Public sector efficiency according to COFOG classification in the European Union

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Abstract

The budgetary constraints governments have to deal with on a daily bases require a new approach in public spending as well as the revision of public goods definition. Consequently the key words are efficiency and effectiveness, in order to comply with the new management approach requirements. Assessing the efficiency and performance of public expenses is a key item for analyzing the quality of public expenses because it connects the entries as public resources and their yield (efficiency) or the entries to the results obtained (performance)

Key words: public spending, performance, efficiency, effectiveness

I. Theoretical background

The budgetary constraints governments have to deal with on a daily bases require a new approach in public spending as well as the revision of public goods definition. Consequently the key words are *efficiency and effectiveness,* in order to comply with the *new management* approach requirements.

Traditionally public goods are considered those whose consumption by an individual does not diminish another individual's consumption (meaning they are non-exclusive and non-rival). Under the new circumstances this definitions should be extended by considering as public goods *the advantages the society is taken from the provision of utilities meant to satisfy certain particular wants, eradication of poverty, disease, environment protection, and social protection.* Moreover, it should be clearly stated that whether they are referred to as goods or public services they should bring advantages to the society as a whole, as well as individually. Though public goods are traditionally supplied by government bodies, their provision can be delegated to private entities under certain conditions: the quality, the availability and the price of the provided goods and services. Moreover, public goods should be cost effective, should enhance productivity and diminish unemployment. All these aspects become more challenging because nowadays public goods become global, range beyond national borders, and once put in place the future generation can benefit of their advantage.

Given the high costs of public goods, either merchandise or services, and the limited funds available to finance them the question of expenditure effectiveness is raised. Therefore the public goods should complement private goods, and the intervention of the state should not trespass the line beyond which private incentives diminish. We consider that the provision of public goods and advantages to the society should support individual development, should sustain economic activity and the tax benefits toward contributors should be maximized. Moreover the provision of public goods should be limited to a volume that does not impede private incentives.

Building performance indicators is not an easy task. Nevertheless, measuring is of an utmost importance because what gets measured will presumably gets done. In order to have a valid measurement three rules should be considered: a correct and accurate definition of what must be measured; the goods and services must be measured correctly; consequences if tasks are not fulfilled. In the public sector, these rules are quite difficult to apply, because often, the least measurable activities may be the most important ones. Moreover, the rules should be adjustable, entailing behavioural changes. It is important to assess the long term outcomes of measurements because the benefits or dysfunctions depend on the ways and fairness of the performance assessment system.

There is a long debate going on whether the public sector enhances economic performance. Most of the economists agree that there are circumstances under which lower levels of government spending would enhance economic growth and other circumstances in which higher levels of government spending would be desirable. If government spending is zero, presumably there will be very little economic growth because enforcing contracts, protecting property, and developing an infrastructure would be very difficult if there were no government at all. In other words, some government spending is necessary for the successful operation of the rule of law. But, economists also agree that government spending becomes a burden at some point, either because government becomes too large or because outlays are misallocated. In such cases, the cost of government exceeds the benefit. Generally, the public sector is not (or should not be) profit seeking and public spending requires costly financing choices. Since public spending requires public funds, collecting the necessary funds means that the public authorities are confronted with the taxpayers' reluctance to comply with the tax laws, especially if taxes discourage productive behaviour. If government spending displaces private-sector activity than it dampens growth, since economic forces guide the allocation of resources in the private sector whereas political forces dominate when politicians and bureaucrats decide how money is spent. Anyway, the impact of public spending on welfare and growth is not straightforward, and therefore the question that it is raised concerns whether the problem should be addressed in an aggregate manner, considering the public spending as a whole, or by judging each type of spending individually. Obviously, economic spending differs as nature and characteristics from the social and administrative public spending. While the first category is regarded as having a direct, positive impact on growth, the latter (i.e. the administrative spending) is regarded as GDP consuming with a negative influence on growth. Amidst we find a third category of spending (social and welfare) considered as quasi public (or mixed spending) since they are financed partially by private funds.

One of the biggest challenges of the extended European Union is to set up a harmonised financial policy in order to accommodate the needs of the older as well as the new member states. The challenges concern the collection of funds, the level of tax compliance, but foremost providing quality public goods under financial constraints. In addressing these issues, the main goal pursued should be the economic growth and the welfare of the citizens. The framework to discuss these problems contains public sector governance, transparency and credibility as well as defining the public goods and their beneficiaries.

In addressing these issues the EU must face cultural differences, customs and habits that define the financial behaviour of its citizens i.e. tax compliance and public funds spending. It further affects the efficiency and effectiveness of public expenditure. Of course, individuals and firms express their options for public goods according to the goods offered by the state. From the state's point of view, the individual preferences should be aggregated thus complying with the mutual interest of the community and stating an objective pursued by the community. The efficiency and effectiveness of public expenditure in the European Union are critical to outcomes, including growth. A country that spends resources in a way that does not complement private sector initiatives or in a cost-effective way will undermine its growth prospects. In the new member states, cost-overruns, poor project management, and poor maintenance of new assets result in inefficient creation and maintenance of infrastructure assets. Leakages and waste may imply that increases in health and education spending do not necessarily translate into better outcomes. Typically these reflect underlying problems of capacity for budget management and, in some cases, of governance. If institutional weaknesses and problems of governance that cause poor outcomes are not addressed, even spending on potentially high return programs will have little impact on growth. The net impact will be to erode the government's solvency and reduce its fiscal space.

Country specific conditions are therefore important in the design of fiscal policy for long-term growth. Creating fiscal space will depend on initial conditions in a country and the strengths of its public sector institutions and the likely trajectory of ongoing reforms to improve their performance. Fiscal policy design that emphasizes the deficit but ignores the composition of spending effectively ignores an important transmission channel for the growth impact of fiscal policy. There is a rich but not uncontroversial literature, for example, on the relationship between public investment and growth. The sustainability of a fiscal deficit itself depends on the productivity of the expenditure. By allowing a fuller consideration of the growth effects of fiscal decisions, an explicit focus on the composition of expenditure would allow both stabilization and growth objectives to be addressed in more sustainable ways.

Comparing the public sectors in EU countries, it could be easily stated that the dimension of this sector reaches different levels. There are several old member states, such as Sweden, Netherlands, Denmark, and Austria that have a large public sector. In opposition countries in Eastern European often have smaller public sectors. This situation is due to several factors. Firstly it is worth mentioning the specific financial behaviour. Scandinavian countries but also Austria and other western countries seem to assume a higher compliance to taxes and agree a larger public sector. Consequently, the benefits offered by the state in those countries to the citizens are much more important. On the other hand Eastern countries but also Ireland and other western countries tried to encourage private sector for growing their economies by reducing taxes. Anyway, this is also correlated to the lower trust which people show towards public institutions in Eastern countries. Secondly, an important issue would be the composition of public expenditure and the percentage of productive vs. non productive public expenditures. There are countries like Sweden, Denmark, Italy but also Poland that spend important percent of their GDP for social security while others like Romania, Czech and Hungary spend less for social security. Evidence also show that Eastern European countries have small budgets assigned for health and education but do spend more than western countries on economical activities.

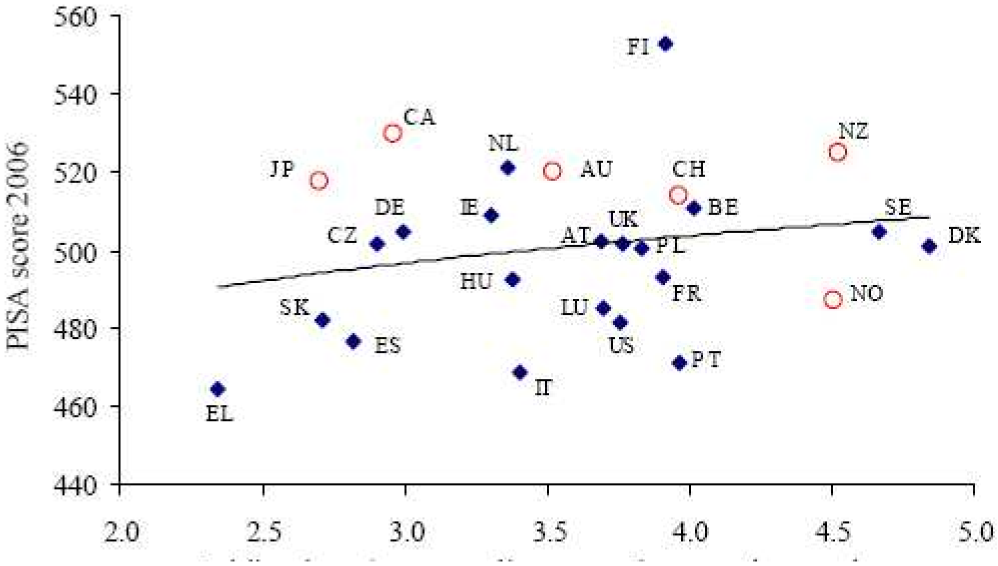
The issue of the impact of public spending on welfare and growth is even more acute for the emerging economies, since the authorities, in these countries, need as many a tool as possible in order to ensure a sustainable growth. It is well known that beside the taxation tool, public spending may be an important channel to boost the economy. Since these countries are *en route* to harmonise their economies and living standard with the more developed countries in Europe a well proportioned mixture of private and public spending may be of valuable help. Above all, spending in education and health may be rewarding on medium and long term due to their positive impact induced on productivity.

Assessing the efficiency and performance of public expenses is a key item for analyzing the quality of public expenses because it connects the entries as public resources and their yield (efficiency) or the entries to the results obtained (performance). However, from an empirical point of view, this analysis has many difficulties to overcome. The main concerns are represented by the difficulty to obtain data and the weakness of statistical estimation methods, mainly in identifying the volume of public funds used for financing certain economic policies goals (for example, education, research-development, health expenses). While these data can be obtained, individually, for certain countries, most times, they are either not made public or, comparing data among countries is hindered by the different statistical methods used. Publishing the COFOG data (functional classification of public expenses adopted at the level of OECD member states) by the EU-27 member states represented a big step forward, but dividing these data in 10 groups of functional expenses may not be sufficient for allowing very detailed analysis.[1] Similarly, right decisions should be taken concerning the choice of some relevant variables used to determine the performance of the public sector (e.g. such as the results of the education system, the number of patients cured, the infant mortality rate and the number of professors, doctors, nurses and researches etc.). Moreover, these performances should be correlated with the objectives of financial policies as well as the final outcomes (such as higher labour productivity, higher life quality (welfare level) and a more rapid technical progress[2]).

II. Empirical data

a. Public expenses efficiency in education

Given the role the education system may play in stimulating the economic growth, it is important to determine whether the public resources used in education are efficiently used. Given the connection between the expenses in the education and the performances of students is relatively low (Verhoeven et al., 2007, Greenwald et al. 1996, Hanushek and Kimko, 2000, and Hanushek, 2002), the mere growth of expenses in public education seems to be insufficient, albeit it is usually stimulating the economic growth. Figure 1 shows that no connection can be determined between the level of public expenses in the primary and secondary education (during 2000-2004) and the results of the educational system measured in the last PISA values for EU and OECD member states.[3] Consequently, a more efficient use of public resources in education became a key objective for public policy decision makers, their main goal being rather to improve the performances of the education system than to save money in this area.



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[1] For example, COFOG-I does not comprise the data concerning the research and development expenses or the public infrastructure expenses. Still, in the future this information will be included in COFOG-II.

[2] Given the fact that benefits are difficult to be determined, the empirical studies focus usually on the efficiency and no on the efficacy. Consequently, in the remaining of this section we will use only the efficiency term although it is clear that a higher efficacy is the main goal.

[3] The program for international student assessment (PISA) is a standardized assessment at international level in the literature, mathematics and science knowledge areas.

Figure 1: Public expenses in education at primary and secondary level and the people's education level and PISA score in 2006Source: OECD PISA 2007 study and Eurostat

b. Efficiency of public expenses in the health area

The second area that empirical studies in the efficiency of public expenses take into account is health. Its connection to the economic growth is two-dimensional. Firstly, fiscally sustainable health systems avoid creating additional pressures on the public budgets, pressures that would lead to increasing the size of the administrative sector and / or that would hinder making other expenses. Secondly, a healthier population would have a positive effect on the labour force supply and on productivity. Moreover, the health insurance programs help levelling the consumption and fighting poverty by protection against the risk of illness. The public expenses in health in EU countries are higher than those in education the average percentage varying between 3% in Cyprus and 7.1% in Great Britain.

Still, calculating the efficiency of expenses in health is quite difficult. Empirical works have used the same approach as for estimating the efficiency of expenses in education. Nevertheless, while the PISA scores were universally accepted as representing yield indicators, as regards the results in health there is no consensus concerning the indicators. The considered variables comprise, usually, the life expectancy or the infant mortality, but there were brought forward reasons according to which the best indicators would be the average life time expectancy adjusted to quality or the number of deaths that could have been prevented (these data are available for a small number of countries), or even the number of beds in public hospitals.[4]

c. Efficiency of public expenses for other functions

There is little research concerning the efficiency of other public expenses area than those mentioned above. A recent study on the efficiency of expenses in the research-development area performed parametrical and non-parametrical estimations by using the private expenses employed in this area and by stating that the governmental expenses are efficient if they stimulate incentives to the research and development in the private sector of economy. The authors reached the conclusion that developed countries that are not members of the European Union (Australia, Canada, Japan, New Zeeland, Singapore, Switzerland and USA) have better results in this area than the EU member states.[5] By using a COFOG classification, Eugene (2007) estimates the efficiency of public expenses in the order and public safety and in supplying public services on a whole. He noticed that Austria, Denmark and Finland are the most efficient from the first point of view and that Denmark, Finland and Great Britain are the most efficient considering the second point of view. Still, these results are not accurate because the estimations were not rectified as regards the exogenous factors. Finally, some studies (Afonso et al. 2008) and (the European Commission, 2008) tried to measure the efficiency of social expenses not from the point of view of economic growth but in connection to other objectives such as fighting poverty, redistributing income and social security. While the first paper finds the Northern countries as the most efficient by using a DEA approach (data development analysis), the second suggests a broader usage of the indicators with similar results.

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[4] The manners for performing the analysis of the public sector efficiency are discussed in Häkkinen and Joumard (2007). They offer 3 versions: analysis of the system level, analysis of the sickening level and analysis of the sub-sectors level (for example, walk in and pharmaceutical treatment).

[5] See also Mandl et al. (2008) for an analysis of the issues occurring at the time of assessing the research-development expenses.

d. Efficiency of markets and of the business environment

Public finance, through budgetary and non-budgetary items, can influence the operating behaviour of the markets and the business environment. Although this influence can be regarded as another dimension of the public finance quality, there are significant overlapping with the dimensions mentioned above and with the governmental policy in general. Thus, next to the structure of taxes and benefits systems and next to offering a public infrastructure, the efficiency of public administrations can be also a factor of economic growth. Therefore the European countries do not neglect these type of expenses: they represent, on average, 6.5% of the GDP (or 14% of the total governmental expenses), varying from 2.7% of the GDP in Estonia to 9.4% of the GDP in Hungary (figure 2)

Consequently, several countries began reforms of the public administration system, to setting a tighter connection between the allocation of resources and the outcomes, changing the management methods and attaching a more important role to the information technologies (electronic governing) in order to increase the productivity of the public sector and the citizens' satisfaction.

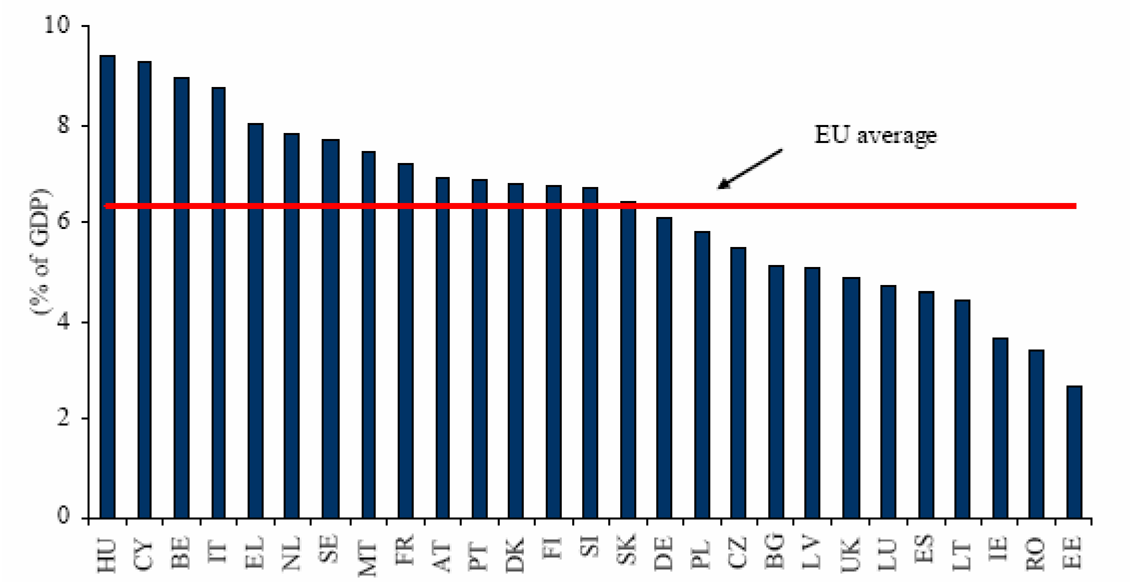

Figure 2: Public expenses in the general services, 2005
Source: Services of the European Commission, according to the COFOG data

In several European Union member states, the margin of improvement of the public administration efficiency has a great importance as described by the following indicators.

First, the indicators used by the World Bank concerning the commercial regulation degree (World Bank Doing Business indicator), can be seen as a method of analyzing the quality of business regulation area and the efficiency for implementing and applying these regulations. The indicator includes aspects that are directly influenced by the public administrations, such as the easiness for obtaining necessary licenses, for closing and opening business, the manner for guaranteeing the observance of contracts, of registering the ownership, for paying taxes an the manner for regulating the international trade.[6] Statistics show that a number of European Union member states (Denmark, Estonia, Finland, Sweden

[6] Other elements of the indicators that are connected just indirectly to the public finance quality are protecting investors, trade among countries, employing workers and obtaining credits.

and Great Britain) are among the first 10 countries in the world (out of 178 countries analyzed).

Secondly, the governance indicator used by the World Bank (World Bank Governance Indicator) analyses four public administration areas, more specifically the governmental efficiency, the quality of regulations, the degree for observing laws (these two comprise also the manner for ensuring the applying of laws and regulations) and the control degree of corruption. From the point of view of governmental efficiency assessed according to the polls made among mangers, experts and citizens, the European Union member states are scoring less than non-member states, because of the deficiencies existing in states like Greece and Italy.

Finally, the indicator relying on a poll performed among managers, similar to those used by World Economic Forum concerning the often embedded waste of governmental expenses that (Figure 3).

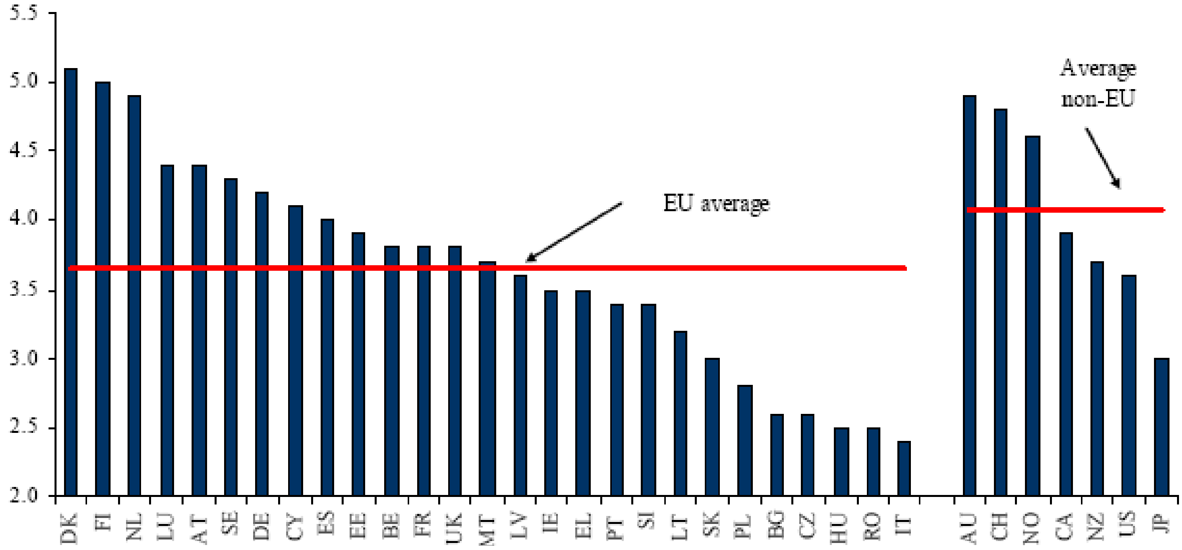

Figure 3: Waste level of governmental expenses, 2007

Note: The index has values between 1 and 7 according to a poll developed among managers

Source: World Economic Forum (2007)

III. The model

A. Econometrical studies concerning the influence of public expenses in different sectors on the representative performance indicators in the analyzed sectors

A.1. Econometric study on the influence of education related expenses on the educational performance

A.1.1 Influence of education-related expense on the performance from a quantitative point of view

The analysis is pursued over 7 years, during 2000-2006 (given the availability of data) and refers to 26 European Union member states (25 old European Union member states and Romania). The economic model achieved is of pool data type.

$$Y_t = \alpha + \beta_i \times X_{it} + \delta_{it} + \varepsilon_t \qquad (1)$$

The model will be:

$$En = \alpha + \beta_i Exped_{it} + \delta_{it} + \varepsilon \qquad (2)$$

where: En- registrations in the secondary education level (number of pupils)

Exed - public expenses for education (Euro)

α = global constant of the model

β = independent variable coefficient

δ_{it} - effect parameter (fix) specific to sections

ε = estimation specific errors

Analyzing the results

After analyzing the data presented in appendix 1, the following conclusions can be reached:

- The standard errors values of the regression function coefficients are low in comparison to the values of coefficients, which emphasizes the accuracy of their estimation.
- The correlation coefficient R^2 is 0.97%, showing that the statistical connection between the resulting variable En and the endogenous one Exped is strong, the modifications of the education expenses being found largely in the modifications of the school registration degree in the secondary school level;
- The Durbin-Watson is 1,81 bellow the threshold of 2, indicating that the residual variables are self-correlated to the left;
- The stationarity tests for the residual variables suggest that, at the level of unitary roots, can be identified certain individual unit root type processes and, as consequence, that there are certain systemic variations in the assessments made according to this empirical model. The result of the stationarity test (appendix 5) shows that the probability for the series to be non-stationary is very low (this was shown by the ADF and PP tests). On a whole, the model quality can be described as satisfactory and it allows reaching conclusions according to the model estimated.

To be noticed that the above model can be considered representative for describing, at macroeconomic level, the connection between public expenses in the education and the registration degree in the secondary level in the 26 countries European Union members undergoing the analysis.

The results concerning the significance of the coefficients corresponding to the independent variable taken into account (level of public expenses corresponding to the education in the European Union member states) show that for 8 of the 26 countries in the sample (Cyprus, Ireland, Italy, Malta, Poland, Slovenia, Sweden and Great Britain) they are not relevant from a statistical point of view. For the remaining 18 countries that can be a subject of the analysis, the following conclusions can be reached:

- in Greece and Spain the relation between increasing the education related expenses and the registration degree in the secondary school level is reversed, certifying a significant inefficiency of public money spending in the education from the point of view of the considered performance indicator.

- for 16 countries, the results show that between the evolution of the school enrollment degree in the secondary level and the evolution of education related expenses there is a direct correlation, meaning that an increase of education expenses leads, in time, to an increase of the school registration level. It is then obvious that the influence is strong in the Eastern Europe countries where the school enrollment degree grew considerably during the analyzed interval (Romania, Hungary, Slovakia, Lithuania, and Latvia), while in highly- developed countries it is observed an increase of the school enrollment degree, but the effects of 1 EUR invested in the education are not as high as in the less developed states of the European Union. Such diminished effects can be noticed in countries such as Denmark, France, Germany or Netherlands.

A.1.2 The impact of the education related expenses on the evolution of number of pupils assigned to a teacher

The analysis is conducted over 7 years 2000-2006 (given the availability of data) and refers to 26 European Union member states (25 old European Union member states and Romania). The economic model achieved is a pool data type. The dependent variable (i.e. an indicator expressing the performance in the education) reveals both quantitatively and qualitatively the level of the education system.

The model is:

$$Npup = \alpha + \beta_i Exped_{it} + \delta_{it} + \varepsilon \qquad (3)$$

where: Npup – number of pupils assigned to a teacher
Exped – public expenses for education (Euro)
α = global constant of the model
β = independent variable coefficient
δ_{it} - effect parameter (fix) specific to sections
ε = estimation specific errors
The results obtained after modeling the statistical data series are the following:

Analyzing the results

After analyzing the data presented in appendix 2, the following conclusions can be reached:

- The standard errors values of the regression function coefficients are low in comparison to the values of coefficients, emphasizing the accuracy of their estimation;
- The correlation coefficient R^2 is 0.99%, showing that the statistical connection between the resulting variable number of pupils and the endogenous one Exped is strong, the changes of the education expenses being found largely in the changes of education quality degree;
- The Durbin-Watson test is 2.1, surpassing the threshold (2), thus indicating that the residual variables are slightly self-correlated to the right;
- The stationary (?) tests for the residual variables suggest that, at the level of unitary roots, certain individual unit root type processes can be identified and consequently there are certain systemic deviations in the assessments made according to this empirical model. The result of the stationarity test shows that the probability for the series to be non-stationary is very low (shown by the ADF and PP tests, appendix no. 6). Overall, the quality of the model can be described as satisfactory and it allows reaching the expected conclusions according to the estimated model.

Consequently, the model can be considered representative for describing, at macroeconomic level, the connection between public expenses in the education and the number of pupils assigned to a teacher in the 26 countries European Union members undergoing the analysis.

As regards the significance of the coefficients attached to the considered independent variable (level of public expenses corresponding to the education sector in the European Union member states) the results show that for 10 countries out of 26 taken in the sample (Cyprus, Ireland, Germany, Greece, Hungary, Malta, Poland, Romania, Slovenia and Slovakia) they are not relevant from a statistical point of view. For the 16 remaining countries that can be subject of the analysis, the following conclusions can be reached:

- in Denmark, Italy and Estonia, the relation between the increase the expenses for education and the number of pupils assigned to a teacher, reveals a significant inefficiency of public money spending in the education according to the considered performance indicator. Thus, although the education expenses increase, the number of pupils assigned to a teacher is also increases.
- for 13 countries, the results show that between the evolution of the number of pupils assigned to a teacher and the evolution of expenses in education is a reversed relation (given by the negative sign of the independent variable coefficients), meaning that, in time, increasing the education related expenses leads to fewer pupils assigned to a teacher. The influence is strong in Eastern Europe countries, but also in states where the public expenses policy was already reformed a smaller percentage of GDP being assigned for public expenses (Lithuania, Latvia, Czech Republic, Finland, and Portugal). The developed countries assign a smaller number of pupils to a teacher, but the effects of 1 Euro invested in the education system are not as high as regards this indicator compared to the less developed countries within the European Union. These lower effects can be seen in Austria, France, Belgium or Netherlands.

A.2 Econometric study concerning the influence of health related expenses on the healthcare sector performance

A.2.1Influence of the public expenses on the number of beds in hospitals

The analysis is pursued over 2000-2006 (given the availability of data) and refers to 26 European Union member states (25 old European Union member states and Romania). The dependent variable measures indirectly the performance of the healthcare sector. Thus, diminishing the number of beds in hospitals leads to shorter admitting periods for patients and to a shorter time of healing of different illnesses requesting hospitalization.

The economic model achieved is pool data type.

The model will be:

$$NBH = \alpha + \beta_i Exph_{it} + \delta_{it} + \varepsilon \qquad (4)$$

Where: NBH – number of beds in hospitals
Exph – public expenses for health
α = global constant of the model
β = independent variable coefficient
δ_{it} - effect parameter (fix) specific to sections
ε = estimation specific errors

The results obtained after modeling the statistical data series are the following:

Analyzing the results

After analyzing the data presented in appendix 3, the following conclusions can be reached:

- The standard errors values of the regression function coefficients are low in comparison to the values of coefficients, which emphasizes the accuracy of their estimation;
- The correlation coefficient R^2, having a value of almost 1%, shows that the statistical connection between the resulting variable NBH and the endogenous one Exph is strong, the modifications of the health related expenses being found largely in the changes of number of beds in hospitals;
- The Durbin-Watson test is 1.56, indicating that the residual variables are self-correlated to the left;
- The stationary tests for the residual variables suggest that, at the level of unitary roots, a certain individual unit root type processes can be identified and consequently, that there are certain systemic deviations in the assessments made according to this empirical model. The result of the stationary test shows that the probability for the series to be non-stationary is very low (this was shown by the ADF and PP tests, appendix no. 7). On a whole, the model quality can be described as satisfactory and it allows reaching conclusions according to the model estimated.

The significance level of the coefficients corresponding to the independent variable taken into account (level of public expenses corresponding to the healthcare sector in the European Union member state) shows that for 9 of the 26 countries included in the sample (Austria, Belgium, Cyprus, Estonia, Germany, Malta, Poland, Portugal, Spain) they are not relevant from a statistical point of view. For the 17 remaining countries that can be subject of the analysis, the following conclusions can be reached:

- in Slovakia, the correlation existing between increasing the health related expenses and the number of beds in hospitals is direct, certifying a significant inefficiency in the manner of spending the public money in the healthcare sector through the considered performance indicator. Thus, although the health related expenses increase, it is found that the number of beds in hospitals is also increasing.
- for 16 countries, the results show that between the evolution of the number of beds in hospitals and of health related expenses is a reversed relation (given by the negative sign of the independent variable coefficients), meaning that, in time, an increase of the health related expenses determines a smaller number of beds in hospitals. The influence is strong in the Eastern Europe countries, as well as in the countries where the health related public expenses policy was reformed (Lithuania, Latvia, Czech Republic, Slovakia, Romania, Hungary and France). The developed countries register a diminishing of the number of beds in hospitals, but the effects of 1 Euro invested in the healthcare system are not as high as regards this indicator as in the less developed countries within the European Union. Thus, lower effects are noticed in countries such as Great Britain, Sweden, Italy, Greece or Netherlands.

A.2.2 Influence of health related expenses on the infant mortality rate

The analysis considers 2003-2006 (given the availability of data) and it refers to 22 European Union member states (21 old European Union member states and Romania). The dependent variable directly measures the performance of the healthcare sector showing to which degree the infant mortality indicator evolves in the considered countries during the 3 year time interval.

The model will be:

$$MR = \alpha + \beta_i Exph_{it} + \delta_{it} + \gamma_t \ + \varepsilon \qquad (5)$$

Where: MR – infant mortality rate

Exph – public expenses for health (Euro)

α = global constant of the model

β = independent variable coefficient

δ_{it} - effect parameter (fix) specific to sections

ε = estimation specific errors

γ = effect parameter specific to the periods

The results obtained after modeling the statistical data series are the following:

Analyzing the results

After analyzing the data presented in appendix 4, the following conclusions can be reached:

- The standard errors values of the regression function coefficients are low in comparison to the values of coefficients, emphasizing the accuracy of their estimation;
- The correlation coefficient R^2 is 1%, shows that the statistical connection between the resulting variable infant mortality rate and the endogenous one Exph is strong, the modifications of the health related expenses being found largely in the modifications of infant mortality rate;
- The Durbin-Watson test, is 2.33, indicates that the residual variables are self-correlated to the right;
- The stationary tests for the residual variables suggest that, at the level of unitary roots, certain individual unit root type processes can be identified and, consequently, there are certain systemic deviations in the assessments made according to this empirical model. The result of the stationary test shows that the probability for the series to be non-stationary is very low (this was shown by the ADF and PP tests, appendix no. 8). On a whole, the quality of the model can be described as satisfactory and it allows reaching conclusions according to the model estimated.

The results obtained as regards the significance level of the coefficients corresponding to the independent variable taken into account (level of public expenses corresponding to the healthcare sector in the European Union member states) show that for 11 of the 22 countries in the sample (Austria, Czech Republic, Denmark, Germany, Greece, Italy, Latvia, Romania, Slovakia, Sweden and Great Britain) they are not relevant from a statistical point of view. For the 11 countries remaining that are subject matter of the analysis, the following conclusions can be reached:

- in Belgium, France, Netherlands, Ireland, Spain, Slovakia and Hungary the existing correlation between increasing the health related expenses and the infant mortality rate is direct, emphasizing a significant inefficiency in the manner of spending public money in the healthcare system through the performance indicator taken into account. Thus, although the health related expenses grow, it is found that the infant mortality rate is also increasing. Still, this result can be explained through reaching an improvement limit of this indicator in the previous decades for the European Union's developed countries, limit that right now cannot be surpassed, given the available medical facilities and the qualification of the medical staff.

- for 3 countries (Estonia, Poland, Portugal), the results obtained show that between the infant mortality rate and the evolution of health related expenses is a reverse relation

IV Conclusions

The issue of the impact of public spending on welfare and growth is important especially for the emerging economies, since the authorities, in these countries, need the right tools in order to ensure a sustainable growth. It is well known that beside the taxation tool, public spending may be an important channel to boost the economy. Since these countries are *en route* to harmonise their economies and living standard with the more developed countries in Europe a well proportioned mixture of private and public spending may be of valuable help.

Assessing the efficiency and performance of public expenses is a key item for analyzing the quality of public expenses because it connects the revenues as public resources and their yield (efficiency) or the revenues to the results obtained (performance). Publishing the COFOG data (functional classification of public expenses adopted at the level of OECD member states) by the EU-27 member states represented a big step forward in judging and organising expenditures on multiannual criteria. Similarly, right decisions should be taken concerning the choice of some relevant variables used to determine the performance of the public sector (e.g. such as the results of the education system, the number of patients cured, the infant mortality rate and the number of professors, doctors, nurses and researches etc.).

Regarding the results of our studies for the period 2000-2006, we could state the fact that government expenditure proved different effects on economy and welfare by considering the member states of the European Union. We could make those remarks especially focusing on educational and healthcare sectors.

The influence of the public education expenses is strong in the Eastern Europe countries where the school enrollment degree grew considerably during the analyzed interval (Romania, Hungary, Slovakia, Lithuania, and Latvia), while in highly- developed countries it is observed an increase of the school enrollment degree, but the effects of 1 EUR invested in the education are not as high as in the less developed states of the European Union. Such diminished effects can be noticed in countries such as Denmark, France, Germany or Netherlands. In Denmark and Italy, the relation between the increase of expenses for education and the number of pupils assigned to a teacher, reveals a significant inefficiency of public money spending according to the considered performance indicator.

Concerning health sector, there could also be emphasized the differences between Eastern european countries and developed countries. Anyway it is interesting to observe even different effects of public investment among developed countries which have or have not promoted public expenditures reforms. The influence of public funds on the reduction of number of beds in hospitals (quicker recovery from deseases) is strong in Eastern European countries, but also in states where the public expenses policy was already reformed. Such results could be noticed in countries like Lithuania, Latvia, Czech Republic but also Portugal and Finland.

In Belgium, France, Netherlands, Ireland, Spain, Slovakia and Hungary the existing correlation between increasing the health related expenses and the infant mortality rate is direct, emphasizing a significant inefficiency in the manner of spending public money in the healthcare system through the performance indicator taken into account. Thus, although the health related expenses grow, it is found that the infant mortality rate is also increasing. Still, this result can be explained through reaching an improvement limit of this indicator in the previous decades for the European Union’s developed countries, limit that right now cannot be surpassed, given the available medical facilities and the qualification of the medical staff. For 3 countries (Estonia, Poland, Portugal), the results obtained show that between the child mortality rate and the evolution of health related expenses is a reverse relation.

Finally we could conclude that country specific conditions are therefore important in the design of fiscal policy for long-term growth.

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Appendix 1- Econometric testing - Education Expenses- School enrollment

Dependent Variable: EN?				
Method: Pooled EGLS (Cross-section weights)				
Sample: 2000 2006				
Included observations: 7				
Cross-sections included: 24				
Total pool (balanced) observations: 168				
Linear estimation after one-step weighting matrix				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	1036183.	145841.1	7.104877	0.0000
_AU--CHE_AU	27.27689	7.050801	3.868622	0.0002
_BE--CHE_BE	114.7590	30.27902	3.790048	0.0002
_CY--CHE_CY	50.47758	27.45515	1.838546	0.0685
_DA--CHE_DA	47.91883	15.35433	3.120867	0.0023
_ES--CHE_ES	63.12468	14.25559	4.428066	0.0000
_FL--CHE_FL	119.0844	26.67504	4.464264	0.0000
_FR--CHE_FR	45.87435	19.58643	2.342150	0.0208
_GE--CHE_GE	31.48098	11.31171	2.783044	0.0063
_GR--CHE_GR	-114.7331	54.71490	-2.096926	0.0381
_NE--CHE_NE	22.23129	7.886624	2.818860	0.0056
_HU--CHE_HU	207.2045	19.40537	10.67769	0.0000
_IR--CHE_IR	-11.03713	10.76738	-1.025053	0.3074
_IT--CHE_IT	68.47906	35.08510	1.951799	0.0533
_LE--CHE_LE	79.92581	24.17508	3.306123	0.0012
_LI--CHE_LI	168.8106	41.48132	4.069558	0.0001
_LU--CHE_LU	128.9173	37.24655	3.461187	0.0007
_MA--CHE_MA	-523.5769	392.7581	-1.333077	0.1850
_PO--CHE_PO	-417.9637	475.2458	-0.879468	0.3809
_RO--CHE_RO	424.9534	102.1389	4.160545	0.0001
_SLK--CHE_SLK	191.6249	60.57088	3.163647	0.0020
_SP--CHE_SP	-57.80533	27.16920	-2.127605	0.0354
_SL--CHE_SL	-26.94537	48.38963	-0.556842	0.5787
_SW--CHE_SW	-33.65477	30.89573	-1.089301	0.2782
_UK--CHE_UK	-120.0593	154.6870	-0.776144	0.4392
R-squared	0.998714	Mean dependent var		11718209
Adjusted R-squared	0.998211	S.D. dependent var		6961229.
S.E. of regression	294466.8	Sum squared resid		1.04E+13
F-statistic	1983.165	Durbin-Watson stat		1.812158
Prob(F-statistic)	0.000000			

Appendix 2- Econometric testing- Education Expenses- Number of students per professor

Dependent Variable: NEL?				
Method: Pooled EGLS (Cross-section weights)				
Sample: 1 7				
Included observations: 2000-2006				
Cross-sections included: 26				
Total pool (balanced) observations: 182				
Linear estimation after one-step weighting matrix				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	14.85536	0.347315	42.77194	0.0000
_AU--CHE_AU	0.001089	0.000291	3.739307	0.0003
_BE--CHE_BE	-0.000643	0.000279	-2.306993	0.0226
_CY--CHE_CY	-0.023510	0.037964	-0.619260	0.5368
_CZ--CHE_CZ	-0.004295	0.000496	-8.665836	0.0000
_DA--CHE_DA	0.000719	0.000331	2.170163	0.0318
_ES--CHE_ES	0.009797	0.001224	8.003817	0.0000
_FL--CHE_FL	-0.002259	0.000921	-2.453529	0.0155
_FR--CHE_FR	-0.000100	3.45E-05	-2.900022	0.0044
_GE--CHE_GE	0.000158	0.000135	1.173910	0.2426
_GR--CHE_GR	-0.008352	0.004284	-1.949642	0.0534
_NE--CHE_NE	-0.000821	0.000173	-4.746339	0.0000
_HU--CHE_HU	-0.000502	0.001489	-0.337031	0.7366
_IR--CHE_IR	-0.000437	0.002237	-0.195565	0.8453
_IT--CHE_IT	0.000268	0.000123	2.170709	0.0318
_LE--CHE_LE	-0.028576	0.005905	-4.839099	0.0000
_LI--CHE_LI	-0.031176	0.014105	-2.210280	0.0288
_LU--CHE_LU	-0.010111	0.002933	-3.447133	0.0008
_MA--CHE_MA	0.338999	0.213786	1.585694	0.1152
_PO--CHE_PO	-0.001372	0.001155	-1.187963	0.2370
_POR--CHE_POR	-0.015647	0.003270	-4.785269	0.0000
_RO--CHE_RO	0.000949	0.001705	0.556458	0.5789
_SL--CHE_SL	-0.001987	0.003122	-0.636474	0.5256
_SP--CHE_SP	-0.000550	0.000154	-3.567893	0.0005
_SLK--CHE_SLK	-0.000155	0.001392	-0.111097	0.9117
_SW--CHE_SW	-0.001378	0.000389	-3.540228	0.0006
_UK--CHE_UK	-0.000525	0.000140	-3.756392	0.0003
	Weighted Statistics			
R-squared	0.999444	Mean dependent var		27.75231
Adjusted R-squared	0.999226	S.D. dependent var		21.30357
S.E. of regression	0.592588	Sum squared resid		45.65082
F-statistic	4584.233	Durbin-Watson stat		2.111563
Prob(F-statistic)	0.000000			

Appendix 3- Econometric testing- Health Expenses – Number of beds in hospitals

Dependent Variable: NRP?				
Method: Pooled EGLS (Cross-section weights)				
Sample: 2000 2006				
Included observations: 7				
Cross-sections included: 26				
Total pool (balanced) observations: 182				
Linear estimation after one-step weighting matrix				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	133617.9	6727.919	19.86021	0.0000
_AU--CHES_AU	3.652445	3.157387	1.156794	0.2495
_BE--CHES_BE	-31.83739	19.97274	-1.594042	0.1134
_CY--CHES_CY	-3.492855	1.927650	-1.811975	0.0723
_CZ--CHES_CZ	-26.77148	13.19869	-2.028343	0.0446
_DA--CHES_DA	-2.245260	0.278923	-8.049742	0.0000
_ES--CHES_ES	-37.64613	23.47099	-1.603943	0.1112
_FL--CHES_FL	-1.878439	0.201224	-9.335055	0.0000
_FR--CHES_FR	-8.515031	0.521935	-16.31434	0.0000
_GE--CHES_GE	-85.76089	93.70935	-0.915180	0.3618
_GR--CHES_GR	-1.332831	0.514397	-2.591054	0.0107
_NE--CHES_NE	-3.400385	0.650843	-5.224583	0.0000
_HU--CHES_HU	-8.645287	4.001383	-2.160574	0.0326
_IR--CHES_IR	-0.482904	0.111731	-4.322033	0.0000
_IT--CHES_IT	-4.220276	0.808837	-5.217709	0.0000
_LE--CHES_LE	-15.03100	7.251841	-2.072715	0.0402
_LI--CHES_LI	-46.17613	10.68899	-4.319971	0.0000
_LU--CHES_LU	-20.21057	7.768193	-2.601708	0.0104
_MA--CHES_MA	-4.313465	21.98342	-0.196214	0.8447
_PO--CHES_PO	-18.21571	10.01949	-1.818027	0.0714
_POR--CHES_POR	-0.107811	1.012407	-0.106489	0.9154
_RO--CHES_RO	-23.68209	11.44661	-2.068918	0.0405
_SL--CHES_SL	-9.071259	1.602570	-5.660446	0.0000
_SP--CHES_SP	-0.156310	0.182138	-0.858197	0.3924
_SLK--CHES_SLK	25.88662	8.926863	2.899857	0.0044
_SW--CHES_SW	-3.156090	0.578473	-5.455899	0.0000
_UK--CHES_UK	-0.849080	0.086163	-9.854304	0.0000
	Weighted Statistics			
R-squared	0.999768	Mean dependent var		383830.8
Adjusted R-squared	0.999677	S.D. dependent var		328489.8
S.E. of regression	5904.053	Sum squared resid		4.53E+09
F-statistic	10983.76	Durbin-Watson stat		1.566714
Prob(F-statistic)	0.000000			

Appendix 4- Econometric testing- Health Expenses – Rate of infant mortality

Dependent Variable: RM?				
Method: Pooled EGLS (Cross-section weights)				
Sample: 2003 2006				
Included observations: 4				
Cross-sections included: 22				
Total pool (balanced) observations: 88				
Linear estimation after one-step weighting matrix				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	7.676842	2.160387	3.553457	0.0010
_AU--CHES_AU	0.006839	0.004670	1.464379	0.1507
_BE--CHES_BE	0.014744	0.003519	4.189983	0.0001
_CZ--CHES_CZ	0.022783	0.016173	1.408683	0.1665
_DEN--CHES_DEN	0.000178	0.000202	0.882384	0.3827
_ES--CHES_ES	-0.104047	0.043192	-2.408970	0.0206
_FR--CHES_FR	0.000157	6.37E-05	2.464817	0.0180
_GE--CHES_GE	-0.000484	0.003129	-0.154801	0.8777
_GR--CHES_GR	0.000344	0.000348	0.987395	0.3292
_NE--CHES_NE	0.003487	0.001597	2.183972	0.0347
_HU--CHES_HU	0.002805	0.000502	5.591345	0.0000
_IR--CHES_IR	0.001309	0.000446	2.936643	0.0054
_IT--CHES_IT	3.55E-05	3.53E-05	1.003690	0.3214
_LE--CHES_LE	0.003474	0.015557	0.223294	0.8244
_LU--CHES_LU	0.075887	0.022164	3.423851	0.0014
_POL--CHES_POL	-0.000965	0.000226	-4.273067	0.0001
_POR--CHES_POR	-0.002872	0.000620	-4.634704	0.0000
_RO--CHES_RO	0.001720	0.002148	0.800755	0.4279
_SLO--CHES_SLO	0.006817	0.003074	2.217468	0.0322
_SP--CHES_SP	9.05E-05	2.68E-05	3.377266	0.0016
_SLK--CHES_SLK	-0.213123	0.203010	-1.049813	0.3000
_SW--CHES_SW	6.62E-05	0.000344	0.192333	0.8484
_UK--CHES_UK	2.19E-05	1.33E-05	1.652774	0.1060
	Weighted Statistics			
R-squared	0.999790	Mean dependent var		39.91044
Adjusted R-squared	0.999554	S.D. dependent var		47.31677
S.E. of regression	0.998925	Sum squared resid		40.91191
F-statistic	4242.623	Durbin-Watson stat		2.869648
Prob(F-statistic)	0.000000			
	Unweighted Statistics			
R-squared	0.963842	Mean dependent var		6.493182
Sum squared resid	58.89047	Durbin-Watson stat		2.332542

Appendix 5- Stationarity test- Education expenses-enrollment

Exogenous variables: Individual effects
Automatic selection of maximum lags
Automatic selection of lags based on MHQC: 0 to 1
Newey-West bandwidth selection using Quadratic Spectral kernel

Method	Statistic	Prob.**	Cross-Sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	-6.32799	0.0000	24	141
Breitung t-stat	0.77643	0.7813	24	117
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	-0.63980	0.2612	24	141
ADF - Fisher Chi-square	53.0366	0.2862	24	141
PP - Fisher Chi-square	97.7531	0.0000	24	144
Null: No unit root (assumes common unit root process)				
Hadri Z-stat	10.7992	0.0000	24	168

** Probabilities for Fisher tests are computed using an asymptotic Chi -square distribution. All other tests assume asymptotic normality.

Appendix 6 Stationarity test - Education expenses-Number of students per professor

Exogenous variables: Individual effects
Automatic selection of maximum lags
Automatic selection of lags based on MHQC: 0 to 1
Newey-West bandwidth selection using Quadratic Spectral kernel

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	-17.9212	0.0000	26	155
Breitung t-stat	-0.77995	0.2177	26	129
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	-5.17456	0.0000	26	155
ADF - Fisher Chi-square	124.091	0.0000	26	155
PP - Fisher Chi-square	148.861	0.0000	26	156
Null: No unit root (assumes common unit root process)				
Hadri Z-stat	11.0415	0.0000	26	182

** Probabilities for Fisher tests are computed using an asympotic Chi -square distribution. All other tests assume asymptotic normality.

Appendix 7 Stationarity test - Health expenses-Number of beds in hospitals

Exogenous variables: Individual effects
Automatic selection of maximum lags
Automatic selection of lags based on MHQC: 0 to 1
Newey-West bandwidth selection using Quadratic Spectral kernel

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	-12.8472	0.0000	26	154
Breitung t-stat	-1.72062	0.0427	26	128
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	-3.87490	0.0001	26	154
ADF - Fisher Chi-square	105.823	0.0000	26	154
PP - Fisher Chi-square	165.396	0.0000	26	156
Null: No unit root (assumes common unit root process)				
Hadri Z-stat	15.8489	0.0000	26	182

** Probabilities for Fisher tests are computed using an asympotic Chi -square distribution. All other tests assume asymptotic normality.

Appendix 8 Stationarity test - Health expenses- Rate of infant mortality

Exogenous variables: Individual effects
Automatic selection of maximum lags
Automatic selection of lags based on MHQC: 0
Newey-West bandwidth selection using Quadratic Spectral kernel
Balanced observations for each test

Method	Statistic	Prob.**	Cross-Sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	-7.14039	0.0000	22	66
Breitung t-stat	-1.25588	0.1046	22	44
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	-6.E+154	0.0000	22	66
ADF - Fisher Chi-square	59.9606	0.0548	22	66
PP - Fisher Chi-square	84.8962	0.0002	22	66
Null: No unit root (assumes common unit root process)				
Hadri Z-stat	8.48202	0.0000	22	88

** Probabilities for Fisher tests are computed using an asympotic Chi -square distribution. All other tests assume asymptotic normality.