistic	2.5827		

Diagnostic Tests		
* Test Statistics	* LM Version	* F Version
* A:Serial Correlation	*CHSQ(4)= 7.3882[.117]	*F(4, 18)= 1.6130[.214]
* B:Functional Form	*CHSQ(1)= .0010842[.974]	*F(1, 21)= .8132E-3[.978]
* C:Normality	*CHSQ(2)= .96945[.616]	* Not applicable
* D:Heteroscedasticity	*CHSQ(1)= 2.2551[.133]	*F(1, 26)= 2.2775[.143]

4.2.1.b. Hungary, balance based (2), dependent variable DLIm, 28 observations from 1997Q1 to 2003Q4

Regressor	Coefficient	Standard Error	T-Ratio[Prob]
DLGDP	-1.2168	.070197	-17.3348[.000]
DLFC	1.0085	.046361	21.7526[.000]
DLGCF	.35867	.012887	27.8311[.000]
DLEx	.85245	.037904	22.4899[.000]
DLNHItr	-.34271	.085507	-4.0080[.001]
U	.0021982	.0014932	1.4721[.155]

R-Squared	.99403	R-Bar-Squared	.99268
S.E. of Regression	.0066920	F-stat. F(5, 22)	732.8405[.000]
Mean of Dependent Variable	.032759	S.D. of Dependent Variable	.078193
Residual Sum of Squares	.9852E-3	Equation Log-likelihood	103.8374
Akaike Info. Criterion	97.8374	Schwarz Bayesian Criterion	93.8408
DW-statistic	1.9158		

Diagnostic Tests

* Test Statistics	* LM Version	* F Version
* A:Serial Correlation	*CHSQ(4)= 3.7043[.448]	*F(4, 18)= .68610[.611]
* B:Functional Form	*CHSQ(1)= 2.4165[.120]	*F(1, 21)= 1.9836[.174]
* C:Normality	*CHSQ(2)= .38368[.825]	* Not applicable
* D:Heteroscedasticity	*CHSQ(1)= .64792[.421]	*F(1, 26)= .61590[.440]

4.4.2. Hungary, autoregressive, dependent variable DLIm , 25 observations used for estimation from 1997Q4 to 2003Q4

Regressor	Coefficient	Standard Error	T-Ratio[Prob]
DLIm(-1)	-.33285	.15652	-2.1266[.045]
DLIm(-3)	-.46723	.15380	-3.0380[.006]
DLNHIhm(-3)	.95978	.78510	1.2225[.235]
U	.052647	.012448	4.2293[.000]

R-Squared	.59701	R-Bar-Squared	.53944
S.E. of Regression	.053207	F-stat. F(3, 21)	10.3700[.000]
Mean of Dependent Variable	.032790	S.D. of Dependent Variable	.078401
Residual Sum of Squares	.059451	Equation Log-likelihood	40.0451
Akaike Info. Criterion	36.0451	Schwarz Bayesian Criterion	33.6073
DW-statistic	1.5464		

Diagnostic Tests

* Test Statistics *	LM Version *	F Version
Serial Correlation	*CHSQ(4)= 7.4530[.114]	*F(4, 17)= 1.8052[.174]
Functional Form	*CHSQ(1)= .070638[.790]	*F(1, 20)= .056671[.814]
Normality	*CHSQ(2)= .63030[.730]	* Not applicable
Heteroscedasticity	*CHSQ(1)= 1.8342[.176]	*F(1, 23)= 1.8211[.190]

5. Impact of harmonization on Exports (Ex)

6. Time Series Stationarity

It was assumed that Dickey-Fuller'a regressions contain an intercept and a linear trend.

6.1. Poland

Variable	Test	Order	Critical value	Test statistic value	Hypothesis 0 – variable is stationary
LGDP	DF	0	-3,55671	-5,2796	YES
LFC	DF	0	-2,9890	-3,1434	YES*
LFCH	DF	0	-2,30303	-2,8847	YES**
LFCG	DF	0	-3,6027	-5,0287	YES
LGCF	DF	0	-3,5671	-5,9976	YES
LET	DF	0	-3,5615	-5,1298	YES
LEx	DF	0	-3,6027	-6,2828	YES
LIm	DF	0	-3,6027	-4,0079	YES
LTlsp	DF	0	-3,6027	-5,8234	YES
DLGDP	DF	0	-3,5731	-7,1426	YES
DLFC	DF	0	-3,6119	-4,3807	YES
DLFCH	DF	0	-3,6119	-5,2804	YES
DLFCG	DF	0	-3,6119	-6,1295	YES
DLGCF	DF	0	-3,5731	-9,5306	YES
DLEx	DF	0	-3,6119	-5,8762	YES
DLIm	DF	0	-3,6119	-5,1219	YES
DLTlsp	DF	0	-3,6119	-8,1458	YES
DLNHIal	DF	0	-3,5671	-6,0282	YES
DLNHIfu	DF	0	-3,5671	-6,3369	YES
DLNHIel	DF	0	-3,5671	-7,1414	YES
DLET	DF	0	-3,5671	-8,6149	YES

* alfa=0,10 , **alfa=0,20

6.2. Slovakia

Variable	Test	Order	Critical value	Test statistic value	Hypothesis 0 – variable is stationary
LGDP	DF	0	-3,5615	-5,3181	YES
LFC	DF	0	-3,5615	-6,2147	YES
LFCH	DF	0	-3,5615	-5,0928	YES
LFCG	DF	0	-3,5615	-6,4150	YES
LGCF	DF	0	-35615	-3,5978	YES
LEx	DF	0	-2,9890	-3,5500	YES*
LIm	DF	0	-3,5615	-5,0266	YES
LTlsp	DF	0	-3,5615	-5,5242	YES
LET	DF	0	-3,5615	-4,1010	YES
DLGDP	DF	0	-3,5671	-5,8514	YES
DLFC	DF	0	-3,5671	-9,3155	YES
DLFCH	DF	0	-3,5671	-7,8964	YES
DLFCG	DF	0	-3,5671	-8,9549	YES
DLGCF	DF	0	-3,5671	-5,0984	YES
DLEx	DF	0	-3,5671	-9,0013	YES
DLIm	DF	0	-3,5671	-12,1544	YES
DLTlsP	DF	0	-3,5671	-6,6975	YES
DLNHIal	DF	0	-3,5671	-6,2613	YES
DLNHIfu	DF	0	-3,5671	-5,1650	YES
DLNHIel	DF	0	-3,5671	-6,2363	YES
DLET	DF	0	-3,5671	-6,6929	YES

*alfa=0,10

6.3. Czech Republic

Variable	Test	Order	Critical value	Test statistic value	Hypothesis 0 – variable is stationary

DLGDP	DF	0	-3,5671	-6,4657	YES
DLFC	DF	0	-3,5671	-10,5329	YES
DLFCH	DF	0	-3,5671	-8,1983	YES
DLFCG	DF	0	-3,5671	-12,4312	YES
DLGCF	DF	0	-3,5671	-6,3206	YES
DLEx	DF	0	-3,5671	-10,2211	YES
DLIm	DF	0	-3,5671	-12,5316	YES
DLTlsP	DF	0	-3,5671	-6,7455	YES
DLNHIal	DF	0	-3,5671	-6,0173	YES
DLNHIhm	DF	0	-3,5671	-9,2209	YES
DLNHItr	DF	0	-3,5671	-4,0532	YES
DLET	DF	0	-3,5671	-6,5310	YES

6.4. Hungary

Variable	Test	Order	Critical value	Test statistic value	Hypothesis 0 – variable is stationary
DLGDP	DF	0	-3,5671	-8,2411	YES
DLFC	DF	0	-3,5671	-7,3052	YES
DLFCH	DF	0	-3,5671	-7,0739	YES
DLGCF	DF	0	-3,5671	-12,9059	YES
DLEx	DF	0	-3,5671	-6,8018	YES
DLIm	DF	0	-3,5671	-10,7096	YES
DLTlsP	DF	0	-3,5671	-12,1513	YES
DLNHIal	DF	0	-3,5671	-7,9489	YES
DLNHIfu	DF	0	-3,5671	-7,6955	YES
DLNHIel	DF	0	-3,5671	-5,6179	YES
DLET	DF	0	-3,5671	-10,0529	YES