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The impact of state aid on economic growth

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Abstract

We shed light on the nature of the relationship between state aid and economic growth for a panel of 28 EU countries over the period 2002-2017. We show that this relationship is statistically significant and negative. A 10% increase (decrease) in the state aid from the sample mean decreases (increases) annual real per capita growth by 1.6% on average suggesting that countries relying solely on state aid will perform worse.

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1 Introduction

There is no doubt that state aid interventions mitigate competition, by alleviating the incentives of the firms to improve their efficiency. State aid distorts market equilibrium since a company gains a comparative advantage over its rivals thus enjoying significant market power. For this reason, the EU Treaty generally regards state aid as incompatible with the common market unless it is justified by reasons of general economic development (see Article 107 par. 1).

According to the European Commission (EC), `State aid can be defined as an advantage in any form whatsoever conferred on a selective basis to undertakings by national public authorities_[1]. The Treaty prohibits State aid unless justified by reasons of general economic development. To be State aid, a measure needs to have the following features: a) the intervention by the State or through State resources which can take a variety of forms (e.g. grants, interest and tax reliefs, guarantees, government holdings of all or part of a company, or providing goods and services on preferential terms, etc.), b) the intervention gives the recipient an advantage on a selective basis, for example to specific companies or industry sectors, or companies located in specific regions competition has been or may be distorted and c) the intervention is likely to affect trade between the Member States. Therefore, subsidies granted to individuals or general measures open to all firms are not covered by this prohibition and do not constitute State aid. In some circumstances though, government intervention is necessary for a well-functioning and equitable economy. Therefore, the EC Treaty leaves room for several policy objectives for which State aid can be considered compatible.

One of the most illustrative examples of State aid within the EU is the Greek Olympic Airways case. Specifically, between 1994 and 2000 the EC took several decisions authorizing public aid for the restructuring of Olympic Airways. In December 2002, the EC found that further aid had been granted to the airline which was incompatible with the common market, and demanded that B160 million be repaid. The aid included: a) 40 million from the Greek State and Olympic Airways to cover part of the costs to Olympic Airlines of leasing aircraft, b) B90 million from an unjustified payment of the Greek State to Olympic Airways when Olympic Airlines was set up and transferred to the State, c) more than B350 million in tax and social security liabilities of Olympic Airways and d) up to B60 million for many financial obligations (i.e aircraft leasing contracts, repayment of a bank loan). By granting this aid, Greece has given Olympic Airways and Olympic Airlines an advantage not available to its competitors distorting the effective level of competition in the relevant market.

While the link between forms of government support such as foreign aid on growth has been heavily examined (Chauvet and Ehrhart, 2018; Galiani et al. 2017; Werker et al. 2009; Djankov et al. 2008), the existing literature has been elusive to provide answers on the state aid-growth nexus. This issue raises significant macro-economic concerns since government support (i.e., equity participation, grant, guarantee, etc) may not only affect the firm˘s growth but the economic prosperity and cohesion of the EU internal market. In this framework, the European Commission has recently launched a State Aid Modernisation program, which allows member states to implement aid measures that foster investment, economic growth, and job creation, leaving the EC to focus its state aid control on cases most liable to distort competition (EC, 2019).

[1] See https://ec.europa.eu/competition/state_aid/overview/index_en.html

In this study, we contribute to the literature by employing various parametric techniques (i.e., OLS fixed effects, 2SLS and dynamic GMM estimators) to quantify the effect of state aid on growth for a panel of 28 EU countries. We argue that government support diminishes economic growth, while this relationship does not appear to exhibit nonlinear effects.

The remainder of the paper is organized as follows. Section 2 discusses the data and the empirical framework. Section 3 presents the empirical findings, while Section 4 concludes the paper.

2 Data and modeling

2.1 Sample and descriptive statistics

The sample consists of a panel data set of 28 EU countries over the non-overlapping 3-year averages for the period 2002-2017.[2] The data are primarily drawn from three sources. State aid data are obtained from the State Aid Scoreboard 2018 of the European Commission.[3] Income, economic growth, inflation, government expenditures, and population data have been extracted by the World Bank (World Development Indicators Database). The rest of the explanatory variables namely the human capital index and share of gross capital formation (a proxy for investment) are available from Penn World Table, version 9.1 (Feenstra et al. 2015).

Table 1 reports the descriptive statistics of the sample variables, while Figure 1 shows a mildly negative relationship between state aid and growth generated by a non-parametric regression (LOWESS). However, one of the most likely explanations for the negative association between state aid and growth might stem from possible endogeneity bias (see discussion on Section 3).

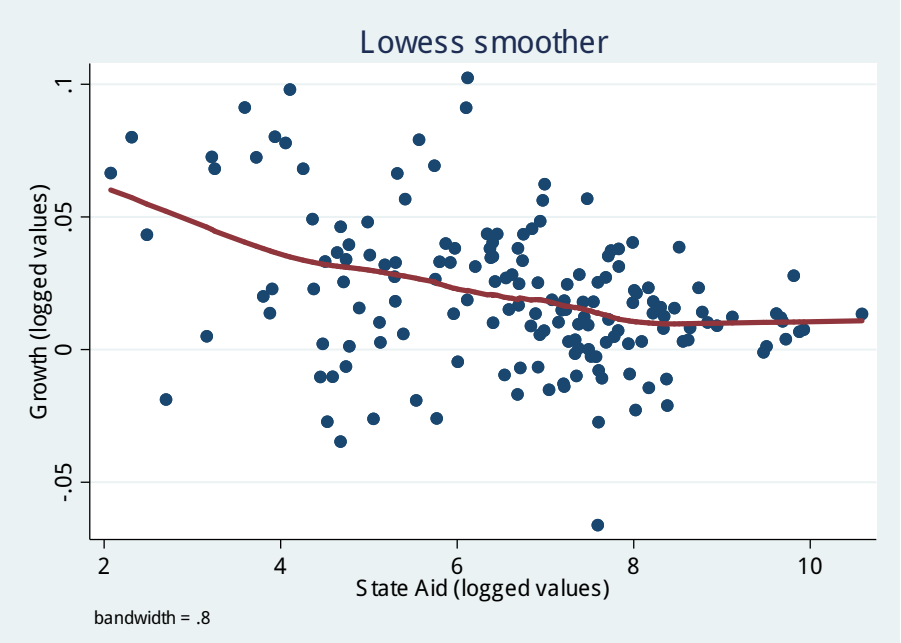
Table 1: Summary statistics

Variables	Observations	Mean	Std. Dev	Min	Max
ln(Growth)	168	0.020	0.027	-0.066	0.102
ln(StateAid)	168	6.631	1.727	2.075	10.59
ln(Income)	168	10.15	0.689	8.349	11.59
ln(Population)	168	15.91	1.413	12.88	18.23
ln(Trade)	168	0.023	0.473	-0.739	1.421
Human	168	3.163	0.310	2.233	3.767
Capital	168	0.251	0.051	0.137	0.409
Government	168	19.72	2.769	12.18	27.29
Inflation	168	2.738	3.519	-2.070	34.62

[2] Following the vast growth literature, we use 3-year averages instead of annual data to avoid business cycle effects.

[3] The database comprises aid expenditure made by Member States before 31.12.2017 and which falls under the scope of Article 107(1) TFEU. Data are available at https://webgate.ec.europa.eu/comp/redisstat/databrowser/view/COMP_AI_SA_X$COMP_AI_SA_01/default/table?category=COMP_SHARE, accessed in November, 2019.

Figure 1: Non-parametric regression line between state aid and growth



2.2 Econometric framework

Based on Galiani et al. (2017), we estimate the augmented Solow growth model as follows:

$$Growth_{is} = Constant + Income_{is-1}a + StateAid_{is-1}b + Z_{is}i g + d_i + v_s + u_{is} \quad (1)$$

where s denotes non-overlapping 3-year periods for the years t, t-1, and t-2. $Growth_{is}$, denotes log real per capita GDP growth rates of country i in period s. $Income_{is-1}$ is the one period lagged log real per capita GDP (in constant 2010 USD). $StateAid_{is-1}$ denotes the log of average state aid granted in country i in period s-1.[4]

$Z_{is}i$ is the column vector of time-varying explanatory variables including log population (Population), share of gross capital formation at current PPPs (Capital), general government final consumption expenditure over GDP (Government), trade openness measured by the logged sum of imports and exports over GDP (Trade), human capital index based on years of schooling and returns to education (Human) and inflation (Inflation) measured by the annual growth rate of the GDP implicit deflator. The model also accounts for country and year fixed effects ($_i$, v_t) to allow for time-invariant unobserved heterogeneity and finally u_{is} is the i.i.d. error term.

[4] We use the one-period lag of state aid to allow time for government support to take effect (Clemens et al. 2012; Galiani et al. 2017).

3 Results and discussion

Table 2 presents the results. Similar to previous studies (Rajan and Subramanian, 2008; Clemens et al. 2012) we address endogeneity and reverse causality of state aid on growth by lagging it one period.[5]

The reason justifying the endogeneity of state aid is twofold. On the one hand, the state may target firms or sectors that are poorly performing (hence an underestimation of the OLS estimates), while on the other hand, firms that face an exogenous shock may both perform poorly and receive financial aid from the state (again leading to an underestimation of the OLS estimates).

As it is evident, the OLS fixed-effect model in Column 1 reveals that state aid is negatively and statistically significant correlated with economic growth (-0.00667). Moreover, we are not able to trace nonlinear effects since the quadratic term although negative is not statistically significant even at the 10% level of significance (see Column 2). The results do not dramatically change when we control for endogeneity by using 2SLS (see Columns 3&4), assuming income also an endogenous variable (Chauvet et al. 2018; Ketteni et al. 2007 Mamuneas, et al. 2006).

Columns 5-8 present the dynamic panel data estimators (Arellano and Bond, 1991; Blundell and Bond, 1998), where the (lagged) linear and the quadratic term of state aid and income are treated as endogenous variables instrumented by their lags, while the rest of the variables are assumed to be predetermined. The point estimates of the state aid coefficient are more than twice as large as those obtained by OLS and 2SLS ranging within a close interval (from -0.149 to -0.182). This means that a 10% increase (decrease) in the state aid from the sample mean decreases (increases) annual real per capita growth by 1.65% on average. Also, estimates suggest the absence of nonlinear (quadratic) effects.

The rest of the covariates when significant are properly signed. Specifically, growth is negatively correlated with lagged income, supporting conditional convergence (Galiani et al. 2017), while trade openness positively affects economic growth in most of the cases.

Tests reported at the bottom of the table show that the instruments are exogenously alleviating the concern of possible severe bias due to the presence of weak instruments (see Cragg-Donald Wald F statistic and first stage F-statistic). Further, the 2SLS models are not under-identified since in all of the specifications the null hypothesis cannot be rejected (see Kleibergen-Paap LM statistic). Moreover, the Sargan and Hansen tests confirm the validity of the overidentifying restrictions, while the specified endogenous regressors (lagged aid and income) can be treated as exogenous in all of the cases (see endogeneity test). Lastly, according to the AR(2) test, the GMM models do not suffer from serial correlation since we cannot reject the null hypothesis.

[5] We must bear in mind that using the aid in t-2 as an instrument for aid in t-1 in columns (3) and (4) is not really satisfactory because aid in t-2 may be correlated with performance in t-1, which itself may explain performance in t, hence violating the exclusion restrictions. However, due to absence of proper instruments based on theoretical grounds, we rely solely on lagged values of state aid as already addressed by the existing literature. Only in the system GMM specifications, we have used use aid in t-3 as an instrument for aid in t-1, since instrumenting aid in t-1 with aid in t-2 assumes that aid is predetermined not endogenous as in this case.

Table 2: Empirical results

Variables	(1) OLS-FE	(2) OLS-NL	(3) 2SLS-FE	(4) 2SLS-NL	(5) DIF-GMM	(6) SYS-GMM	(7) DIF-GMM-NL	(8) SYS-GMM-NL
$\ln(Growth_{is-1})$	-	-	-	-	0.00798**	0.00829	0.0311**	0.0214
					(0.00385)	(0.00513)	(0.0144)	(0.0348)
$\ln(StateAid_{is-1})$	-0.00667**	0.00769	-0.00321***	-0.00721*	-0.149**	-0.182*	-0.176***	-0.129*
	(0.00286)	(0.00791)	(0.00024)	(0.00407)	(0.0691)	(0.101)	(0.0681)	(0.0950)
$\ln(StateAid_{is-1})^2$	-	-0.000402	-	0.000445	-	-	-0.00204	-0.00156
		(0.000594)		(0.000373)			(0.00140)	(0.00337)
$\ln(Income_{is-1})$	-0.00322	-0.00427	-0.0200***	-0.0110***	-0.128***	-0.146***	-0.123***	-0.167***
	(0.00365)	(0.00349)	(0.00359)	(0.00296)	(0.0234)	(0.0409)	(0.0228)	(0.0602)
$\ln(Population_{is})$	0.121**	0.163***	-0.00143	0.00114	-0.0525	-0.150	-0.0255	-0.204*
	(0.0517)	(0.0606)	(0.00255)	(0.00502)	(0.0570)	(0.0947)	(0.0592)	(0.124)
$\ln(Trade_{is})$	0.0781***	0.0657**	0.0113*	0.00896**	-0.0247	-0.109***	-0.0304	-0.104**
	(0.0293)	(0.0301)	(0.00641)	(0.00453)	(0.0243)	(0.0408)	(0.0265)	(0.0467)
$Human_{is}$	-0.0565	-0.0610	0.0618	-0.0190	0.0987**	0.233***	0.0921**	0.288***
	(0.0462)	(0.0485)	(0.0500)	(0.0456)	(0.0400)	(0.0667)	(0.0407)	(0.0975)
$Capital_{is}$	0.0990***	0.102**	0.0137***	0.00993***	0.150**	0.221**	0.160**	0.243**
	(0.0339)	(0.0431)	(0.00427)	(0.00308)	(0.0607)	(0.0866)	(0.0641)	(0.106)
$Government_{is}$	-0.000457	-0.00245	-0.000837	-0.000570	-0.0115***	-0.0121***	-0.0115***	-0.0111***
	(0.00205)	(0.00252)	(0.000795)	(0.000862)	(0.00125)	(0.00248)	(0.00126)	(0.00311)
$Inflation_{is}$	0.00148***	0.00153***	0.00156***	0.00213***	0.00365***	0.00325**	0.00363***	0.00408**
	(0.000397)	(0.000480)	(0.000537)	(0.000547)	(0.000952)	(0.00147)	(0.00110)	(0.00174)
Constant	-1.733**	-2.422**	0.185***	0.127	-	-	-	-
	(0.835)	(1.004)	(0.0495)	(0.0905)				
Country FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	163	163	161	162	134	134	134	134
Instruments	-	-	$\ln(StateAid_{is-2})$ $\ln(Income_{is-2})$	$\ln(StateAid_{is-2})$ $\ln(StateAid_{is-2})^2$ $\ln(Income_{is-2})$ $\ln(Income_{is-2})^2$	$\ln(StateAid_{is-2})$ $\ln(Income_{is-2})$ $\ln(Population_{is-1})$ $\ln(Trade_{is-1})$ $Human_{is-1}$	$\ln(StateAid_{is-3})$ $\ln(Income_{is-2})$, $\ln(Population_{is-1})$ $\ln(Trade_{is-1})$ $Human_{is-1}$	$\ln(StateAid_{is-2})$ $\ln(StateAid_{is-2})^2$ $\ln(Income_{is-2})$ $\ln(Population_{is-1})$ $\ln(Trade_{is-1})$	$\ln(StateAid_{is-3})$ $\ln(StateAid_{is-2})^2$ $\ln(Income_{is-2,}$ $\ln(Population_{is-1})$ $\ln(Trade_{is-1})$

					$Capital_{is-1}$ $Government_{is-1}$ $Inflation_{is-1}$	$Capital_{is-1}$ $Government_{is-1}$ $Inflation_{is-1}$	$Human_{is-1}$ $Capital_{is-1}$ $Government_{is-1}$ $Inflation_{is-1}$	$Human_{is-1}$ $Capital_{is-1}$ $Government_{is-1}$ $Inflation_{is-1}$
First stage F-statistic (K-P Wald)	-	-	37.69*** [0.000]	39.88*** [0.000]	776.90*** [0.000]	302.74*** [0.000]	1,099.18*** [0.000]	517.00*** [0.000]
AR(2) p-value	-	-	-	-	0.765	0.802	0.539	0.902
Kleibergen-Paap LM statistic	-	-	10.353*** [0.0013]	11.243*** [0.0008]	-	-	-	-
Cragg-Donald Wald F statistic	-	-	99.872 {16.38}	19.658 {7.03}	-	-	-	-
Sargan-Hansen test p-value	-	-	0.9992	0.9993	0.238	0.605	0.856	0.752
Endogeneity test	-	-	2.062 [0.1510]	2.007 [0.3665]	-	-	-	-

Notes: P-values in brackets, while number in {} denotes the critical values for Cragg-Donald F statistic for 10% maximal IV size. Standard errors clustered at the country level are in parentheses.
*** p<0.01, ** p<0.05, * p<0.1.

4 Conclusion

Using parametric techniques, we examine how government support influences the level of economic growth within the EU. We argue that there is a negative relationship between state aid and growth. This finding holds also when dealing with endogeneity and reverse causality between aid and growth.

Our findings are in alignment with the new industrial policy framework favoring competition and limited government intervention within the EU (Aghion et al. 2015). The empirical results incur significant policy implications about the effectiveness of the EU state aid program, which allows member states to implement government support measures that foster economic growth.

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