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The Impact of Reducing the Corporate Income Tax Rate on the State Aid Practices of EU Member States (2000 to 2015)

SUMMARY: The paper analyses the trends of State aid and corporate income taxation in Member States of the European Union after 2000. The issue is rather topical because the competition in State aid and detrimental international competition in taxation may both lead to a disintegration of the internal market. Out of all the tax types, corporate income tax is the greatest burden on undertakings, so the rate of this tax and how its base is defined are competitiveness factors of Member States. The control of State aids is a Community competence, so the risk of competition in aid is lower for this policy. The research started out from the hypothesis that the decreasing trend of corporate income tax rates will result in a decrease in State aids. The assumption is based on the fact that the subjects of both these policies are undertakings, so a reduction of taxes collected by the State will lead to a decrease in aid amounts. Correlation analysis was used to answer the questions whether it is possible to detect a parallel movement between tax burdens and State aid amounts, and what factors influenced this movement. In departure from the general understanding, our results indicate that while nominal corporate income tax rates and GDP-proportionate State aids both decreased continuously, the actual tax burden increased in some cases, and on the other hand, the high redistribution rate of Nordic Member States appeared also in State aids.

KEYWORDS: State aid, corporate income taxation

JEL-CODES: H25, H71

State aid policy and taxation are intertwined at more than one point. The major connection between the policies is the two subjects of the policies: states and undertakings. This relationship may be regarded as a peculiar interaction between the operators, but with opposite signs, considering that while the state withdraws resources from the market, it redistributes these funds between market actors by various interventions (such as tax allowances) by virtue of the State aids. The policies also

show similarities in respect of their objectives, which serves broader economic, social and political goals through the equitable bearing of public burdens and economic cohesion. This points beyond the consideration of merely budgetary interests of the state. Our investigations attribute particular significance to the inter-state aspects of the two policies, as both competition in State aids and harmful international tax competition may lead to the disintegration of the internal market. All this corroborates the need to control State aids and manage harmful tax competition.

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The first part of the paper describes the framework and methodology restrictions of our research. Items to be highlighted include the differences between nominal and actual tax rates, the distorting effect of special taxes, the deficiencies of data series, and the definition of support methods taken into account in the framework of State aids. The paper focuses on reviewing State aid trends followed by the major features of corporate income taxation in a breakdown by cluster. As part of our investigation we will look at the actual tax burden, and we will also assess how tax liability and state aid practices relate to each other.

THE FRAMEWORK, GOALS AND LIMITATIONS OF THE ANALYSIS

The greatest limitation to drafting this paper was that there was a small quantity of reliable and comprehensive statistical data available for analysing the relationship between State aids and international taxation. This explains the low number of specialised professional studies on the subject (DBR 2014, EB 2016) while also pointing out that the range of statistical data published by states on taxation is relatively narrow.

Although as a result of the data collected by Eurostat, data series concerning State aids are available for the entire inspected period, the results can only be interpreted by taking into account a number of assumptions. These assumptions influence the temporal and geographic spectrum of our investigations, so they also have an effect on the explanatory power of the results.

The research was conducted on EU Member States. Analyses on State aids are based on aid granted on the basis of Article 107(1) of the TFEU. Reporting is based on Commission Regulation No 794/2004, according to which Member States are obliged to report

on aid granted to the processing industry, the service industry, agriculture and fisheries, as well as aid subject to group exemption regulations. The figures show aid content; aid content means the amount shown as the ultimate financial benefit in the nominal amount of the aid (EB 2013, 1.). This may appear in the form of subventions, tax exemptions, capital subsidy, credit support, deferred tax payment or guarantees, but only the part different from market conditions shall be taken into account in calculating the aid content. Statistical figures do not include the subsidies granted to railway companies, aid associated with general measures and services of a general economic interest, or funds and assets not originating from Member States. Calculations do not include aid from European Union Funds, though we are aware that such aids may also distort the economic conditions in the internal market and the Member State market. As no statistics are available on Croatia until 2013, the country was not included in calculations related to State aid.¹ Given that figures on State aid for 2016 have not been disclosed at the time of drafting this paper, the research relates to the period from 2000 to 2015. Thanks to figures expressed in proportion to GDP, the data allows for relative comparison, whereas the actual amounts spent on aid show significant differences. Our investigation attempted to eliminate the (distorting) effects of the global economic crisis that spilled over to the European Union in the autumn of 2008 by including only State aid unrelated to the crisis. Please note that the amounts of GDP-proportionate state aids for 2014 and 2015 were drawn down at a date different from the data of earlier years (similarly to total GDP figures for 2015), which showed departures from the figures of earlier years in certain cases.

The analysis has a severe methodological constraint, namely that the state aid granted

remained below one per cent when compared to GDP in nearly all Member States, and data volatility is slight, which reduces the reliability of the results of the different statistical methods. Another restrictive factor is that our figures include only permitted aid, whereas the range of European Union aid is broader than this: *de minimis* aid constitutes funds, just as aid disbursed out of the various Funds of the EU.

In the case of corporate income tax systems with multiple rates, the highest rate of corporate income tax is considered to be the tax rate to be applied in the given economy. Developed economies continuously increase the proportion of sales-type taxes to the detriment of income taxes in their budgets, so the revenue flowing from corporate income tax provides a decreasing portion of budget revenue in Member States. For instance, this ratio is five per cent in Germany and around eight per cent in Hungary (OECD 2016, KSH 2017). In order to maintain the level of budget revenue, a reduction of the corporate income tax rate may bring about an increase in tax burdens for other tax types, meaning that the actual tax burden will not necessarily decrease in proportion with the reduction of corporate income tax. On the other hand, we admit that figures on corporate income tax do not necessarily allow for the true and fair comparability of actual tax burdens without a harmonised definition of the national tax bases. On the other hand, economies are known to employ other incentives that cannot be allocated to tax bases or tax rates, however, such factors cannot be quantified. Therefore, we also admit that the investigation of how corporate income tax rates change is not suitable for assessing the composition of the budget's revenue side, but it is suitable for allowing a comparison between the tax liabilities of undertakings, which in turn enables determination of the tax burden.

The definition of the methodological framework sheds light on the fact that the development of the empirical background of this paper encountered numerous limitations that were difficult to overcome, if at all, and all this confirms that the outcome of the analyses should be interpreted in the light of a number of non-statistical variables, so we relied primarily on the tools of descriptive statistics.

DECREASING TAX RATES, BUT INCREASING TAX BURDEN?

In the course of our analyses, the starting point was the assumption that there is a positive correlation between the GDP-proportionate rate of State aid and the evolution of corporate income tax rates, meaning that decreasing corporate income tax rates are accompanied by decreasing GDP-proportionate State aid expenditure. Although the analyses to this effect were conducted using correlation analysis, we note that the applicable tax rates and the final amount of State aid granted are determined at different points in time. The reason for this is that tax changes usually take effect at the beginning of a calendar year, whereas a few larger aid items may have a significant impact on the aggregate of State aids. We will look at the impact of the delay, but first, the starting assumption is that the reduction of the corporate income tax burden will entail the reduction of State aids within the year in question.

The evolution of State aids

According to the statistics on State aids, the European Commission's efforts (SAAP 2005) to curb aids granted by Member States in order to maintain the unity of the internal market and dismantle the obstacles to free competition were partly successful.

State aids granted between 2000 and 2011 decreased by 0.28 percentage points, but started to grow again as from 2012. As regards the results shown in *Figure 1*, we recall that these figures include only eligible aids, so the GDP-proportionate reduction should be interpreted knowing that – in accordance with the economic development goals of the European Commission and most Member States – the long-term goal to be pursued is primarily to increase the extent of aids granted in connection with the creation of a knowledge-based economy. Therefore, a shift can be seen between the ratios of main groups of State aids aimed at generating high added-value outputs (EB 2014).

As the low volatility of figures related to GDP-proportionate State aids does not allow

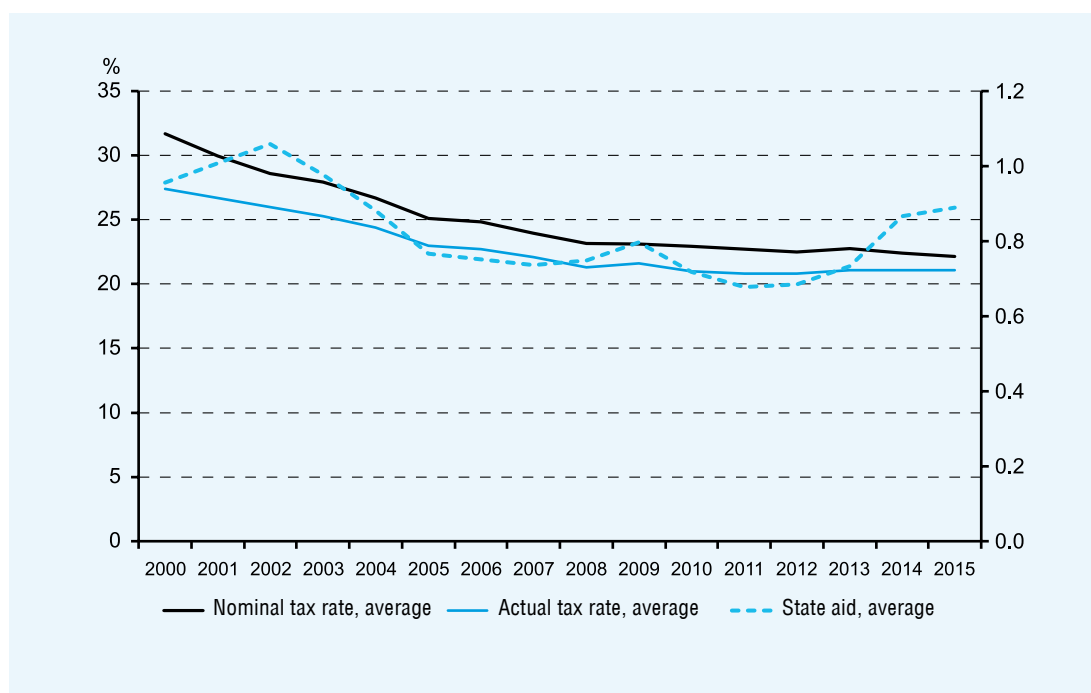
for drawing far-reaching conclusions from the data of individual Member States, the major characteristics of state aids will be presented on the basis of the aggregate values of the time series analysed.

In the time interval encompassed by our statistical analysis, the rate of GDP-proportionate State aids varied between the 0.28 per cent measured in the United Kingdom on average and the 2.36 per cent recorded in Malta. The average of the EU-27 over 16 years reached less than one per cent (0.82 per cent), while the rate of aids was 8 per cent lower in 2015 than in 2000 on a year-on-year basis. The decrease matches the similar trend seen in the 1990's (Nicolaidis, Kekeleakis, Buyskes 2005).

Between 2000 and 2015, the average nominal rate of corporate income tax decreased by

Figure 1

CHANGES IN THE AVERAGE VALUES OF THE NOMINAL RATE OF CORPORATE INCOME TAX, THE ACTUAL RATE OF CORPORATE INCOME TAX (LEFT AXIS) AND THE GDP-PROPORTIONATE STATE AID (RIGHT AXIS), 2000–2015



Source: Figures edited by the author based on Eurostat 2015a, KPMG 2002, KPMG 2017

9.56 per cent, and its average rate was as low as 22.15 per cent in the last year of the inspected period, while the actual tax rate decreased by 6.4 percentage points to 21.1 per cent. The difference between nominal and actual tax rates is explained by the methodology for calculating the tax base. Member States employ a number of incentives to make their business conditions more attractive, whereas the actual tax burden is raised by the special taxes calculated on the basis of the tax base, albeit undertakings do not necessarily pay such burdens on the basis of their business results.

In order to eliminate the statistical distortions arising out of the difference in the size of national economies, Eurostat's purchasing power standard indicator was taken into account. However, this covers only the 13 years between 2003 and 2015, so the results also apply to that period.

In order to enhance the reliability of the results, the EU-27 Member States analysed were classified into four groups, after which the state aid amounts by country were calculated on the basis of their GDP. The purpose of doing so was to eliminate the differences in the size of the Member States and to facilitate a better comparison of the results.

The clusters were defined based on the system applied by *Farkas* (2017) to market economy types. The author classifies the EU-25 Member States on the basis of six policies and empirical results in international trade literature. The six policies do not include either taxation or State aids, so the significance of this paper is that it looks at whether the statistical features of these two policies confirm this kind of cluster classification.

The northwest cluster encompasses eight old Member States deemed to be core countries. However, Ireland's economic history over the past 15 years is very different from the development of the other Member States of the cluster (Honohan, 2009, O'Sullivan,

Kennedy 2010). According to our hypothesis, we presume a moderate relationship between State aids and taxation in cluster members, that is, a low aid value coupled with a relatively high rate of taxation.

The economic potential of the Mediterranean countries that make up the second cluster is significantly different. Their common feature is that the primary sector had a greater share in their economy prior to the European integration. Data series of Malta and Cyprus were also included in our investigations [which is a difference compared to the cluster classification of *Farkas* (2017)]. The difference between cluster members is also reflected when investigating our topic: we believe that the restricted room for fiscal maneuver fundamentally determines the State aid policy of Member States, that is, similarly to the first cluster, we think that the ratio of GDP-proportionate State aids will be low in the southern countries as well.

The northern cluster consists of Finland, Sweden and Luxembourg. Its members are extremely competitive in global terms as well, assisted by their growth-friendly tax system. The high rate of taxation allows for giving considerable support to undertakings. Active participation of the state in the economy also point in this direction.

The fourth, central and eastern European cluster is the most populated: in addition to the eight post-Socialist countries that acceded in 2004, it includes Bulgaria and Romania. Their institutional backgrounds show a lot of similarities, including highly skilled and inexpensive labour, the central role of foreign working capital, while their level of development may show significant differences in certain respects. It is assumed that the decades of these economies after the political regime change were characterised by the involvement of FDI, which is why granting State aid may be an important means for enhancing their

ability to attract capital. This is coupled with low corporate income tax burdens, so it is assumed that the low rate of taxation goes hand in hand with a high rate of State aids, which would contradict the processes assumed for the first three clusters.

Figure 2, showing the aggregate results,

demonstrates that East-Central European countries have granted an outstandingly high amount of State aid as compared to the GDP in the first years of the period inspected. This may be attributed primarily to the high GDP-proportionate expenditure of the Czech Republic and Poland (2.7 per cent and 3 per

Table 1

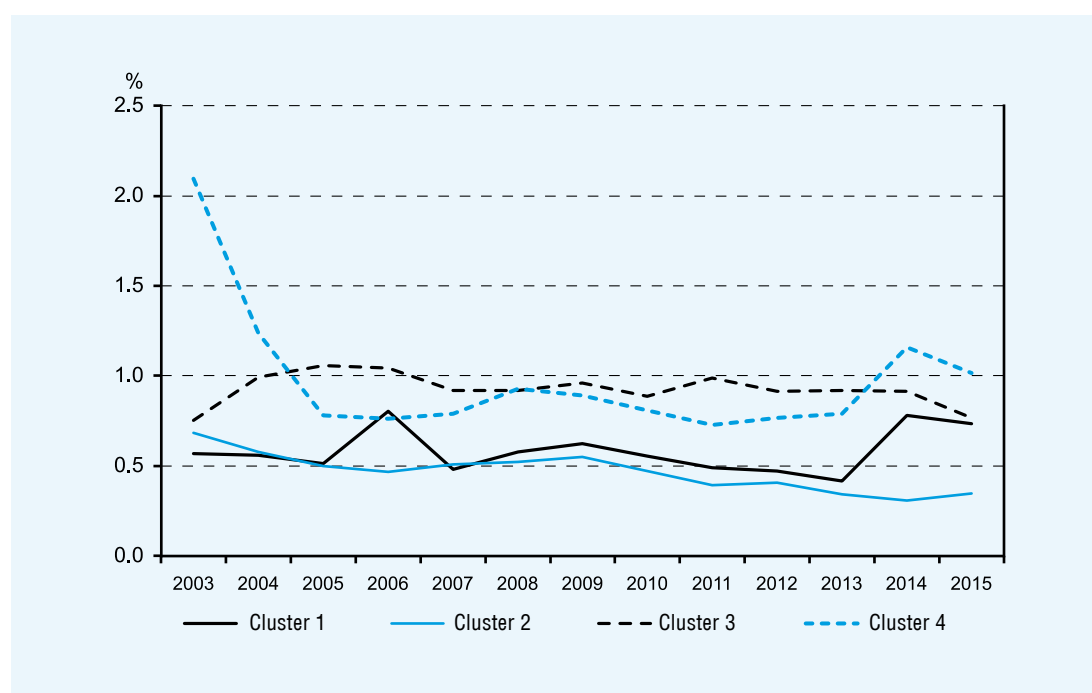
CLASSIFICATION OF MEMBER STATES BY CLUSTER

Cluster name	Countries
Cluster 1 northwest	Austria, Belgium, Denmark, United Kingdom, France, Netherlands, Ireland, Germany
Cluster 2 Mediterranean	Italy, Spain, Greece, Portugal, Malta, Cyprus
Cluster 3 northern	Finland, Luxembourg, Sweden
Cluster 4 East-Central European	Bulgaria, Estonia, Czech Republic, Poland, Latvia, Lithuania, Hungary, Romania, Slovakia, Slovenia

Source: Figures edited by the author based on Farkas (2017)

Figure 2

RATIO OF STATE AIDS IN PROPORTION TO THE GDP BY CLUSTER, 2000–2015



Source: Figures edited by the author based on Eurostat 2015a, Eurostat 2015b

cent, respectively, in 2003), and Poland's economic weight. Hungary has also significantly contributed to the high average, being the only country in the group that has spent at least one per cent of its GDP on State aids (at values between 1.2 and 2.1 per cent) during the entire period inspected.

The novelty of our statistical analyses is that in proportion to the GDP, the countries of the northern cluster (Finland, Sweden and Luxembourg) have granted more State aid than the East-Central European countries between 2004 and 2013 (except for 2008). The high rate of aid granted to undertakings explains the value of around one percentage point. On the other hand, *Tindale* (2015) points out that aid related to the dissemination of renewable energy may infringe the integrity of the internal market in certain cases. Between 2007 and 2013, states of the northwest cluster show a constant level of State aid – around 0.5 per cent – while Member States of the south cluster granted aids below half a per cent. The parallel movement of clusters 1 and 4 after 2013 needs to be highlighted, this kind of movement may be attributed primarily to the high GDP-proportionate value in Germany and Lithuania in 2014–2015.

Trends in corporate income tax rates

The European Commission's 2015 report entitled *Tax Reforms in EU Member States* (EB 2015) defines the promotion of economic growth and the maintenance of fiscal balance as the two fundamental goals of a good taxation policy. The report points out that direct tax burdens amounted to 12.5–13 per cent of the GDP at EU level between 2011 and 2015, and expects this rate to stabilise in the future. Considering that the total GDP-proportionate tax burden was 39.4 per cent on average in the EU-28 in 2012

(EP 2015), this means that direct taxes and good tax governance play a significant role in maintaining the fiscal balance of Member States.

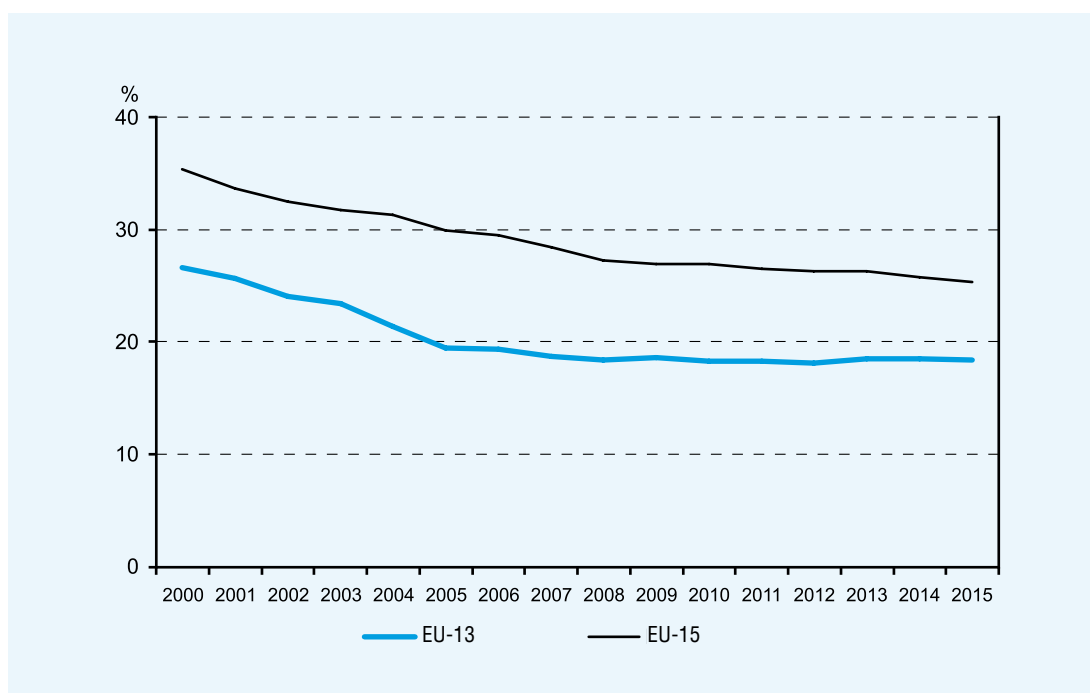
In the period between 2000 and 2015, the nominal corporate income tax burden of the EU Member States has decreased continuously and significantly. In 2000, the average tax burden for the 26 states taken into account, excluding Croatia and Cyprus due to lack of data, amounted to 31.71 per cent, with considerable differences within that average. At that time, the highest tax burden appeared in Germany (51.6 per cent), while the average of the EU-15 amounted to 35.44 per cent. The average tax burden of the EU-11 acceded in or after 2004 reached 26.64 per cent. The gap started to open in 2005, while the difference became permanent after 2006: as regards the entire period, the average nominal rate of corporate income tax in the EU-15 was 29.02 per cent, while in the EU-13, the average was about nine per cent lower, 20.38 per cent.

Although the *Porterian model* of competitiveness does not regard the tax system to be an independent factor of competitiveness (Porter 1990), it is important to note that the corporate income tax rate is a significant factor in East-Central European Member States. The new Member States employed several incentives difficult to quantify statistically (greenfield investments, wide-ranging tax allowances, royalty structures, contribution reliefs, etc.) in order to attract foreign working capital. The features of actual tax burdens will be reviewed later on, but it may be said up front that the incentives inherent in the tax system have fundamentally determined the development of East-Central European economies following the political regime change.²

In most Member States, corporate income tax rates have decreased continuously and from time to time even substantially, and this trend has not been broken even by the crisis.

Figure 3

NOMINAL CORPORATE INCOME TAX RATE OF OLD MEMBER STATES AND MEMBER STATES ACCEDED AFTER 2004, 2000–2015



Source: Own editing based on KPMG 2017

The trend that became clear by 2015 indicates (EB 2015) that a part of the Member States intended to facilitate growth incentives also by increasing the proportion of less distorting taxes (sales tax, environmental tax, property tax) compared to taxes charged on labour as well. The ratio of corporate income tax within total tax revenue is less significant today: The 2015 figures indicate that the average corporate income tax was 6.8 per cent for the first cluster, 8.9 per cent for the second cluster, 7.7 per cent for the third cluster, and also 6.8 per cent for the East-Central European cluster. In Slovakia’s case, the increase of the corporate income tax rate may be deemed to be a step towards simplifying the Slovakian tax system. Slovakia’s example demonstrates that economic development is not triggered by decreasing corporate tax rates; rather in many cases, it de-

pends on other factors, which might be country-specific. Corporate income taxation in Greece has corresponded to the trend seen in the European Union (as well as in the OECD) until 2012, whereas the 2013 tax rate increase may clearly be interpreted as a response to the reforms that have been postponed over the previous decade (OXFAM 2013) and through that, to the crisis (Matsaganis 2013). The different role taxation played in the history of economic development of the two Member States throws light on the fact that taxation cannot be investigated in itself, independent from other economic subsystems, and not only from the perspective of fiscal stability and growth, and the extent to which taxation is embedded and integrated (which is understood to cover tax compliance, that is, the extent to which taxpayers satisfy their taxation

obligations at all times) has long-term social repercussions as well.

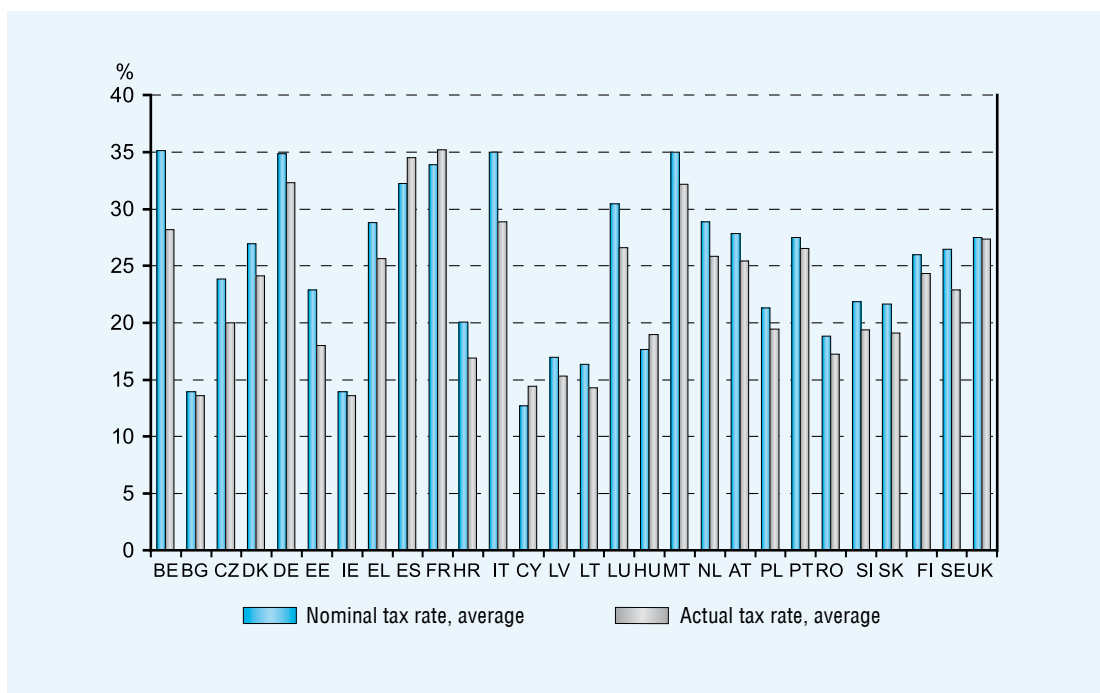
Understanding the processes underlying the trends is greatly promoted by an overview of the actual burdens on undertakings in addition to the nominal tax rate. The investigation was based on the statistics of Zentrum für Europäische Wirtschaftsforschung (ZEW) on actual tax rates, published by Eurostat. There are a number of different definitions for the actual tax rate in international trade literature (see Nicodème 2001). For the purposes of this paper, actual tax rate shall mean the rate actually imposed on the tax base or economic activity of an undertaking by a Member State, regardless of whether it is a direct or indirect burden on economic operators (EB 2017). Thus, actual tax rate is an economic methodology indicator that represents the real tax li-

ability of an undertaking. However, the actual tax rate does not necessarily mean a liability lower than the nominal tax rate. During the crisis years, several Member States imposed special taxes to improve balance, the calculation of which was based on the corporate income tax base. This definition of tax liability focuses on the actual tax liability rather than merely the imposition of tax.

Results of the comparisons between nominal and actual tax rates show a rather mixed picture (Figure 4). Between 2000 and 2015, the median value of the European Union average of the average nominal corporate income tax rate was 23.57 per cent, while rates for the Member States were widely dispersed. The actual burden was higher than the nominal tax rate in altogether four Member States (Spain, Cyprus, Hungary and France).

Figure 4

NOMINAL AND ACTUAL AVERAGE CORPORATE INCOME TAX RATES, 2000–2015



Source: Own editing based on Eurostat 2016 and KPMG 2017. Note: Cyprus and Croatia 2001–2015

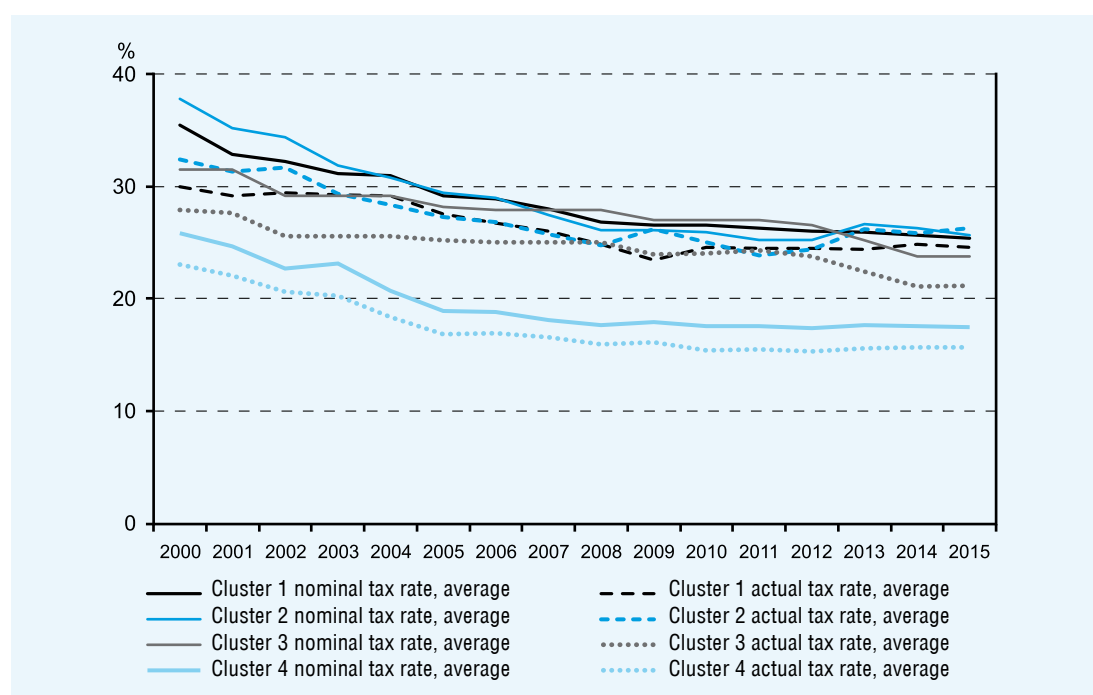
A breakdown by cluster shows that the difference between the nominal and the actual tax rate was the greatest in the northern group (3.07 per cent), while it is the smallest in the southern cluster (1.72 per cent). The difference in respect of the East-Central European states is 2.1 per cent, which is close to the value of the northwest cluster.

We also tried to answer the question whether the analyses performed on the basis of nominal and actual tax rates confirm Farkas' (2017) cluster classification. The results are summarised in *Figure 5*; it should be noted that both nominal and actual tax rates are on a path of decrease. Reduction was fast until 2006, with the average tax burden decreasing by 6.5 per cent nominally (4.4 per cent actually) in the seven years between 2000 and 2006 and a further 2.3 per cent (actually by 1.4 per cent) be-

tween 2007 and 2015. As regards the tax rate, the East-Central European countries in the fourth cluster are considerably different from the other three groups, although the continuous trend of decrease can be seen here as well. This confirms the assumption that one of the most important factors for the competitiveness of the East-Central European economies is the lower rate of corporate income taxation. *Figure 5* also demonstrates that the difference between the nominal and actual corporate income tax rates is constant mostly in the case of East-Central European states. This may be explained by the low level of taxation and the insignificant variation of items modifying the tax base. After 2012, the northern cluster converged to this cluster, but the difference between actual tax burdens was 5.5 per cent in spite of the reduction in 2015. The decrease

Figure 5

DEVELOPMENT OF NOMINAL AND ACTUAL CORPORATE INCOME TAXATION RATES BY CLUSTER, 2000–2015



Source: own editing based on KPMG 2002, KPMG 2017 and Eurostat 2016. Note: excluding the data of Croatia and Cyprus for the year 2000.

may be attributed to the 4.5 and 3.8 per cent cuts by Finland and Sweden, respectively.

There is another correlation seen in the figure: while the gap between the nominal and the actual rate of corporate income tax was closed in the northwest cluster with the 5.4 per cent difference measured in 2000 shrinking to 0.8 per cent by 2015, the actual rate of corporate income tax exceeded the nominal tax rate – by 0.65 per cent on average – by 2015 in the Mediterranean cluster. Out of the six cluster members, the actual corporate income tax rate was higher than the nominal in the case of Cyprus, Greece, Portugal and Spain, i.e. in the Member States where significant balance improving measures were implemented. We note that the actual corporate income tax rate was higher also in Ireland and Hungary. In the former case, the difference could be observed from as early as 2003, the period of the Irish banking crisis, while in the case of Hungary, the value fluctuated between 0.1 and 3.5 per cent during the period in question (with the maximum reached between 2007 and 2009, the reasons for this may also attributed to the balance improving measures). The greatest (negative) difference from the EU average can be seen in Bulgaria, Ireland and Cyprus, which are also Member States that tax with the most favourable rates.

Correlation between tax rates and State aid

We have conducted a correlation analysis to describe the relationship between State aids and corporate income tax rates. The correlation run for the 28 Member States did not lead to any measurable result in the case of Croatia and Malta. Similarly to the statistical data on State aids, the low volatility also proved to be a restrictive factor for the corporate income tax rates.

The Pearson correlation coefficient of the

analysis of 16 elements (years between 2000 and 2015) is 0.4, the correlation analysis shows a significant relationship in the case of 12 Member States. The results show that positive correlation may be observed for seven Member States, while negative correlation exists in relation to five Member States. When there is positive correlation, the changes in the corporate income tax rate and the GDP-proportionate amount of State aids moved in the same direction. The outcomes of the correlation analysis are shown in *Annex 1*.

According to our results, the corporate income tax imposed on three old Member States that had positive correlations (Italy, Portugal and Spain) was above average during the period under review, while the rates applied in Cyprus, the Czech Republic and Romania stayed a number of percentage points below the EU-28 average. The correlation rate changes because the figures are higher than 0.8 in the case of Cyprus, Portugal and Romania. However, as the common feature for the seven Member States the GDP-proportionate State aid expenditures have been reduced significantly over a long-term. That leads to a conclusion that the positive and significant correlation was induced by the GDP-proportionate State aids which, apart from the fluctuation observed until 2004–2005, were gradually decreasing.

Significantly negative correlation was observed in the case of the United Kingdom, Estonia, Greece, Latvia and Slovenia. With the exception of Slovenia and Greece, the correlation does not exceed significantly the Pearson significance level applicable to the given number of elements. The 0.4 per cent GDP-proportionate State aid was outstanding in the United Kingdom in 2014–2015, and it was the highest figure over the entire period in question. In Slovenia, the strong correlation might be caused by the structure of the Slovenian economy. In our opinion the spe-

cial status of the Slovenian economy is very much related to the Yugoslav ‘market-friendly’ socialist features and the relatively advanced state of the country, in which the technology intensive sectors played a very important role.

In Greece, the results of the correlation analysis have to be interpreted in the light of the economic and euro crisis. There the GDP-proportionate state aid figures varied around 1 per cent after 2008 and the shrinking economy was one of the factors leading to the reduction in the State aids. The Greek economy, which was most heavily affected among the states of the periphery, had a number of characteristics which may significantly influence the volume of State aids and the corporate income tax rate. From a regulatory aspect they include accelerated privatisation, the introduction of special taxes and tax increases, while from the aspects of tax payers primarily the transfer of head offices to Bulgaria, which was considered a safe country (Katsikis, Frigidis, Pashaloudis 2013).

In case of the two Baltic Member States of Estonia and Latvia, the data series perfectly illustrate the negative correlation because while the corporate income tax rates were falling gradually, GDP-proportionate State aid expenditures were rising gradually.

As the various tax base or tax reducing items are not included in the review of nominal corporate income tax rates, the correlation analysis was also run with the actual corporate income tax rates. The comparison of GDP-proportionate State aid rates and the corporate income tax rates did not result in any significant difference compared to the nominal tax rates (our results are presented in *Annex I*), therefore it would be difficult to draw far reaching conclusions from it. However, in Denmark the use of the actual tax rates in the analysis resulted in a significantly negative correlation. Though, while during the analysis of nominal corporate income tax rates

the correlation was positive for Ireland (with a major decline in the corporate income tax rate), the rising actual corporate income tax rate turned around the sign of the correlation and a significantly negative 0.44 per cent shift was identified. It all results from the fact that while in 2000 the nominal corporate income tax rate was 24 per cent, the actual rate was 9.4 per cent, which means that the companies operating in Ireland made considerable deductions against their tax base, the situation turned around by 2015, when the nominal tax rate was 12.5 per cent, but the actual rate was 14.1 per cent. The nominal corporate income tax rate fell by 11.5 per cent between 2000 and 2003, and the actual tax rate grew only by 4.9 per cent during those years, and therefore most of the processes that had an impact on the direction and strength of the correlation ended by 2003. The trends changed because of the crisis (OECD 2011): there was a need for additional tax revenues to fund the budgetary expenses of bailing out and capitalising the banks.

With the review of the actual tax rate a significant difference, changing even the sign of the correlation was found not only in Ireland, but also in Belgium and Sweden. However, this significance may not be considered statistically important in those two countries.

THE IMPACT OF THE GLOBAL ECONOMIC CRISIS ON THE CORRELATION BETWEEN THE ACTUAL CORPORATE INCOME TAX AND STATE AIDS AND THE OUTCOME OF THE SHIFTED COMPARISON

Braking down the data of the time series into two periods, one from 2000 to 2008 and the other from 2009 to 2015, the effects of the global economic crisis on the non-crisis-related aid may be observed. In our study State aids associated with the crisis are not analysed

because, on the one hand, the economic shock triggered by the crisis resulted in a recession that lasted for few years in most Member States and, apart from a few Member States, neither the nominal, nor the actual corporate income tax rates increased significantly. We assume that crisis related aids were funded as a result of a looser fiscal policy, which is also confirmed by *Czékus* in his research (2012).

The results of the timeline divided into two periods are shown in *Annex 2*. The most important result of our calculations made on the basis of the breakdown is that we observed strong correlation in two cases (in Italy positive in both periods, and in Portugal the period of positive correlation between 2000–2008 was followed by a period of negative correlation in 2009–2015) compared to the 12 significant correlations that were concluded on the basis of our original calculations.³ Portugal is noteworthy because the shift in the trend was most probably caused by increasing State aid expenditures. In the first period strong positive correlation was observed in Romania, Cyprus, Finland and Sweden. That strong correlation disappeared by the second period and occasionally its sign also reversed. With regard to the period of 2000–2008, this means that the falling corporate income tax rates were accompanied with decreasing GDP-proportionate subsidies (with the exception of Slovakia, whose tax policy was described above). Similarly, Austria, Denmark, France, Estonia, Slovenia and Luxembourg showed strong correlation in the second period, all with negative signs, with the exception of Luxembourg. All this suggests that with falling corporate income tax rates GDP-proportionate State aids began to increase after 2009.

In general, the fiscal and major economic policy measures of the developed market economies usually enter into force on 1 January. Some Anglo-Saxon countries are exceptions where the financial year does not follow

the calendar year. Nevertheless, the impacts on the budget of the fiscal measures introduced during the ‘rule of thumb’ financial year and of the measures relating to GDP-proportionate State aids do not necessarily lead to results in the same financial year, which may indicate the correlation between the corporate income tax burden and the aid practices. We intended to dampen that impact by shifting State aid statistics, i.e. the actual corporate income tax rates applied in 2000 were compared to the State aid figures of 2001. Thus our analysis was based on the corporate income tax rates applied between 2000 and 2014 and the State aid statistics between 2001 and 2015.

The shifted State aid statistics reflected a significant correlation for 13 out of the 26 Member States: Denmark, the United Kingdom and Ireland fell into that category from the northwest cluster, and all three Member States had a negative correlation. Of the members of the East-Central European cluster Estonia, Latvia and Slovenia showed negative and strong correlations, while the correlation was positive and strong in Romania. We measured a significant correlation for all five countries belonging to the Mediterranean cluster, but while it was negative for Greece, the two variables fluctuated together in Cyprus, Italy, Portugal and Spain.

At this point the Member States of the East-Central European and Mediterranean clusters should be divided into two groups according to the sign of their correlation. Thus Latvia, Slovenia and Greece belong to the group with negative correlations. These countries were heavily affected by the global economic crisis: The GDP of Latvian shrank by 14.3 per cent only in 2009, the average growth of the Slovenian economy between 2005 and 2015 was only 1.1 per cent, while the Greek economy dwindled by 29.7 per cent between 2008 and 2013 (Eurostat 2016). This also leads to the conclusion that in the Member States where

the GDP dropped significantly (or for a long period) the actual corporate income tax rates and the GDP-proportionate State aids moved in different directions. This may be an economically sound correlation because State aid figures are expressed in proportion to the GDP, while this is not the case for the data series of corporate income tax rates used by us.

The other group includes Member States where correlation was positive and strong: i.e. Finland, Cyprus, Italy, Portugal and Spain. In the three Member States belonging to the Mediterranean cluster the positive and strong correlation was caused by the global economic crisis. The results suggest that the decreasing actual corporate income tax rates were accompanied by decreasing GDP-proportionate State aids, which was the result of the more limited room state budget to manoeuvre. Besides the overall GDP decline, the reduction of the GDP-proportionate aids led to an accumulated decrease in the aid amount.

SUMMARY

In our study we wanted to identify the statistical correlations between State aids and corporate income taxes in EU Member States. We concluded that in total both ratios were decreasing during the period in review. In order to enhance the reliability of our analyses, we categorized the Member States into clusters; in general the results show that decreasing nominal and actual corporate income tax burden was accompanied by decreasing State aid rates. Among the results, we wish to highlight the consistency in the fluctuation of the northwest cluster and the Mediterranean cluster, which can also be observed in the State aids and corporate income tax rates. However, while in the case of the northwest cluster we assume that moderate State aid is associated with the remarkable

state of development of these Member States even in a global comparison, the moderate State aid observed in the southern states was mainly the result of the economic difficulties and the fiscal pressure the Member States of the peripheries has to face after the turn of the millennium. In addition, a significant correlation was found among the indicators of the southern countries and only the situation of Greece was significantly different from the cluster members. The main conclusion relating to State aids is that the states of the northern cluster supported their enterprises even more than the East-Central European states. At the same time, we also showed that in the northern countries the actual corporate income tax rate was significantly lower than the nominal tax rate, i.e. the three Member States also support their businesses indirectly. We are unable to either confirm or reject our hypothesis in relation to the members of the East-Central European cluster, but the development of their economies after the change of regime had an impact on the taxation and aid practice applied for fifteen years after the turn of the millennium. In terms of corporate income tax rates, we found that as an average of the analysed period there were four Member States (Cyprus, France, Hungary and Spain) where the actual tax rate was higher than the nominal burden. This phenomenon is, most probably, the result of the special taxes. Our calculations made with a one year shift in time suggest that in the Member States where the GDP declined significantly, the actual corporate income tax rates and the ratio of State aids changed in different directions.

Our results are to be interpreted in consideration of the methodological limits. Our calculations are affected by the tax base calculation methods, which are different in each Member State (increasing and decreasing items, rules of carrying forward losses, con-

ditions of establishing a site) and the special taxes imposed on the basis of the corporate income tax base. Limiting factors distorted our calculations. Thus the introduction of rules for a common consolidated corporate income tax base at EU level would significantly improve the comparability of the actual tax

burden. Without that, the tax base calculation based on global income would give a greater role to tax conventions, because they allow for the avoidance of double taxation of the income with either exemptions or offsetting, and therefore the internal market distortions of the EU may be reduced.

Annex 1

COMPARISON OF THE NOMINAL AND ACTUAL CORPORATE INCOME TAX RATES AND GDP-PROPORTIONATE STATE AIDS, 2000–2015

Member State	In addition to the nominal VAT rate (STR)		In addition to the actual VAT rate (ETR)	
	Correlation coefficient	Correlation direction (+–) and strength (E)	Correlation coefficient	Correlation direction (+–) and strength (E)
NORTHWEST CLUSTER				
Austria	–0.146	–	–0.180	–
Belgium	0.201	+	–0.072	–
Denmark	–0.397	–	–0.417	–E
United Kingdom	–0.494	–E	–0.513	–E
France	–0.265	–	–0.175	–
Netherlands	0.266	+	0.243	+
Ireland	0.419	+	–0.440	–E
Germany	0.211	+	0.255	+
EAST-CENTRAL EUROPEAN CLUSTER				
Bulgaria	0.034	+	0.090	+
Czech Republic	0.634	+E	0.450	+E
Estonia	–0.509	–E	–0.512	–E
Poland	0.196	+	0.180	+
Latvia	–0.418	–E	–0.443	–E
Lithuania	–0.256	–	–0.208	–
Hungary	–0.248	–	–0.223	–
Romania	0.938	+E	0.932	+E
Slovakia	–0.250	–	–0.256	–
Slovenia	–0.791	–E	–0.846	–E

Member State	In addition to the nominal VAT rate (STR)		In addition to the actual VAT rate (ETR)	
	Correlation coefficient	Correlation direction (+-) and strength (E)	Correlation coefficient	Correlation direction (+-) and strength (E)
MEDITERRANEAN CLUSTER				
Cyprus	0.919	+E	0.854	+E
Greece	-0.618	-E	-0.424	-E
Italy	0.749	+E	0.778	+E
Portugal	0.846	+E	0.576	+E
Spain	0.749	+E	0.704	+E
NORTHERN CLUSTER				
Finland	0.416	+E	0.428	+E
Luxembourg	0.155	+	0.155	+
Sweden	-0.125	-	-0.128	-

Source: own calculation based on KPMG 2002, KPMG 2017, Eurostat 2015a and Eurostat 2016

Annex 2

CORRELATION ANALYSIS OF ACTUAL CORPORATE INCOME TAX RATES BETWEEN 2000–2008 AND 2009–2015 AND NON-CRISIS-RELATED GDP-PROPORTIONATE STATE AIDS; SHIFTED STATE AIDS

Member State	Period 1: 2000–2008 (critical value: 0.521)		Period 2: 2009–2015 (critical value: 0.582)		State aid in the tax year (n) and in n+1 year (2001–2015) (critical value: 0.412)
	Correlation coefficient	Correlation direction (+-) and strength (E)	Correlation coefficient	Correlation direction (+-) and strength (E)	
NORTHWEST CLUSTER					
Austria	-0.091	-	-0.763	-E	-0.371
Belgium	0.441	+	-0.533	-	-0.369
Denmark	0.400	+	-0.907	-E	-0.531
United Kingdom	0.075	+	-0.544	-	-0.536
France	-0.322	-	-0.687	-E	-0.143
Netherlands	0.469	+	-0.212	-	0.145
Ireland	-0.450	-	0.559	+	-0.533
Germany	0.213	+	0.205	+	0.248

Member State	Period 1: 2000–2008 (critical value: 0.521)		Period 2: 2009–2015 (critical value: 0.582)		State aid in the tax year (n) and in n+1 year (2001–2015) (critical value: 0.412)
	Correlation coefficient	Correlation direction (+–) and strength (E)	Correlation coefficient	Correlation direction (+–) and strength (E)	
EAST-CENTRAL EUROPEAN CLUSTER					
Bulgaria	0.051	+	0.160	+	0.059
Czech Republic	0.431	+	–0.495	–	0.310
Estonia	–0.453	–	–0.815	–E	–0.436
Poland	0.131	+	zero divisor		0.320
Latvia	–0.423	–	–0.505	–	–0.503
Lithuania	–0.490	–	–0.056	–	–0.217
Hungary	–0.354	–	–0.366	–	–0.063
Romania	0.933	+E	zero divisor		0.771
Slovakia	–0.694	–E	0.138	+	–0.095
Slovenia	–0.082	–	–0.746	–E	–0.842
MEDITERRANEAN CLUSTER					
Cyprus	0.932	+E	–0.558	–	0.902
Greece	–0.412	–	0.344	+	–0.798
Italy	0.577	+E	0.630	+E	0.553
Portugal	0.840	+E	–0.928	–E	0.673
Spain	0.453	+	–0.286	–	0.666
NORTHERN CLUSTER					
Finland	0.567	+E	0.538	+	0.474
Luxembourg	0.168	+	0.639	+E	0.374
Sweden	0.737	+E	0.540	+	0.174

Note: excluding Croatia and Malta.

Source: own editing based on KPMG 2002, KPMG 2017, Eurostat 2015a and Eurostat 2016

NOTES

- ¹ No such figures are available for Romania and Bulgaria until 2002.
- ² For further details on the incentives of East-Central European Member States related to taxation, see e.g. Mintz, Tsiopoulos (1992).
- ³ Member States where strong correlation was observed for both periods, are deemed to be characterised by a strong correlation.

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