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Political orientation and education investment: an OECD perspective

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Abstract
This paper explores the potential causal relationship between political orientation and education investment by using panel data from 21 OECD countries from 1970 to 2020 and utilizing estimators that address endogeneity (i.e. 2SLS, System GMM, and Lewbel 2SLS). In particular, using communist influence as a physical instrument for political orientation, we find a positive impact of the right political orientation on education investment, and the impact of the left orientation is negative. The positive impact from the right orientation is also stronger than the negative impact from the left. Moreover, these core results are robust to alternative measures of political orientation and education investment, alternative estimators that address endogeneity, and the moderation effect of innovation.

Keywords: political orientation; education resources; instrumental variable; communist influence; OECD countries

Introduction

In Organization for Economic Cooperation and Development (OECD) countries, education investments and outcomes are increasingly focused on by governments in terms of providing incentives for greater efficiency in schooling and transferring resources to respond to rising demands[1] As education has long been recognized as a prerequisite for economic growth around the world, it improves economic development by increasing skills,[2] stimulating innovation,[3] establishing an environment for more efficient governance[4] and mitigating inequality between social classes.[5] Therefore, identifying the potential factors and mechanisms that influence investment in education is imperative. Previous studies have focused on the impact of separate factors on education investment. For example, tax revenue implies the total available funds for government expenditure, which could further affect public investment in education[6]; technological innovation and industrial structure upgrades raise the demand for human capital,[7] which in turn forces government expenditure on education development. However, evidence of how the policy environment itself determines education policies remains limited. For OECD countries, policy decision-making, including education investment, is fundamentally based on the political ideology of the ruling parties in the context of democratic political regimes.[8] To fill the gap in the literature, this paper aims to investigate the impact of political orientation on education investment.

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[1]OECD (2022).

[2]Habibi and Zabardast (2020); Marquez-Ramos and Mourelle (2019).

[3]Edquist (2019); Gundry et al. (2014).

[4]Ariu et al. (2016); Sahnoun and Abdennadher (2022).

[5]Abdullah et al. (2015); Arshed et al. (2018, 2019); Coady and Dizioli (2018).

[6]Ángeles Castro and Ramírez Camarillo (2014).

[7]Balmaceda (2021); Kottelenberg and Lehrer (2019).

[8]Wang et al. (2019).

In a democratic society, the impact of political orientation on education investment is determined by the voter base of left- and right-wing parties.[9] Previous literature suggests that a government dominated by a leftist party tends to implement policies that benefit the working class.[10] The worker-class-benefiting ideology makes the leftist ruling government reduce expenditure on providing public goods and increase transfer payments to labor welfare. As an important public service provided by the government, public education investment could be decreased by the government ruled by the left party. On the other hand, the rightist party represents the interests of wealthier classes who have more willingness to maintain education development.[11] The rightist-dominated government, therefore, tends to reduce social welfare but increase public expenditure, which eventually expands education spending policy. Due to the incentive of the ruling party to implement policies to maximize its re-election prospects,[12] education investment policy can be explained by political orientation.

Another important mechanism through which political orientation might influence education investment is that such investment could serve as a strategic tool for cultivating a party's target electorate. A key study in this context demonstrates that education tends to shift individuals towards right-wing ideologies. Specifically, each additional year of education is associated with an approximately 5–6% increase in right-leaning political views.[13] This finding suggests that parties with differing political orientations may be strategically inclined to adopt distinct educational investment policies to optimize their electoral success rates. More specifically, left-wing parties may reduce education funding to maintain allegiance from voters with limited educational attainment, while right-wing parties may increase such investment to cultivate a more educated voter base, potentially aligned with their policies.

Attitude to innovation and technology is another channel through which political orientation affects education investment. Past evidence[14] suggested that the adoption of new technology could benefit capital owners by decreasing human resource inputs. Technological progress potentially transfers the demanded type of human capital from workers to a professional labor force, such as researchers and managers. As education is known as a key factor for technological progress, leftist and rightist parties have different policy preferences on education investment to back up their represented social classes. By reducing education investment, a leftist government can limit the adoption of new technologies and therefore decrease the unemployment rate, which is a major goal of the left ideology.[15] Conversely, a rightist government tends to increase expenditure on education to encourage innovative activities. The promotion of innovation could benefit capital owners by promoting human capital efficiency and increasing the profitability of firms.[16]

The current literature about the relationship between political orientation and education investment exhibits significant variation depending on the political and economic context. Additionally, leftist parties have often implemented tighter budgets, while rightist parties have increased spending, particularly in education, to alleviate economic hardships, as observed in Hungary and Poland.[17] This pattern is supported by an analysis of cabinet ideology's influence on education spending in thirteen post-Communist democracies between 1989 and 2004. However, the current literature primarily focuses on specific countries or regions.

Building on the available evidence, this paper attempts to answer two key research questions by using detailed information about political orientation and associated education investment: (1) can political orientation explain cross-country differences in education investment; and (2) how leftist and rightist ideologies affect government policies on education resource development. Examining the

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[9]Aidt (2016); Herwartz and Theilen (2014).
[10]Alonso and Fonseca (2012); Gingrich and Häusermann (2015); Häusermann et al. (2013).
[11]Potrafke (2011).
[12]Bove et al. (2017).
[13]Meyer (2017).
[14]Wang et al. (2019).
[15]Pickering and Rockey (2013); Vivarelli (2014).
[16]Bjørnskov and Potrafke (2013).
[17]Tavits and Letki (2009).

impact of political orientation on education resources is not a trivial task. While attempting to investigate the impact of political orientation on education resources, the adverse impact of education on political orientation could result in an endogeneity problem. It may bias estimates of how political orientation affects education resources. More specifically, differences in education policies can influence voters' preferences for political ideology, which further determines their political orientation.[18] For example, voters with lower education are traditionally associated with votes for left-wing parties.[19] However, a recent study also suggested a transformation that higher-educated voters are currently more inclined to support left-wing parties with more progressive ideologies such as environmental issues; voters with less education are more inclined to support right-wing parties with conservative policies.[20]

The uncertainty of the reverse relationship between the two factors makes it challenging to identify the impact of political orientation on education resources. To address the endogeneity issue, we performed instrumental-variable (IV) regressions that used external communist influence as an exogenous variable to make a causal inference. The political orientation in OECD countries is highly associated with the far-left ideology of communism. As the foreign communist influence is solely determined by the communist revolution in other countries,[21] IV estimations allow us to capture the causal impact of political orientation on education resources through the exogenous shock of communism.

Using a panel sample of 21 OECD countries from 1970 to 2020, our research contributes to the current literature on the relationship between political orientation and education resources in several aspects. First, our analysis employed political orientation data from past studies[22] that firstly grouped political ideologies by a binary classification (i.e., left- or right-parties), which allows us to directly analyze political orientation under the scenario of two-party systems. Compared with previous political studies that only considered ideological differences, our study presents more straightforward results of how political orientation affects education resources. Second, we investigated the impact of political orientation on education resources in terms of both educational inputs and educational outputs. For the inputs, we considered government expenditure on education, while we also considered measures of education quality and outcomes by using pupil-teacher ratio and enrollment rate as alternative explanatory variables. Third, we used foreign communist influence as an instrumental variable (IV), as well as other techniques including System GMM[23] and IV estimators[24] to address the endogeneity issue. Finally, we further explored the possible mechanisms through which political orientation can affect education by splitting samples based on country differences in technological development (i.e., the number of researchers).

The rest of the paper is organized as follows. Section "Data" describes the data structure and variable definition. Section "Empirical strategy" outlines the empirical strategy. Section "Baseline results" presents the baseline results. Section "Robustness checks" presents results from sensitivity checks, and Section "Conclusion" concludes.

Data

Our empirical analysis was performed based on unbalanced panel data on political orientation, education resources, revenue, population ages between 0 and 14, economic structural change, and external communist influence index for 21 OECD countries from 1970 to 2020. The detailed country list can be found in Appendix A1. We provide summary statistics and definitions for the key variables in the estimations in Table 1.

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[18]Alesina et al. (1995); Berliner et al. (2015); Kerrissey (2015); Murillo and Schrank (2005); Tavares (2004).
[19]Piketty (2021).
[20]Edo et al. (2019).
[21]Madsen et al. (2017).
[22]Gethin et al. (2022).
[23]Blundell and Bond (1998)
[24]Lewbel (2012).

Table 1. Summary statistics of variables

Variable	Obs	Mean	Std. Dev.	Min	Max
Education resources					
Expenditure$_{educ}$ (%)	873	5.25	1.16	2.08	8.56
Pupil-teacher$_{pca}$ (%)	552	20.94	4.91	11.97	37.09
Enrollment$_{pca}$ (%)	933	128.38	32.07	36.92	244.23
Political orientation					
Left (%)	1,467	46.77	8.31	27.23	72
Right (%)	1,467	47.49	10.70	10.14	69.60
Dominant$_{left}$ (dummy)	1,467	0.49	0.50	0	1
Dominant$_{right}$ (dummy)	1,467	0.43	0.49	0	1
Control variables					
Revenue (%)	931	32.04	8.00	14.49	51.27
Pop$_{age0-14}$ (%)	719	25.38	4.96	10.43	40.29
Industry (%)	719	61.99	6.45	45.66	80.08
Service (%)	1,210	21.05	4.59	13.22	35.06
Instrumental variable					
Communist (%)	1,467	23.34	9.46	9.60	49.19

Notes: *Expenditure$_{educ}$* is the total government expenditure on education (% of GDP). *Pupil-teacher* is an indicator calculated by taking PCA of pupil-teacher ratio in each stage. *Enrollment$_{pca}$* is an indicator calculated by taking PCA of enrollment in each stage. *Left* measures the share (%) of party orientation on left. *Right* measures the share (%) of party orientation in right. *Dominant$_{left}$* is a dummy variable that takes value of 1 if left party was in a dominant position (i.e., share of left-wing was greater than 50%). *Dominant$_{right}$* is a dummy variable that takes value of 1 if right-wing party was in a dominant position (i.e., share of right-wing was greater than 50%). *Revenue* is the government revenue excluding grants share of GDP. *Pop$_{age0-14}$* is the share (%) of population ages 0–14 in total population. *Industry* and *Service* represent the industry and service sector share of GDP (%), respectively. *Communist* is the index (%) measures external communist influence in OECD countries.

Political orientation

The political orientation data were sourced from Election Results Data from this past study.[25] The vote-results data are manually hand-coded for 21 OECD countries which are also Western democracies. The database was established based on multiple sources of political attitudes surveys as well as official election results, including the Manifesto Project Database, Eurobarometer, the European Social Survey, and the European Election Studies. The data usefully separate political orientation into two major groups, the "left" and "right," which allows us to compare election results in two-party systems with highly fragmented party systems. Parties on the left side of the political spectrum generally implement expansionary fiscal policies to support the benefits of labor forces.[26] The data categorize social democratic, socialist, communist, green, and their affiliated parties such as Labour in the UK and Australia, as well as the Democratic Party in the US, as left parties based on party ideology. Parties with ideas of protecting capital owners by tightening fiscal policies are on the right side of the political spectrum.[27] For example, conservative parties in the UK, the Republican Party in the US, and anti-immigration parties such as the Danish People's Party are identified as traditional right-wing parties.

We separately calculated the percentage of left- and right-wing voting (*Left* and *Right*) in each election in each country, which represents the society's cleavage on political orientation. For a given country c, we filled in the missing observations between two elections with the previous election result

[25]Gethin et al. (2022).
[26]Berliner et al. (2015); Kerrissey (2015); Murillo and Schrank (2005).
[27]Alesina et al. (1995); Tavares (2004).

because the election results would have a persistent impact on government policy until the next election campaign.[28] The proportion of left or right-wing voting reflects the social intention of political ideology. We also extracted two dummy variables that take the value of 1 if the proportion of left- or right-wing parties is greater than a threshold of 50 percent in an election ($Dominant_{left}$ and $Dominant_{right}$), which indicates a government and its policy is fundamentally dominated by one particular political ideology during the term.[29]

Education investment

We collected education data from the World Development Indicators (WDI) by the World Bank. The education resources were measured in three ways. First, we used the percentage of general government expenditure on education relative to GDP ($Expenditure_{educ}$), where a high percentage of education expenditure reflects that the government has a higher priority for education resources.[30] Second, we used the pupil-teacher ratio ($Pupil\text{-}teacher_{pca}$) as a measurement of education resource abundance, which is generated by dividing the number of students by the number of teachers at the same level of education. A higher pupil-teacher ratio indicates lower-level education resource abundance. In the education literature,[31] the pupil-teacher ratio is also widely used as a predictor of education quality and student performance. The third measurement is the ratio of school enrollment ($Enrollment_{pca}$), which divides the number of students by the population of the age group corresponding to the same level of education. The school enrollment rate is widely used as an outcome variable of educational investment,[32] which could eventually determine the level of human capital. For the pupil-teacher ratio and school enrollment that were recorded at each level of education (i.e., primary, secondary, and tertiary), we used the first standardized principal component of the three levels of education to combine the data.

Other explanatory (control) variables

We used the share of government revenue excluding grants in GDP, the share of population ages 0–14 in the total population, as well as the industry and service sectors' share in the economic structure as other explanatory variables to control their potential effects on education resources. These control variables were also obtained from the World Bank's WDI database.

First, we used the share of government revenue in GDP (*Revenue*) to control the potential influence of the government's economic situation on education expenditure. Previous studies suggest that a government with a good economic situation generally invests more financial resources in the public education sector to obtain long-term economic benefits from the growth of human capital.[33] The positive effect of government revenue on education resources is thus expected. Second, we set the ratio of population ages 0–14 to the total population ($Pop_{age0\text{-}14}$) as an additional explanatory variable to control the potential population impact on education resources. The young age population under 15 years old is an important determinant of education resource allocation. The population structure with a larger proportion of young children requires the government to provide more education services, as suggested by this study.[34] Hence, a positive correlation between the young population and education resources is expected.

Finally, we used the share of industry and service sectors in GDP (*Industry* and *Service*) to control the potential effect of in-demand skills on education resources. More specifically, *Industry* accounts for value added in fields such as manufacturing, construction, and electricity, while *Service* refers to value added in fields such as retail trade, financial, professional, and personal services, including healthcare.

[28]Forand (2014); Somer-Topcu (2009); Vona (2019).
[29]D'Alimonte (2019); Kantola and Lombardo (2019); Oliver and Ostwald (2018).
[30]Jones et al. (2022); Martey et al. (2021); Patel and Annapoorna (2019); Sequeira (2021).
[31]Xie and Kang (2009); Wang and Lu (2022).
[32]Biasi et al. (2021); Khanal (2018); Mann and Bruno (2022).
[33]Kuka et al. (2020); Ngo et al. (2022).
[34]Peng et al. (2020).

Previous literature has found that economies concentrated in the industry and services sectors have a high demand for skilled human capital.[35] As education investment is a key driver to increase the capacity of skilled human capital,[36] we expected a positive effect of industry and service sectors on education resources.

External communist influence

To identify the causal relationship between political orientation and education resources, we used external communist influence (*Communist*), which has been suggested to be an important determinant of political orientation,[37] as an instrumental variable. The *Communist* was instigated by the labor movement in the 21 OECD countries, which was influenced by communist regimes in a total of 111 countries that cover approximately 95% of the world's population. The data were sourced from this past study.[38] The external communist influence was calculated as follows:

$$Communist_{i,t} = \frac{\sum_{j=1}^{111}\left(D_{j,t}^{Com}Pop_{i,j,t}/Dist_{i,j}^{Lin}\right)}{\sum_{j=1}^{111}\left(Pop_{i,j,t}/Dist_{i,j}^{Lin}\right)} \tag{1}$$

where

$$Dist_{ij}^{Lin} = 1 - \left\{\frac{\omega_{i,j}}{[0.5(\omega_i + \omega_j)]}\right\}^{\lambda} \tag{2}$$

D^{Com} is a dummy variable that takes the value of 1 if the government is dominated by a communist party and 0 otherwise; *Pop* refers to the population size. The communist influence is weighed by $Dist_{ij}^{Lin}$, which denotes the linguistic distance as a proxy for cultural distance. The spread of political (communist) ideology is more dependent on cultural and linguistic distance rather than geographic proximity. Based on the concept of a complex network analysis, $\omega_{i,j}$ is the number of nodes between languages of *i* and *j*. The linguistic distance is scaled by a parameter set to 0.5[39]. The data only cover a time span from 1870 to 2011. We kept the external communist influence constant for each country using the observations from the year 2011.

Empirical strategy

We estimated the impact of political orientation on education resources using the following equation:

$$Educ_{i,t} = \beta_0 + \beta_1 Polit_{i,t} + \beta_2 X_{i,t} + \delta_i + \varepsilon_{i,t} \tag{3}$$

where the dependent variable $Educ_{i,t}$ represents education resources measured by government expenditure, pupil-teacher ratio, and enrollment in country *i* in year *t*; $Polit_{i,t}$ refers to political orientation measured by percentage and dummy for left and right parties; $X_{i,t}$ is a vector of control variables including revenue, population ages 0–14, and the share of industry and service in the economic structure. We included country fixed effects δ_i to control for other potential factors associated with country differences. β_1 is the coefficient of interest, which represents the impact of the political orientation of left or right on education resources.

The OLS estimation of Equation (3) is likely to suffer from endogeneity problem due to the potential reverse causality. The endogeneity issue could bias the estimated effect of political orientation on education resources, but the overall direction could be either positive or negative. The abundance of educational resources could affect educational attainment, which may eventually hinder the success of left-wing parties in electoral campaigns. Previous studies have suggested that lower-educated electorate

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[35]Khan et al. (2021); Wang and Lu (2020).
[36]Balmaceda (2021); Kottelenberg and Lehrer (2019).
[37]Pop-Eleches and Tucker (2020); Snegovaya (2022).
[38]Madsen, Islam and Doucouliagos (2018).
[39]Fearon (2003).

was historically associated with voting for social democratic parties that were ideologically based on defending the rights of less off-well classes.[40] By contrast, the literature also suggested a transformation in which higher-educated voters turned to parties with more progressive policies including equality and environmental issues, while lower-educated voters supported more conservative ideologies such as anti-immigration and nationalism.[41] Therefore, the consequence of the endogeneity issue remains ambiguous.

In order to address the endogeneity problem, an exogenous variation of external communist influence on the 21 OECD countries was employed as an instrumental variable for two-stage least squares. There are two reasons why Communist could be used as a valid instrument to make causal inferences. First, the external communist influence captures the political orientation of the government and society. In political economics studies, communist influence is commonly used as a predictor of the left party's movement, as it has been recognized as a far-left ideology.[42] Therefore, we expected the communist influence to positively impact left political orientation in the first-stage regressions.

Second, the external communist influence has no direct impact on education resources but only through its effect on political orientation, which fulfills the exclusion restriction assumption of IV estimations. In the case of external communist influence, this influence predominantly shifts political ideologies and alignments, which is more relevant to ideological and political persuasion rather than direct intervention in specific policy preferences and implementations, including in education investment.[43] More specifically, in a communist system, education policies are shaped by the ideology's emphasis on societal equality, leading to state-funded education systems that aim to provide equal access and opportunities for all. Conversely, when a country transitions away from communism, ideology may shift towards development, involving a balance between maintaining educational equality and enhancing quality, innovation, and alignment with global standards. The impact of external communist influence on education investment in OECD countries is an indirect effect, resulting from changes in political orientation, rather than a direct consequence of the communist influence itself. Unlike forms of economic aid or direct investment,[44] this influence generally lacks direct mechanisms for affecting education investment, except through the alteration of political orientation.

We utilized two alternative techniques to address the endogeneity problem as a robustness check for the main results: (1) we used the IV estimator[45] to technically address the endogeneity issue, which provides the identification of a causal relationship on the condition that errors of exogenous variables are heteroskedastic; (2) we employed the System GMM,[46] which generates internal lags of endogenous variables as instruments and estimates a dynamic panel model. The System GMM model is estimated by the equation:

$$Educ_{i,t} = \beta_3 + \beta_4 Educ_{i,t-1} + \beta_5 Polit_{i,t} + \beta_6 X_{i,t} + \varepsilon_{i,t} \tag{4}$$

where $Educ_{i,t-1}$ is a lagged factor in education resources. The country-fixed effects are removed from Equation (4) because this estimator uses a dynamic small T and large N panel, which already contains country-fixed effects.[47]

Baseline results

Table 2 shows the results estimated by panel OLS and IV regressions with fixed effects. The results from columns (1) and (2) are estimated by the panel fixed-effects model, and columns (3) and (4) are estimated by panel IV regressions. There are consistent results of a statistically significant impact of

[40]Gethin et al. (2021); Piketty (2021).
[41]Edo et al. (2019).
[42]Bugajski (2020); Williams and Ishiyama (2018).
[43]Frye (2012); Otrachshenko et al. (2023).
[44]Burnside and Dollar (2000).
[45]Lewbel (2012).
[46]Blundell-Bond (1998).
[47]Roodman (2009).

Table 2. The effect of political orientation on education expenditure

Dependent variable: Government expenditure on education (% of GDP)				
	Panel OLS regressions		Pane IV regressions	
	(1)	(2)	(3)	(4)
Panel A: Second-stage results				
Left	−0.306**		−0.239***	
	(−2.49)		(−3.99)	
Right		0.028**		0.328***
		(2.43)		(2.99)
Revenue	0.052*	0.052*	0.036*	0.018
	(2.02)	(2.00)	(1.89)	(0.72)
$Pop_{age0-14}$	0.086	0.085	0.163***	0.190***
	(1.31)	(1.26)	(4.15)	(3.15)
Industry	−0.014	−0.010	−0.010	0.046
	(−0.27)	(−0.18)	(−0.16)	(0.83)
Service	0.092*	0.099*	0.049	0.116**
	(1.92)	(2.03)	(0.98)	(2.11)
Observations	655	655	655	655
No. of countries	21	21	21	21
Fixed effects	Yes	Yes	Yes	Yes
F-statistics	8.20	8.22	22.17	9.11
(*p*-value)	(0.000)	(0.000)	(0.000)	(0.000)
Panel B: First-stage information				
			(1) *Left*	(2) *Right*
Communist			0.209***	−0.152***
			(4.15)	(−2.93)
Control			Yes	Yes
Kleibergen-Paap LM statistic			17.06	8.49
for under-identification (*p*-value)			(0.000)	(0.004)

Notes: The regressions are estimated by panel OLS and IV models with fixed effects. The heteroskedasticity robust *z*-values are reported in the parentheses. The year coverage ranges from 1970 to 2020. We reported Kleibergen-Paap Lagrange Multiplier (LM) statistics for under-identification in panel B. The significant *p*-values indicate the rejection of null hypothesis that IV models are under-identified. Significance at the 10%, 5%, and 1% levels are indicated by *, **, and ***.

political orientation on education resources across all model specifications. More specifically, an increase of votes on the left parties generates a decrease in government expenditure on education, while an increase of votes on the right parties can increase the government's investment in education. As expected, the magnitude of the effect estimated by IV regressions is different from panel fixed-effects estimates, which provides further evidence that our IV models have addressed the potential endogeneity issue caused by reverse causality and omitted variables. These results also suggested that votes on the right parties have a larger impact on education resources than votes on the left parties.

Panel B from columns (3) and (4) shows the first-stage results of IV estimations. First-stage results confirmed that the external communist influence has a positive effect on left-voting in elections and a negative effect on right-voting at the 1% significance level, which is consistent with the literature.[48] We also performed a Kleibergen-Paap Lagrange Multiplier test to provide a diagnosis of the model under-identification. The null hypothesis is that IV models are under-identified, and the results rejected the

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[48]Bugajski (2020); Williams and Ishiyama (2018).

null hypothesis at the 1% significance level, which indicates the validity of our IV model. In addition, the direction of estimated coefficients of all control variables is as expected where the coefficients were statistically significant: the revenue, population aged 0–14, and service share in economic structure have a positive impact on education resources.

Robustness checks

We perform three types of robustness checks against our core results. First, we check whether our core results are driven by the specific measures of political orientation and education development used in the core model (i.e., left and right percentage measures and government expenditure on education). For this purpose, we adopt alternative measures of these two variables. In particular, we create left and right dummies which equals one if the left/right orientation is dominant (i.e., percentage share greater than 50%) and zero otherwise. This is used as an alternative measure for political orientation. We then collect data on pupil-teacher ratios as well as enrollment rates from various educational attainment levels (i.e., primary, secondary, and tertiary) and combine them using the first principal component analysis (PCA) to form overall measures of pupil-teacher ratio and enrollment rates. These then are used as two alternative measures for education development. These alternative measures of political orientation and education development are commonly used in the current literature.[49]

Second, we check whether our core results are driven by the specific estimators that we use (in particular, the specific instrumental variable we use to take care of endogeneity) in the core model. For this purpose, we adopt estimators that take care of endogeneity using artificial/constructed instruments such as the two-step System GMM and Lewbel 2SLS. The system GMM approach utilizes internal time lags as artificial instruments for the endogenous explanatory variables and is implemented in a dynamic time panel setting.[50] In doing so, we also adopt the instrument collapsing technique to ensure that the number of instruments we use is less than the number of countries.[51] The Lewbel 2SLS approach uses constructed instruments that are synthesized from exogenous control variables and the endogenous explanatory variables and is used to identify causal relationships in the event that the errors of exogenous variables exhibit heteroskedasticity.[52] The above two estimators have been widely used in the current literature to address endogeneity.[53]

Third, we examine the relationship between political orientation and education development in different economies characterized by innovation. The reasons are two folds. On the one hand, the current literature has documented a significant causal relationship between political orientation (especially in the form of government ideology) and innovation.[54] On the other hand, innovation is long argued in the standard literature to be a potential driver for education development (albeit the opposite can also be true[55]). Therefore, it's interesting to see whether innovation can be a potential moderator in the relationship between political orientation and education development. In particular, we aim to answer the question: does innovation enhance or weaken the impact of political orientation on education development?

Table 3 presents results on the alternative measures of education development. It's quite evident that the significant impact of political orientation on education development is confirmed regardless of how we measure education development. In particular, on the one hand, the left political ideology exerts a positive impact on the pupil-teacher ratio (see Column (1) in Table 3), suggesting that this ideology weakens education development, in line with the core results note that the higher the pupil-teacher ratio, the lower the education development). On the other hand, the left political ideology exerts a negative impact on enrollment rates (see Column (3) in Table 3), which also suggests the same. It needs

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[49]see e.g., Biasi et al. (2021); Khanal (2018); Mann and Bruno (2022).
[50]see Blundell and Bond (1998).
[51]see Roodman (2009).
[52]see Lewbel (2012).
[53]see e.g., Naveed and Wang (2023); Naveed and Wang (2021); Wang and Naveed (2021); Wang and Naveed (2019).
[54]see e.g., Wang et al. (2019).
[55]see e.g., Blouin et al. (2009); Spielman et al. (2008).

Table 3. The effect of political orientation on education expenditure: alternative measure of education development

	Panel IV regressions			
	(1)	(2)	(3)	(4)
	Pupil-teacher$_{pca}$	Pupil-teacher$_{pca}$	Enrollment$_{pca}$	Enrollment$_{pca}$
Second-stage results				
Left	0.322**		−8.928***	
	(2.22)		(−4.15)	
Right		8.083		12.492***
		(0.12)		(2.92)
Revenue	0.068	2.176	0.601	−0.178
	(1.61)	(0.12)	(0.95)	(−0.19)
Pop$_{age0-14}$	0.836***	13.194	−2.569*	−1.492
	(3.70)	(0.13)	(−1.73)	(−0.62)
Industry	−0.042	−2.594	0.919	3.307
	(−0.52)	(−0.12)	(0.65)	(1.62)
Service	0.097	−2.454	0.596	3.336*
	(1.06)	(−0.12)	(0.37)	(1.74)
Observations	441	441	667	667
No. of countries	18	18	20	20
Fixed effects	Yes	Yes	Yes	Yes
F-statistics	54.80	0.15	39.84	16.12
(*p*-value)	(0.000)	(0.979)	(0.000)	(0.000)
First-stage information				
	(1) *Left*	(2) *Right*	(3) *Left*	(4) *Right*
Communist	0.191***	0.008	0.219***	−0.156***
	(3.32)	(0.12)	(4.37)	(3.01)
Control	Yes	Yes	Yes	Yes
Kleibergen-Paap LM statistic for under-identification (*p*-value)	9.02 (0.003)	0.01 (0.908)	19.10 (0.000)	8.98 (0.003)

Notes: The regressions are estimated by panel IV models with fixed effects. The heteroskedasticity robust *z*-values are reported in the parentheses. The year coverage ranges from 1970 to 2020. We reported Kleibergen-Paap LM statistics for under-identification in panel B. The significant *p*-values indicate the rejection of null hypothesis that IV models are under-identified. Significance at the 10%, 5%, and 1% levels are indicated by *, **, and ***.

to be pointed out though that the impact of right political ideology on pupil-teacher ratio is insignificant. We think this may be a statistical artifact caused by the low number of observations for the pupil-teacher ratio regressions (441 versus 667 for the regressions involving enrollment, see Table 3 for details). Nevertheless, the positive impact of the right political ideology on enrollment rates is confirmed (Column (4) in Table 3), in line with expectations. In all regressions, the first-stage results once again confirm the validity of our core instrument (communist influence) with the only exception in Column (2), which has insignificant second-stage results likewise.

Table 4 presents results from alternative measures of political orientation (Columns (1) and (2)), and alternative estimators (Columns (3) to (6)). It's quite evident that regardless of how we measure political orientation (whether by percentage share or by dummies), the significant positive/negative impacts of the right/left political orientation on education development are once again confirmed. The absolute value of the positive impact of the right orientation is also greater than the absolute value of the negative impact of the left orientation, which is consistent with the core results. It's also evident that regardless of what estimators we use to address endogeneity, we obtain the same conclusion on the

Table 4. The effect of political orientation on education expenditure: alternative measure of political orientation and alternative estimator for endogeneity

Dependent variable: Government expenditure on education (% of GDP)	Political orientation: dummy		Alternative estimators			
	Panel IV regressions		Two-step System GMM		Lewbel IV	
	(1)	(2)	(3)	(4)	(5)	(6)
Second-stage results						
l. Expenditure$_{educ}$			0.771*** (5.94)	0.426*** (5.76)		
Left			−0.019** (2.61)		−0.092*** (−2.95)	
Right				0.036*** (2.98)		0.094*** (3.51)
Dominant$_{left}$	−2.665*** (−4.19)					
Dominant$_{right}$		3.801*** (3.35)				
Revenue	0.007 (0.41)	0.021 (0.99)	0.015 (0.585)	0.086** (2.10)	0.047*** (4.77)	0.044*** (4.81)
Pop$_{age0-14}$	0.178*** (4.66)	0.112*** (2.66)	0.111 (1.04)	0.179 (1.43)	0.109*** (4.07)	0.108*** (4.28)
Industry	−0.044 (−1.08)	0.018 (0.47)	−0.008 (−0.10)	0.351*** (2.66)	−0.012 (−0.46)	0.002 (0.09)
Service	0.059 (1.38)	0.067 (1.52)	0.054 (0.57)	0.364*** (3.00)	0.079*** (2.99)	0.103*** (4.09)
Observations	655	655	651	651	655	655
No. of countries	21	21	21	21	21	21
Fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
F-statistics (*p*-value)	16.65 (0.000)	10.23 (0.000)			42.90 (0.000)	47.57 (0.000)
Number of instruments	1	1	13	13	8	8
Hansen test for overidentification			8.28 (0.219)	4.04 (0.672)	0.699 (0.873)	0.778 (0.855)
AR (1) *p*-value			(0.023)	(0.014)		
AR (2) *p*-value			(0.942)	(0.407)		
First-stage information						
Instrumented	(1) *Dominant$_{left}$*	(2) *Dominant$_{right}$*				
Communist	0.019*** (4.32)	−0.013*** (−3.27)				
Control	Yes	Yes				
Kleibergen-Paap LM statistic for under-identification (*p*-value)	17.10 (0.000)	10.38 (0.001)				

Notes: The regressions are estimated by panel IV, two-step System GMM, and Lewbel IV models with fixed effects. The heteroskedasticity robust *z*-values are reported in the parentheses. The year coverage ranges from 1970 to 2020. For panel IV regressions, we reported Kleibergen-Paap LM statistics for under-identification in panel B. The significant *p*-values indicate the rejection of null hypothesis that IV models are under-identified. For System GMM regressions, we reported the number of instruments (lags) used in GMM process and ensured that the number of instruments was less than the number of countries. *l. Expenditure$_{educ}$* is the lagged dependent variable. We also reported *p*-values of AR(1) and AR(2) for System GMM regressions. Significance at the 10%, 5%, and 1% levels are indicated by *, **, and ***.

Table 5. The effect of political orientation on education expenditure: high innovation countries *vs* low innovation countries

Dependent Variable: Government expenditure on education (% of GDP)				
	High innovation (Researchers ≥ 3937)		Low innovation (Researchers < 3937)	
	(1)	(2)	(3)	(4)
Second-stage results				
Left	−0.230*** (−3.31)		−0.232 (−1.59)	
Right		0.219*** (3.58)		0.601 (0.67)
Revenue	−0.002 (−0.07)	0.017 (0.69)	0.060* (1.91)	0.048 (0.74)
$Pop_{age0-14}$	0.154** (2.50)	0.269*** (3.68)	0.178*** (3.06)	0.060 (0.45)
Industry	0.146* (2.20)	0.189*** (3.04)	−0.096* (−1.92)	0.045 (0.19)
Service	0.196*** (2.86)	0.287*** (5.12)	−0.043 (−0.58)	−0.038 (−0.24)
Observations	310	310	345	345
No. of countries	9	9	12	12
Fixed effects	Yes	Yes	Yes	Yes
F-statistics (*p*-value)	30.93 (0.000)	17.59 (0.000)	5.93 (0.000)	1.07 (0.379)
First-stage information				
Instrumented	(1) Left	(2) Right	(3) Left	(4) Right
Communist	0.286*** (3.32)	−0.301*** (−3.81)	0.133 (1.65)	−0.051 (−0.65)
Control	Yes	Yes	Yes	Yes
Kleibergen-Paap LM statistic for under-identification (*p*-value)	12.68 (0.000)	11.77 (0.001)	2.78 (0.096)	0.44 (0.507)

Notes: The regressions are estimated by panel IV models with fixed effects. The heteroskedasticity robust *z*-values are reported in the parentheses. The year coverage ranges from 1970 to 2020. We split sample into high R&D and low R&D countries by the median number of researchers in R&D (per million people). We reported Kleibergen-Paap LM statistics for under-identification in panel B. The significant *p*-values indicate the rejection of null hypothesis that IV models are under-identified. Significance at the 10%, 5%, and 1% levels are indicated by *, **, and ***.

relationship between political orientation and education development. In both the System GMM (Columns (3) and (4)) and Lewbel 2SLS (Columns (5) and (6)) regressions, the positive impact of the right orientation once again outweighs the negative impact of the left orientation, in line with core results. Moreover, in the system GMM regressions, there's evidence of first-order autocorrelation, but no second-order autocorrelation. The Hansen tests of overidentification in all regressions from Columns (3) to (6) pass, which suggests the validity of the artificial and constructed instruments used in System GMM and Lewbel 2SLS.

Finally, Table 5 presents results from splitting the sample using innovation. We use the median value of number of researchers per 100,000, which equals 3,937 in our 21-country sample, as the criteria to split the sample. In particular, the impact of political orientation on education development is only significant in the high innovation sample (Columns (1) and (2)). However, it needs to be pointed out that the low innovation sample yields consistent direction of impacts (i.e., positive impact from the right, and negative from the left), albeit the impacts are insignificant with the impact from the left at the

borderline in terms of significance at 10%. We think this result could suggest that innovation is an important moderator in the relationship between political orientation and education development. In other words, a country needs to be at certain innovation level for the political ideology to impact education development. The divergent views on politics from society may not translate into divergent views on education development if innovation is not high enough to generate such incentive. This result therefore is important for policymakers who may want to take advantage of this relationship between political orientation and education development, since innovation level may be an inhibitor/enabler of such relationship.

Conclusion

In sum, this paper explores the potential causal relationship between political orientation and education development using a panel data of 21 OECD countries from 1970 to 2020 by utilizing estimators that address endogeneity (i.e. 2SLS, System GMM, and Lewbel 2SLS) and have found empirical evidence to support the following:

First, using communist influence as a physical instrument for political orientation, our results find that political orientation has a statistically significant impact on education investment policies. An increase in leftist party votes can decrease government expenditure on education, while an increase in rightist party votes can increase government investment in education. In addition, we find that rightist orientation has a stronger impact on education than leftist orientation.

Second, our results are robust against a number of sensitivity checks including alternative measures of political orientations and education development, alternative estimators that take care of endogeneity (i.e., System GMM and Lewbel 2SLS), and the moderation effect of innovation in the relationship between political orientation and education development. In all these robustness checks, the positive/ negative impacts of the right/left political orientation on education development are consistent with the core results. Moreover, the absolute value of the positive impact from the right outweighs the absolute value of the negative impact from the left, in line with the core results.

Third, the above results have profound implications for policymakers who aim to boost education investment and development in their countries. On the one hand, the significant impacts of political orientations on education suggest that policymakers should aim to avoid the impact of party politics on education policymaking. There needs to be perhaps an independent organization set up to oversee the making and implementation of education policies (much like how a country's central bank should be independent from the political system) so that the impact of politics on education can be minimized. On the other hand, the above policy recommendations should only be used in the context of the level of a country's innovation development. For countries that are currently experiencing low level of innovation development, the above imperatives may be less relevant for policymakers, as the impacts of political orientation on education investment in this case is insignificant. However, as a country develops further into a mature economy with high level of innovativeness, policymakers should think more about the impacts of political orientation on education investment. Moreover, the differing impacts of right versus left-leaning politics on education investment (which are opposite to each other), also have significant implications for policymakers. For example, in case a dominant left-leaning political environment is in place, policymakers may need to make stronger political advice to their leadership in order to maintain an adequate level of public education funding and investment. This need may be less for a political environment that's dominated by the right-leaning politics. However, this is not to say that any type of political orientation should be a factor in education investment policymaking, but that these conditions should be considered by policymakers to avoid and potentially offset when making education investment policies.

References

Abdullah, A., H. Doucouliagos, and E. Manning. 2015. "Does Education Reduce Income Inequality? A Meta-Regression Analysis." *Journal of Economic Surveys* 29 (2): 301–316.

Aidt, T.S. 2016. "Rent Seeking and the Economics of Corruption." *Constitutional Political Economy* 27 (2): 142–157.

Alesina, A., R. Perotti, F. Giavazzi, and T. Kollintzas. 1995. "Fiscal Expansions and Adjustments in OECD Countries." *Economic Policy* 10 (21): 205.

Alonso, S., and S.C.da. Fonseca. 2012. "Immigration, Left and Right." *Party Politics* 18 (6): 865–884.

Ángeles Castro, G., and D.B. Ramírez Camarillo. 2014. "Determinants of Tax Revenue in OECD Countries over the Period 2001–2011." *Contaduría y Administración* 59 (3): 35–59.

Ariu, A., F. Docquier, and M.P. Squicciarini. 2016. "Governance Quality and Net Migration Flows." *Regional Science and Urban Economics* 60: 238–248.

Arshed, N., A. Anwar, M.S. Hassan, and S. Bukhari. 2019. "Education Stock and its Implication for Income Inequality: The Case of Asian Economies." *Review of Development Economics* 23 (2): 1050–1066.

Arshed, N., A. Anwar, N. Kousar, and S. Bukhari. 2018. "Education Enrollment Level and Income Inequality: A Case of SAARC Economies." *Social Indicators Research* 140 (3): 1211–1224.

Balmaceda, F. 2021. "A Failure of the Market for College Education and on-the-Job Human Capital." *Economics of Education Review* 84: 102165. https://doi.org/10.1016/j.econedurev.2021.102165

Berliner, D., A. Greenleaf, M. Lake, and J. Noveck. 2015. "Building Capacity, Building Rights? State Capacity and Labor Rights in Developing Countries." *World Development* 72: 127–139.

Biasi, B., J. Lafortune, and D. Schönholzer. 2021. "School Capital Expenditure Rules and Distribution." *AEA Papers and Proceedings* 111: 450–454.

Bjørnskov, C., and N. Potrafke. 2013. "The Size and Scope of Government in the US States: does Party Ideology Matter?" *International Tax and Public Finance* 20 (4): 687–714.

Blouin, R.A., W.H. Riffee, E.T. Robinson, D.E. Beck, C. Green, P.U. Joyner, … & G.M. Pollack. 2009. "Roles of Innovation in Education Delivery." *American Journal of Pharmaceutical Education* 73 (8): 154.

Blundell, R., and S. Bond. 1998. "Initial Conditions and Moment Restrictions in Dynamic Panel Data Models." *Journal of Econometrics* 87 (1): 115–143.

Bove, V., G. Efthyvoulou, and A. Navas. 2017. "Political Cycles in Public Expenditure: Butter vs Guns." *Journal of Comparative Economics* 45 (3): 582–604.

Bugajski, Janusz. 2020. *Political Parties of Eastern Europe: A Guide to Politics in the Post-communist Era*. Oxfordshire: Routledge. https://doi.org/10.4324/9781003075523

Burnside, C., and D. Dollar. 2000. "Aid, Policies, and Growth." *American Economic Review* 90 (4): 847–868.

Coady, D., and A. Dizioli. 2018. "Income Inequality and Education Revisited: Persistence, Endogeneity and Heterogeneity." *Applied Economics* 50 (25): 2747–2761.

D'Alimonte, R. 2019. "How the Populists Won in Italy." *Journal of Democracy* 30 (1): 114–127.

Edo, A., Y. Giesing, J. Öztunc, and P. Poutvaara. 2019. "Immigration and Electoral Support for the Far-Left and the Far-Right." *European Economic Review* 115: 99–143.

Edquist, C. 2019. "Towards a Holistic Innovation Policy: Can the Swedish National Innovation Council (NIC) be a Role Model?" *Research Policy* 48 (4): 869–879.

Fearon, J. 2003. "Ethnic and Cultural Diversity by Country." *Journal of Economic Growth* 8 (2): 195–222.

Forand, J.G. 2014. "Two-Party Competition with Persistent Policies." *Journal of Economic Theory* 152: 64–91.

Frye, T. 2012. "In from the Cold: Institutions and Causal Inference in Postcommunist Studies." *Annual Review of Political Science* 15: 245–263.

Gethin, A., C. Martínez-Toledano, and T. Piketty. 2021. "Brahmin Left Versus Merchant Right: Changing Political Cleavages in 21 Western Democracies," 1948–2020." *The Quarterly Journal of Economics* 137 (1): 1–48.

Gethin, A., C. Martínez-Toledano, and T. Piketty. 2022. "Brahmin left versus merchant right: Changing political cleavages in 21 Western Democracies, 1948–2020." *The Quarterly Journal of Economics* 137 (1): 1–48.

Gingrich, J., and S. Häusermann. 2015. "The Decline of the Working-Class Vote, the Reconfiguration of the Welfare Support Coalition and Consequences for the Welfare State." *Journal of European Social Policy* 25 (1): 50–75.

Gundry, L.K., L.F. Ofstein, and J.R. Kickul. 2014. "Seeing Around Corners: How Creativity Skills in Entrepreneurship Education Influence Innovation in Business." *The International Journal of Management Education* 12 (3): 529–538.

Habibi, F., and M.A. Zabardast. 2020. "Digitalization, Education and Economic Growth: A Comparative Analysis of Middle East and OECD Countries." *Technology in Society* 63: 101370. https://doi.org/10.1016/j.techsoc.2020.101370

Häusermann, S., G. Picot, and D. Geering. 2013. "Review Article: Rethinking Party Politics and the Welfare State – Recent Advances in the Literature." *British Journal of Political Science* 43 (1): 221–240.

Herwartz, H., and B. Theilen. 2014. "Health Care and Ideology: A Reconsideration of Political Determinants of Public Healthcare Funding in the OECD." *Health Economics* 23 (2): 225–240.

Jones, P.A., V. Reitano, and C. Buerger. 2022. "Fiscal Shocks, Budgetary Pressures, and Public Education Expenditure Stabilization." *International Journal of Public Administration* 45 (2): 147–156.

Kantola, J., and E. Lombardo. 2019. "Populism and Feminist Politics: The Cases of Finland and Spain." *European Journal of Political Research* 58 (4): 1108–1128.

Kerrissey, J. 2015. "Collective Labor Rights and Income Inequality." *American Sociological Review* 80 (3): 626–653.

Khan, Z., S. Ali, K. Dong, and R.Y.M. Li. 2021. "How does Fiscal Decentralization Affect CO2 Emissions? The Roles of Institutions and Human Capital." *Energy Economics* 94: 105060. https://doi.org/10.1016/j.eneco.2020.105060

Khanal, S. 2018. "Gender Discrimination in Education Expenditure in Nepal: Evidence from Living Standards Surveys." *Asian Development Review* 35 (1): 155–174.

Kottelenberg, M.J., and S.F. Lehrer. 2019. "How Skills and Parental Valuation of Education Influence Human Capital Acquisition and Early Labor Market Return to Human Capital in Canada." *Journal of Labor Economics* 37 (S2): S735–S778.

Kuka, E., N. Shenhav, and K. Shih. 2020. "Do Human Capital Decisions Respond to the Returns to Education? Evidence from DACA." *American Economic Journal: Economic Policy* 12 (1): 293–324.

Lewbel, A. 2012. "Using Heteroscedasticity to Identify and Estimate Mismeasured and Endogenous Regressor Models." *Journal of Business & Economic Statistics* 30 (1): 67–80.

Madsen, J. B., Md. R. Islam, and H. Doucouliagos. 2018. "Inequality, Financial Development and Economic Growth in the OECD, 1870–2011." *European Economic Review* 101: 605–624.

Madsen, J. B., C. Wang, and B. Steiner. 2017. "The creation of effective states in the OECD since 1870: The role of inequality." *European Journal of Political Economy* 50: 106–121.

Mann, B.A., and P. Bruno. 2022. "The Effects of Charter School Enrollment Losses And Tuition Reimbursements on School Districts: Lifting Boats or Sinking Them?" *Educational Policy* 36 (5): 1078–1107.

Marquez-Ramos, L., and E. Mourelle. 2019. "Education and Economic Growth: An Empirical Analysis of Nonlinearities." *Applied Economic Analysis* 27 (79): 21–45.

Martey, E., P.M. Etwire, and D. Atinga. 2021. "To Attend or Not to Attend: Examining the Relationship Between Food Hardship, School Attendance and Education Expenditure." *International Journal of Educational Development* 80: 102304. https://doi.org/10.1016/j.ijedudev.2020.102304

Meyer, A.G. 2017. "The Impact of Education on Political Ideology: Evidence from European Compulsory Education Reforms." *Economics of Education Review* 56: 9–23.

Murillo, M.V., and A. Schrank. 2005. "With a Little Help from my Friends." *Comparative Political Studies* 38 (8): 971–999.

Naveed, A., and C. Wang. 2021. "Can Attitudes Toward Immigrant Explain Social Integration in Europe? EU versus Non-EU Migrant." *Social Indicators Research* 153 (1): 345–383.

Naveed, A., and C. Wang. 2023. "Innovation and Labour Productivity Growth Moderated by Structural Change: Analysis in a Global Perspective." *Technovation* 119: 102554. https://doi.org/10.1016/j.technovation.2022.102554

Ngo, T., H.H. Trinh, I. Haouas, and S. Ullah. 2022. "Examining the Bidirectional Nexus Between Financial Development and Green Growth: International Evidence through the Roles of Human Capital and Education Expenditure." *Resources Policy* 79: 102964. https://doi.org/10.1016/j.resourpol.2022.102964

OECD. 2022. *Education at a Glance 2022: OECD Indicators*. Paris: OECD Publishing. https://doi.org/10.1787/3197152b-en

Oliver, S., and K. Ostwald. 2018. "Explaining Elections in Singapore: Dominant Party Resilience and Valence Politics." *Journal of East Asian Studies* 18 (2): 129–156.

Otrachshenko, V., M. Nikolova, and O. Popova. 2023. "Double-Edged Sword: Persistent Effects of Communist Regime Affiliations on Well-Being and Preferences." *Journal of Population Economics* 36 (3): 1139–1185.

Patel, G., and M.S. Annapoorna. 2019. "Public Education Expenditure and Its Impact on Human Resource Development in India: An Empirical Analysis." *South Asian Journal of Human Resources Management* 6 (1): 97–109.

Peng, H., L. Qi, G. Wan, B. Li, and B. Hu. 2020. "Child Population, Economic Development and Regional Inequality of Education Resources in China." *Children and Youth Services Review* 110: 104819. https://doi.org/10.1016/j.childyouth.2020.104819

Pickering, A.C., and J. Rockey. 2013. "Ideology and the Size of US State Government." *Public Choice* 156 (3–4): 443–465.

Piketty, T. 2021. *Political Cleavages and Social Inequalities*. Cambridge, MA: Harvard University Press. https://doi.org/10.4159/9780674269910

Pop-Eleches, G., and J.A. Tucker. 2020. "Communist Legacies and Left-Authoritarianism." *Comparative Political Studies* 53 (12): 1861–1889.

Potrafke, N. 2011. "Public Expenditures on Education and Cultural Affairs in the West German States: Does Government Ideology Influence the Budget Composition?" *German Economic Review* 12 (1): 124–145.

Roodman, D. 2009. "How to do Xtabond2: An Introduction to Difference and System GMM in Stata." *The Stata Journal: Promoting Communications on Statistics and Stata* 9 (1): 86–136.

Sahnoun, M., and C. Abdennadher. 2022. "Returns to Investment in Education in the OECD Countries: Does Governance Quality Matter?" *Journal of the Knowledge Economy* 13 (3): 1819–1842.

Sequeira, T.N. 2021. "Inflation, Economic Growth and Education Expenditure." *Economic Modelling* 99: 105475. https://doi.org/10.1016/j.econmod.2021.02.016

Snegovaya, M. 2022. "How Ex-Communist Left Parties Reformed and Lost." *West European Politics* 45 (4): 716–743.

Somer-Topcu, Z. 2009. "Timely Decisions: The Effects of Past National Elections on Party Policy Change." *The Journal of Politics* 71 (1): 238–248.

Spielman, D.J., J. Ekboir, K. Davis, and C.M. Ochieng, 2008. "An Innovation Systems Perspective on Strengthening Agricultural Education and Training in sub-Saharan Africa." *Agricultural Systems* 98 (1): 1–9.

Tavares, J. 2004. "Does Right or Left Matter? Cabinets, Credibility and Fiscal Adjustments." *Journal of Public Economics* 88 (12): 2447–2468.

Tavits, M., and N. Letki. 2009. "When Left is Right: Party Ideology and Policy in Post-Communist Europe." *American Political Science Review* 103 (4): 555–569.

Vivarelli, M. 2014. "Innovation, Employment and Skills in Advanced and Developing Countries: A Survey of Economic Literature." *Journal of Economic Issues* 48 (1): 123–154.

Vona, F. 2019. "Job Losses and Political Acceptability of Climate Policies: Why the 'Job-Killing' Argument is so Persistent and How to Overturn it." *Climate Policy* 19 (4): 524–532.

Wang, C., and Y. Lu. 2020. "Can Economic Structural Change and Transition Explain Cross-Country Differences in Innovative Activity?" *Technological Forecasting and Social Change* 159: 120194. https://doi.org/10.1016/j.techfore.2020.120194.

Wang, C., and Y. Lu. 2022. "Regional Favouritism and Education Development." *Regional Studies, Regional Science* 9 (1): 302–319.

Wang, C., and A. Naveed, 2019. "The Social Inclusion and Inequality Nexus: EU versus Non-EU Migrants." *International Migration* 57 (3): 41–62.

Wang, C., and A. Naveed. 2021. "Can Women Empowerment Explain Cross-Country Differences in Inequality? A Global Perspective." *Social Indicators Research* 158: 667–697.

Wang, Q.-J., G.-F. Feng, Y.E. Chen, J. Wen, and C.-P. Chang. 2019. "The Impacts of Government Ideology on Innovation: What are the Main Implications?" *Research Policy* 48 (5): 1232–1247.

Williams, C., and J. Ishiyama. 2018. "Responding to the Left: the Effect of Far-Left Parties on Mainstream Party Euroskepticism." *Journal of Elections, Public Opinion and Parties* 28 (4): 443–466.

Xie, H., and J. Kang. 2009. "Relationships Between Environmental Noise and Social–Economic Factors: Case Studies Based on NHS Hospitals in Greater London." *Renewable Energy* 34 (9): 2044–2053.