

## Appendix- Supporting Information and Tables

### Supporting Information 1: Robustness of Results in Table 1

To verify the robustness of our findings in Table 2, we focus on Model 3 and add other variables likely to affect the fiscal balance including: international and civil war duration dummies (Correlates of War); European Community/European Union membership dummy; dummy for countries of the former Soviet Union; dummy variables for presidential systems, proportional representation electoral systems and closed list electoral systems (Beck et al. 2010). Our results remain almost identical. To expand coverage to 1960-2007, we exclude the capital account openness variable (available only from 1970) and re-estimate our models. To reflect the bulk of CBI reform in developing countries we limit our sample to years beginning in the 1980s or the 1990s. Increasing or reducing the number of observations does not affect the substance of the results. The results are also robust if we do not use observations with high inflation rates (yearly inflation of 50% or 100%). To mitigate a possible simultaneity bias between Polity IV and the fiscal balance, we use the lagged five-year moving average of the Polity IV score and the results remain supportive. Excluding prominent outliers (Germany, the US, Switzerland) does not change our results. We also include five or ten year moving average inflation lags to capture country inflation aversion and our results remain robust, while past inflation reduces fiscal deficits.<sup>1</sup> To further try to alleviate concerns about the role of such aversion, we also use the average CBI in the past 5 years and the five year lag of CBI in our models, and the estimates remain similar.

Government debt may be another important determinant of fiscal balance, as large outstanding liabilities likely increase the cost of new debt. In addition, fiscal deficits may result from governments' reaction to severe financial crises, a situation in which central banks concerned with financial stability may accommodate deficits. Also, international financial conditions may be yet another determinant of fiscal deficits. We include these variables in our GMM models and the results continue to hold, while greater debt to GDP ratios reduce fiscal deficits<sup>2</sup>, banking crises<sup>3</sup> indeed result in fiscal deficits, and increases in the US federal funds rate<sup>4</sup> improve fiscal balance. We also include the deposit interest rate (WDI) in our Model 3. It may be the case that CBI does not deter

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<sup>1</sup> Hayo (1998) suggests this is a reasonable strategy.

<sup>2</sup> The ratio of central government (foreign and domestic) debt (Reinhardt and Rogoff 2011). We lose 470 observations when using this variable.

<sup>3</sup> Reinhardt and Rogoff (2011). We lose 374 observations when banking crises are included.

<sup>4</sup> <http://www.federalreserve.gov/releases/h15/data.htm> accessed 9/23/2013.

fiscal spending, but rather that fiscal deficits react consistently to central bank raising interest rates. Estimations show that higher interest rates reduce deficits, while out results remain unchanged.<sup>5</sup> Furthermore, the application of the Mundell-Fleming open economy model to our theory (Oatley 1999, Clark and Hallerberg 2000, Clark 2003), suggests that the effect of CBI on fiscal deficits may be contingent on the exchange rate regime and the international mobility of capital. That is, the ability of central banks to deter fiscal spending (through interest rate increases) may be lower under fixed exchange rates and mobile capital. We include in Model 3 interactions of CBI and fixed exchange rates, triple interactions of CBI, fixed rates and capital mobility, in both the full sample and for democracies only, as well as a triple interaction of CBI, fixed exchange rates and democracy. We do not find that CBI's effect on fiscal deficit is conditioned by the exchange rate regime and the mobility of capital.

Finally, fiscal balance is accomplished either by reducing expenditure or increasing revenue. Appendix Table A4 (Models 10&11) uses as dependent variables the government's fiscal revenue, and, respectively, expenditure scaled to GDP. The CBI index, the Polity IV score and their interaction have no effect on fiscal revenue relative to GDP (Model 10). Model 11 shows, however, that for fiscal spending the interaction between the CBI index and the Polity IV score is negative and statistically significant. Looking at the conditional relationship graphically, the marginal effect of the CBI index on fiscal expenditure is negative and statistically significant at high levels of the Polity IV score (Appendix Figure A2). This means that CBI likely affects the fiscal balance through less spending (smaller government), rather than boosting revenue.

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<sup>5</sup> 446 observations are lost. We use deposit rates because they react to central bank monetary policy and using directly central bank discount rates means losing 50% of the sample.

Table A1. Fiscal Balance across Regions and Time

	Fiscal deficits (% of GDP)	Observations	Revenue (% of GDP)	Observations	Expenditure (% of GDP)	Observations
All Observations	-2.19	5,355	24.01	5,247	26.14	5236
Western World	-1.55	1,252	27.79	1,255	29.33	1233
Eastern Europe	-2.56	481	33.02	473	35.45	473
Latin America	-2.35	1,033	17.84	1,021	20.24	1016
Sub-Saharan Africa	-2.71	1,038	20.73	992	23.06	1006
Asia	-1.69	713	18.56	699	20.36	694
North Africa and the Middle East	-2.06	552	29.79	521	32	524
1960s	-1.29	519	18.26	539	19.30	528
1970s	-1.96	935	22.36	924	24.09	925
1980s	-3.44	1,029	25.13	1,023	28.44	1030
1990s	-2.81	1,368	25.24	1,339	27.95	1340
2000's (2000-2007)	-1.35	1,237	27.38	1,145	28.91	1140

Table A2. Descriptive Statistics

Variables	Observations	Mean	Standard Deviation	Minimum	Maximum	Data Sources
Fiscal balance	2,031	-1.92	4.99	-36.65	26.1	Various Data Sources (a)
Fiscal Expenditure	1,997	27.35	11.04	0.14	78.83	Various Data Sources (a)
Fiscal Revenue	1,997	25.43	10.7	0.16	73.1	Various Data Sources (a)
Central Bank Independence (CBI)	2,031	0.46	0.21	0.06	0.95	Bodea & Hicks (2012)
Polity IV scores	2,031	15.78	5.81	1	20	Polity IV Project
Freedom House Index	1,952	8.69	3.15	0	12	Freedom House
Political Constraints (PolCon)	2,028	0.35	0.18	0	0.7	Henisz (2002)
Executive Constraints	2,009	5.64	1.9	1	7	Polity IV Project
Freedom of Press	1,610	1.34	0.75	0	2	Freedom House
Elections	2,031	0.31	0.46	0	1	Goemans (2009), NELDA, and author corrections (b)
GDP percapita	2,031	8.74	0.84	6.7	10.35	Maddison (2012)
GDP Growth	2,031	3.57	4.61	-30.9	34.5	World Development Indicators
Trade Openness	2,031	63.21	52.05	1.26	412.87	World Development Indicators
Capital Account Openness	2,031	0.46	1.51	-1.83	2.5	Chin & Ito (2008)
Fixed Exchange Rate Regime	2031	0.56	0.49	0	1	Ilzetzki, Reinhart & Rogoff (2008)
Population over aged 65	2,031	8.73	4.7	2.4	20.9	World Development Indicators
GDP deflator	2,031	54.02	478.61	-9.21	13611.6	World Development Indicators
Oil-Gas Rent percapita (100s)	2,031	3.07	11.26	0	191.69	Ross (2011)
Judicial independence	2012	0.614304	0.271294	0.0254	0.9869	Linzer and Staton (2012)
The Number of Strikes	2,031	0.22	0.67	0	7	Cross-National Time-Series Data Archive

Note: (a): Government Financial Indicators (IMF) , International Financial Indicators (IMF), IMF Annual Country Report, OECD Statistics, EBRD Transition Reports, and Brender & Drazen (2006). (b): Nohlen, Dieter eds, Elections in Asia (2001), Elections in Africa (1999), Elections in the Americas (2005), Elections in Europe (2010).

Table A3. Fiscal Balance and Democracy: Mechanisms

	Model 7 System GMM	Model 8 System GMM	Model 9 System GMM
Central Bank Independence (CBI)	-1.099* (0.660)	-2.666** (1.170)	-0.591 (0.738)
Political Constraints (PolCon)	-1.707* (0.876)		
CBI*PolCon	3.155** (1.430)		
Executive Constraint		-0.248*** (0.088)	
CBI*Executive Constraint		0.480*** (0.186)	
Freedom of Press			-0.272 (0.229)
CBI*Freedom of Press			0.614 (0.409)
Elections	-0.197 (0.128)	-0.181 (0.129)	-0.211 (0.147)
GDP Growth (t-1)	0.019 (0.024)	0.019 (0.025)	0.022 (0.028)
Logged GDP per capita (t-1)	-0.041 (0.127)	-0.040 (0.141)	-0.154 (0.138)
Trade Openness (t-1)	0.003** (0.001)	0.003** (0.001)	0.003** (0.002)
Capital Controls (t-1)	0.058 (0.041)	0.058 (0.045)	0.069 (0.047)
Fixed Exchange Rate Regime	0.058 (0.134)	0.062 (0.146)	-0.003 (0.171)
Population over 65	0.002 (0.021)	0.003 (0.021)	0.014 (0.020)
GDP Deflator (t-1)	0.001*** (0.000)	0.001*** (0.000)	0.001*** (0.000)
Oil-Gas value per capita (t-1)	0.022*** (0.005)	0.023*** (0.005)	0.023*** (0.005)
Number of Strikes (t-1)	-0.029 (0.118)	-0.024 (0.115)	0.040 (0.142)
Constant	0.470 (1.038)	1.801 (1.148)	1.604 (1.255)
Observations	1,947	1,928	1,579
Countries	78	78	78
Wald chi-squared	7126.24***	6765.02***	5671.96***
GMM specification tests (p values)			
Arellano-Bond test for AR(2) in first differences	0.35	0.34	0.30
The Hansen test of overidentifying restrictions	0.37	0.38	0.44

Note: Dependent variable is fiscal balance (positive values for surpluses; negative values for deficits). \*\*\* p<0.01, \*\* p<0.05, \* p<0.1, Robust standard errors in parenthesis. All models include 5 year period dummies.

Table A4. CBI, Fiscal Revenue and Expenditure

Dependent Variable Statistical Model	Model 10	Model 11
	Fiscal Revenue System GMM	Fiscal Expenditure System GMM
Central Bank Independence (CBI)	0.960 (0.920)	3.003** (1.170)
Polity IV	0.057*** (0.020)	0.124*** (0.032)
CBI*Polity IV	-0.062 (0.051)	-0.201*** (0.066)
Fiscal Revenue (t-1)	0.893*** (0.045)	0.062 (0.049)
Fiscal Expenditure (t-1)	0.046 (0.045)	0.861*** (0.053)
Elections	-0.411*** (0.136)	-0.219 (0.168)
GDP Growth (t-1)	0.085*** (0.029)	0.058 (0.035)
Logged GDP per capita (t-1)	-0.139 (0.150)	-0.134 (0.195)
Trade Openness (t-1)	0.002 (0.002)	-0.001 (0.002)
Capital Controls (t-1)	-0.052 (0.042)	-0.116* (0.061)
Fixed Exchange Rate Regime	0.128 (0.142)	0.090 (0.174)
Population over 65	0.081** (0.036)	0.104** (0.044)
GDP Deflator (t-1)	0.0001*** (0.00001)	-0.001*** (0.00001)
Oil-Gas value per capita (t-1)	0.014*** (0.006)	-0.010 (0.006)
Number of Strikes (t-1)	-0.008 (0.098)	0.001 (0.099)
Constant	1.010 (1.325)	0.583 (1.788)
Observations	1,930	1,930
Number of Countries	78	78
Wald chi-squared	22762.43***	23012.24***
GMM specification tests (p values)		
Arellano-Bond test for AR(2) in first differences	0.83	0.99
The Hansen test of overidentifying restrictions	0.97	0.86

Note: \*\*\* p<0.01, \*\* p<0.05, \* p<0.1, Robust standard errors in parenthesis. All models include 5 year period dummies. Both models include the lagged dependent variable. <sup>F</sup>: significant at p<0.1 in a joint F test.

Table A5. Fiscal Balance: CBI, Elections and Partisanship in Democracies

	Model 12	Model 13	Model 14	Model 15
Dependent Variable	Fiscal Balance	Fiscal Balance	Fiscal Balance	Fiscal Balance
Statistical Model	System GMM	System GMM	System GMM	System GMM
Sample	All Democracies	Non-Western Democracies	All Democracies	Non-Western Democracies
Central Bank Independence (CBI)	1.207* (0.686)	2.621* (1.357)	0.673 (0.662)	1.683 (1.171)
Elections	0.363 (0.475)	0.967 (0.860)	-0.158 (0.152)	0.031 (0.234)
CBI*Elections	-1.048 (0.818)	-1.641 (1.337)		
Leftist Government			-0.053 (0.321)	-0.794 (0.650)
CBI*Leftist Government			0.500 (0.568)	2.301** (1.108)
Fiscal Balance (t-1)	0.638*** (0.064)	0.507*** (0.058)	0.633*** (0.065)	0.489*** (0.059)
GDP Growth (t-1)	0.080** (0.034)	0.048 (0.037)	0.075** (0.033)	0.034 (0.033)
Logged GDP per capita (t-1)	0.280 (0.249)	0.322 (0.344)	0.270 (0.248)	0.194 (0.351)
Trade Openness (t-1)	0.002 (0.002)	0.003 (0.003)	0.002* (0.001)	0.004 (0.003)
Fixed Exchange Rate Regime	-0.051 (0.219)	0.576 (0.468)	-0.024 (0.224)	0.707 (0.475)
Population over 65	0.003 (0.038)	0.046 (0.072)	0.006 (0.037)	0.094 (0.075)
GDP Deflator (t-1)	0.001*** (0.000)	0.000*** (0.000)	0.000*** (0.000)	0.000*** (0.000)
Capital Controls (t-1)	0.085 (0.084)	0.003 (0.126)	0.089 (0.083)	0.010 (0.127)
Oil-Gas Value per capita (t-1)	0.043*** (0.009)	0.046** (0.021)	0.043*** (0.009)	0.051** (0.022)
Number of Strikes (t-1)	-0.206* (0.111)	-0.366** (0.170)	-0.214* (0.009)	-0.400** (0.171)
Constant	-4.123* (2.462)	-5.761* (3.002)	-4.004 (2.519)	-4.538 (2.985)
Observations	1,218	597	1218	597
Number of Countries	63	42	63	42
Wald chi-squared	3076.75***	4391.42***	8235.59***	9029.27***
GMM specification tests (p values)				
The Arellano-Bond test for AR(2) in first differences	0.437	0.477	0.442	0.492
The Hansen test of overidentifying restrictions	0.61	0.379	0.608	0.383

Note: \*\*\* p<0.01, \*\* p<0.05, \* p<0.1, Robust standard errors in parenthesis All models include regional and 5 year period dummies. Sample is restricted to observations with a Polity IV score greater or equal to 8.

Table A6. Countries Included in the Empirical Models

Albania	1991-2007	Kenya	1970-2007
Argentina	1970-2004	Korea (South)	1970-2007
Armenia	1993-2007	Kyrgyzstan	1992-2007
Australia	1970-2007	Latvia	1993-2007
Austria	1970-1998 (a)	Lithuania	1992-2007
Azerbaijan	1992-2007	Macedonia	1994-2007
Belarus	1992-2007	Malaysia	1970-2007
Belgium	1970-1998 (a)	Mexico	1971-2007
Bolivia	1970-2007	Moldova	1992-2007
Botswana	1974-2007	Mongolia	1995-2007
Brazil	1970-2007	Netherlands	1970-1998 (a)
Bulgaria	1990-2007	New Zealand	1970-2007
Canada	1970-2007	Nicaragua	1970-2004
Czech Republic	1993-2007	Norway	1970-2007
Chile	1970-2007	Panama	1980-1998
Columbia	1970-2007	Paraguay	1989-2007
Costa Rica	1970-2007	Peru	1970-2007
Croatia	1992-2007	Philippines	1970-2007
Denmark	1970-2007	Poland	1991-2007
Dominican Republic	1989-2007	Portugal	1970-1998 (a)
El Salvador	1993-2007	Romania	1990-2007
Estonia	1992-2007	Russia	1992-2007
Finland	1970-1998 (a)	Singapore	1970-2004
France	1971-1998 (a)	Slovenia	1992-2007
Georgia	1994-2007	Slovak Republic	1994-2007
West Germany	1971-1989	South Africa	1970-2007
Germany	1990-1998	Spain	1970-1998 (a)
Greece	1970-2000	Sweden	1970-2007
Guatemala	1989-2007	Switzerland	1996-2001
Honduras	1970-2007	Tajikistan	1992-2007
Hungary	1990-2007	Thailand	1992-2003
India	1970-2007	The United Kingdom	1970-2007
Indonesia	1970-2007	The United States	1971-2007
Ireland	1970-1998 (a)	Trinidad	1993-2007
Israel	1970-2007	Turkey	1970-2001
Italy	1970-1998 (a)	Turkmenistan	1992-2007
Jamaica	1992-2007	Ukraine	1992-2007
Japan	1970-2007	Uruguay	1970-2007
Kazakhstan	1992-2007	Venezuela	1970-2005
		Zimbabwe	1984-2001

Note: (a) Due to the introduction of the euro (January 1999) we do not extend the data to 1999-2007 for these countries.



Table A7. Central Bank Independence Index and Reform Years

Creation of the CBI index

For each of the indicators, possible scores run in intervals from 0 to 1 with the intervals depending on the number of categories. For example, there are five categories in the central bank governor's term of office indicator: 0=under four years or at the discretion of the appointer; .25=4 year appointment; 0.50=5 years; 0.75=6 to 8 years; 1=more than 8 years. Scores from the individual indicators are then aggregated into their broader categories as such: the four indicators in the CEO category are averaged; policy formation is a weighted average of the 3 components with who formulates monetary policy and role in government's budgetary process worth a quarter and resolution of conflict worth one half; objectives and the first four indicators in limitations on lending were each treated separately; finally the last four indicators in limitations on lending were averaged. These aggregate scores were then summed to get an unweighted average independence score.<sup>6</sup> To get the weighted average used in most studies, including this one, the weights listed in the Appendix were applied to each of the aggregate scores and then the totals were summed. The aggregate CWN scores range from a possible 0 to a possible 1, with 1 representing the most independent possible central bank.

Components of the Cukierman, Webb, and Neyapti index

Chief Executive Officer (weight = .20)

- (a) Term of office (6 categories)
- (b) Who appoints CEO? (6 categories)
- (c) Dismissal (7 categories)
- (d) May CEO hold other offices in government (3 categories)

Policy Formation (weight = .15)

- (a) Who formulates monetary policy? (4 categories)
- (b) Resolution of conflict (6 categories)
- (c) Role in government's budgetary process (2 categories)

Objectives (weight = .15; 6 categories)

Limitations on lending to the government

Part 1 (weight = .40)

- (a) Advances (weight = .15; 4 categories)
- (b) Securitized lending (weight = .10; 4 categories)
- (c) Terms of lending (weight = .10; 4 categories)
- (d) Potential borrowers from bank (weight = .05; 4 categories)

Part 2 (weight = .10)

- (e) Limits on central bank lending determined by? (weight = .025; 4 categories)
- (f) Maturity of loans (weight = .025; 4 categories)
- (g) Interest rates on loans must be? (weight = .025; 5 categories)
- (h) Is central bank prohibited from buying or selling government securities in primary market? (weight = .025; 2 categories)

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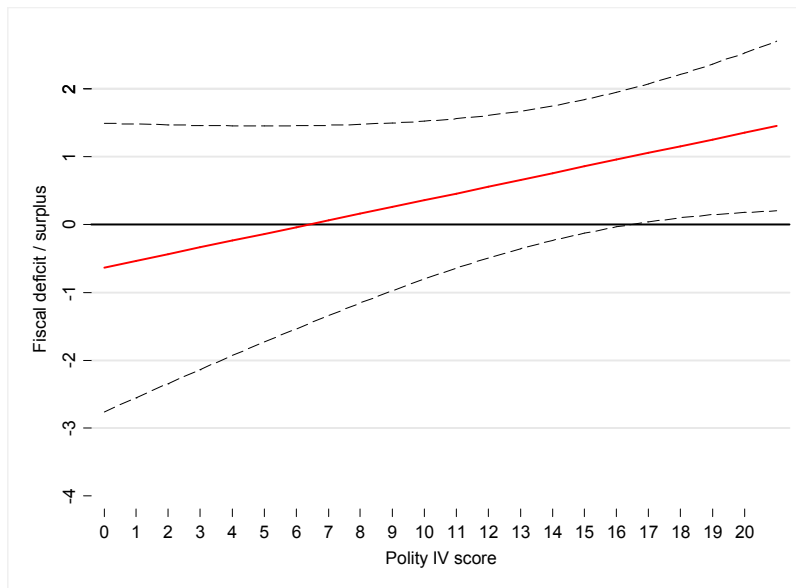
<sup>6</sup> If the legislation does not cover one of the indicators, it is not coded as 0. Instead, "the weights of the missing variables are allocated proportionally to the remaining variables within the subgroup" (Cukierman, Webb, and Neyapti 1992, p. 12).

## CBI reform years

Country	Reforms	Country	Reforms
Albania	1997	Kyrgyz Republic	1997
Argentina	1975, 1992, 2002	Latvia	1998, 2001, 2002
Armenia	1996, 2001	Lithuania	1996
Australia	--	Macedonia, FYR	2002
Austria	1984	Malaysia	--
Azerbaijan	1996, 2004	Mexico	1985, 1994
Belarus	2001	Moldova	1995, 2006
Belgium	1993	Mongolia	1996
Bolivia	1977, 1995	Netherlands	--
Botswana	--	New Zealand	1990
Brazil	--	Nicaragua	1992, 1999
Bulgaria	1997, 2005	Norway	1972, 2003
Canada	--	Paraguay	1995, 2003
Chile	1975, 1989	Peru	1993
Colombia	1993	Philippines	1993
Costa Rica	1996	Poland	1997
Croatia	2001, 2002, 2008	Portugal	1975, 1980, 1990, 1995, 1998
Czech Republic	2001	Romania	1998, 2004
Denmark	--	Russian Federation	1995, 2002
Dominican Republic	2002	Singapore	--
El Salvador	--	Slovak Republic	1999, 2002
Estonia	2006	Slovenia	2002, 2007
Finland	1998	South Africa	1989, 1996
France	1972, 1993	Spain	1980, 1994
Georgia	--	Sweden	1998
Germany	--	Switzerland	1979, 2003
Greece	1995	Tajikistan	1996
Guatemala	2002	Thailand	2008
Guyana	1998	Trinidad and Tobago	--
Honduras	1997	Turkey	1990, 2001
Hungary	2001	Turkmenistan	1994
Iceland	--	Ukraine	1999
India	--	United Kingdom	1997
Indonesia	1998	United States	--
Ireland	--	Uruguay	1995, 1997, 2008
Israel	--	Uzbekistan	1995
Italy	1994	Venezuela, RB	1975, 1987, 1993, 2001
Jamaica	--	Zimbabwe	1984, 1999
Japan	1998	Kenya	1985, 1996
Kazakhstan	1995, 1997, 2003, 2006	Korea, Rep.	1998

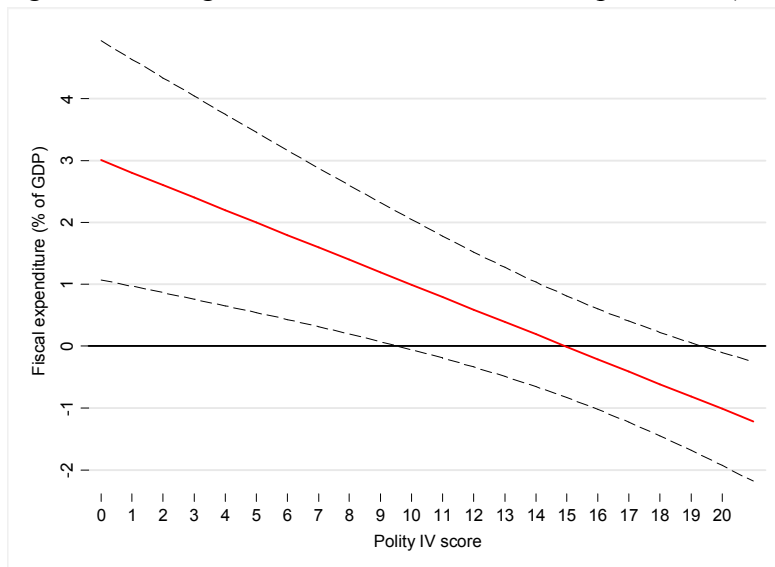
## Appendix Figures

Figure A1. Marginal effect of CBI on fiscal deficit / surplus (% of GDP)



Note: Figure is based on Model 4 in Table 1 – the fixed effects model. Dotted lines reflect the 90% confidence intervals.

Figure A2. Marginal effect of CBI on fiscal expenditure (% of GDP)



Note: Figure is based on Model 11 in Appendix Table A4. Dependent variable is the ratio of fiscal expenditure to GDP. Dotted lines reflect the 90% confidence intervals.

## **Appendix Data Sources**

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