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A tale of government spending efficiency and trust in the state

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Abstract
This paper empirically links the efficiency and performance assessment of the general government, proxied by efficiency scores, to the trust in government. Government spending efficiency scores are first computed via data envelopment analysis (DEA). Then, relying on panel data and instrumental variable approaches, we estimate the effect of public sector efficiency on citizens trust on national governments. The sample covers 36 OECD countries between 2007 and 2019. We find that the more efficient countries in terms of government spending are Australia, Chile, Ireland, New Zealand, South Korea, Switzerland. Secondly, our main finding is that better public sector spending efficiency is positively associated with citizens' higher trust in governments. In general, political economy variables and the existence of fiscal rules do not seem to significantly affect our measure of trust. The results hold using alternative proxies for public sector efficiency, alternative measures for trust, specifications with different control variables and different empirical approaches (instrumental variables).

Keywords Government spending efficiency · DEA · Panel data analysis · Confidence effects · Ideology · Fiscal rules

JEL Classification C14 · C23 · E44 · G15 · H11 · H50

1 Introduction

In a context of scarcer budgetary funds, special attention is given to the more efficient use of public resources, with better government spending performance and efficiency being preferred by policymakers and taxpayers (see, Afonso et al., 2021a, 2021b). At the same time, a more efficient use of public resources and consequently better government performance, is also (positively) internalized by financial markets (see Afonso et al., 2022). We conjecture that such general efficiency-enhancing policy and approach to government´s assets (physical and human) can generate a higher degree of confidence and trust in the state.

Trust in the government has been identified as one of the most important foundations upon which the legitimacy and sustainability of political systems are built (Fukuyama,

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1995). The trust citizens place in their government reflects their confidence in the government's actions. It is a function of the congruence between citizens' preferences—their interpretation of what is right and fair and what is unfair—and the perceived actual functioning of government (Bouckaert & Walle, 2003). Public trust helps governments manage and administer a country on a daily basis in a way that reinforces the democratic institutions.[1] However, trust in the government has decreased not only in the US but also in several European countries (Intawan & Nicholson, 2018; Pérez-Morote, et al., 2020). Hence, the key question in this paper is whether we can empirically provide strong evidence on the relationship between government´s trust and public sector efficiency.

The relevance of public sector efficiency has been addressed by a growing literature. Several authors have identified substantial public spending efficiency differences between countries and scope for spending savings. Most public spending efficiency related studies report that there is room for improvement in terms of government spending efficiency, and this typically implies that more public services could be provided with the same public resources, or conversely, the same level of public resources might be provided with fewer public resources. For OECD and EU countries see, notably the evidence reported by Gupta and Verhoeven (2001), Afonso et al. (2005), Adam et al. (2011), Dutu and Sicari (2016), Afonso and Kazemi (2017), Antonelli and de Bonis (2019), and Afonso et al. (2023). Regarding Emerging Markets see, for instance, Afonso et al. (2010), Herrera and Ouedrago (2018), and for Latin American and Caribbean countries see Afonso et al. (2013). To explain these cross-country efficiency differences, studies have examined, in a two-step analysis, the so-called discretionary factors such as: population size, education, income level, quality of the institutions (property right security and corruption) and quality of the country's governance level, size of the government, political orientation, voter participation, and civil service competence (Afonso et al., 2005; Hauner and Kyobe, 2008; Antonelli & de Bonis, 2019).

Regarding the literature on the level of trust that citizens place in their governments, we can infer that this will depend on the credibility of the government's commitment to the quality of public policies in relation to the amount of spending. For instance, Alesina and Warcziarg (2000) argue that a more pronounced polarisation of voter preferences in advanced economies and the low quality of government policy, which favour particular groups and less the median voter, both reduce trust. Moreover, unproductive government spending reduces public trust in the State, which might become more damaging for large and ineffective governments (Garen & Clark, 2015). Besley et al. (2010) mentioned that governments somehow associated with rent-seeking and lobbying activities contributed to a lower level of public trust. Hence, one can observe unproductive public spending and lower trust of voters in the government. This may be consistent with the decrease of citizens´ trust in government over the years (Intawan & Nicholson, 2018). On the other hand, Pérez-Morote et al. (2020) mentioned that economic events, corruption, or the disclosure of classified information tended to decrease the trust in government. On the same vein, Belabed and Hake (2018) reported that corruption and weak rule of law undermined trust in European governments. In addition, Foster and Frieden (2017) found via survey

[1] The rule of law and independent judiciary are especially relevant since they appropriate functioning is a fundamental driver of trust in government (Blind, 2007; Johnston, Krahn and Harrison, 2006; Knack and Zak, 2003). Furthermore, as well-functioning government institutions matter for business investment decisions, trust in them is a necessary component to propel economic growth (Dasgupta, 2009; Algan and Cahu, 2010).

responses that economic factors at individual and national levels contributed to the trust in the State over the years. Finally, Rodrigues (2021), for a panel of developed and developing countries, reports adverse effects of inefficient public spending on public trust.

Moreover, one might consider the assumption that often politicians know what the 'right' policy is, but have private incentives to do something else. Still, it is less clear that politicians do indeed know about the "right" policies. Indeed, for instance, ideological views or lack of information can firmly support different convictions of what is "right" to do. For instance, there might be some interaction between knowledge held and gathered by policy makers and incentive problems that can skew some decisions.

In addition, people's trust in the government is probably also related to their trust in each other. Probably, one can consider that overall economic and societal prosperity is linked and depends on cooperation between individuals and large groups, which is only feasible if trust is indeed present, notably in institutions such as government. Hence, high-trust societies with high moral beliefs, particularly cultural beliefs, can result in better government performance than low-trust societies. This relation can then be perceived as a cultural question as well (see, notably Rose, 2011, 2018).

In this study, we first compute composite indicators of government public sector performance. Secondly, we calculate so-called input efficiency scores for the period 2006–2019. Third, we empirically assess the relevance of these efficiency scores on proxies of trust in the government in a panel setting of 36 OECD countries. It naturally follows that the idea of efficiency is also linked to some measure of fiscal prudence embedded in spending rationalization and optimization efforts.

We find that the more efficient countries in terms of government spending, in our baseline specification (Model 0), are Australia (2009–2011; 2013; 2019), Chile (2007–2016; 2019); Ireland (2015; 2019), New Zealand (2018), South Korea (2006–2018), and Switzerland (2006–2009; 2014–2016; 2019). Moreover, better spending efficiency is positively associated with citizens' higher trust in the governments. This result holds using alternative proxies for public sector efficiency, alternative measures for trust, specifications with different control variables and different empirical approaches (instrumental variables). In general, political economy variables and the existence of fiscal rules do not seem to significantly affect our measure of trust.

The remainder of the paper is organized as follows. Section 2 discusses and constructs the indicators and scores of public sector efficiency. Section 3 conducts the empirical panel analysis of trust and efficiency. The last section concludes.

2 Public sector efficiency and data envelopment analysis

To compute the public sector efficiency scores, we use data envelopment analysis (DEA),[2] which compares each observation with an optimal outcome. For each country i, we consider the following function:

$$Y_i = f\left(X_i\right), i = 1, \ldots, 36 \tag{1}$$

[2] DEA is a non-parametric frontier methodology, which draws from Farrell's (1957) seminal work and that was further developed by Charnes et al. (1978). Coelli et al. (2002) and Thanassoulis (2001) offer introductions to DEA.

Table 1 Total public sector performance (PSP) indicator

Sub index	Variable
Opportunity indicators	
Administration	Corruption
	Red tape
	Judicial independence
	Property rights
	Shadow economy
Education	Secondary school enrolment
	Quality of educational system
	PISA scores
Health	Infant survival rate
	Life expectancy
	CVD, cancer, diabetes or CRD survival rate
Public infrastructure	Infrastructure quality
Standard musgravian indicators	
Distribution	Gini index
Stabilization	Coefficient of variation of growth
	Standard deviation of inflation
Economic performance	GDP per capita
	GDP growth
	Unemployment

Source: authors' elaboration

where Y is the composite output measure (Public Sector Performance, PSP) and X is the composite input measure (Public Expenditure, PE), namely government spending-to-GDP ratio. We compute the yearly efficiency scores for 36 OECD member countries[3] between 2006 and 2019.

The output composite indicator for Public Sector Performance (PSP), as suggested by Afonso et al., (2005, 2022), includes two main components: opportunity and the traditional Musgravian indicators. The opportunity indicators evaluate the performance of the government in administration, education, health and infrastructure sectors. The Musgravian indicators includes three sub-indicators: distribution, stability and economic performance. Table 1 summarizes the variables used to construct the PSP indicators. PSP is the average between the opportunity and Musgravian indicators. Accordingly, the opportunity and Musgravian indicators result from the average of the measures included in each sub-indicator. To ensure a convenient benchmark, each sub-indicator measure is first normalized by dividing the value of a specific country by the average of that measure for all the countries in the sample.

[3] The 36 OECD member countries are: Australia, Austria, Belgium, Canada, Chile, Colombia, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Israel, Italy, Japan, Korea, Latvia, Lithuania, Luxembourg, the Netherlands, New Zealand, Norway, Poland, Portugal, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey, the United Kingdom, and the United States. We were not able to compute the efficiency scores for Mexico and Costa Rica, due to data unavailability.

Our input measure, Public Expenditure (PE), is lagged 1 year and expressed as a percentage of GDP in several sectors. More specifically, we consider government consumption, expenditure on education, expenditure on health, public investment, transfers and subsidies and total expenditure. Each area of government expenditure is equally weighted to compute the public expenditure input. Tables 7 and 8 in Appendix A provide additional information on the sources and variable construction. Further explanation on the variable's construction is provided in Afonso et al. (2022).

We adopt an input orientated approach, to measure the proportional increase in inputs while holding output constant and assume variable-returns to scale (VRS), to account for the fact that countries might not operate at the optimal scale. The efficiency scores are computed through the following linear programming problem[4]:

$$\begin{aligned} &\min_{\theta,\lambda} \theta \\ &s.t. - y_i + Y\lambda \geq 0 \\ &\theta x_i - X\lambda \geq 0 \\ &I1'\lambda = 1 \\ &\lambda \geq 0 \end{aligned} \tag{2}$$

where y_i is a vector of outputs, x_i is a vector of inputs, λ is a vector of constants, $I1'$ is a vector of ones, X is the input matrix and Y is the output matrix. The efficiency scores,θ, range from 0 to 1, such that countries performing in the frontier score 1. More specifically, if $\theta < 1$, the country is inside the production frontier (i.e., it is inefficient), and if $\theta = 1$, the country is at the frontier (i.e., it is efficient).We performed DEA for different models: baseline model (Model 0) includes only one input (PE as percentage of GDP) and one output (PSP); Model 1 uses two inputs, governments' normalized spending on opportunity and on "Musgravian" indicators and one output, total PSP scores; and Model 2 assumes one input, governments´ normalized total spending (PE) and two outputs, the opportunity PSP and the "Musgravian" PSP scores. Detailed results are illustrated on Tables 9, 10 and 11 of Appendix B.

Table 2 provides a summary of the DEA results for the period 2009–2019 using input-oriented models. The purpose of an input-oriented assessment is to assess by how much input quantities can be proportionally reduced without changing the output quantities produced. Alternatively, and by computing output-oriented measures, one can assess how much output quantities can be proportionally increased without changing the input quantities used.

Analyzing our results for the input efficiency scores, we find that the average scores of our baseline model ranged between 0.58 to 0.68, For Model 1, the average scores ranged between 0.63 to 0.71, which means that with the same level of outputs, inputs could decrease between 29 and 37%. Model 2's input efficiency scores averaged between 0.61 and 0.69. Overall, the countries located in the production possibility frontier, hence the more efficient ones in terms of government spending for Model 0 are: Australia (2009–2011; 2013; 2019), Chile (2007–2016; 2019); Ireland (2015; 2019), New Zealand (2018), South Korea (2006–2018), and Switzerland (2006–2009; 2014–2016; 2019).

[4] This is the equivalent envelopment form (see Charnes et al., 1978), using the duality property of the multiplier form of the original model.

Table 2 Summary of DEA input efficiency scores

		2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Model 0	Efficient	2	3	3	4	3	3	2	3	3	4	3	1	2	3
	Name	CHE; KOR	CHE; CHL; KOR	CHE; CHL; KOR	AUS; CHE; CHL; KOR	AUS; CHL; KOR	AUS; CHL; KOR	CHL; KOR	AUS; CHL; KOR	CHE; CHL; KOR	CHE; CHL; IRL; KOR	CHE; CHL; KOR	KOR	KOR; NZL	AUS; CHL; IRL
	Average	0.61	0.60	0.59	0.61	0.58	0.58	0.58	0.58	0.63	0.63	0.65	0.65	0.68	0.66
	Median	0.57	0.56	0.55	0.56	0.53	0.53	0.53	0.54	0.59	0.60	0.62	0.63	0.64	0.64
	Min	0.44	0.43	0.41	0.44	0.41	0.40	0.39	0.39	0.42	0.42	0.46	0.45	0.48	0.47
	Max	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
	Stdev	0.15	0.15	0.15	0.16	0.16	0.16	0.16	0.16	0.15	0.16	0.15	0.14	0.15	0.14
Model 1	Efficient	2	3	3	4	3	3	3	3	4	4	4	2	4	3
	Name	CHE; KOR	CHE; CHL; KOR	CHE; CHL; KOR	AUS; CHE; CHL; KOR	AUS; CHL; KOR	AUS; CHL; KOR	AUS; CHL; KOR	AUS; CHL; KOR	CHE; CHL; KOR; USA	CHE; CHL; IRL; KOR	CHE; CHL; IRL; KOR	CHL; KOR	CHL; IRL; KOR; NZL	AUS; CHL; IRL
	Average	0.65	0.64	0.63	0.67	0.66	0.65	0.65	0.65	0.70	0.71	0.71	0.69	0.71	0.71
	Median	0.63	0.60	0.58	0.62	0.60	0.61	0.62	0.64	0.67	0.70	0.70	0.69	0.69	0.69
	Min	0.50	0.48	0.47	0.53	0.51	0.49	0.48	0.48	0.50	0.52	0.52	0.46	0.48	0.48
	Max	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
	Stdev	0.14	0.14	0.13	0.14	0.14	0.14	0.14	0.14	0.14	0.13	0.13	0.13	0.14	0.13

Table 2 (continued)

		2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Model 2	Efficient	3	3	3	4	4	4	3	4	3	4	4	2	4	5
	Name	CHE; ESP; KOR	CHE; CHL; KOR	CHE; CHL; KOR	AUS; CHE; CHL; KOR	AUS; CHE; CHL; KOR	AUS; CHE; CHL; KOR	AUS; CHE; CHL	AUS; CHE; CHL; KOR	CHE; CHL; KOR	CHE; CHL; IRL; KOR	CHE; CHL; IRL; KOR	CHE; KOR	CHE; IRL; KOR; NZL	AUS; CHE; CHL; DNK; IRL
	Average	0.66	0.63	0.63	0.64	0.61	0.62	0.63	0.64	0.66	0.67	0.68	0.69	0.69	0.69
	Median	0.64	0.60	0.59	0.59	0.56	0.57	0.59	0.60	0.64	0.67	0.68	0.67	0.65	0.64
	Min	0.46	0.44	0.47	0.48	0.47	0.46	0.46	0.44	0.46	0.50	0.51	0.50	0.48	0.48
	Max	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
	Stdev	0.15	0.15	0.14	0.15	0.16	0.16	0.15	0.16	0.15	0.15	0.14	0.14	0.15	0.16

Summary of the DEA results for the periods 2006–2019 using input-oriented models. Model 0 uses one input, government' normalized total spending and one output, the total PSP. Model 1 uses two inputs, governments' normalized spending on opportunity and on "Musgravian" indicators and one output, total PSP. Model 2 assumes one input, government' normalized total spending and two outputs, the opportunity PSP and the "Musgravian" PSP scores. The results obtained from the three models are illustrated on Tables 9, 10 and 11 of Appendix B

3 Trust and public sector efficiency

To estimate the impact of public sector efficiency ($PSE_{i,t}$) on trust ($T_{i,t}$), we run the following reduced-form panel regression for the period between 2007 and 2020:

$$T_{i,t} = \alpha_i + \delta_t + \beta PSE_{i,t-1} + \gamma \boldsymbol{X}'_{i,t-1} + \varepsilon_{i,t} \tag{3}$$

where α_i are country-fixed effects included to capture unobserved heterogeneity across countries, and time-unvarying factors such as geographical variables which may affect the degree of trust; δ_t are time effects to control for global shocks (such as commodity prices or the world´s business cycle); $\varepsilon_{i,t}$ is an i.i.d. error term satisfying usual assumptions of zero mean and constant variance.

.Our dependent variable is trust in government (T_{it}) measured by the share of people who report having confidence in the national government. This indicator was retrieved from the OECD Stats (OECD, 2022) and it reflects the percentage of all survey respondents answering "yes" to the survey question: "In this country, do you have confidence in … national government?".[5]

The main independent variable is the 1 year-lag input efficiency scores($PSE_{i,t-1}$), as computed in the previous section. We also include a vector of other determinants of trust in government, ($\boldsymbol{X_{it-1}}$)**,** lagged 1 year to reduce potential reverse causality concerns.[6] This vector includes the following variables: the logarithm of population and the age dependency ratio (as percentage of working-age population) included to control for the size of the social benefits, both variables retrieved from World Bank´s World Development Indicators; the debt-to-GDP ratio to control for the size of government retrieved from the IMF´s World Economic Outlook; a dummy variable equaling one for single-party majority government to control for political cohesion, and dummy variable for the right government to control for the political ideology, both retrieved from the Database of Political Institutions (Cruz et al., 2021) and Comparative Political Dataset, respectively.[7] According to related literature, left-wing governments prefer larger governments, which might be subjected to more elite capture, consequently less efficient (Blais et al., 1993; Cusack, 1997; Hick and Swank, 1992; Jensen, 2011).[8]

[5] Data on trust is not available for all the years for the folowin countries: Australia, Austria, Belgium, Czech Republic, Estonia, Finland, Greece, Hungary, Iceland, Ireland, Latvia, Luxembourg, the Netherlands, New Zealand, Norway, Portugal, Slovakia, Slovenia, Switzerland and Turkey.

[6] Similar results are obtained using contemporaneous regressors instead (not shown, but available from the authors upon request).

[7] Summary statistics of these variables are provided in the appendix. Note that the ideology variable available in the Database of Political Institutions is often incorrect. For this reason the Comparative Political Data set was used which more accurately displays the nature of the ideological streams in power across countries and over time.

[8] This understanding of the issue has been put down by Gary Becker´s – 1992 Nobel Laureate in Economics – Business Week columns under titles such as "To root out corruption, boot out big governments" or "If you want to cut corruption, cut government". According to Becker "the source of official corruptiuon is the same everywhere: large governments with the power to dispense many goodies to different groups" (…) Therefore, smaller government is "the only surefire way to reduced corrption".

Table 3 Unconditional regression on input efficiency scores

Specification	(1)	(2)	(3)
Dependent variable	Trust	Trust	Trust
PSE_0 (t − 1)	0.274***		
	(0.097)		
PSE_1 (t − 1)		0.227**	
		(0.094)	
PSE_2 (t − 1)			0.289***
			(0.074)
Constant	0.264***	0.282***	0.238***
	(0.062)	(0.066)	(0.053)
Country effects	Yes	Yes	Yes
Time effects	Yes	Yes	Yes
Observations	464	464	464
R-squared	0.173	0.163	0.183

Clustered standard errors in parenthesis. *, **, *** denote statistical significance at the 10, 5 and 1 percent levels, respectively. Country and time fixed effects included but omitted for reasons of parsimony

4 Empirical results

We begin our empirical analysis by assessing the standalone (unconditional) link between the input level of government spending efficiency and trust. Columns (1) to (3) present our results for Model 0 (one input and one output), Model 1 (two inputs and one output) and Model 2 (one input and two outputs), respectively.

Results reported in Table 3 show that better spending efficiency is positively associated with citizens' higher trust in governments. These results hold for alternative output efficiency scores (for Models 0, 1 and 2 in Appendix C, Table 13).[9] As a next step, we estimate the initial baseline specification augmented with a set of control variables, notably: population, age dependency ratio, the debt-to-GDP ratio, right-wing ideology, and majority. Table 4 reports this new set of results again for alternative input efficient scores (for Models 0, 1 and 2).

We continue to find that better public spending efficiency contributes to strengthening the trust in governments, notably for the input and output efficiency scores variables, except for output efficiency scores in Model 2. Results for the output efficiency scores (for Models 0, 1 and 2) are reported in Appendix C, Table 14. Regarding the control variables, we find that countries with larger population and higher level of government indebtedness are associated with lower government trust across both the input and output efficiency scores. Countries with higher levels of age dependency ratio tend to exhibit higher levels of government trust. Finally, no statistically significant result is found for the political economy variables, namely majority and right ideology.

At this point, it is important to address a relevant concern, the possible endogeneity of the efficiency score variables. We estimated specification (2) using panel fixed effect model,

[9] Note that the output efficiency scores are higher or equal to 1. To easily interpret the results, we made the following transformation $\widehat{PSE}_{i,t-1} = \frac{1}{\varphi_{i,t-1}}$.

Table 4 Conditional regression on input efficiency scores

Specification	(1)	(2)	(3)
Dependent variable	Trust	Trust	Trust
PSE_0 (t − 1)	0.165*		
	(0.083)		
PSE_1 (t − 1)		0.147*	
		(0.081)	
PSE_2 (t − 1)			0.204***
			(0.062)
Log(Population) (t − 1)	−0.618**	−0.623***	−0.602**
	(0.229)	(0.227)	(0.224)
Age dependency ratio (t − 1)	0.008*	0.009*	0.009*
	(0.004)	(0.004)	(0.004)
Debt-to-GDP ratio (t − 1)	−0.002***	−0.002***	−0.002***
	(0.001)	(0.001)	(0.001)
Right (t − 1)	0.015	0.013	0.016
	(0.014)	(0.014)	(0.014)
Majority (t − 1)	−0.000	−0.001	0.002
	(0.020)	(0.021)	(0.020)
Constant	10.148**	10.230**	9.849**
	(3.874)	(3.835)	(3.783)
Country effects	Yes	Yes	Yes
Time effects	Yes	Yes	Yes
Observations	464	464	464
R-squared	0.290	0.288	0.298

Clustered standard errors in parenthesis. *, **, *** denote statistical significance at the 10, 5 and 1 percent levels, respectively. Country and time fixed effects included but omitted for reasons of parsimony

however, there might be a potential bi-directional relationship between the efficiency scores and trust in the government. Public sector efficiency may influence trust scores, but trust scores may also have an impact on public sector performance. For example, the citizens trust scores will affect the way they may opt out of the public services such as in the health sector and get treatment in the private sector or simply purchase private health insurances. This could then transform into a vicious cycle for the lack of need for public investment or increased efficiency in public hospitals and other primary care providers (gatekeepers) as less people are using them. A similar reasoning could apply to the provision of public education services. To account for this issue, we used the lagged efficiency score to explain the current trust score. Furthermore, we employ an instrumental variable (IV) or Two-Stage Least Squares approach. To instrument for the efficiency score variables, we select the government effectiveness index from the World Bank´s Governance Indicators. This measure is likely to be correlated with our measure of public sector efficiency, but presumably not directly related to trust. Table 5 reports the IV estimation results using alternative input efficiency score variables.

Input efficiency scores are again positively related to the trust, except for Column (2). These main results are also captured for output efficiency scores (see Table 15 in Appendix C). Note that for an instrument to be valid the following conditions have to be satisfied.

Table 5 Endogeneity unconditional and conditional regression on input efficiency scores

Specification	(1)	(2)	(3)	(4)	(5)	(6)
Dependent variable	Trust	Trust	Trust	Trust	Trust	Trust
PSE_0 (t − 1)	3.159*	2.775				
	(1.726)	(2.075)				
PSE_1 (t − 1)			2.068**	1.666*		
			(0.910)	(0.996)		
PSE_2 (t − 1)					2.218**	1.637*
					(1.027)	(0.993)
Log(Population) (t − 1)		0.008		−0.261		−0.215
		(0.600)		(0.309)		(0.372)
Age dependency ratio (t − 1)		0.002		0.006		0.007
		(0.007)		(0.004)		(0.004)
Debt-to-GDP ratio (t − 1)		0.002		−0.001		0.000
		(0.004)		(0.001)		(0.002)
Right (t − 1)		0.077		0.044		0.053*
		(0.057)		(0.027)		(0.031)
Majority (t − 1)		−0.006		−0.006		0.017
		(0.031)		(0.023)		(0.025)
Country effects	Yes	Yes	Yes	Yes	Yes	Yes
Time effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	464	464	464	464	464	464
Weak identification test: Kleibergen-Paap rk LM statistic	3.608	2.233	7.160	4.796	5.176	3.924
Under-identification test: Kleibergen-Paap rk Wald F-statistics	3.536	2.148	7.054	4.585	5.189	3.932

Clustered standard errors in parenthesis. *, **, *** denote statistical significance at the 10, 5 and 1 percent levels, respectively. Country and time fixed effects included but omitted for reasons of parsimony. The null hypothesis of the Kleibergen-Paap rk LM statistic is that the equation is underidentified; the null hypothesis of the Kleibergen-Paap rk Wald F-statistics is that the equation is weakly identified

First, the instrument needs to be correlated with the endogenous variable. In Appendix C, Table 16, we see that this condition is met, except for input efficiency scores for Model 0. Second, the lagged values of the instrument should not be strongly correlated with the trust score (our dependent variable), otherwise the estimated coefficient would still be biased. To test the relevancy of the instrument, we report the Kleibergen-Paap (2016) Wald F statistics. The results are reported at the bottom of Table 5. The rejection of the Kleibergen-Paap rk LM statistics indicates that the instruments are not redundant and hence, they are valid ones.

To assess the heterogeneity of our results, we split countries considering their share of public administration employment and their type of government (coalition versus non-collation governments). From OECD, we retrieved data on employment from on all activities (in services) as well as employment in public administration and defense. Additionally, we collected coalition data from the Comparative Political data and we created a dummy variable that takes the value of one for governments classified as either "Minimal winning

coalition" or "Surplus coalition", and zero otherwise (for all other types). The results of both analyses are presented in Columns (1)–(4) of Table 17 in Appendix C. We find that the positive relationship between public sector spending efficiency and citizens' trust in governments only holds in countries with lower share of public employment and with non-coalition governments.

We performed several robustness analyses. Our first robustness exercise considers alternative measures for trust in the government. For that purpose, we retrieved data from Gallup confidence, EuroBarometer trust and World Values Survey confidence. Unfortunately, these datasets have more missing observations compared to our measure of trust in the baseline results. The results for alternative measures for trust are presented in Columns (5)–(6) of Table 17 in Appendix C. We continue to find a positive relationship between public sector spending efficiency and citizens' trust in governments. Note that the magnitude of the coefficients associated with trust are similar to the baseline results presented in Table 4, nonetheless the standard errors are larger.

Our results are still kept when we restrict our sample to a sub-sample of 22 European countries[10] and control if they have complied with or deviated from the rules set out in the Stability and Growth Pact (SGP). This is an important issue as the interaction between rules, fiscal space, counter-cyclical policies and credibility has been subjected to more and more scrutiny in recent times (see. e.g. Kopits, 2001; Nerlich and Reuter, 2016). To avert cross-border impact of a country budgetary decisions or jeopardize the functioning of the Economic and Monetary Union, the SGP encompasses four distinct numerical rules: the deficit rule, the structural budget balance rule, the expenditure rule and the debt rule.[11] Data on the rules of the SGP was retrieved from Larch and Santacroce (2020), Table 6 presents the results for the restricted sample using fixed effects and instrumental variable approach. We continue to find a positive effect of the input efficiency scores on trust for the unconditional regression (results not reported) using fixed effects and instrumental variable approach. When we include the control variables, the positive effect of input efficiency scores on trust is statistically significant in the fixed effect model specification and for input efficiency under Model 1 for instrumental variables.

Finally, we considered an alternative instrument variable. Instead of using government effectiveness, we considered the regulatory quality variable, retrieved from World Bank's Governance Indicators. Using this as instrument for our key trust variable yields a positive and significant result but only for unconditional regression.

[10] The 22 European countries are: Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Luxembourg, the Netherlands, Poland, Portugal, Slovakia, Slovenia, Spain, Sweden, and the United Kingdom.

[11] According with the budget deficit rule, the budget balance of the general government is equal or larger than − 3% of GDP or, in case the − 3% of GDP threshold is breached, the deviation remains small (maximum 0.5% of GDP) and limited to one year. The debt rule defines the debt-to-GDP ratio should be below 60% of GDP or if the excess above 60% of GDP has been declining by 1/20 on average over the past three years. The structural balance rule defines that the structural budget balance of the general government is at or above the medium-term objective or, in case the MTO has not been reached yet, the annual improvement is equal or higher than 0.5% of GDP. The expenditure rule defines that the annual rate of growth of primary government expenditure, net of discretionary revenue measures and one-offs, is at or below the 10-year average of the nominal rate of potential output growth minus the convergence margin necessary to ensure an adjustment of the structural budget deficit of the general government in line with the structural balance rule (Larch and Santacroce, 2020).

Table 6 Fixed effects and endogeneity conditional regression on input efficiency scores

Specification	(1)	(2)	(3)	(4)	(5)	(6)
Dependent Variable	Trust	Trust	Trust	Trust	Trust	Trust
Estimation	FE	FE	FE	IV	IV	IV
PSE_0 (t − 1)	0.349***			1.879		
	(0.049)			(1.169)		
PSE_1 (t − 1)		0.284***			1.267*	
		(0.070)			(0.720)	
PSE_2 (t − 1)			0.305***			1.211
			(0.054)			(0.739)
Log(Population) (t − 1)	−0.815***	−0.812***	−0.791***	−0.781***	−0.777***	−0.696***
	(0.175)	(0.185)	(0.176)	(0.279)	(0.213)	(0.244)
Age dependency ratio (t − 1)	−0.004	−0.003	−0.004	−0.012	−0.006	−0.010
	(0.004)	(0.004)	(0.004)	(0.008)	(0.005)	(0.006)
Debt-to-GDP ratio (t − 1)	−0.001*	−0.002**	−0.001*	−0.000	−0.002***	−0.001
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Right (t − 1)	0.012	0.012	0.013	0.006	0.010	0.013
	(0.015)	(0.015)	(0.016)	(0.015)	(0.013)	(0.014)
Majority (t − 1)	−0.001	−0.005	0.003	0.004	−0.011	0.019
	(0.023)	(0.024)	(0.022)	(0.021)	(0.020)	(0.025)
Deficit rule (t − 1)	0.021	0.023	0.022	−0.021	−0.004	−0.006
	(0.020)	(0.020)	(0.020)	(0.036)	(0.027)	(0.031)
Debt rule (t − 1)	0.011	0.014	0.016	−0.049	−0.025	−0.012
	(0.013)	(0.014)	(0.013)	(0.048)	(0.034)	(0.030)
Structural balance rule (t − 1)	−0.005	−0.002	−0.008	−0.031	−0.013	−0.035
	(0.014)	(0.014)	(0.014)	(0.024)	(0.016)	(0.028)
Expenditure rule (t − 1)	0.011	0.010	0.013	0.006	0.002	0.017
	(0.010)	(0.010)	(0.010)	(0.014)	(0.014)	(0.013)
Country effects	Yes	Yes	Yes	Yes	Yes	Yes
Time effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	301	301	301	301	301	301
Weak identification test: Kleibergen-Paap rk LM statistic				3.771	6.947	4.290
Under-identification test: Kleibergen-Paap rk Wald F-statistics				3.472	6.404	4.078

Clustered standard errors in parenthesis. *, **, *** denote statistical significance at the 10, 5 and 1 percent levels, respectively. Country and time fixed effects included but omitted for reasons of parsimony. The null hypothesis of the Kleibergen-Paap rk LM statistic is that the equation is underidentified; the null hypothesis of the Kleibergen-Paap rk Wald F-statistics is that the equation is weakly identified

5 Conclusion

The 2007–08 Global Financial Crisis led to a significant loss of trust in governments. In contrast, the response by governments amidst the COVID-19 pandemic inverted that

situation. A context of high-inflation and a situation of war in Europe are eroding trust in the State again. As governments search for a path to economic resilience to avoid a recession, the challenge they face is not only knowing what policies to choose, but also how to implement them. Yet, capacity to implement depends crucially on citizens' trust and this on the other hand, depends on the ability of governments to efficiently use and allocate public moneys.

This paper empirically assessed the role of public sector efficiency scores in shaping the degree of trust in governments. By means of DEA, we first constructed several proxies of public spending efficiency and then related these, in a reduced form panel setting for a sample of 36 OECD countries over the 2007–2019 period, to a measure of trust. We find that the more efficient countries in terms of government spending are Australia, Chile, Ireland, New Zealand, South Korea, Switzerland.

Moreover, we found that indeed the more efficient a government is in managing its expenditure, the higher the level of trust it will gather from voters and citizens. This has important policy implications as the fiscal space available to conduct counter-cyclical fiscal policy is more and more limited.[12] Being able to convince the median-voter that the appropriate policies are being designed and implemented at times when tax burdens in OECD countries are at historic heights is the counterpart of benefitting from more trust which has positive externalities across other segments of the economy. In general, political economy variables and the existence of fiscal rules do not seem to significantly affect our measure of trust. Our results hold using alternative proxies for public sector efficiency, alternative measures for trust, specifications with different control variables and different empirical approaches (instrumental variables).

Future work could consider exploring more closely the way fiscal policy discretion versus rules matters in shaping government trust. On the one hand, too much discretion can erode trust if governments mismanage freely; on the other, too many rules can limit the necessary actions from the government to cope with crises and hence reap the needed trust so that policies are effective.

Appendix A

See Tables 7 and 8.

Appendix B

See Tables 9, 10 and 11.

[12] As robustness, we used data on populism from Meijers and Zaslove (2021) and we split countries into high populism and low populism (with scores higher and lower than the sample median, respectively). We find that the positive relationship between public sector spending efficiency and citizens' trust in governments holds as before and the difference is not statistically significant between the two.

Table 7 DEA output components

Sub index	Variable	Source	Series
Opportunity Indicators			
Administration	Corruption	Transparency International's Corruption Perceptions Index (CPI) (2006- 2019)	Corruption on a scale from 10 (Perceived to have low levels of corruption) to 0 (highly corrupt), 2006–2011; Corruption on a scale from 100 (Perceived to have low levels of corruption) to 0 (highly corrupt), 2012–2019
	Red Tape	World Economic Forum: The Global Competitiveness Report (2006–2017)	Burden of government regulation on a scale from 7 (not burdensome at all) to 1 (extremely burdensome)
		World Economic Forum: Global Competitiveness Index 4.0 (2018–2019)	
	Judicial Independence	World Economic Forum: The Global Competitiveness Report (2006–2017)	Judicial independence on a scale from 7 (entirely independent) to 1 (heavily influenced)
		World Economic Forum: Global Competitiveness Index 4.0 (2018–2019)	
	Property Rights	World Economic Forum: The Global Competitiveness Report (2006–2017)	Property rights on a scale from 7 (very strong) to 1 (very weak)
		World Economic Forum: Global Competitiveness Index 4.0 (2018–2019)	Property rights on a scale from 100 (very strong) to 0 (very weak)
	Shadow Economy	Medina and Schneider (2019) (2006–2017)	Shadow economy measured as percentage of official GDP. Reciprocal value 1/x
			For the missing years, we assumed that the scores were the same as in the previous years

Table 7 (continued)

Sub index	Variable	Source	Series
Education	Secondary School Enrolment	World Bank, World Development Indicators (2006–2019)	Ratio of total enrolment in secondary education
	Quality of Educational System	World Economic Forum: The Global competitiveness Report (2006–2017)	Quality of educational system on a scale from 7 (very well) to 1 (not well at all). For the missing years, we assumed that the scores were the same as in the previous years
	PISA scores	PISA Report (2006, 2009, 2012, 2015, 2018)[a]	Simple average of mathematics, reading and science scores for the years 2018, 2015, 2012, 2009. For the missing years, we assumed that the scores were the same as in the previous years
Health	Infant Survival Rate	World Bank, World Development Indicators (2006–2019)	Infant survival rate = (1000-IMR)/1000. IMR is the infant mortality rate measured per 1000 lives birth in a given year
	Life Expectancy	World Bank, World Development Indicators (2006–2019)	Life expectancy at birth, measured in years
	CVD, cancer, diabetes or CRD Survival Rate	World Health Organization, Global Health Observatory Data Repository (2000,-2019)	CVD, cancer and diabetes survival rate = 100-M. M is the mortality rate between the ages 30 and 70. For the missing years, we assumed that the scores were the same as in the previous years

Table 7 (continued)

Sub index	Variable	Source	Series
Public Infrastructure	Infrastructure Quality	World Economic Forum: The Global competitiveness Report (2006–2017)	Infrastructure quality on a scale from 7 (extensive and efficient) to 1 (extremely underdeveloped)
		World Economic Forum: Global Competitiveness Index 4.0 (2018–2019)	Quality of road infrastructure from 7 (extensive and efficient) to 1 (extremely underdeveloped)
			Efficiency of train services from 7 (extensive and efficient) to 1 (extremely underdeveloped)
			Efficiency of air transport services from 7 (extensive and efficient) to 1 (extremely underdeveloped)
			Efficiency of seaport services from 7 (extensive and efficient) to 1 (extremely underdeveloped)
			Reliability of water supply from 7 (extensive and efficient) to 1 (extremely underdeveloped)
Standard Musgravian indicators			
Distribution	Gini Index	Eurostat (2006–2019)	Gini index on a scale from 1(perfect inequality) to 0 (perfect equality). Transformed to 1-Gini
		OECD (2006–2019)	For the missing years, we assumed that the scores were the same as in the previous years
		World Bank, World Bank, Development Research Group (2006–2019) [b]	
Stabilization	Coefficient of variation of growth	IMF World Economic Outlook (WEO database) (2006–2019)	Coefficient of variation = standard deviation/mean of GDP growth based on 5 year data. GDP constant prices (percent change). Reciprocal value 1/x
	Standard deviation of inflation	IMF World Economic Outlook (WEO database) (2006–2019)	Standard deviation of inflation based on 5-year consumer prices (percent change) data. Reciprocal value 1/x

Table 7 (continued)

Sub index	Variable	Source	Series
Economic performance	GDP per capita	IMF World Economic Outlook (WEO database) (2006–2019)	GDP per capita based on PPP, current international dollar
	GDP growth	IMF World Economic Outlook (WEO database) (2006–2019)	GDP constant prices (percent change)
	Unemployment	IMF World Economic Outlook (WEO database) (2006–2019)	Unemployment rate, as a percentage of total labor force. Reciprocal value 1/x

[a]For Costa Rica, we were only able to collect data for the years 2018, 2015 and 2012

[b]For Colombia we were collected data from World Bank

Table 8 Input components

Sub Index	Variable	Source	Series
Opportunity indicators			
Administration	Government Consumption	IMF World Economic Outlook (WEO database) (2005–2018)	General government final consumption expenditure (% of GDP) at current prices
Education	Education Expenditure	UNESCO Institute for Statistics (2005–2018)[a]	Expenditure on education (% of GDP)
Health	Health Expenditure	OECD database (2005–2018)[b]	Expenditure on health compulsory (% of GDP)
Public infrastructure	Public Investment	European Commission, AMECO (2005–2018)[c]	General government gross fixed capital formation (% of GDP) at current prices
Standard Musgravian indicators			
Distribution	Social Protection Expenditure	OECD database (2005–2018)[d]	Aggregation of the social transfers (% of GDP)
Stabilization/economic performance	Government Total Expenditure	OECD database (2005–2018)[e]	Total expenditure (% of GDP)

[a]From IMF World Economic Outlook (WEO database), we retrieved data for Belgium for the period between 2001 to 2007, France for the period between 2000 and 2014, Greece for the period between 2006 and 2015, South Korea for the period between 2001 and 2009 and 2012 and 2015, for Turkey for the period between 2012 and 2014, and for the USA for the period 2010 and 2012. For the missing years, we assumed that the scores were the same as in the previous years

[b]We were not able to collect data on the following countries: Canada, Mexico, New Zealand, and Turkey. For the missing years, we assumed that the scores were the same as in the previous years

[c]We were not able to collect data on the following countries: Australia, Canada, Chile, Colombia, Costa Rica, Mexico, New Zealand, Israel and South Korea. For the missing years, we assumed that the scores were the same as in the previous years

[d]From IMF World Economic Outlook (WEO database), we retrieved data for New Zealand for the period 2005 and 2012. For Turkey, we retrieve data from European Commission, AMECO database. For Turkey, we were only able to get data for the period between 2009 and 2015. We were not able to collect data for Canada. For the missing years, we assumed that the scores were the same as in the previous years

[e]From IMF World Economic Outlook (WEO database), we retrieved data for Canada for the period between 2000 and 2017, for New Zealand for the period 2009 and 2017 and for Turkey for the period 2004 and 2017. We were not able to collect data for Mexico. For the missing years, we assumed that the scores were the same as in the previous years

Table 9 Input-oriented DEA VRS efficiency scores model 0

	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
AUS	0.74	0.66	0.66	**1.00**	**1.00**	**1.00**	**1.00**	**1.00**	0.79	0.69	0.69	0.68	0.71	**1.00**
AUT	0.56	0.50	0.47	0.49	0.47	0.46	0.46	0.46	0.50	0.50	0.52	0.51	0.54	0.53
BEL	0.47	0.49	0.48	0.49	0.48	0.47	0.46	0.45	0.48	0.49	0.52	0.52	0.54	0.53
CAN	0.71	0.60	0.71	0.61	0.58	0.56	0.56	0.57	0.75	0.64	0.64	0.63	0.65	0.64
CHE	**1.00**	**1.00**	**1.00**	**1.00**	0.79	0.82	0.75	0.78	**1.00**	**1.00**	**1.00**	0.78	0.81	0.81
CHL	0.98	**1.00**	**1.00**	**1.00**	**1.00**	**1.00**	**1.00**	**1.00**	**1.00**	**1.00**	**1.00**	0.98	0.99	**1.00**
COL	0.77	0.76	0.77	0.82	0.81	0.79	0.80	0.83	0.83	0.81	0.85	0.86	0.88	0.75
CZE	0.52	0.53	0.55	0.57	0.54	0.54	0.54	0.54	0.57	0.61	0.60	0.64	0.69	0.65
DEU	0.50	0.50	0.52	0.55	0.51	0.52	0.53	0.52	0.60	0.59	0.60	0.58	0.60	0.58
DNK	0.48	0.43	0.41	0.44	0.41	0.40	0.39	0.39	0.44	0.44	0.47	0.46	0.49	0.64
ESP	0.76	0.65	0.55	0.54	0.52	0.51	0.51	0.53	0.56	0.59	0.63	0.65	0.67	0.65
EST	0.66	0.63	0.59	0.55	0.53	0.58	0.59	0.56	0.61	0.63	0.64	0.64	0.64	0.64
FIN	0.49	0.48	0.46	0.49	0.44	0.44	0.43	0.40	0.42	0.42	0.46	0.45	0.48	0.47
FRA	0.53	0.43	0.41	0.44	0.42	0.42	0.41	0.41	0.44	0.45	0.47	0.46	0.48	0.47
GBR	0.65	0.59	0.54	0.57	0.53	0.52	0.52	0.52	0.63	0.60	0.62	0.62	0.64	0.63
GRC	0.50	0.48	0.48	0.47	0.47	0.48	0.47	0.46	0.51	0.52	0.55	0.55	0.56	0.57
HUN	0.52	0.44	0.47	0.51	0.53	0.53	0.53	0.52	0.53	0.54	0.56	0.63	0.63	0.60
IRL	0.67	0.60	0.53	0.50	0.45	0.47	0.53	0.55	0.68	**1.00**	0.91	0.91	1.00	**1.00**
ISL	0.57	0.58	0.48	0.51	0.52	0.54	0.52	0.55	0.59	0.62	0.65	0.59	0.63	0.60
ISR	0.54	0.55	0.58	0.62	0.64	0.65	0.67	0.71	0.70	0.68	0.71	0.70	0.69	0.68
ITA	0.48	0.48	0.49	0.50	0.49	0.50	0.50	0.49	0.50	0.53	0.55	0.56	0.58	0.57
JPN	0.61	0.76	0.60	0.63	0.60	0.57	0.56	0.55	0.59	0.61	0.64	0.64	0.66	0.65
KOR	**1.00**	**1.00**	**1.00**	**1.00**	**1.00**	**1.00**	0.99	**1.00**	**1.00**	**1.00**	**1.00**	**1.00**	**1.00**	0.96
LTU	0.63	0.61	0.58	0.56	0.53	0.53	0.57	0.62	0.67	0.70	0.74	0.76	0.79	0.75
LUX	0.64	0.68	0.57	0.60	0.55	0.55	0.54	0.53	0.66	0.61	0.63	0.61	0.62	0.62
LVA	0.64	0.63	0.62	0.60	0.56	0.57	0.60	0.58	0.61	0.66	0.69	0.72	0.72	0.68
NLD	0.51	0.56	0.65	0.74	0.52	0.51	0.49	0.49	0.54	0.55	0.58	0.58	0.61	0.61
NOR	0.51	0.52	0.50	0.55	0.49	0.50	0.50	0.48	0.58	0.51	0.48	0.45	0.48	0.47
NZL	0.59	0.55	0.55	0.62	0.58	0.53	0.50	0.55	0.69	0.66	0.68	0.68	1.00	0.70
POL	0.50	0.50	0.52	0.55	0.55	0.63	0.59	0.54	0.56	0.58	0.62	0.63	0.64	0.61
PRT	0.47	0.49	0.51	0.51	0.48	0.47	0.49	0.50	0.51	0.55	0.59	0.62	0.64	0.63
SVK	0.55	0.57	0.62	0.61	0.56	0.56	0.57	0.57	0.57	0.57	0.56	0.62	0.65	0.62
SVN	0.46	0.47	0.50	0.51	0.48	0.46	0.47	0.44	0.46	0.50	0.54	0.58	0.61	0.60
SWE	0.44	0.43	0.43	0.47	0.47	0.47	0.45	0.43	0.48	0.50	0.51	0.49	0.50	0.50
TUR	0.66	0.68	0.70	0.71	0.68	0.71	0.74	0.69	0.72	0.75	0.76	0.74	0.76	0.72
USA	0.67	0.63	0.60	0.61	0.59	0.58	0.59	0.61	0.81	0.72	0.72	0.70	0.73	0.72
Count	2	3	3	4	3	3	2	3	3	4	3	1	2	3
Average	0.61	0.60	0.59	0.61	0.58	0.58	0.58	0.58	0.63	0.63	0.65	0.65	0.68	0.66
Median	0.57	0.56	0.55	0.56	0.53	0.53	0.53	0.54	0.59	0.60	0.62	0.63	0.64	0.64
Min	0.44	0.43	0.41	0.44	0.41	0.40	0.39	0.39	0.42	0.42	0.46	0.45	0.48	0.47
Max	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Stdev	0.15	0.15	0.15	0.16	0.16	0.16	0.16	0.16	0.15	0.16	0.15	0.14	0.15	0.14

Bold indicates the efficient countries

Table 10 Input-oriented DEA VRS efficiency scores model 1

	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
AUS	0.83	0.70	0.69	**1.00**	**1.00**	**1.00**	**1.00**	**1.00**	0.89	0.70	0.69	0.71	0.74	**1.00**
AUT	0.60	0.57	0.56	0.59	0.58	0.57	0.58	0.58	0.61	0.62	0.62	0.58	0.59	0.60
BEL	0.54	0.58	0.56	0.60	0.60	0.59	0.56	0.55	0.58	0.59	0.61	0.59	0.59	0.60
CAN	0.74	0.62	0.77	0.67	0.66	0.62	0.62	0.63	0.79	0.71	0.69	0.65	0.65	0.65
CHE	**1.00**	**1.00**	**1.00**	**1.00**	0.95	0.98	0.90	0.90	**1.00**	**1.00**	**1.00**	0.88	0.88	0.91
CHL	0.98	**1.00**	**1.00**	**1.00**	**1.00**	**1.00**	**1.00**	**1.00**	**1.00**	**1.00**	**1.00**	**1.00**	**1.00**	**1.00**
COL	0.79	0.77	0.77	0.86	0.85	0.80	0.82	0.85	0.83	0.85	0.88	0.87	0.88	0.77
CZE	0.53	0.54	0.56	0.60	0.57	0.58	0.58	0.58	0.64	0.66	0.60	0.64	0.69	0.66
DEU	0.63	0.64	0.66	0.71	0.68	0.66	0.67	0.67	0.72	0.73	0.73	0.69	0.69	0.69
DNK	0.52	0.50	0.47	0.53	0.51	0.49	0.48	0.48	0.50	0.52	0.53	0.50	0.52	0.72
ESP	0.82	0.65	0.57	0.61	0.59	0.59	0.61	0.66	0.73	0.77	0.76	0.77	0.78	0.78
EST	0.71	0.67	0.62	0.56	0.57	0.62	0.63	0.56	0.62	0.66	0.66	0.64	0.64	0.64
FIN	0.53	0.55	0.54	0.59	0.56	0.55	0.53	0.49	0.51	0.53	0.56	0.52	0.54	0.55
FRA	0.55	0.51	0.49	0.55	0.54	0.53	0.52	0.52	0.54	0.57	0.58	0.55	0.56	0.57
GBR	0.66	0.65	0.62	0.66	0.64	0.61	0.61	0.61	0.68	0.68	0.69	0.66	0.66	0.67
GRC	0.54	0.53	0.55	0.56	0.57	0.62	0.64	0.65	0.66	0.70	0.70	0.66	0.63	0.70
HUN	0.56	0.48	0.55	0.66	0.68	0.67	0.66	0.65	0.64	0.62	0.59	0.70	0.64	0.61
IRL	0.68	0.63	0.56	0.55	0.58	0.53	0.61	0.64	0.73	**1.00**	**1.00**	0.92	**1.00**	**1.00**
ISL	0.69	0.70	0.49	0.57	0.53	0.56	0.52	0.56	0.61	0.65	0.65	0.59	0.66	0.67
ISR	0.54	0.56	0.58	0.64	0.69	0.68	0.69	0.73	0.70	0.72	0.73	0.70	0.69	0.68
ITA	0.56	0.54	0.58	0.62	0.62	0.63	0.64	0.64	0.67	0.72	0.72	0.70	0.71	0.73
JPN	0.64	0.78	0.67	0.74	0.71	0.69	0.66	0.64	0.67	0.69	0.71	0.69	0.70	0.71
KOR	**1.00**	**1.00**	**1.00**	**1.00**	**1.00**	**1.00**	**1.00**	**1.00**	**1.00**	**1.00**	**1.00**	**1.00**	**1.00**	0.96
LTU	0.64	0.63	0.59	0.60	0.61	0.58	0.58	0.65	0.71	0.77	0.77	0.77	0.79	0.79
LUX	0.64	0.73	0.67	0.73	0.69	0.66	0.68	0.64	0.73	0.74	0.75	0.70	0.71	0.73
LVA	0.65	0.67	0.67	0.62	0.64	0.65	0.63	0.59	0.63	0.71	0.72	0.75	0.72	0.68
NLD	0.57	0.58	0.67	0.74	0.59	0.57	0.55	0.55	0.59	0.62	0.63	0.60	0.62	0.64
NOR	0.52	0.55	0.52	0.60	0.54	0.55	0.55	0.53	0.59	0.54	0.52	0.46	0.48	0.48
NZL	0.65	0.55	0.57	0.62	0.60	0.54	0.53	0.56	0.77	0.68	0.72	0.72	**1.00**	0.77
POL	0.59	0.56	0.58	0.62	0.64	0.70	0.63	0.61	0.66	0.67	0.70	0.72	0.70	0.67
PRT	0.50	0.53	0.55	0.59	0.57	0.52	0.59	0.64	0.67	0.72	0.73	0.76	0.73	0.75
SVK	0.60	0.58	0.68	0.70	0.66	0.65	0.64	0.66	0.67	0.66	0.57	0.65	0.67	0.67
SVN	0.51	0.51	0.55	0.58	0.56	0.55	0.55	0.55	0.54	0.58	0.60	0.65	0.67	0.65
SWE	0.50	0.51	0.50	0.55	0.55	0.55	0.54	0.50	0.53	0.55	0.57	0.52	0.52	0.52
TUR	0.69	0.69	0.73	0.80	0.82	0.83	0.86	0.73	0.75	0.81	0.81	0.74	0.76	0.72
USA	0.82	0.72	0.70	0.66	0.60	0.60	0.63	0.65	**1.00**	0.80	0.78	0.77	0.78	0.81
Count	2	3	3	4	3	3	3	3	4	4	4	2	4	3
Average	0.65	0.64	0.63	0.67	0.66	0.65	0.65	0.65	0.70	0.71	0.71	0.69	0.71	0.71
Median	0.63	0.60	0.58	0.62	0.60	0.61	0.62	0.64	0.67	0.70	0.70	0.69	0.69	0.69
Min	0.50	0.48	0.47	0.53	0.51	0.49	0.48	0.48	0.50	0.52	0.52	0.46	0.48	0.48
Max	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Stdev	0.14	0.14	0.13	0.14	0.14	0.14	0.14	0.14	0.14	0.13	0.13	0.13	0.14	0.13

Bold indicates the efficient countries

Table 11 Input-oriented DEA VRS efficiency scores model 2

	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
AUS	0.79	0.74	0.72	**1.00**	**1.00**	**1.00**	**1.00**	**1.00**	0.81	0.76	0.74	0.74	0.71	**1.00**
AUT	0.59	0.57	0.57	0.56	0.55	0.54	0.55	0.56	0.57	0.57	0.57	0.58	0.54	0.53
BEL	0.56	0.53	0.54	0.53	0.51	0.51	0.50	0.50	0.52	0.54	0.57	0.56	0.54	0.53
CAN	0.71	0.67	0.73	0.68	0.66	0.65	0.66	0.68	0.76	0.72	0.70	0.70	0.65	0.64
CHE	**1.00**	**1.00**	**1.00**	**1.00**	**1.00**	**1.00**	**1.00**	**1.00**	**1.00**	**1.00**	**1.00**	**1.00**	**1.00**	**1.00**
CHL	0.98	**1.00**	**1.00**	**1.00**	**1.00**	**1.00**	**1.00**	**1.00**	**1.00**	**1.00**	**1.00**	0.98	0.99	**1.00**
COL	0.77	0.76	0.77	0.83	0.82	0.81	0.83	0.89	0.90	0.82	0.85	0.86	0.88	0.75
CZE	0.52	0.53	0.56	0.57	0.54	0.54	0.54	0.54	0.58	0.61	0.60	0.64	0.69	0.65
DEU	0.63	0.61	0.62	0.61	0.59	0.59	0.62	0.64	0.65	0.67	0.66	0.66	0.60	0.58
DNK	0.56	0.53	0.52	0.51	0.48	0.48	0.46	0.46	0.49	0.51	0.52	0.53	0.49	**1.00**
ESP	**1.00**	0.77	0.56	0.54	0.52	0.51	0.52	0.56	0.58	0.62	0.65	0.66	0.67	0.65
EST	0.71	0.63	0.61	0.56	0.54	0.59	0.61	0.59	0.64	0.67	0.67	0.68	0.64	0.64
FIN	0.62	0.60	0.60	0.58	0.54	0.55	0.55	0.54	0.53	0.52	0.55	0.55	0.56	0.57
FRA	0.55	0.48	0.48	0.49	0.48	0.47	0.47	0.47	0.48	0.50	0.51	0.50	0.48	0.48
GBR	0.66	0.62	0.59	0.60	0.57	0.57	0.59	0.61	0.64	0.67	0.68	0.69	0.64	0.63
GRC	0.50	0.49	0.48	0.48	0.47	0.48	0.47	0.46	0.51	0.52	0.55	0.55	0.56	0.57
HUN	0.70	0.44	0.47	0.52	0.53	0.53	0.53	0.52	0.53	0.54	0.56	0.63	0.63	0.60
IRL	0.68	0.60	0.56	0.52	0.47	0.50	0.60	0.65	0.70	**1.00**	**1.00**	0.99	**1.00**	**1.00**
ISL	0.71	0.64	0.57	0.59	0.63	0.64	0.62	0.66	0.67	0.70	0.72	0.67	0.64	0.60
ISR	0.57	0.56	0.58	0.62	0.64	0.65	0.67	0.72	0.72	0.69	0.73	0.72	0.69	0.68
ITA	0.48	0.48	0.49	0.50	0.49	0.50	0.50	0.49	0.50	0.53	0.55	0.56	0.58	0.57
JPN	0.75	0.83	0.70	0.70	0.67	0.66	0.64	0.65	0.68	0.70	0.71	0.72	0.67	0.67
KOR	**1.00**	**1.00**	**1.00**	**1.00**	**1.00**	**1.00**	1.00	**1.00**	**1.00**	**1.00**	**1.00**	**1.00**	**1.00**	0.96
LTU	0.63	0.62	0.58	0.57	0.53	0.53	0.57	0.62	0.68	0.70	0.74	0.76	0.79	0.75
LUX	0.67	0.73	0.66	0.66	0.62	0.62	0.64	0.64	0.67	0.69	0.69	0.69	0.63	0.62
LVA	0.64	0.64	0.62	0.61	0.56	0.57	0.60	0.58	0.61	0.66	0.69	0.72	0.72	0.68
NLD	0.68	0.62	0.69	0.74	0.60	0.60	0.61	0.63	0.65	0.68	0.68	0.70	0.70	0.69
NOR	0.60	0.57	0.56	0.59	0.53	0.54	0.56	0.56	0.58	0.56	0.52	0.51	0.48	0.48
NZL	0.65	0.58	0.60	0.67	0.64	0.59	0.59	0.66	0.72	0.74	0.75	0.77	**1.00**	0.70
POL	0.50	0.50	0.53	0.56	0.56	0.79	0.62	0.54	0.56	0.58	0.62	0.63	0.64	0.62
PRT	0.48	0.50	0.52	0.52	0.48	0.47	0.50	0.53	0.56	0.59	0.62	0.65	0.64	0.64
SVK	0.55	0.57	0.68	0.62	0.57	0.56	0.57	0.57	0.57	0.57	0.56	0.62	0.65	0.63
SVN	0.46	0.47	0.51	0.51	0.48	0.46	0.47	0.44	0.46	0.50	0.54	0.58	0.61	0.60
SWE	0.51	0.51	0.52	0.54	0.55	0.55	0.54	0.52	0.52	0.55	0.57	0.56	0.53	0.51
TUR	0.66	0.68	0.70	0.71	0.68	0.72	0.74	0.71	0.74	0.76	0.76	0.74	0.76	0.72
USA	0.80	0.72	0.71	0.68	0.65	0.65	0.67	0.71	0.83	0.80	0.81	0.82	0.81	0.76
Count	3	3	3	4	4	4	3	4	3	4	4	2	4	5
Average	0.66	0.63	0.63	0.64	0.61	0.62	0.63	0.64	0.66	0.67	0.68	0.69	0.69	0.69
Median	0.64	0.60	0.59	0.59	0.56	0.57	0.59	0.60	0.64	0.67	0.68	0.67	0.65	0.64
Min	0.46	0.44	0.47	0.48	0.47	0.46	0.46	0.44	0.46	0.50	0.51	0.50	0.48	0.48
Max	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Stdev	0.15	0.15	0.14	0.15	0.16	0.16	0.15	0.16	0.15	0.15	0.14	0.14	0.15	0.16

Bold indicates the efficient countries

Appendix C

See Tables 12, 13, 14, 15, 16 and 17.

Table 12 Summary statistics

Variable	Obs	Mean	Std. dev
Dependent variable			
Trust	464	0.42	0.16
Independent variables			
PSE_0 (t – 1)	464	0.62	0.15
PSE_1 (t – 1)	464	0.68	0.14
PSE_2 (t – 1)	464	0.65	0.15
ln(Population) (t – 1)	464	16.44	1.46
Age dependency ratio (t – 1)	464	50.70	5.60
Debt-to-GDP ratio (t – 1)	464	65.54	44.00
Right (t – 1)	464	0.52	0.50
Majority	464	0.14	0.35
Deficit rule (t – 1)	301	0.65	0.48
Debt rule (t – 1)	301	0.61	0.49
Structural balance rule (t – 1)	301	0.48	0.50
Expenditure rule (t – 1)	301	0.49	0.50
Instrumental Variable			
Governance efficiency (t – 1)	464	1.26	0.55

Table 13 Unconditional regression on alternative output efficiency scores

Specification	(1)	(2)	(3)
Dependent variable	Trust	Trust	Trust
PSE_0 (t – 1)	0.243***		
	(0.065)		
PSE_1 (t – 1)		0.234***	
		(0.068)	
PSE_2 (t – 1)			0.320*
			(0.180)
Constant	0.232***	0.237***	0.152
	(0.058)	(0.062)	(0.156)
Country effects	Yes	Yes	Yes
Time effects	Yes	Yes	Yes
Observations	463	463	464
R-squared	0.195	0.190	0.157

Clustered standard errors in parenthesis. *, **, *** denote statistical significance at the 10, 5 and 1 percent levels, respectively. Country and time fixed effects included but omitted for reasons of parsimony

Table 14 Conditional regression on alternative output efficiency scores

Specification	(1)	(2)	(3)
Dependent variable	Trust	Trust	Trust
PSE_0 (t − 1)	0.158**		
	(0.074)		
PSE_1 (t − 1)		0.156*	
		(0.078)	
PSE_2 (t − 1)			0.212
			(0.171)
Ln(Population) (t − 1)	−0.612**	−0.621**	−0.661***
	(0.246)	(0.245)	(0.240)
Age dependency ratio (t − 1)	0.008*	0.008*	0.008*
	(0.004)	(0.004)	(0.005)
Debt-to-GDP ratio (t − 1)	−0.002***	−0.002***	−0.002***
	(0.001)	(0.001)	(0.001)
Right (t − 1)	0.012	0.012	0.012
	(0.013)	(0.013)	(0.014)
Majority (t − 1)	0.004	0.004	0.004
	(0.020)	(0.020)	(0.020)
Constant	10.027**	10.170**	10.780**
	(4.142)	(4.128)	(4.036)
Country effects	Yes	Yes	Yes
Time effects	Yes	Yes	Yes
Observations	463	463	464
R-squared	0.297	0.297	0.286

Clustered standard errors in parenthesis. *, **, *** denote statistical significance at the 10, 5 and 1 percent levels, respectively. Country and time fixed effects included but omitted for reasons of parsimony

Table 15 Endogeneity conditional regression on alternative output efficiency scores

Specification	(1)	(2)	(3)	(4)	(5)	(6)
Dependent variable	Trust	Trust	Trust	Trust	Trust	Trust
PSE_0 (t − 1)	0.935**	0.616				
	(0.380)	(0.376)				
PSE_1 (t − 1)			1.112**	0.727		
			(0.489)	(0.464)		
PSE_2 (t − 1)					2.276**	1.187*
					(0.950)	(0.694)
Ln(Population) (t − 1)		−0.425**		−0.422**		−0.636***
		(0.187)		(0.194)		(0.151)
Age dependency ratio (t − 1)		0.006		0.006		0.007*
		(0.004)		(0.005)		(0.004)
Debt-to-GDP ratio (t − 1)		−0.001		−0.001		−0.002***
		(0.001)		(0.001)		(0.001)
Right (t − 1)		0.014		0.014		0.013
		(0.011)		(0.011)		(0.011)
Majority (t − 1)		0.008		0.010		0.012
		(0.017)		(0.018)		(0.017)
Country effects	Yes	Yes	Yes	Yes	Yes	Yes
Time effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	428	428	428	428	429	429
Weak identification test: Kleibergen-Paap rk LM statistic	9.158	8.384	7.101	6.250	8.599	11.12
Under-identification test: Kleibergen-Paap rk Wald F-statistics	3.683	8.091	7.319	6.049	8.993	11.269

Clustered standard errors in parenthesis

*, **, *** denote statistical significance at the 10, 5 and 1 percent levels, respectively

Country and time fixed effects included but omitted for reasons of parsimony. The null hypothesis of the Kleibergen-Paap rk LM statistic is that the equation is underidentified; the null hypothesis of the Kleibergen-Paap rk Wald F-statistics is that the equation is weakly identified

Table 16 First stage results of Table 5

Specification	(1)	(2)	(3)	(4)	(5)	(6)
Dependent variable	PSE_0 (t − 1)	PSE_0 (t − 1)	PSE_1 (t − 1)	PSE_1 (t − 1)	PSE_2 (t − 1)	PSE_2 (t − 1)
Regressors\estimation	IV1	IV2	IV1	IV2	IV1	IV2
Governance efficiency (t − 1)	0.043*	0.032	0.066***	0.054**	0.062**	0.055**
	(0.023)	(0.022)	(0.025)	(0.025)	(0.027)	(0.028)
Ln(Population) (t − 1)		−0.201		−0.173		−0.204
		(0.132)		(0.130)		(0.143)
Age dependency ratio (t − 1)		0.002		0.002		0.001
		(0.002)		(0.002)		(0.002)
Debt-to-GDP ratio (t − 1)		−0.002***		−0.001**		−0.002***
		(0.000)		(0.000)		(0.000)
Right (t − 1)		−0.024***		−0.020**		−0.026***
		(0.008)		(0.008)		(0.009)
Majority (t − 1)		0.000		0.001		−0.013
		(0.012)		(0.013)		(0.014)
Country effects	Yes	Yes	Yes	Yes	Yes	Yes
Time effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	464	464	464	464	464	464

Clustered standard errors in parenthesis

*, **, *** denote statistical significance at the 10, 5 and 1 percent levels, respectively

Country and time fixed effects included but omitted for reasons of parsimony

Table 17 Conditional regression on input efficiency scores considering different types of country and using alternative dependent variables for trust

Specification	(1)	(2)	(3)	(4)	(5)	(6)
Type of country	High share of public employment	Low share of public employment	Coalition	Non − coalition	Full sample	Full sample
Dependent Variable	Trust	Trust	Trust	Trust	Gallup Confidence	EuroBarometer Trust
Estimation	FE	FE	FE	FE	FE	FE
PSE_2 (t − 1)	0.157	0.273**	0.035	0.257***	0.318***	0.329**
	(0.103)	(0.091)	(0.082)	(0.073)	(0.103)	(0.123)
Log(Population) (t − 1)	−0.800	0.009	−0.423	−0.813**	−0.581	−1.143**
	(0.494)	(0.478)	(0.327)	(0.324)	(0.400)	(0.412)
Age dependency ratio (t − 1)	0.007	0.014	0.004	−0.011	0.009	−0.005
	(0.008)	(0.008)	(0.007)	(0.007)	(0.008)	(0.007)
Debt-to-GDP ratio (t − 1)	−0.001	−0.001*	−0.001**	−0.001	−0.002*	−0.002**
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Right (t − 1)	0.009	0.024	0.018	0.025**	0.024	0.021
	(0.026)	(0.018)	(0.016)	(0.012)	(0.019)	(0.017)
Majority (t − 1)	0.012	−0.063	0.077***	−0.032	−0.016	−0.017
	(0.023)	(0.043)	(0.024)	(0.026)	(0.023)	(0.029)
Constant	13.091	−0.512	7.039	14.379**	9.428	19.143**
	(8.213)	(7.982)	(5.451)	(5.503)	(6.835)	(6.885)
Country effects	Yes	Yes	Yes	Yes	Yes	Yes
Time effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	197	177	232	163	268	189
R-squared	0.281	0.370	0.327	0.433	0.171	0.389

Clustered standard errors in parenthesis

*, **, *** denote statistical significance at the 10, 5 and 1 percent levels, respectively

Country and time fixed effects included but omitted for reasons of parsimony

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