State Aid Policy in the European Union*

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Abstract

Industrial policy is an important tool of economic policy-making, and this has been the case especially since the onset of the current global financial crisis in 2008. However, only relatively few empirical studies consider the macroeconomic effects of industrial policy, especially for European Union countries. In this study we investigate the effect of state aid policy on economic growth and investment, using a panel data set which covers 27 European Union countries over the period 1992–2011. Our results suggest that state aid policy is not an effective tool to achieve higher economic growth and investment rates.

Introduction

Recently, increasing concerns about the international competitiveness of European countries, together with their deindustrialization (Bianchi and Labory, 2011, p. 130; Legarda and Blazquez, 2013, p. 3), have stimulated a new debate about industrial policy. This is especially true in the context of the global economic and financial crisis. During the crisis, the European Union set out a new integrated industrial policy strategy which emphasizes the importance of a strong and diversified manufacturing sector for the competitiveness and job creation potential of the European Union (Commission of the European Communities, 2010, p. 3). The rising importance of industrial policy as a tool of economic policy-making in the European Union countries, moreover, is compounded by the fact that the EU competition policy simultaneously imposes strict limits on the ability of the Member States to pursue their own industrial policy objectives. Therefore, industrial policy and its effects are issues of increasing importance, in particular in the context of European integration.

Yet the number of studies that examine the effectiveness of industrial policy in European Union countries is low. In this paper, we try to fill this gap in the literature by investigating the effects of state aid policy on economic growth and investment in the European Union countries. We use the most comprehensive data set available on state aid and we consider all of the European Union countries.[1] Hence, our study is one of the most comprehensive studies in terms of data coverage at the macro level.

The rest of the paper is structured as follows: in section 1, we briefly explain the theoretical arguments behind industrial policy and the results of previous empirical studies

[1] Our data set does not include Croatia since this country was not a member of the European Union during the time period that we investigate.

investigating the industrial policy of the European Union. In section 2, we review state aid policy in the European Union. In section 3, we present our data and empirical methodology. In sections 4 and 5, we discuss the results of our analysis of the effect of state aid on economic growth and investment. In the last section, we offer some concluding remarks.

I. Literature Review

Although industrial policy is a much debated issue in economics literature, economists and policy-makers have not reached a consensus on its definition. There are a number of different perspectives on its objectives and instruments (Evenett, 2003, pp. 15–18), and the definition changes with regard to these objectives and instruments. One of the most commonly used definitions was that put forward by Pack and Saggi (2006, pp. 267, 268), who describe it as 'any type of selective government intervention or policy that attempts to alter the structure of production in favor of sectors that are expected to offer better prospects for economic growth in a way that would not occur in the absence of such intervention in the market equilibrium'.

At the European Union level, industrial policy is defined as interventions that affect the cost, price and innovative competitiveness of the industry (such as standardization or innovation policies) or sectoral policies focusing on the innovation performance of individual sectors (Commission of the European Communities, 2010, p. 4). According to this definition, industrial policy includes both horizontal and sectoral measures.

The main economic rationale behind industrial policy is to increase efficiency. This view asserts that governments should correct market failures (such as externalities, asymmetric information or market power) and co-ordination problems (Hölscher *et al.,* 2010, p. 6). One of the most significant externalities in terms of countries' competitiveness, namely the Marshallian externality, arises when firms benefit from the production and innovation activities of other firms in the same or related industries. In this case, it would be optimal to provide a subsidy to the firms creating the Marshallian externality (Rodriguez-Clare, 2007, pp. 43–4).

Another justification for industrial policy is asymmetric information. For example, firms – especially small and medium-sized enterprises – might have difficulty borrowing in the financial markets since their risks and profits have not been properly evaluated by financial institutions (Hölscher *et al.,* 2010, p. 6).

Finally, co-ordination problems arise when, for instance, an industry remains locked into an old and inefficient standard. Since moving to a better standard – which is beneficial for everybody – requires co-ordination across many actors, government intervention may provide the required impetus to reach the desired outcomes (Warwick, 2013, p. 22). A classic example of a co-ordination failure is the use of the QWERTY layout in typewriters, which remains standard in computer keyboards today. An alternative and more efficient layout, the Dvorak keyboard – which supposedly enables people to type 20–40 per cent faster – was invented after the launch of the QWERTY keyboard; however, the Dvorak keyboard continues to be sparsely used and the QWERTY layout still dominates typewriters and computer keyboards (David, 1985, p. 332).[2]

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[2] The superiority of the Dvorak layout has nevertheless been questioned: see Liebowitz and Margolis (1990).

In contrast to the above arguments in favour of industrial policy, there are counter-arguments that cast doubt on the effectiveness of such measures. The first counter-argument, which is usually stated as 'governments cannot pick winners', asserts that because of asymmetric information it is not possible for governments to determine the firms, sectors or industries stricken by market failures. The second counter-argument suggests that industrial policy leads to corruption and rent-seeking. Accordingly, if the government provides support to the industry, entrepreneurs spend much of their time seeking to gain these benefits rather than searching for new ways to decrease their costs (Rodrik, 2008, pp. 7, 8).

From the above discussion, it is obvious that the success of industrial policy depends considerably on the political system and institutions of the country in question. However, there is always a risk of government failure, even in countries with well-functioning political systems. Therefore, in recent years there has been a trend towards a new, 'soft' industrial policy which provides for a more facilitative and co-ordinating role of the government (Warwick, 2013, pp. 23, 24).

Existing studies of European industrial policy can be classified into two main groups. In the first category are studies which investigate the effects of industrial policy at the country level; in the second category, industrial policy is examined at the firm level. Gual and Jodar-Rosell (2006); Aghion *et al.* (2011) and Stöllinger and Holzner (2013) fall into the first category. Since the main instrument of industrial policy in the European Union countries is state aid, all of these studies consider state aid as their main independent variable. Gual and Jodar-Rosell (2006) examine the effect of vertical state aid policy on multi-factor productivity in the manufacturing sector in 11 European Union countries over the period 1992–2003. According to their results, vertical state aid has a positive effect on productivity growth. Aghion *et al.* (2011) find a positive effect of total sectoral aid to industry and services on exports of manufacturing and services over the period 1992–2008 in 12 European Union countries. Furthermore, by including an interaction term between state aid and financial development, they conclude that state aid is more effective in financially less developed countries. Similarly, Stöllinger and Holzner (2013) try to explain the impact of state aid on value added exports (defined as the value added generated by the country concerned but absorbed in another country) for 27 European Union countries using a data set over the period 1995–2011. They also examine whether effective governments are more successful in terms of applying state aid policy. They find that while state aid to manufacturing increases export competitiveness, government effectiveness has only a minor impact on the success of state aid policy.

Studies that investigate industrial policy at the disaggregated (firm, sectoral or regional) level are much more numerous than the country-level studies. These analyses mainly focus on one of the subcomponents of industrial policy, such as regional policy. For example, Wren and Taylor (1999) examined the effect of regional policy on the employment structure of recipient areas using annual panel data for 12 UK regions over the period 1971–1994 and found that regional policy encourages convergence of the supported industry with the national pattern of employment. Bronzini and De Blasio (2006) investigated whether regional policy that provided a public subsidy to firms which invest in underdeveloped areas in Italy led to investments that would have not materialized otherwise. By using financial statements of 1008 Italian firms from 1994 to 2001, they came to the conclusion that the resulting increase in investment was counterbalanced

by a reduction in accumulation by the supported firms. Hence, their results raise doubts about the efficacy of industrial policy. Gobillon *et al.* (2012) evaluated the 1997 French Enterprise Zone Program and investigated whether the programme had had a positive effect on the employment level of local residents. Using an exhaustive data set for the Paris region over the period 1993–2003, they concluded that the program had no effect on the unemployment level. Martin *et al.* (2011) analysed a public policy (local productive systems; LPS) which promoted industrial clusters in France. They drew on a data set which covered 345 LPS firms over the period 1996–2003 and found that the policy had no effect on employment or exports. Curiscuolo *et al.* (2012) examined the effect of a regional selective assistance programme on employment, investment and productivity in the UK by using a firm-level data set which covered the period 1986–2004. According to their results, although the programme had a significant effect on the treated firms in terms of employment and investment, it had no additional effect on productivity.

Importantly, disaggregated analyses can be biased toward finding positive effects of industrial policy because of the associated distributional impacts: subsidies to selected firms, sectors or regions may boost the performance of the recipients at the expense of other entities (which may be less likely to be included in the analysis). Such distributional implications should partially cancel out in aggregate studies, allowing the analyst to quantify the net impact of industrial policy.

II. A Brief Overview of State Aid Policy in the European Union

State aid is defined by the European Union as 'an advantage in any form whatsoever conferred on a selective basis to undertakings by national public authorities' (Commission of the European Communities, 2013a). Articles 107 to 109 of the Treaty on the Functioning of the European Union (TFEU) set out the application and control of state aid policy in the member countries. Although Article 107 (1) generally prohibits any kind of aid which distorts or threatens to distort competition, Articles 107 (2) and 107 (3) state the exemptions from this prohibition. Accordingly, the following types of state aid are exempt: aid having a social character; compensating the damage caused by natural disasters; granted to certain areas of the Federal Republic of Germany affected by the division of Germany; promoting economic development of areas where the standard of living is abnormally low; promoting an important project of common European interest and remedying a serious disturbance in the economy; facilitating the development of certain activities or certain economic areas; and promoting culture and heritage conservation (European Union, 2008, pp. 91, 92). Hence, governments may provide state aid to specific firms and industries when the aim of the expenditure falls within these boundaries.

State aid is regulated by the European Commission Directorate General for Competition. Member countries have to report all state aid measures to the Commission and these measures can only be implemented after European Union approval (Hölscher *et al.*, 2010, p. 9). Although state aid has been effectively controlled by the European Union in recent years, establishing a well-functioning system for the control of state aid took a very long time. There are several reasons behind this delay (Kassim and Lyons, 2013, pp. 3, 4). First, state aid control is politically sensitive. Second, the articles of the treaty that

Figure 1: Total State Aid and Its Main Subcomponents as a Percentage of GDP (EU-27).
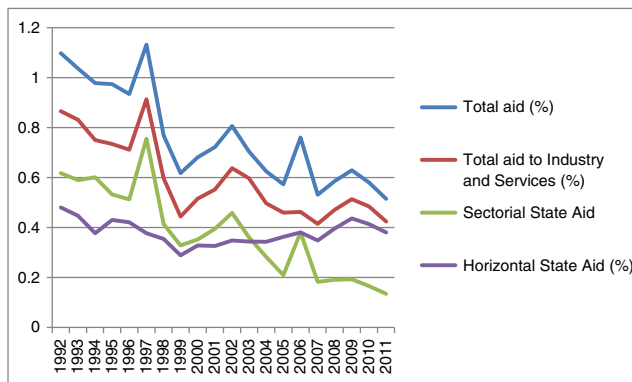
Note: State aid figures do not include aid provided due to the 2008 financial crisis.
Source: Commission of the European Communities, 2013b; 2013c.

regulate state aid are complex and do not impose rules at the national level. Third, member countries were not eager to co-operate with the Commission in order to operationalize the articles of the treaty and to comply with the obligations imposed. However, in conjunction with the announcement of State Aid Action Plan (SAAP), whose main aim is 'less and better targeted state aid' (Commission of the European Communities, 2005), state aid rules have become more transparent and easier to implement (Kassim and Lyons, 2013, p. 11). Thus, oversight of member countries' state aid policies is much better now in comparison to ten years ago.

In the European Union, state aid expenditures are divided into two main categories: horizontal expenditures and sectoral expenditures. Horizontal expenditures cover regional development aid, environmental aid (including energy saving), research development and innovation aid and aid to small and medium-sized enterprises (including risk capital). Sectoral expenditures are composed of rescue and restructuring aid and aid to transport, agriculture, fisheries and aquaculture and coal, steel and shipbuilding. Figure 1 shows the evolution of total state aid expenditure together with its main subcomponents for the European Union as a whole over the period 1992–2011. As can be seen from the figure, total state aid expenditure fell from 1.10 per cent in 1992 to 0.51 per cent in 2011.[3] Furthermore, state aid to industry and services and sectoral state aid follow a similar pattern to that of total state aid, in contrast to horizontal state aid. However, the share of horizontal state aid shows an upward trend, especially in recent years. These developments are compatible with recent regulations which put more emphasis on horizontal state aid because of the distortive effects of sectoral measures on market mechanism (Commission of the European Communities, 2005, p. 5).[4]

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[3] The hike in 1997 stems from the huge increase in French sectoral aid because of the Credit Lyonnais case ((Hölscher, 2010, p. 10; Kassim and Lyons, 2013, p. 11).

[4] It should be noted, however, that between 65 and 75 per cent of horizontal state aid has been directed recently to three areas: environmental protection, regional development and research and development. Only the third (and smallest), accounting for around 20 per cent of state aid, can be expected to have direct impact on efficiency and productivity (although the other two areas may have indirect effects). We are grateful to an anonymous referee for pointing this out.

Table 1: The State Aid Expenditures of Member Countries as a Percentage of GDP

	Total state aid	State aid to industry and services	Horizontal state aid	Sectoral state aid
Austria	0.75	0.44	0.41	0.35
Belgium	0.56	0.43	0.36	0.19
Bulgaria	0.41	0.21	0.12	0.29
Cyprus	1.71	1.28	0.56	1.09
Czech Rep	1.53	1.39	0.52	1.01
Denmark	0.86	0.68	0.65	0.21
Germany	1.18	1.07	0.63	0.55
Spain	0.83	0.69	0.31	0.52
Estonia	0.26	0.11	0.11	0.15
Greece	0.85	0.57	0.53	0.32
France	0.95	0.65	0.38	0.56
Finland	1.68	0.45	0.43	1.25
Ireland	0.93	0.53	0.32	0.61
Hungary	1.71	1.41	0.76	0.96
Italy	0.80	0.63	0.53	0.27
Luxembourg	0.42	0.26	0.26	0.16
Lithuania	0.53	0.28	0.17	0.36
Latvia	1.01	0.42	0.34	0.66
Malta	3.03	2.79	0.23	2.81
Netherlands	0.48	0.23	0.22	0.26
Portugal	1.70	1.48	0.31	1.38
Poland	1.15	0.95	0.44	0.71
Romania	1.31	1.02	0.22	1.08
Sweden	0.76	0.61	0.58	0.15
Slovenia	0.92	0.69	0.57	0.35
Slovakia	0.60	0.52	0.38	0.22
United Kingdom	0.30	0.21	0.17	0.13

Source: Commission of the European Communities, 2013b, 2013c.

Although state aid expenditure has had a downward trend since 1992, there is considerable variation across countries. Table 1 shows the average state aid expenditure of member countries during the period concerned. From the table it can be seen that Malta devotes most resources to state aid (3.03 per cent) while Cyprus (1.71 per cent), Hungary (1.71 per cent), Portugal (1.70 per cent) and Finland (1.68 per cent) spend nearly 2 per cent of GDP on state aid measures. In contrast, state aid expenditures are below 0.50 per cent of GDP in the Netherlands (0.48 per cent), Luxembourg (0.42 per cent), Bulgaria (0.41 per cent), the United Kingdom (0.30 per cent) and Estonia (0.26 per cent). A similar pattern is also observed for the main subcomponents of state aid.

In summary, although the amount of state aid differs across the member countries, such expenditure has decreased considerably at the European Union level over the period 1992–2011. Furthermore, in line with recent regulations about state aid, the composition of state aid has changed, from domination by sectoral measures to a greater share of horizontal measures.

III. Data and Methodology

In our empirical model, we draw on an unbalanced panel data set of 27 European Union countries covering the period 1992–2011. Gross fixed capital formation, population growth and gross domestic product (GDP) data were obtained from the Annual Macro-Economic Database of the European Commission's Directorate General for Economic and Financial Affairs (AMECO) and the data on state aid was taken from the European Commission's State Aid Scoreboard.

In order to examine the effects of state aid on growth, we estimate a standard Solow model featuring the accumulation of physical capital and population growth[5] and add state aid as an additional explanatory variable. In this respect, our approach is very similar to that of Fidrmuc (2008), who investigated the effects of EBRD investments on the economic growth of transition countries. The model we estimate is as follows:

$$\Delta y_{it} = \beta_{1t}\, s_{it} + \beta_{2t}(g_{it} + n_{it} + \delta_{it}) + \beta_{3t} sa_{it} + \beta_{4t} en + \beta_{5t} re + \mu_i + \varphi_t + u_{it} \qquad (1)$$

where: y is output per capita; s is the ratio of gross fixed capital formation to GDP; n is population growth; g and δ are technological progress and depreciation respectively, we substitute the sum of them with a constant term equal to 0.06, sa is the ratio of state aid (total state aid, state aid to industry and services, horizontal state aid and sectoral state aid) to GDP; en and re are dummy variables that represent the enlargement of the European Union in 2004 and the 2008 global economic and financial crisis respectively; μ is country fixed effects; φ is time fixed effects; u is the error term and i and t are country and time subscripts, respectively. In the equation, all variables are in the logarithmic form.

We first estimate the above equation by using a fixed effects OLS estimator. However, there is a risk of potential endogeneity of state aid, and this may result in biased coefficient estimates. In order to remedy this problem, we also estimate our model by two-stage least squares (2SLS, IV) estimator.

IV. Results

The descriptive statistics of the variables are presented in Table 2. Since our data set covers 20 years, we perform the Fisher-type Augmented Dickey–Fuller and Phillips–Perron Tests proposed by Maddala and Wu (1999) and Choi (2001) to check whether our variables display unit roots. The results of these tests are presented in Table 3. We reject the null hypothesis of unit root for all of our variables at conventional significance levels.[6] Therefore, we conclude that our variables are stationary and there is no risk of encountering spurious regression results.

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[5] The Solow model also includes technological progress and depreciation as determinants of economic growth. However, since there are no reliable measures of these variables, we substitute them with a constant term, as is the case with many other studies.

[6] The only variable that may seem problematic in terms of stationarity is population growth, since we can only reject the null hypothesis of unit root at the 10 per cent level according to the result of the Augmented Dickey–Fuller Test. For this reason, we re-estimated our main regressions without population growth. Since the parameter estimates are almost the same we present the results for the standard Solow model, with population growth included. The results of the regressions that exclude population growth are available upon request.

Table 2: Descriptive Statistics

	Observation	Mean	Standard Deviation	Minimum	Maximum
Value Added Growth (per capita)	525	0.0213	0.0387	−0.1775	0.1181
Investment/GDP	532	−1.4426	0.1896	−2.2443	−0.8925
Population Growth	540	−2.7818	0.1584	−4.6402	−2.4422
Total State Aid	428	−4.8612	0.6726	−6.9730	−3.0727
State Aid to Ind.	428	−5.2883	0.8080	−7.6009	−3.0791
Horizontal State Aid	428	−5.8212	1.9956	−44.5437	−4.1387
Sectoral State Aid	428	−5.9145	3.1537	−41.5794	−3.1156
Lagged Total State Aid	401	−4.8479	0.6728	−6.9730	−3.0727
Lagged State Aid to Ind.	401	−5.2803	0.8114	−7.6009	−3.0791
Lagged Horizontal State Aid	401	−5.8403	2.0533	−44.5437	−4.1387
Lagged Sectoral State Aid	401	−5.8897	3.2482	−41.5794	−3.1156
Economic Freedom Index	450	4.1925	0.1128	3.7588	4.4140
Political Stability Index	351	1.1880	0.1388	0.7021	1.4274
Lagged Economic Freedom In.	423	4.1895	0.1141	3.7588	4.4140
Lagged Political Stability In.	324	1.1891	0.1399	0.7021	1.4274

Table 4 summarizes the results of fixed effects OLS regressions. Columns 1, 2, 3 and 4 show the effects of total state aid, state aid to industry and services, horizontal state aid and sectoral state aid on economic growth, respectively, while columns 5, 6, 7 and 8 show the effects of one-period lagged values of these variables on economic growth. Investment and population growth have the expected signs and are statistically significant. The dummies for EU enlargement and the recent crisis are also significant: the former appears with a positive sign (demonstrating the acceleration of growth experienced by the new member states after their EU accession) while the latter is, not surprisingly, negative. In contrast, none of the state aid variables has a statistically significant and positive effect on economic growth. While total state aid and state aid to industry

Table 3: Unit Root Test Results

	Aug.Dickey–Fuller (Inverse χ^2 Stat.)	Philips–Perron (Inverse χ^2 Stat.)
Value Added Growth (per capita)	129.771***	147.730***
Gross Fixed Cap. Formation	85.2292**	76.6044**
g+n+δ	68.4552*	27.6638
Total State Aid	77.3416**	80.1780**
State Aid to Ind. and Services	69.1510*	74.3061**
Horizontal State Aid	82.2164***	108.789***
Sectoral State Aid	104.500***	134.385***
Lagged Total State Aid	71.7042**	79.5669**
Lagged State Aid to Ind. and Services	67.5195*	69.1707*
Lagged Horizontal State Aid	73.7582**	113.153***
Lagged Sectoral State Aid	94.1271***	123.998***

Note:***,**,*indicates $p<0.01$, $p<0.05$, $p<0.10$ respectively. All tests are calculated with an intercept and a time trend. Lag length is selected according to Akaike Information Criterion.

Table 4: The Effects of Total State Aid, State Aid to Industry and Services, Horizontal State Aid and Sectoral State Aid on Economic Growth: Fixed Effects Model

Dependent Variable: Output Growth (per capita)	(1) Total State Aid	(2) State Aid to Ind. and Services	(3) Horizontal State Aid	(4) Sectoral State Aid
Gross Fixed Cap. Formation	0.0559*** (0.0189)	0.0566*** (0.0192)	0.0564*** (0.0190)	0.0570*** (0.0192)
g+n+δ	−0.0428*** (0.0085)	−0.0421*** (0.0091)	−0.0427*** (0.0089)	−0.0418*** (0.0086)
EU Enlargement	0.0135** (0.0050)	0.0144*** (0.0046)	0.0108*** (0.0036)	0.0141*** (0.0043)
Crisis	−0.0137** (0.0061)	−0.0260*** (0.0072)	−0.0225*** (0.0070)	−0.0135** (0.0065)
Total State Aid/GDP	−0.0030 (0.0044)			
State Aid to Ind. and Services/GDP		0.0006 (0.0039)		
Horizontal State Aid/GDP			−0.0005* (0.0002)	
Sectoral State Aid/GDP				−0.0010*** (0.0001)
Lagged Total State Aid/GDP				
Lagged State Aid to Ind. and Services/GDP				
Lagged Horizontal State Aid/GDP				
Lagged Sectoral State Aid/GDP				
Constant	−0.0346 (0.0457)	−0.0146 (0.0523)	−0.0222 (0.0432)	−0.0215 (0.0432)
F Test	179.33	96.41	180.54	258.97
R^2	0.5583	0.5518	0.5572	0.5583
R^2-Within	0.5933	0.5922	0.5927	0.5978
R^2-Adjusted	0.6057	0.6046	0.6051	0.6100

Note:***,**,*indicates $p \leq 0.01$, $p \leq 0.05$, $p \leq 0.10$ respectively. Standard errors are in parenthesis. All regressions include individual and time effects and are estimated by using robust standard errors.

and services are not statistically significant, horizontal and sectoral state aid are significant at the 10 and 1 per cent levels respectively but have negative signs. However, their coefficients are very close to zero. The lagged results are very similar to the contemporaneous ones; the only difference is that horizontal state aid becomes statistically insignificant. In summary, state aid does not appear to have a positive effect on economic growth and if some of its subcomponents have an effect on growth, this effect is either negative or approximately zero.

However, as stated above, the potential endogeneity of state aid variables, which stems from the simultaneity or reverse causality between state aid and economic growth, may bias the estimation results. To deal with this problem, we use the instrumental variable estimator for panel data developed by Schaffer (2010). In these regressions, we use the first lags of government spending on social protection, health and public order and safety as instruments.[7] Since these variables are subcategories of government spending, it is reasonable to assume that they are correlated with state aid. Furthermore, it is conceivable to assume that this kind of government expenditure does not have a direct impact on current economic growth (we discuss the formal tests of this assumption in the next

[7] We also tried using various political variables as instruments. Since none of these variables was significant in the first stage regressions, we use subcategories of government expenditures as instruments.

Table 4: (Continued)

Dependent Variable: Output Growth (per capita)	(5) Total State Aid	(6) State Aid to Ind. and Services	(7) Horizontal State Aid	(8) Sectoral State Aid
Gross Fixed Cap. Formation	0.0612*** (0.0221)	0.0624*** (0.0218)	0.0621*** (0.0219)	0.0616*** (0.0218)
g+n+δ	−0.0409*** (0.0081)	−0.0406*** (0.0090)	−0.0406*** (0.0088)	−0.0400*** (0.0086)
EU Enlargement	0.0219*** (0.0058)	0.0211*** (0.0064)	0.0210*** (0.0063)	0.0138*** (0.0047)
Crisis	−0.0182*** (0.0065)	−0.0177** (0.0066)	−0.0153* (0.0076)	−0.0087* (0.0049)
Total State Aid/GDP				
State Aid to Ind. and Services/GDP				
Horizontal State Aid/GDP				
Sectoral State Aid/GDP				
Lagged Total State Aid/GDP	−0.0042 (0.0034)			
Lagged State Aid to Ind. and Services/GDP		0.0005 (0.0031)		
Lagged Horizontal State Aid/GDP			−0.0001 (0.0003)	
Lagged Sectoral State Aid/GDP				−0.0005*** (0.0002)
Constant	−0.0310 (0.0463)	−0.0060 (0.0515)	−0.0099 (0.0453)	−0.0114 (0.0460)
F Test	69.92	53.68	79.60	146.08
R^2	0.5582	0.5518	0.5543	0.5547
R^2-Within	0.6057	0.6036	0.6036	0.6053
R^2-Adjusted	0.6112	0.6091	0.6091	0.6108

paragraph). Tables 5 and 6 present the instrumental variable estimates. There is not a big difference between the FE OLS estimations and the instrumental variable estimations. The only difference is that horizontal and sectoral state aid becomes insignificant in the latter.

In order to ensure reliable results in instrumental variables estimation, the instruments should be relevant and should not be strongly correlated with the dependent variable of the original model. In Tables 5 and 6 we present some test statistics about our instruments, together with the regression results. According to Kleinbergen–Paap Underidentification Test, the null hypothesis that the regression is under-identified is rejected in all of our regressions. This result suggests that our instruments are relevant and sufficiently correlated with the endogenous variable. Furthermore, our regressions pass the Hansen's J Test of over-identification, in which the joint null hypothesis states that the instruments are valid and we cannot reject this hypothesis in any of our regressions. This means that our instruments are not strongly correlated with the dependent variable of the original model. Finally, we check the strength of our instrumental variables. The Kleinbergen-Paap F statistic is below the critical value,[8] implying that the bias resulting from using 2SLS instead of OLS is greater than 10 per cent in all of our regressions except the one with horizontal state aid (Stock and Yogo, 2005). Specifically, this statistic is around 3, which is far below the critical value for sectoral state aid regression. Thus, these results indicate that

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[8] This critical value, which is taken from Stock and Yogo (2005), is 9.08 for three instruments.

Table 5: The Effects of Total State Aid and State Aid to Industry and Services on Economic Growth (Instrumental Variable Estimations)

Dependent Variable: Output Growth (per capita)	Total State Aid			State Aid to Industry and Services		
	(1) 1st stage, 2sls	(2) 2nd stage, 2sls	(3) 2nd stage, liml	(4) 1st stage, 2sls	(5) 2nd stage, 2sls	(6) 2nd stage, liml
Gross Fixed Cap. Formation	−0.2682 (0.2683)	0.0556*** (0.0155)	0.0555*** (0.0155)	−0.9732*** (0.3202)	0.0454*** (0.0168)	0.0449*** (0.0170)
$g+n+\delta$	−0.2667* (0.1485)	−0.0460*** (0.0110)	−0.0462*** (0.0111)	−0.1583 (0.1863)	−0.0439*** (0.0114)	−0.0440*** (0.0114)
EU Enlargement	−0.4529** (0.1908)	0.0117 (0.0077)	0.0112 (0.0081)	−0.4356* (0.2349)	0.0139** (0.0063)	0.0138** (0.0065)
Crisis	−0.1373 (0.1209)	−0.0194*** (0.0066)	−0.0196*** (0.0067)	−0.1472 (0.1375)	−0.0190*** (0.0064)	−0.0191*** (0.0065)
Total State Aid/GDP						
State Aid to Ind. and Services/GDP		−0.0165 (0.0149)	−0.0176 (0.0163)		−0.0147 (0.0117)	−0.0153 (0.0122)
Excluded Instruments						
Lagged Social Protection	−0.7533*** (0.2745)			−0.8628** (0.3408)		
Lagged Health	0.8143*** (0.2819)			1.2757*** (0.3996)		
Lagged Public Order Safety	−0.5143*** (0.1861)			−0.5686*** (0.2124)		
Angrist-Pischke						
Chi-Square (Underidentification)	22.83			19.67		
p-value	(0.0000)			(0.0002)		
F-Test (Weak Instrument)	7.13			6.14		
Kleinbergen-Paap						
Chi-Square (Underidentification)		19.521	19.521		18.655	18.655
p-value		(0.0002)	(0.0002)		(0.0003)	(0.0003)
Cragg-Donald						
Wald F Statistic (Weak Instrument)		8.581	8.581		10.900	10.900
Endogeneity of Instruments (C Test)		1.258	1.258		2.529	2.529
p-value		(0.2620)	(0.2620)		(0.1118)	(0.1118)
Hansen J Statistic		1.556	1.552		0.937	0.935
p-value		0.4594	0.4603		0.6258	0.6266
C-Statisticsocialprotection		0.003	0.002		0.001	0.001
p-value		0.9555	0.9613		0.9804	0.9787
C-Statistichealth		0.966	0.965		0.383	0.383
p-value		0.3258	0.3260		0.5358	0.5359
C-Statisticpublicordersafety		0.876	0.883		0.762	0.761
p-value		0.3492	0.3473		0.3828	0.3829
F Test	4.45	10.74	10.66	2.68	10.17	10.09
Centered-R^2	0.1886	0.5802	0.5765	0.1766	0.5588	0.5554

Note: ***, **, * indicates $p \leq 0.01$, $p \leq 0.05$, $p \leq 0.10$ respectively. Standard errors are in parenthesis. All regressions include individual and time effects and are estimated by using robust standard errors.

Table 6: The Effects of Horizontal State Aid and Sectoral State Aid on Economic Growth (Instrumental Variable Estimations)

Dependent Variable: Output Growth (per capita)	Horizontal State Aid			Sectoral State Aid		
	(1) 1st stage, 2sls	(2) 2nd stage, 2sls	(3) 2nd stage, liml	(4) 1st stage, 2sls	(5) 2nd stage, 2sls	(6) 2nd stage, liml
Gross Fixed Cap. Formation	−0.6449** (0.2815)	0.0564*** (0.0150)	0.0563*** (0.0150)	1.3182 (1.8804)	0.0558*** (0.0152)	0.0544*** (0.0162)
g+n+δ	−0.8371*** (0.2551)	−0.0453*** (0.0125)	−0.0455*** (0.0131)	0.4445 (0.8147)	−0.0434*** (0.0116)	−0.0440*** (0.0120)
EU Enlargement	−0.0260 (0.2199)	0.0169*** (0.0051)	0.0169*** (0.0053)	−0.5947 (0.5052)	0.0184*** (0.0051)	0.0193*** (0.0061)
Crisis	0.2869* (0.1498)	−0.0162** (0.0067)	−0.0162** (0.0069)	−0.1013 (0.6953)	−0.0166*** (0.0060)	−0.0162*** (0.0061)
Horizontal State Aid/GDP		−0.0036 (0.0115)	−0.0039 (0.0130)			
Sectoral State Aid/GDP					0.0013 (0.0033)	0.0030 (0.0060)
Excluded Instruments						
Lagged Social Protection	−1.4470*** (0.3111)			1.2952 (1.5052)		
Lagged Health	−0.0667 (0.3365)			0.7041 (1.2578)		
Lagged Public Order Safety	−0.3698* (0.2144)			−3.7718** (1.5818)		
Angrist–Pischke						
Chi-Square (Underidentification)	30.00			9.41		
p-value	(0.0000)			(0.0243)		
F-Test (Weak Instrument)	9.37			2.94		
Kleinbergen–Paap						
Chi-Square (Underidentification)		28.459	28.459		10.000	10.000
p-value		(0.0000)	(0.0000)		0.0186	0.0186
F-Test (Weak Instrument)		9.375	9.375		2.941	2.941
Cragg–Donald						
Wald F Statistic (Weak Instrument)		12.047	12.047		2.893	2.893
Endogeneity of Instruments (C Test)		0.075	0.075		0.022	0.022
p-value		0.7844	0.7844		0.8831	0.8831
Hansen J Statistic		3.326	3.307		3.481	3.252
p-value		0.1896	0.1914		0.1754	0.1967
C-Statistic (social protection)		0.374	0.373		0.115	0.156
p-value		0.5409	0.5413		0.7347	0.6925
C-Statistic (health)		2.800	2.782		3.213	2.986
p-value		0.0942	0.0954		0.0731	0.0840
C-Statistic (public order/safety)		0.140	0.137		3.158	2.948
p-value		0.7079	0.7117		0.0755	0.0860
F Test	2.38	11.13	4.01		10.64	10.06
Centered-R²	0.1940	0.5971	0.0542		0.5701	0.5082

Note.***,**,*indicates $p \leq 0.01$, $p \leq 0.05$, $p \leq 0.10$ respectively. Standard errors are in parenthesis. All regressions include individual and time effects and are estimated by using robust standard errors.

our instruments are not very strong. The limited maximum likelihood estimation (liml) developed by Anderson and Rubin (1949, 1950) should perform better than 2SLS when the instruments are weak (Stock and Yogo, 2005; Blomquist and Dahlberg, 1999, p. 81); therefore, in Tables 5 and 6, we present LIML estimation results as well as 2SLS estimations. The results of these estimations are in fact almost identical to the results of the 2SLS estimations.

We also check whether endogeneity is an issue for total state aid and its subcomponents. According to the test results, we cannot reject the null hypothesis that the difference between the OLS estimation and the 2SLS estimation is not statistically significant. So, it seems that endogeneity is not an important issue for total state aid and its subcomponents.[9]

In a nutshell, when we take into account all of the above regression results, it becomes obvious that total state aid and its subcomponents do not have important effects on economic growth. Although horizontal and sectoral state aid is statistically significant according to the OLS estimation results, the sign of the coefficients of these variables is negative and the magnitude of these coefficients is very close to zero. We conclude therefore that state aid does not make an economically significant contribution to economic growth.

V. Does State Aid Increase Investment?

So far, we have investigated the effect of state aid and its subcomponents on economic growth of EU countries. However, one of the main aims of state aid is to increase investment in the economy. Given that investment is one of the most robust factors of growth, it is therefore possible that state aid does not foster growth directly, but has an indirect effect through increasing investment.

We estimate two models, in which we use economic freedom and political stability indexes together with state aid and its subcomponents as explanatory variables.[10] Economic freedom and political stability indexes were obtained from the website of Heritage Foundation and the World Bank's (2013)Worldwide Governance Indicators, respectively.[11] The index of economic freedom measures progress in areas such as property rights, (lack of) corruption, size of government, efficiency of regulation and openness of the economy with respect to trade and investment (both physical capital and financial investment). The political stability index reflects the perceived likelihood of political instability and of politically motivated violence and terrorism. We also create interaction terms between these two institutional variables and state aid to take account of the possible effect of state aid conditional on economic freedom or political stability. In the first model, we use state aid, economic freedom and the interaction term between economic freedom and state aid as independent variables. In the second model, we draw on state aid, political stability

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[9] However, since our instruments are not very strong for state aid variables except horizontal state aid, the endogeneity test is not highly reliable either.

[10] Without doubt, these institutional variables may also have an effect on economic growth. We tried to use these variables in our growth regressions. However, since we obtained mixed results and the instrumentation of state aid and interaction terms was problematic, we do not present these results.

[11] The economic freedom index takes the values between 0 and 100 where higher values indicate more economic freedom, political stability index takes the values between -2.5 and $+2.5$. Since we use logarithmic forms of our variables, we transformed this variable to range from 0 to 5. Similar to economic freedom index, higher values of this index indicate higher political stability. According to the Fisher type Augmented Dickey–Fuller and Phillip–Perron Tests, both of these indexes are stationary. These results are available upon request.

and the interaction term between political stability and state aid. The models we estimate are as follows:

$$s_{it} = \beta_{1t}a_{it} + \beta_{2t}f_{it} + \beta_{3t}(a_{it} \times f_{it}) + \beta_{4t}en + \beta_{5t}re + \mu_i + \varphi_t + u_{it} \tag{2}$$

$$s_{it} = \beta_{1t}a_{it} + \beta_{2t}p_{it} + \beta_{3t}(a_{it} \times p_{it}) + \beta_{4t}en + \beta_{5t}re + \mu_i + \varphi_t + u_{it} \tag{3}$$

where: s is the ratio of gross fixed capital formation to GDP; a is the ratio of state aid (total state aid, state aid to industry and services, horizontal state aid and sectoral state aid) to GDP; f is the economic freedom index; p is the political stability index; $s_{it} \times f_{it}$ and $a_{it} \times p_{it}$ are interaction terms formed by state aid and economic freedom and state aid and political stability, respectively; en and re are dummy variables that represent the enlargement of the European Union in 2004 and the 2008 global economic and financial crisis; μ is the country fixed effects; φ is the time fixed effects; u is the error term; and i and t are the country and time subscripts, respectively. In these models, all variables are in the logarithmic form and we use centred values of state aid and institutional variables in order to alleviate potential multicollinearity among variables.

Tables 7 and 8 summarize the results of estimating models 2 and 3.[12] In both tables, columns 1–4 present the current effects on investment of state aid, its subcomponents and the relevant institutional variable, while columns 5–8 show the effects on investment of one-period lagged values of these variables. The current values of economic freedom have a statistically significant and positive effect on investment. The one period lagged value of this variable is also significant and has a positive effect at the 10 per cent level when we estimate the model with total state aid and horizontal state aid variables (columns 5 and 7). However, apart from state aid to industry and services, none of the state aid variables has a statistically significant effect on investment, and state aid to industry and services affects investment negatively. Finally, none of the interaction terms between state aid (or its subcomponents) and economic freedom are statistically significant, suggesting that economic freedom affects investment directly only and its effect is free from any interaction with state aid.

Table 8 shows the effects of state aid and its subcomponents on investment when we use political stability as an institutional variable. Both the current and lagged values of political stability have a statistically significant and positive effect on investment. The effects of state aid and its subcomponents are similar to the results presented in Table 7. Once again, none of the state aid variables has a statistically significant effect on

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[12] Undoubtedly, there is a risk of potential endogeneity of state aid, its subcomponents and the interaction terms between state aid and institutional variables in these regressions. Because of this risk, we instrumented these variables by using the first and second lagged values of these variables and reestimated our models with 2SLS. These instruments worked well for the regressions in which we use economic freedom as an institutional variable. Since the results of these regressions are almost identical to the results of the fixed effect OLS estimations we do not present them here. However, these instruments did not work for the regressions in which we use political stability as an institutional variable. For this reason, we should be cautious about interpreting the results of the regressions in which political stability is used as an institutional variable. The 2SLS estimation results for the regressions in which economic freedom is used as an institutional variable are available upon request.

Table 7: The Effects of State Aid and Its Subcomponents on Investment (Institutional Variable: Economic Freedom)

Dependent Variable: Gross Fixed Cap. For.	(1) Total State Aid	(2) State Aid to Ind.	(3) Hor. State Aid	(4) Sec. State Aid
Total State Aid/GDP	−0.0187 (0.0215)			
State Aid to Ind. and Services/GDP		−0.0439** (0.0207)		
Horizontal State Aid/GDP			−0.0200 (0.0144)	
Sectoral State Aid/GDP				0.0011 (0.0049)
Economic Freedom	0.6648** (0.2924)	0.6407** (0.2675)	0.7023** (0.2833)	0.6740** (0.2855)
Total State Aid·× Ec. Freedom	0.0876 (0.1936)			
State Aid to Ind.· × Ec. Freedom		0.0523 (0.1333)		
Horizontal State Aid·× Ec.Freedom			−0.2620 (0.1918)	
Sectoral State Aid·× Ec.Freedom				0.0011 (0.0383)
Lagged Total State Aid/GDP				
Lagged State Aid to Ind. and Services/GDP				
Lagged Horizontal State Aid/GDP				
Lagged Sectoral State Aid/GDP				
Lagged Economic Freedom				
Lagged Total State Aid·× Ec. Freedom				
Lagged State Aid to Ind.· × Ec. Freedom				
Lagged Horizontal State Aid·× Ec.Freedom				
Lagged Sectoral State Aid·× Ec.Freedom				
EU Enlargement	0.0646 (0.0384)	0.1195** (0.0469)	0.1052** (0.0504)	0.0324 (0.0421)
Crisis	−0.1227*** (0.0352)	−0.0314* (0.0168)	0.0048 (0.0212)	−0.0837** (0.0347)
Constant	−1.4753*** (0.0284)	−1.4758*** (0.0305)	−1.4907*** (0.0351)	−1.4836*** (0.0298)
F Test	12.09	9.67	11.31	13.60
R^2	0.0413	0.0502	0.0508	0.0399
R^2-Within	0.4101	0.4342	0.4151	0.4057
R^2-Adjusted	0.6918	0.7044	0.6944	0.6895

Note:***,**,*indicates $p \leq 0.01$, $p \leq 0.05$, $p \leq 0.10$ respectively. Standard errors are in parenthesis. All regressions include individual and time effects and are estimated by using robust standard errors.

investment except state aid to industry and services, and this variable affects investment negatively. However, in contrast to the results of the regressions in which economic freedom is used as an institutional variable, the interaction of political stability with total state aid and state aid to industry and services is statistically significant and has a positive effect on investment. These results indicate that state aid may affect investment positively if and only if political stability is assured. Hence, our findings again fail to show much support for a positive effect, whether direct or indirect, of state aid policy. Where such a positive effect might occur, it appears that it is conditional on the stability of the political environment.

Table 7: (Continued)

Dependent Variable: Gross Fixed Cap. For.	(5) Total State Aid	(6) State Aid to Ind.	(7) Hor. State Aid	(8) Sec. State Aid
Total State Aid/GDP				
State Aid to Ind. and Services/GDP				
Horizontal State Aid/GDP				
Sectoral State Aid/GDP				
Economic Freedom				
Total State Aid·× Ec. Freedom				
State Aid to Ind.· × Ec. Freedom				
Horizontal State Aid·× Ec.Freedom				
Sectoral State Aid·× Ec.Freedom				
Lagged Total State Aid/GDP	−0.0256 (0.0246)			
Lagged State Aid to Ind. and Services/GDP		−0.0353* (0.0195)		
Lagged Horizontal State Aid/GDP			−0.0134 (0.0198)	
Lagged Sectoral State Aid/GDP				−0.0004 (0.0050)
Lagged Economic Freedom	0.4972 (0.2923)	0.4186 (0.2575)	0.5027* (0.2896)	0.4785 (0.2899)
Lagged Total State Aid·× Ec. Freedom	0.0354 (0.2227)			
Lagged State Aid to Ind.· × Ec. Freedom		0.1463 (0.1096)		
Lagged Horizontal State Aid·× Ec.Freedom			−0.1930 (0.2812)	
Lagged Sectoral State Aid·× Ec.Freedom				−0.0037 (0.0374)
EU Enlargement	0.0194 (0.0381)	0.1129** (0.0433)	0.1254** (0.0502)	0.0256 (0.0394)
Crisis	−0.1544*** (0.0369)	−0.2449*** (0.0386)	−0.2407*** (0.0371)	−0.1507*** (0.0426)
Constant	−1.4578*** (0.0294)	−1.4575*** (0.0283)	−1.4692*** (0.0335)	−1.4663*** (0.0297)
F Test	9.46	8.23	15.48	22.54
R^2	0.0528	0.0731	0.0664	0.0604
R^2-Within	0.4109	0.4282	0.4090	0.4043
R^2-Adjusted	0.6957	0.7047	0.6948	0.6923

Conclusions

In this study, we investigated the effects of state aid on economic growth and investment in 27 European Union countries over the period 1992–2011. To this effect, we considered both total state aid and its various subcomponents. To account for the potential endogeneity of state aid, we used instrumental variables and 2SLS in addition to OLS.

Our findings suggest that neither state aid nor its subcomponents are effective in fostering economic growth. Although horizontal state aid was statistically significant with regard to OLS results, its sign was negative and the size of its effect was very close to

Table 8: The Effects of State Aid and Its Subcomponents on Investment (Institutional Variable: Political Stability)

Dependent Variable: Gross Fixed Cap. For.	(1) Total State Aid	(2) State Aid to Ind.	(3) Hor. State Aid	(4) Sec. State Aid
Total State Aid/GDP	-0.0057 (0.0216)			
State Aid to Ind. and Services/GDP		-0.0326 (0.0191)		
Horizontal State Aid/GDP			-0.0245 (0.0207)	
Sectoral State Aid/GDP				-0.0009 (0.0012)
Political Stability	0.4215*** (0.1270)	0.3228** (0.1279)	0.4191*** (0.1413)	0.4246*** (0.1246)
Total State Aid·× Pol. Stability	0.2425** (0.1172)			
State Aid to Ind.· × Pol. Stability		0.2400** (0.0956)		
Horizontal State Aid·× Pol. Stability			0.0335 (0.1066)	
Sectoral State Aid·× Political Stability				0.1394* (0.0726)
Lagged Total State Aid/GDP				
Lagged State Aid to Ind. and Services/GDP				
Lagged Horizontal State Aid/GDP				
Lagged Sectoral State Aid/GDP				
Lagged Political Stability				
Lagged Total State Aid·× Pol. Stability				
Lagged State Aid to Ind.· × Pol. Stability				
Lagged Horizontal State Aid·× Pol. Stability				
Lagged Sectoral State Aid·× Pol. Stability				
EU Enlargement	0.0907*** (0.0325)	0.1505*** (0.0394)	0.0975*** (0.0346)	0.1750*** (0.0366)
Crisis	-0.1600*** (0.0411)	-0.1642*** (0.0307)	-0.1579*** (0.0378)	-0.2377*** (0.0379)
Constant	-1.4879*** (0.0227)	-1.4771*** (0.0244)	-1.4846*** (0.0249)	-1.4904*** (0.0222)
F Test	13.85	14.11	10.73	13.61
R^2	0.0696	0.1293	0.0851	0.0529
R^2-Within	0.4311	0.4572	0.4217	0.4274
R^2-Adjusted	0.6892	0.7035	0.6840	0.6872

Note:***,**,*indicates $p \leq 0.01$, $p \leq 0.05$, $p \leq 0.10$ respectively. Standard errors are in parenthesis. All regressions include individual and time effects and are estimated by using robust standard errors.

zero. We obtained similar results with investment as the dependent variable. None of the state aid variables had a statistically significant positive effect on investment; the only significant coefficient that we obtained was for state aid to industry and services, which appears to affect investment negatively.

In contrast, our results confirm that both economic freedom and political stability have a positive and statistically significant effect on investment. Furthermore, total state aid and state aid to industry and services may affect investment positively if the political environment is stable. These results need further investigation, however, because of the potential endogeneity of the state aid variables.

Table 8: (Continued)

Dependent Variable: Gross Fixed Cap. For.	(5) Total State Aid	(6) State Aid to Ind.	(7) Hor. State Aid	(8) Sec. State Aid
Total State Aid/GDP				
State Aid to Ind. and Services/GDP				
Horizontal State Aid/GDP				
Sectoral State Aid/GDP				
Political Stability				
Total State Aid·× Pol. Stability				
State Aid to Ind.· × Pol. Stability				
Horizontal State Aid·× Pol. Stability				
Sectoral State Aid·× Political Stability				
Lagged Total State Aid/GDP	-0.0105 (0.0271)			
Lagged State Aid to Ind. and Services/GDP		-0.0232 (0.0183)		
Lagged Horizontal State Aid/GDP			-0.0167 (0.0223)	
Lagged Sectoral State Aid/GDP				-0.0014 (0.0012)
Lagged Political Stability	0.4585*** (0.1138)	0.3832*** (0.1229)	0.4420*** (0.1361)	0.4550*** (0.1144)
Lagged Total State Aid·× Pol. Stability	0.2318* (0.1137)			
Lagged State Aid to Ind.· × Pol. Stability		0.2037** (0.0948)		
Lagged Horizontal State Aid·× Pol. Stability			0.0655 (0.1235)	
Lagged Sectoral State Aid·× Pol. Stability				0.1365** (0.0639)
EU Enlargement	0.0970** (0.0378)	0.1290*** (0.0393)	0.1411*** (0.0401)	0.0917** (0.0345)
Crisis	-0.1921*** (0.0415)	-0.0271* (0.0149)	-0.0251 (0.0150)	-0.1804*** (0.0391)
Constant	-1.4611*** (0.0273)	-1.4545*** (0.0276)	-1.4605*** (0.0277)	-1.4643*** (0.0257)
F Test	13.58	9.26	9.46	12.18
R^2	0.0649	0.1020	0.0790	0.0511
R^2-Within	0.4621	0.4722	0.4502	0.4580
R^2-Adjusted	0.7050	0.7106	0.6985	0.7028

In considering all of these results, we conclude that state aid is not an effective tool in terms of fostering economic growth or investment in the European Union countries. This does not imply, however, that state aid is entirely pointless. First, we find, reassuringly, that state aid does not lead to lower growth (at least not consistently, although some of our estimated coefficients do turn out to be significantly negative). Thus, despite its redistributionary nature, state aid does not lower efficiency. Second, neither economic growth nor investment equate to social welfare. Indeed, as we point out above, the bulk of state aid is directed to environmental protection and regional development, which are unlikely to have direct efficiency-enhancing effects. State aid nevertheless may increase

welfare in ways that go beyond the scope of our analysis. In as much as it helps alleviate market failures and externalities (as may be the case with state aid on environmental causes) or improves the economic connectedness of remote and underdeveloped areas (regional aid), state aid can deliver good value for money. Future research should address this possibility. Nevertheless, given that the stated objective of state aid in the EU context is enhancing efficiency, both national governments and the European Commission should consider rationalizing state aid policies to avoid wasting government resources.

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