

# THE IMPLICATIONS OF STATE AID TO R&D ON ECONOMIC DEVELOPMENT IN THE EUROPEAN UNION

**Băcilă Nicolae**

*“Babeş-Bolyai” University, Cluj Napoca Faculty of Economics and Business Administration*

*In economic terms, the importance of state aid policy refers to the maintaining of an undistorted competition and the correction of inherent “market failures” which may occur in the economy, aiming at increasing economic efficiency, based on the traditional assumption that an effective competition will have a positive impact on economic development.*

*The main objective of the present paper is to establish a possible correlation between state aid to research and development (R&D) and GDP level in the EU. Our research hypothesis relates to considering state aid as a significant contribution to the economic development, measured by GDP level, which will be estimated as a function of state aid. Consequently, the main variables of this study are state aid to R&D and GDP level, considered in both relative and absolute terms.*

*The relationship between technological change and economic development has been at the centre of the interest in both theoretical and empirical literature. The role of institutions and government policies in stimulating technological change has been provided mainly by the evolutionary theory, which considers economic development as a technological change driven process featured by a complex pattern which includes both uniformity and idiosyncrasy across time and countries.*

*The relationship between these variables was estimated through a panel model which used seemingly unrelated regression (SUR) and ordinary least squares estimation (OLS). Taking into account that the economic value is likely to be realized after the innovation process took place we have interpreted this economic aspect in an econometric sense by using time lags. In analysing the relative importance of state aid to R&D, we have proposed an index which evaluates the relation between state aid and the relative size of the Member State’s economy.*

*The relationship between state aid and GDP level was found to be positive and statistically significant, suggesting that state aid is positively correlated with economic development and showing that state aid programs tend to have an incentive effect for the economic activity after they have been granted, due to the spillover effect of R&D activities assumed by the government funding incorporated in the state aid projects.*

*On the other hand, the analysis of state aid relative to GDP has demonstrated that significant levels of volatility indicate a persistence of disparities between Member States in the period considered (2004-2009), suggesting that national particularities remain an important determinant of government support through state aid, which implies the necessity of a better coordination in the economic policies targeting innovation in the Member States.*

*Keywords: state aid policy, economic development, GDP level, technological change, market failure.*

*JEL Classification: C22, F36, H23.*

## **I. Introduction**

In economic terms, the importance of state aid policy refers to the correction of inherent “market failure” situations which may occur in the economy, aiming at maintaining an undistorted competition in the economic environment. Although maintaining undistorted competition represents the only objective which is explicitly mentioned by the Treaty establishing the European Community and which is confirmed by decisions taken by the Commission, state aid policy cannot be reduced to removing distortions caused by anticompetitive practices, since economic literature has constantly argued in favour of an integrative approach which relates state

aid policy to improving the allocation of resources, increasing economic efficiency and supporting economic development (e.g. De Moor and Calamai 1997; Bilal and Nicolaidis 1999; Wishlade 2003).

The main objective of the present paper is to provide a contribution to the related literature, focusing primarily on establishing a possible correlation between state aid to R&D and GDP level in the EU. In this respect, our research hypothesis relates to considering state aid as a significant contribution to the economic development, quantified by GDP level, which will be estimated as a function of state aid, in order to evaluate whether there is a connection between these variables.

The paper is structured as follows: the second section provides a description of the related literature; the third section explains the main methodological aspects proposed by the research; the fourth section presents the empirical results of the paper, while the last section concludes and establishes future perspectives for research in this area.

## **II. Literature review**

The economic literature provides very different conclusions concerning the problem of government support, ranging from keynesian economic policy, which stresses the importance of state interventions for stabilizing the business cycle, to neoclassical considerations, which regard the government interventions more as a complement of the self-regulating market mechanisms. Despite different approaches of the problem, one of the most important unifying aspects of this literature concerns the fact that state aid is used as a regulatory economic policy instrument, while its efficiency has been related to the support of economic development through the effects on innovation, investment or employment.

The role of institutions and government policies in stimulating technological change has been provided in the economic literature mainly by the evolutionary theory, which considers economic development as a technological change driven process featured by a complex pattern which includes both uniformity and idiosyncrasy across time and countries (Dosi et al. 1990; Chiaromonte and Dosi 1993: 40-55; Silverberg and Verspagen 1995: 210-225; Geels 2004: 902-915). Its empirical models provided a wide range of perspectives on the relationship between technological change and economic growth, focusing especially on patterns concerning technological diffusion (Conlisk, 1989: 791-794), growth effects of new technology, regarded as a stochastic phenomenon (Silverberg and Lehnert 1993: 9-37) and the nature of interactions between rational actors (Fagiolo and Dosi 2003: 267-271).

Recent historical developments, such as the increasing trend towards global and regional economic integration and the policy oriented approach of the EU for building a “knowledge-based economy” (European Commission 2005) have reinforced both the academic and political interest in technological change, expressed through R&D activities, as main engine in promoting long-run economic development.

While in the US the main direction of government support has been towards policies aimed at new capital formation and stimulation of demand (Eisinger 1988; Gray and Lowery 1990: 5-23), in the EU ambiguous Treaty rules and heterogeneous Member States’ preferences have enabled the Commission to act as a “supranational entrepreneur”, enforcing the prohibition of distortive state aid and at the same time creating positive integration by developing a model of what it considers to be “good” state aid policy (Blauberger 2009: 10-15).

This was pointed out by the Lisbon European Council of March 2000 that calls the Member States both to reduce the general level of State aid and to shift the emphasis from supporting individual sectors or companies towards horizontal objectives of common interest (“less and better targeted state aid”).

State aid to R&D, as a component of horizontal aid, is considered more acceptable by the Commission, because it does not cause distortion of competition in the internal market and can be efficiently used to create an incentive effect on innovation by tackling the market failures that

prevent markets from naturally delivering the best results in this respect (European Commission 2004).

### III. Methodology

The relationship between state aid to R&D and economic development, expressed by GDP level, was analysed in both relative and absolute terms for the period considered (2004-2009) and was estimated through a panel model which used seemingly unrelated regression (SUR) and ordinary least squares estimation (OLS).

Taking into account that the economic value of knowledge progressively depreciates in time, the economic value is likely to be realized after the innovation process took place. As a result, we have interpreted this economic aspect in an econometric sense by using time lags, which are related to the fact that one of the most significant particularities of R&D activity is the time gap between the introduction of an innovation through a research project and the moment when the results of the research are embodied into a new product or process, which becomes profitable.

In analysing the relative importance of state aid to R&D, we have proposed an index which evaluates the relation between state aid and the relative size of the Member State's economy, designed to indicate the countries that support their domestic industries proportionally more and, respectively, less than EU average.

### IV. Empirical results

In relative terms, the relationship between state aid to R&D and GDP level is evaluated using an index which relates the amount of national expenditure in the total EU aid, on the one hand, to the contribution of Member States to the aggregated level of GDP, on the other hand. Based on this relation, a country allocating proportionally more (less) state aid than the relative size of its economy would have a supraunitary (subunitary) index, while the EU average value would conventionally be equal to 1.

It can be noticed that while the countries situating above the EU average are: Belgium, the Czech Republic, Germany, Spain (from 2007-2009), France, Hungary (from 2006-2009), Austria, Slovenia (from 2004-2006 and 2009) and Finland, Belgium (from 2007-2009) and the Czech Republic (from 2006-2008) are the only countries that have supported their industries, relative to their size, more than twice as much as the EU average.

At the other side, the countries that during most of the period considered reported values below half of the EU average are: Bulgaria, Estonia, Greece, Cyprus, Latvia, Lithuania, Malta, Poland, Portugal, Slovakia and Sweden, indicating that they have granted significantly less aid than the relative size of their economy.

Furthermore, looking at the variation in index values (captured by the standard deviation), we notice that countries reporting more important modifications of their support to domestic industries, compared to other Member States, were the Czech Republic, Luxembourg and Hungary. In contrast, the Member States that encountered the smallest modifications in the relative amount of aid granted to their industries were: Bulgaria, Greece, Latvia, Poland, Slovakia, Sweden and the United Kingdom.

Table 1. Index of the relative importance of state aid to R&D

Country	Index 2004	Index 2005	Index 2006	Index 2007	Index 2008	Index 2009	Stdev 2004- 2006	Stdev 2007- 2009
Belgium	1.18	0.94	1.02	2.05	2.24	2.55	0.12	0.25
Bulgaria	0	0	0.11	0.42	0.23	0.38	0.06	0.10
Czech Republic	1.22	1.93	2.32	2.31	2.02	1.83	0.56	0.24
Denmark	0.23	0.27	0.40	0.46	0.85	0.77	0.09	0.21

Germany	1.52	1.40	1.50	1.43	1.33	1.15	0.06	0.14
Estonia	0.35	0.53	0.38	0.27	0.29	0.09	0.10	0.11
Ireland	0.49	0.49	0.66	0.65	0.82	1.07	0.10	0.21
Greece	0.07	0.08	0.04	0.06	0.09	0.04	0.02	0.03
Spain	0.96	0.66	0.73	1.09	1.17	1.45	0.16	0.19
France	1.34	1.55	1.67	1.51	1.31	1.29	0.17	0.12
Italy	0.92	1.16	0.85	0.59	0.83	0.73	0.16	0.12
Cyprus	0.47	0.53	0.42	0.23	0.08	0.02	0.06	0.11
Latvia	0	0	0.01	0.03	0.04	0.01	0	0.02
Lithuania	0.06	0.20	0.41	0	0	0.19	0.18	0.11
Luxembourg	0.57	0.71	0.65	0.75	0.70	1.76	0.07	0.60
Hungary	0.31	0.94	1.16	0.12	1.01	1.16	0.44	0.56
Malta	0	0.01	0.02	0.01	0	0.37	0.01	0.21
Netherlands	0.93	0.99	0.83	0.79	0.68	0.96	0.08	0.14
Austria	1.04	1.07	1.33	1.42	1.39	1.38	0.16	0.02
Poland	0.24	0.29	0.20	0.22	0.16	0.12	0.05	0.05
Portugal	0.40	0.12	0.11	0.18	0.15	0.36	0.16	0.11
Romania	0.71	0.38	0.37	0.58	0.67	0.26	0.19	0.22
Slovenia	1.75	1.55	1.07	0.98	0.82	2.16	0.35	0.73
Slovakia	0.03	0.10	0.15	0.12	0.08	0.16	0.06	0.04
Finland	1.86	1.81	1.65	1.49	1.98	1.61	0.11	0.26
Sweden	0.53	0.47	0.44	0.43	0.43	0.43	0.05	0
United Kingdom	0.55	0.43	0.40	0.53	0.49	0.51	0.08	0.02

Source: author's own calculations based on data from European Commission and Eurostat

Note: The index is calculated as follows:  $\text{Index} = \frac{(\text{Member State's aid}) / (\text{EU-27 aid})}{(\text{Member State's GDP}) / (\text{EU-27 GDP})}$

However, when comparing the average variations experienced by Member States, we found that most of the countries follow an ascendant trend in the period considered, indicating a growing level of disparity in the relative importance of state aid to R&D. The higher variability in the granting of state aid by some countries could indicate that national prerogatives are still determinant in supporting their domestic industries. This aspect suggests that state aid to R&D does not appear to be of a general nature or designed to address general economic problems, but rather of a specific nature aiming at addressing economic and social particularities, showing that national traditions seem to remain a significant factor in shaping the development of state aid to R&D in the EU Member States.

When analysing the relationship between mean values of state aid to R&D and GDP in absolute terms, we found a positive correlation, with a 0.63 R<sup>2</sup> value, which means that the relationship between these variables is robust. This seems to confirm the fact that countries with higher GDP tend to finance state aid to R&D to a greater extent than the countries that have reported lower values of GDP.

Table 2. The relationship between State aid to R&D and GDP

$$\text{Equation : } \text{GDP}(t) = C(1) + C(2) * \text{State aid}(t)$$

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C(1)	114968.90	27830.47	4.1310	0.0001
C(2)	830.9055	54.7456	15.1776	0.0000

Source: author's own calculations based on data from European Commission and Eurostat

Weighted Statistics

R <sup>2</sup>	Adjusted R <sup>2</sup>	F-statistic	Prob (F-statistic)	Mean dependent var	Sum squared resid
0.6355	0.6332	278.9340	0.000000	0.5569	132.1367

Source: author's own calculations based on data from European Commission and Eurostat

When using state aid values from the previous year, we have found a relationship which maintains its statistical significance and has a 0.68 R<sup>2</sup>, which shows that the investment has continued to exert an effect on economic activity after the government support was made. While government support through state aid significantly contributes to the development of economic activity after the grant has been provided, we appreciate that it is reasonable to expect even longer lags for spillover effects because of the additional diffusion lag and also for the basic research because of the longer invention to innovation lag.

Table 3. The relationship between State aid to R&D and GDP (lagged)

$$\text{Equation : } \text{GDP}(t) = C(1) + C(2) * \text{State aid}(t-1)$$

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C(1)	207754.4	35111.63	5.9170	0.0000
C(2)	902.7413	58.8934	15.3284	0.0000

Source: author's own calculations based on data from European Commission and Eurostat

Weighted Statistics

R <sup>2</sup>	Adjusted R <sup>2</sup>	F-statistic	Prob (F-statistic)	Mean dependent var	Sum squared resid
0.6951	0.6828	56.5298	0.000000	0.7666	107.9369

Source: author's own calculations based on data from European Commission and Eurostat

## V. Conclusions

The present paper provided an analysis of the relationship between state aid to R&D and economic growth in the EU Member States. In this respect, we have assumed that state aid contributes in a significant manner to the economic development, measured by GDP level, which was estimated as a function of state aid, in order to evaluate the nature of the connection between these variables. The relationship between state aid and GDP level was found to be positive and statistically significant, suggesting that state aid is positively correlated with economic development. We have proved that state aid has the potential to act as a relevant determinant for the GDP level, which has also been confirmed by the econometric results showing that state aid programs tend to have an incentive effect for the economic activity after they have been granted, due to the spillover effect of R&D activities assumed by the government funding.

When analysing state aid relative to the GDP, we have noticed that significant levels of volatility indicate a persistence of disparities between Member States in the period considered, suggesting that national particularities remain an important determinant of government support through state aid, which implies the necessity of a better coordination in the economic policies targeting innovation in the Member States.

Admitting that this analysis of the relationship between state aid to R&D and economic growth has been limited to the application of basic empirical instruments to a very complex topic, we appreciate that further research could evaluate the extent to which the differences between sectors and countries with regard to government policies directed at R&D influence the economic growth in the EU Member States.

## VI. Acknowledgements

This article is the outcome of doctoral research under the scientific supervision of Professor Mihaela Luțaș, Ph.D., “Babeș-Bolyai” University, Cluj Napoca, Faculty of Economics and Business Administration, financed through Investing in people! Ph.D. scholarship, Project co-financed by the Sectoral Operational Program for Human Resources Development 2007–2013, Priority Axis 1. "Education and training in support for growth and development of a knowledge based society", Key area of intervention 1.5: Doctoral and post-doctoral programs in support of research, Contract nr.: POSDRU/88/1.5/S/60185 – “Innovative doctoral studies in a Knowledge Based Society”, Babeș-Bolyai University, Cluj-Napoca, Romania.

## VII. References

1. Blauburger M., 2009. From Negative to Positive Integration. European State Aid Control through Soft and Hard Law, European Union Studies Association, Eleventh Biennial International Conference, Los Angeles.
2. Chiaromonte, F. and Dosi, G., 1993. Heterogeneity, Competition, and Macroeconomic Dynamics. *Structural Change and Economic Dynamics*, 4(1), pp.39-63.
3. European Commission. Report on Competition Policy 2005. Luxembourg: Office for Official Publications of the European Communities, 2007.
4. Conlisk, J., 1989. An Aggregate Model of Technical Change. *The Quarterly Journal of Economics*, 104(4), pp.787-821.
5. De Moor, A. and Calamai, P., 1997. Subsidizing Unsustainable Development: Undermining the Earth with Public Funds. The Hague: Institute for Research on Public Expenditure.
6. Dosi, G. et al., 1990. *The Economics of Technical Change and International Trade*. New York: Harvester Wheatsheaf.
7. Eisinger, P.K., 1988. *The Rise of the Entrepreneurial State : State and Local Economic Development Policy in the United States*, Madison: University of Wisconsin Press.
8. Fagiolo, G. and Dosi, G., 2003. Exploitation, Exploration and Innovation in a Model of Endogenous Growth With Locally Interacting Agents. *Structural Change and Economic Dynamics*, 14(3), pp.237-273.
9. Geels, F.W., 2004. From Sectoral Systems of Innovation to Socio-Technical Systems: Insights about Dynamics and Change from Sociology and Institutional Theory. *Research Policy*, 33(6-7), pp.897-920.
10. Gray, V. and Lowery, D., 1990. The Corporatist Foundations of State Industrial Policy, *Social Science Quarterly*, 71 (1), pp. 3-24.
11. Nicolaidis, P. and Bilal, S., 1999. An Appraisal of the State Aid Rules of the European Community : Do They Promote Efficiency, *Journal of World Trade*, 33(2), pp.97-124.
12. Silverberg, G. and Verspagen, B., 1995. An Evolutionary Model of Long Term Cyclical Variations of Catching Up and Falling Behind. *Journal of Evolutionary Economics*, 5(3), pp.209-227.
13. Silverberg, G. and Lehnert, D., 1993. Long Waves and Evolutionary Chaos in a Simple Schumpeterian Model of Embodied Technical Change. *Structural Change and Economic Dynamics*, 4(1), pp 9-37.
14. Wishlade, F., 2003. *Regional State Aid and Competition Policy*. The Hague: Kluwer Law International.