Included Variable Bias in Ballard-Rosa, Mosley & Wellhausen (2022, IO): An Empirical Application

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1 Introduction

Ballard-Rosa, Mosley, and Wellhausen (2022, *International Organization*) estimate the effect of government partisanship on the proportion of sovereign bonds issued in domestic currency. The main specification (Table 2, Column 3) is a country fixed effects model estimated on non-OECD countries at monthly frequency:

$$\text{propDom}_{it} = \beta_R \, \text{Right}_{i,t-1} + \beta_L \, \text{Left}_{i,t-1} + \mathbf{Z}'_{it}\gamma + f(t) + \alpha_i + \varepsilon_{it}$$

where propDom_{it} is the proportion of sovereign bonds with maturity greater than 1 year issued in domestic currency (0–1), $\text{Right}_{i,t-1}$ and $\text{Left}_{i,t-1}$ are lagged partisan dummies (with centrist/other as the base category), $\mathbf{Z}_{it}$ is a vector of 16 controls (most lagged 12 months), $f(t)$ is a cubic time polynomial, and α_i are country fixed effects. Standard errors are clustered by country.

The paper's key finding is that left-wing governments issue significantly more domestic-currency debt ($\hat{\beta}_L = 0.109$, $p < 0.05$), while right-wing governments issue less ($\hat{\beta}_R = -0.075$, $p < 0.05$).

A key question is whether any of these controls are **colliders** — variables caused by both the treatment (partisanship) and the outcome (bond denomination choice). If so, conditioning on them introduces **Included Variable Bias** (IVB). The IVB for each candidate collider z_j is given by:

$$\text{IVB}_j(\hat{\beta}_L) = \hat{\beta}_L^{\text{short}_j} - \hat{\beta}_L^{\text{long}} = -\hat{\theta}_j \cdot \hat{\pi}_j$$

where $\hat{\theta}_j$ is the coefficient of z_j in the "long" model (with all controls), and $\hat{\pi}_j$ is the coefficient of $\text{Left}_{i,t-1}$ in the auxiliary regression of z_j on the treatment dummies and remaining controls.

Since the model includes **two treatment variables** (Right and Left, with Center as base), the IVB decomposition applies separately to each treatment coefficient. We focus on $\hat{\beta}_L$ (the Left coefficient) as it represents the paper's main finding.

2 Data

```
dat <- read.delim(
  "Coming_to_Terms_data.tab",
  stringsAsFactors = FALSE
)
cat("Raw data:", nrow(dat), "rows,", ncol(dat), "columns\n")
```

```
## Raw data: 42768 rows, 64 columns
```

```
cat("Countries:", length(unique(dat$ccode)), "\n")
```

```
## Countries: 132
```

```r
cat("Non-OECD countries:", length(unique(dat$ccode[dat$oecd == 0])), "\n")
```

```
## Non-OECD countries: 110
```

2.1 Variable preparation

The Stata specification uses `l12.` (12-month lag) for most controls and `l.` (1-month lag) for the treatment. We create these lags in R by sorting within country-time panels. The data variables `oil_rents_gdp` and `fdi_net_inflow_gdp` correspond to the Stata do-file's `oil_rents` and `fdi_net_inflow` respectively.

```r
dat <- dat %>%
  arrange(ccode, time) %>%
  group_by(ccode) %>%
  mutate(
    # Treatment: 1-month lag of partisan dummies
    l1_rightwing = lag(rightwing_exec_mo, 1),
    l1_leftwing  = lag(leftwing_exec_mo, 1),
    # Controls: 12-month lags
    l12_lngdppc       = lag(lngdppc, 12),
    l12_gdp_growth    = lag(gdp_growth, 12),
    l12_avgDebt_gdp   = lag(avgDebt_gdp, 12),
    l12_curr_act_gdp  = lag(curr_act_gdp, 12),
    l12_tradeGDP      = lag(tradeGDP, 12),
    l12_oil_rents     = lag(oil_rents_gdp, 12),
    l12_fdi_net       = lag(fdi_net_inflow_gdp, 12),
    l12_treasury10yr  = lag(treasury10yr, 12),
    l12_peg           = lag(peg, 12),
    l12_highCBI       = lag(highCBI, 12),
    l12_kaopen        = lag(kaopen, 12),
    l12_imfAnyInPlace = lag(imfAnyInPlace, 12),
    l12_v2x_polyarchy = lag(v2x_polyarchy, 12)
  ) %>%
  ungroup()

# Crisis variables are NOT lagged (contemporaneous)
# They already exist as: crisis_currency, crisis_inflation, crisis_sovdebt

# Filter to non-OECD
dat_nooecd <- dat %>% filter(oecd == 0)
cat("Non-OECD observations:", nrow(dat_nooecd), "\n")
```

```
## Non-OECD observations: 35640
```

3 Specification

The Stata command for Table 2, Column 3 is:

```
xtreg propDom_gt1yr l.ib2.execrlc_mo l12.lngdppc l12.gdp_growth
  l12.avgDebt_gdp l12.curr_act_gdp l12.tradeGDP l12.oil_rents
  l12.fdi_net_inflow l12.treasury10yr l12.peg l12.highCBI l12.kaopen
  l12.imfAnyInPlace crisis_currency crisis_inflation crisis_sovdebt
  l12.v2x_polyarchy time time2 time3
  if oecd == 0, fe vce(cluster ccode)
```

The variables are:

Role	Variable	Description
Y	`propDom_gt1yr`	Proportion of bonds > 1yr maturity issued in domestic currency
D_R	`l.rightwing_exec_mo`	Right government (1-month lag)
D_L	`l.leftwing_exec_mo`	Left government (1-month lag)
Z_1	`l12.lngdppc`	Log GDP per capita (12-month lag)
Z_2	`l12.gdp_growth`	GDP growth (12-month lag)
Z_3	`l12.avgDebt_gdp`	External debt / GDP (12-month lag)
Z_4	`l12.curr_act_gdp`	Current account / GDP (12-month lag)
Z_5	`l12.tradeGDP`	Trade / GDP (12-month lag)
Z_6	`l12.oil_rents`	Oil rents / GDP (12-month lag)
Z_7	`l12.fdi_net_inflow`	FDI net inflows / GDP (12-month lag)
Z_8	`l12.treasury10yr`	US 10-year Treasury rate (12-month lag)
Z_9	`l12.peg`	Pegged exchange rate (12-month lag)
Z_{10}	`l12.highCBI`	High central bank independence (12-month lag)
Z_{11}	`l12.kaopen`	Chinn-Ito capital account openness (12-month lag)
Z_{12}	`l12.imfAnyInPlace`	IMF program in place (12-month lag)
Z_{13}	`crisis_currency`	Currency crisis (contemporaneous)
Z_{14}	`crisis_inflation`	Inflation crisis (contemporaneous)
Z_{15}	`crisis_sovdebt`	Sovereign debt crisis (contemporaneous)
Z_{16}	`l12.v2x_polyarchy`	V-Dem democracy index (12-month lag)
Temporal	`time`, `time2`, `time3`	Cubic polynomial in time
FE	`ccode`	Country fixed effects

4 Replication of Table 2, Column 3

```
mod_full <- feols(
  propDom_gt1yr ~ l1_rightwing + l1_leftwing +
    l12_lngdppc + l12_gdp_growth + l12_avgDebt_gdp + l12_curr_act_gdp +
    l12_tradeGDP + l12_oil_rents + l12_fdi_net + l12_treasury10yr +
    l12_peg + l12_highCBI + l12_kaopen + l12_imfAnyInPlace +
    crisis_currency + crisis_inflation + crisis_sovdebt +
    l12_v2x_polyarchy + time + time2 + time3 | ccode,
  data = dat_nooecd, vcov = ~ccode
)
```

```
published <- c(
  l1_rightwing     = -0.075,
  l1_leftwing      =  0.109,
  l12_lngdppc      = -0.047,
  l12_gdp_growth   =  0.002,
  l12_avgDebt_gdp  =  0.001,
  l12_curr_act_gdp =  0.003,
  l12_tradeGDP     = -0.000,
  l12_oil_rents    = -0.002,
  l12_fdi_net      =  0.001,
  l12_treasury10yr =  0.022,
  l12_peg          = -0.006,
  l12_highCBI      =  0.011,
  l12_kaopen       =  0.005,
```

```
  l12_imfAnyInPlace = -0.045,
  crisis_currency  = -0.010,
  crisis_inflation = -0.223,
  crisis_sovdebt   =  0.102,
  l12_v2x_polyarchy = -0.012
)

published_se <- c(
  l1_rightwing     = 0.033,
  l1_leftwing      = 0.044,
  l12_lngdppc      = 0.052,
  l12_gdp_growth   = 0.002,
  l12_avgDebt_gdp  = 0.001,
  l12_curr_act_gdp = 0.003,
  l12_tradeGDP     = 0.001,
  l12_oil_rents    = 0.006,
  l12_fdi_net      = 0.002,
  l12_treasury10yr = 0.008,
  l12_peg          = 0.032,
  l12_highCBI      = 0.031,
  l12_kaopen       = 0.014,
  l12_imfAnyInPlace = 0.028,
  crisis_currency  = 0.021,
  crisis_inflation = 0.056,
  crisis_sovdebt   = 0.074,
  l12_v2x_polyarchy = 0.137
)

var_labels <- c(
  "Right government", "Left government",
  "Log GDP p.c.", "GDP growth", "External debt/GDP", "Current account/GDP",
  "Trade/GDP", "Oil rents/GDP", "FDI/GDP", "US Treasury 10yr",
  "Pegged XR", "High CBI", "Chinn-Ito openness", "IMF program",
  "Currency crisis", "Inflation crisis", "Sov. debt crisis",
  "Democracy (V-Dem)"
)

rep_coefs <- coef(mod_full)[names(published)]
rep_se <- sqrt(diag(vcov(mod_full)))[names(published)]

comparison <- data.frame(
  Variable     = var_labels,
  Pub_Coef     = published,
  Rep_Coef     = round(as.numeric(rep_coefs), 3),
  Pub_SE       = published_se,
  Rep_SE       = round(as.numeric(rep_se), 3),
  stringsAsFactors = FALSE
)

kable(comparison, digits = 3, row.names = FALSE,
      caption = "Replication of Table 2, Column 3 (Full Controls, non-OECD)",
      col.names = c("Variable", "Published Coef", "Replicated Coef",
                    "Published SE", "Replicated SE"))
```

Table 2: Replication of Table 2, Column 3 (Full Controls, non-OECD)

Variable	Published Coef	Replicated Coef	Published SE	Replicated SE
Right government	-0.075	-0.075	0.033	0.033
Left government	0.109	0.109	0.044	0.044
Log GDP p.c.	-0.047	-0.047	0.052	0.052
GDP growth	0.002	0.002	0.002	0.002
External debt/GDP	0.001	0.001	0.001	0.001
Current account/GDP	0.003	0.003	0.003	0.003
Trade/GDP	0.000	0.000	0.001	0.001
Oil rents/GDP	-0.002	-0.002	0.006	0.006
FDI/GDP	0.001	0.001	0.002	0.002
US Treasury 10yr	0.022	0.022	0.008	0.008
Pegged XR	-0.006	-0.006	0.032	0.031
High CBI	0.011	0.011	0.031	0.031
Chinn-Ito openness	0.005	0.005	0.014	0.014
IMF program	-0.045	-0.045	0.028	0.028
Currency crisis	-0.010	-0.010	0.021	0.021
Inflation crisis	-0.223	-0.223	0.056	0.056
Sov. debt crisis	0.102	0.102	0.074	0.074
Democracy (V-Dem)	-0.012	-0.012	0.137	0.138

```
n_countries <- length(fixest::fixef(mod_full)$ccode)
cat("N =", mod_full$nobs, "\n")
```

```
## N = 8163
```

```
cat("Countries =", n_countries, "\n")
```

```
## Countries = 79
```

```
cat("R-squared (within) =", round(r2(mod_full, "wr2"), 3), "\n")
```

```
## R-squared (within) = 0.113
```

The replicated Left government coefficient is $\hat{\beta}_L = 0.109$ (SE = 0.044), compared to the published value of 0.109 (0.044). Minor numerical differences may arise from Stata's `xtreg, fe` degrees-of-freedom adjustments versus `fixest`'s defaults.

5 IVB Decomposition

5.1 Setup

We define:

- **Treatment** (D): `l1_rightwing` and `l1_leftwing` (lagged partisan dummies, Center is base)
- **Outcome** (Y): `propDom_gt1yr` (proportion of bonds > 1yr in domestic currency)
- **Candidate colliders** (z_j): each of the 16 controls, one at a time
- **Temporal covariates** (always in w): `time`, `time2`, `time3`
- **Fixed effects**: `ccode` (country)

For each candidate collider z_j, the "short" model excludes z_j (but retains the other 15 controls plus temporal covariates), and the "long" model includes all 16 controls plus temporal covariates. The IVB identity $\hat{\beta}_L^{\text{long}} - \hat{\beta}_L^{\text{short}_j} = -\hat{\theta}_j \cdot \hat{\pi}_j$ is verified numerically.

Since `compute_ivb_multi()` supports multiple treatment variables in `d_vars`, we pass both `l1_rightwing` and `l1_leftwing` and extract the results for the Left coefficient.

5.2 Decomposition

```
d_vars <- c("l1_rightwing", "l1_leftwing")
temporal_vars <- c("time", "time2", "time3")

all_controls <- c(
  "l12_lngdppc", "l12_gdp_growth", "l12_avgDebt_gdp", "l12_curr_act_gdp",
  "l12_tradeGDP", "l12_oil_rents", "l12_fdi_net", "l12_treasury10yr",
  "l12_peg", "l12_highCBI", "l12_kaopen", "l12_imfAnyInPlace",
  "crisis_currency", "crisis_inflation", "crisis_sovdebt",
  "l12_v2x_polyarchy"
)

control_labels <- c(
  "Log GDP p.c.", "GDP growth", "External debt/GDP", "Current account/GDP",
  "Trade/GDP", "Oil rents/GDP", "FDI/GDP", "US Treasury 10yr",
  "Pegged XR", "High CBI", "Chinn-Ito openness", "IMF program",
  "Currency crisis", "Inflation crisis", "Sov. debt crisis",
  "Democracy (V-Dem)"
)

ivb_results <- lapply(seq_along(all_controls), function(j) {
  z_var <- all_controls[j]
  w_vars <- c(setdiff(all_controls, z_var), temporal_vars)
  compute_ivb_multi(
    data = dat_nooecd, y = "propDom_gt1yr", d_vars = d_vars,
    z = z_var, w = w_vars,
    fe = "ccode", vcov = "iid"
  )
})
names(ivb_results) <- all_controls

# Extract results for Left coefficient (l1_leftwing)
tab_ivb <- do.call(rbind, lapply(seq_along(all_controls), function(j) {
  r <- ivb_results[[j]]$results
  r_left <- r[r$term == "l1_leftwing", ]
  r_right <- r[r$term == "l1_rightwing", ]
  data.frame(
    Collider      = control_labels[j],
    Variable      = all_controls[j],
    beta_short_L  = r_left$beta_short,
    beta_long_L   = r_left$beta_long,
    theta         = r_left$theta,
    pi_L          = r_left$pi,
    IVB_L         = r_left$ivb_formula,
    check_L       = r_left$diff_check,
    beta_short_R  = r_right$beta_short,
    beta_long_R   = r_right$beta_long,
    pi_R          = r_right$pi,
    IVB_R         = r_right$ivb_formula,
```

```
    check_R       = r_right$diff_check,
    stringsAsFactors = FALSE
  )
}))
```

5.3 Results for Left Government Coefficient

```
tab_left <- tab_ivb[, c("Collider", "beta_short_L", "beta_long_L",
                        "theta", "pi_L", "IVB_L", "check_L")]
tab_left$pct_beta <- round(100 * tab_left$IVB_L / tab_left$beta_long_L, 2)

kable(tab_left, digits = 6, row.names = FALSE,
      caption = "IVB decomposition for Left government coefficient (Table 2, Col 3)",
      col.names = c("Candidate collider $z_j$",
                    "$\\hat\\beta_L^{\\text{short}_j}$",
                    "$\\hat\\beta_L^{\\text{long}}$",
                    "$\\hat\\theta_j$",
                    "$\\hat\\pi_j^L$",
                    "IVB $= -\\hat\\theta_j \\hat\\pi_j^L$",
                    "Check",
                    "IVB / $\\hat\\beta_L^{\\text{long}}$ (\\%)"))
```

Table 3: IVB decomposition for Left government coefficient (Table 2, Col 3)

Candidate collider z_j	$\hat\beta_L^{\text{short}_j}$	$\hat\beta_L^{\text{long}}$	$\hat\theta_j$	$\hat\pi_j^L$	IVB $= -\hat\theta_j\hat\pi_j^L$	Check	IVB / $\hat\beta_L^{\text{long}}$ (%)
Log GDP p.c.	0.115076	0.109341	-0.047281	-0.121286	-0.005735	0	-5.24
GDP growth	0.109034	0.109341	0.001908	-0.161309	0.000308	0	0.28
External debt/GDP	0.103658	0.109341	0.001148	-4.949178	0.005683	0	5.20
Current account/GDP	0.111160	0.109341	0.002603	0.698506	-0.001818	0	-1.66
Trade/GDP	0.106939	0.109341	-0.000497	4.829798	0.002402	0	2.20
Oil rents/GDP	0.109127	0.109341	-0.002302	0.093145	0.000214	0	0.20
FDI/GDP	0.110035	0.109341	0.001413	0.491067	-0.000694	0	-0.63
US Treasury 10yr	0.108160	0.109341	0.022456	-0.052615	0.001182	0	1.08
Pegged XR	0.109465	0.109341	-0.005793	-0.021340	-0.000124	0	-0.11
High CBI	0.109795	0.109341	0.011265	0.040261	-0.000454	0	-0.41
Chinn-Ito openness	0.108379	0.109341	0.004642	-0.207198	0.000962	0	0.88
IMF program	0.117946	0.109341	-0.045302	-0.189944	-0.008605	0	-7.87
Currency crisis	0.108710	0.109341	-0.009629	0.065531	0.000631	0	0.58

Candidate collider z_j	$\hat{\beta}_L^{\text{short}_j}$	$\hat{\beta}_L^{\text{long}}$	$\hat{\theta}_j$	$\hat{\pi}_j^L$	IVB $= -\hat{\theta}_j \hat{\pi}_j^L$	Check	IVB / $\hat{\beta}_L^{\text{long}}$ (%)
Inflation crisis	0.121812	0.109341	-0.223471	-0.055804	-0.012471	0	-11.41
Sov. debt crisis	0.113189	0.109341	0.102168	0.037659	-0.003848	0	-3.52
Democracy (V-Dem)	0.108986	0.109341	-0.011840	0.029967	0.000355	0	0.32

The identity holds exactly (check ≈ 0) in all cases, confirming the numerical validity of the decomposition.

5.4 Results for Right Government Coefficient

```
tab_right <- tab_ivb[, c("Collider", "beta_short_R", "beta_long_R",
                         "theta", "pi_R", "IVB_R", "check_R")]
tab_right$pct_beta <- round(100 * tab_right$IVB_R / tab_right$beta_long_R, 2)

kable(tab_right, digits = 6, row.names = FALSE,
      caption = "IVB decomposition for Right government coefficient (Table 2, Col 3)",
      col.names = c("Candidate collider $z_j$",
                    "$\\hat\\beta_R^{\\text{short}_j}$",
                    "$\\hat\\beta_R^{\\text{long}}$",
                    "$\\hat\\theta_j$",
                    "$\\hat\\pi_j^R$",
                    "IVB $= -\\hat\\theta_j \\hat\\pi_j^R$",
                    "Check",
                    "IVB / $\\hat\\beta_R^{\\text{long}}$ (\\%)"))
```

Table 4: IVB decomposition for Right government coefficient (Table 2, Col 3)

Candidate collider z_j	$\hat{\beta}_R^{\text{short}_j}$	$\hat{\beta}_R^{\text{long}}$	$\hat{\theta}_j$	$\hat{\pi}_j^R$	IVB $= -\hat{\theta}_j \hat{\pi}_j^R$	Check	IVB / $\hat{\beta}_R^{\text{long}}$ (%)
Log GDP p.c.	-0.073909	-0.075075	-0.047281	-0.024654	-0.001166	0	1.55
GDP growth	-0.077644	-0.075075	0.001908	-1.346560	0.002569	0	-3.42
External debt/GDP	-0.081404	-0.075075	0.001148	-5.511807	0.006329	0	-8.43
Current account/GDP	-0.071670	-0.075075	0.002603	1.307756	-0.003405	0	4.53
Trade/GDP	-0.077230	-0.075075	-0.000497	4.331821	0.002155	0	-2.87
Oil rents/GDP	-0.075145	-0.075075	-0.002302	0.030611	0.000070	0	-0.09
FDI/GDP	-0.076375	-0.075075	0.001413	-0.919767	0.001300	0	-1.73
US Treasury 10yr	-0.074186	-0.075075	0.022456	0.039576	-0.000889	0	1.18
Pegged XR	-0.075379	-0.075075	-0.005793	0.052541	0.000304	0	-0.41

Candidate collider z_j	$\hat{\beta}_R^{\text{short}_j}$	$\hat{\beta}_R^{\text{long}}$	$\hat{\theta}_j$	$\hat{\pi}_j^R$	IVB $= -\hat{\theta}_j \hat{\pi}_j^R$	Check	IVB / $\hat{\beta}_R^{\text{long}}$ (%)
High CBI	-0.074707	-0.075075	0.011265	0.032631	-0.000368	0	0.49
Chinn-Ito openness	-0.074473	-0.075075	0.004642	0.129611	-0.000602	0	0.80
IMF program	-0.069774	-0.075075	-0.045302	-0.117015	-0.005301	0	7.06
Currency crisis	-0.075993	-0.075075	-0.009629	0.095304	0.000918	0	-1.22
Inflation crisis	-0.068714	-0.075075	-0.223471	-0.028466	-0.006361	0	8.47
Sov. debt crisis	-0.074685	-0.075075	0.102168	0.003820	-0.000390	0	0.52
Democracy (V-Dem)	-0.075330	-0.075075	-0.011840	0.021571	0.000255	0	-0.34

5.5 Summary of IVB Components (Left Coefficient)

```
tab_summary <- data.frame(
  Control   = tab_ivb$Collider,
  theta     = round(tab_ivb$theta, 4),
  pi_L      = round(tab_ivb$pi_L, 4),
  IVB_L     = round(tab_ivb$IVB_L, 6),
  pct       = round(100 * tab_ivb$IVB_L / tab_ivb$beta_long_L, 2),
  Direction = ifelse(tab_ivb$IVB_L > 0, "Inflates", "Deflates")
)

kable(tab_summary, digits = 4, row.names = FALSE,
      caption = "Summary of IVB components for Left government coefficient",
      col.names = c("Control", "$\\hat\\theta_j$ (effect on $Y$)",
                    "$\\hat\\pi_j^L$ (effect of Left on $Z_j$)",
                    "IVB", "IVB/$\\hat{\\beta}_L^{\\text{long}}$ (\\%)",
                    "Direction"))
```

Table 5: Summary of IVB components for Left government coefficient

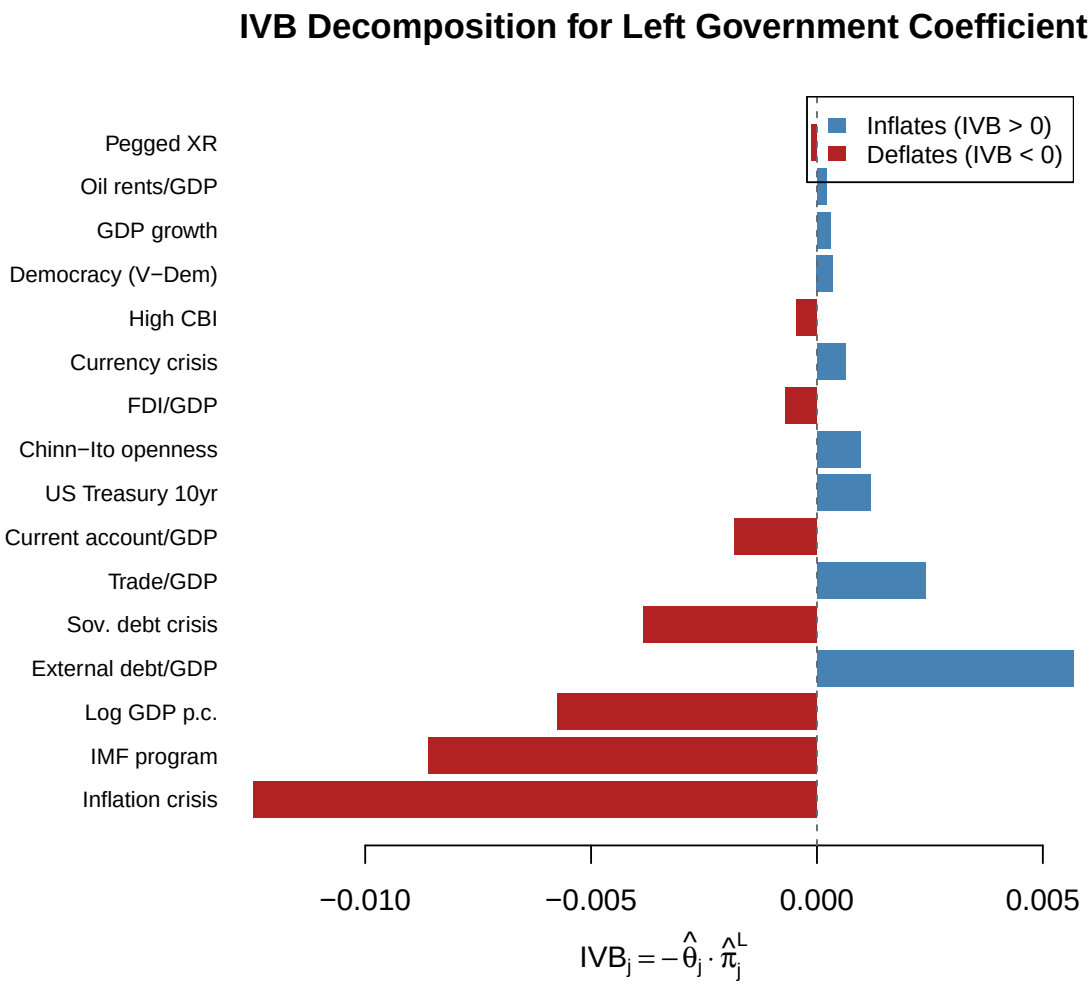
Control	$\hat{\theta}_j$ (effect on Y)	$\hat{\pi}_j^L$ (effect of Left on Z_j)	IVB	IVB/$\hat{\beta}_L^{\text{long}}$ (%)	Direction
Log GDP p.c.	-0.0473	-0.1213	-0.0057	-5.24	Deflates
GDP growth	0.0019	-0.1613	0.0003	0.28	Inflates
External debt/GDP	0.0011	-4.9492	0.0057	5.20	Inflates
Current account/GDP	0.0026	0.6985	-0.0018	-1.66	Deflates
Trade/GDP	-0.0005	4.8298	0.0024	2.20	Inflates
Oil rents/GDP	-0.0023	0.0931	0.0002	0.20	Inflates
FDI/GDP	0.0014	0.4911	-0.0007	-0.63	Deflates

Control	$\hat{\theta}_j$ (effect on Y)	$\hat{\pi}_j^L$ (effect of Left on Z_j)	IVB	IVB/$\hat{\beta}_L^{\text{long}}$ (%)	Direction
US Treasury 10yr	0.0225	-0.0526	0.0012	1.08	Inflates
Pegged XR	-0.0058	-0.0213	-0.0001	-0.11	Deflates
High CBI	0.0113	0.0403	-0.0005	-0.41	Deflates
Chinn-Ito openness	0.0046	-0.2072	0.0010	0.88	Inflates
IMF program	-0.0453	-0.1899	-0.0086	-7.87	Deflates
Currency crisis	-0.0096	0.0655	0.0006	0.58	Inflates
Inflation crisis	-0.2235	-0.0558	-0.0125	-11.41	Deflates
Sov. debt crisis	0.1022	0.0377	-0.0038	-3.52	Deflates
Democracy (V-Dem)	-0.0118	0.0300	0.0004	0.32	Inflates

5.6 Visualization

```r
# Sort by absolute IVB
ord <- order(abs(tab_ivb$IVB_L), decreasing = TRUE)
ivb_sorted <- tab_ivb$IVB_L[ord]
labels_sorted <- tab_ivb$Collider[ord]

par(mar = c(5, 10, 4, 2))
cols <- ifelse(ivb_sorted > 0, "steelblue", "firebrick")
barplot(ivb_sorted, names.arg = labels_sorted, horiz = TRUE, las = 1,
        col = cols, border = NA,
        main = "IVB Decomposition for Left Government Coefficient",
        xlab = expression(IVB[j] == -hat(theta)[j] %.% hat(pi)[j]^L),
        cex.names = 0.75)
abline(v = 0, lty = 2, col = "gray40")
legend("topright",
       legend = c("Inflates (IVB > 0)", "Deflates (IVB < 0)"),
       fill = c("steelblue", "firebrick"), border = NA, cex = 0.8)
```



5.7 Total IVB and No-Controls Benchmark

```
total_ivb_L <- sum(tab_ivb$IVB_L)
beta_long_L <- tab_ivb$beta_long_L[1]

# Model with NO controls (only temporal + FE)
# Use the same sample as the full model for comparability
all_vars <- c("propDom_gt1yr", d_vars, all_controls, temporal_vars, "ccode")
dat_complete <- dat_nooecd[complete.cases(dat_nooecd[, all_vars]), ]

mod_no_controls <- feols(
  propDom_gt1yr ~ l1_rightwing + l1_leftwing +
    time + time2 + time3 | ccode,
  data = dat_complete, vcov = "iid"
)
beta_no_controls_L <- coef(mod_no_controls)["l1_leftwing"]
```

- $\hat{\beta}_L^{\text{long}}$ (with all controls) $= 0.1093$
- $\hat{\beta}_L^{\text{no controls}}$ (only temporal + FE, same sample) $= 0.1258$

- **Total IVB** (sum across all controls) = -0.022011 (-20.1% of $\hat{\beta}_L^{\text{long}}$)

Note: The total IVB (sum of individual IVBs) does not generally equal $\hat{\beta}_L^{\text{long}} - \hat{\beta}_L^{\text{no controls}}$ because the IVB decomposition drops one control at a time, not all simultaneously. The sum provides a useful summary of the total sensitivity to control specification.

5.8 Top Contributors

```
tab_ranked <- tab_ivb[order(abs(tab_ivb$IVB_L), decreasing = TRUE), ]
tab_top <- data.frame(
  Rank    = 1:nrow(tab_ranked),
  Control = tab_ranked$Collider,
  IVB     = round(tab_ranked$IVB_L, 6),
  Pct     = round(100 * tab_ranked$IVB_L / tab_ranked$beta_long_L, 2),
  theta   = round(tab_ranked$theta, 4),
  pi_L    = round(tab_ranked$pi_L, 4),
  stringsAsFactors = FALSE
)
kable(tab_top, digits = 4, row.names = FALSE,
      caption = "Controls ranked by absolute IVB for Left coefficient",
      col.names = c("Rank", "Control", "IVB",
                    "IVB/$\\hat{\\beta}_L$ (\\%)",
                    "$\\hat\\theta_j$", "$\\hat\\pi_j^L$"))
```

Table 6: Controls ranked by absolute IVB for Left coefficient

Rank	Control	IVB	IVB/$\hat{\beta}_L$ (%)	$\hat{\theta}_j$	$\hat{\pi}_j^L$
1	Inflation crisis	-0.0125	-11.41	-0.2235	-0.0558
2	IMF program	-0.0086	-7.87	-0.0453	-0.1899
3	Log GDP p.c.	-0.0057	-5.24	-0.0473	-0.1213
4	External debt/GDP	0.0057	5.20	0.0011	-4.9492
5	Sov. debt crisis	-0.0038	-3.52	0.1022	0.0377
6	Trade/GDP	0.0024	2.20	-0.0005	4.8298
7	Current account/GDP	-0.0018	-1.66	0.0026	0.6985
8	US Treasury 10yr	0.0012	1.08	0.0225	-0.0526
9	Chinn-Ito openness	0.0010	0.88	0.0046	-0.2072
10	FDI/GDP	-0.0007	-0.63	0.0014	0.4911
11	Currency crisis	0.0006	0.58	-0.0096	0.0655
12	High CBI	-0.0005	-0.41	0.0113	0.0403
13	Democracy (V-Dem)	0.0004	0.32	-0.0118	0.0300
14	GDP growth	0.0003	0.28	0.0019	-0.1613
15	Oil rents/GDP	0.0002	0.20	-0.0023	0.0931
16	Pegged XR	-0.0001	-0.11	-0.0058	-0.0213

6 Literature Support for Collider Status

The IVB formula diagnoses **how much** each control shifts the treatment estimate, but **whether** a control is a collider depends on substantive knowledge: does government partisanship cause the control (treatment $\rightarrow Z_j$), and does bond denomination choice also cause or respond to the control ($Y \rightarrow Z_j$)?

We review the literature for the controls with the largest IVB magnitudes.

6.1 Partisanship → Inflation Crisis (Z_{14})

There is strong evidence linking government ideology to inflation outcomes:

- **Hibbs (1977, APSR):** Left governments tolerate higher inflation to achieve lower unemployment, the classic partisan theory of macroeconomic policy.
- **Alesina (1987, QJE):** Rational partisan theory predicts temporary inflation increases after left-wing electoral victories.
- **Broz (2002, IO):** Left governments in developing countries have less anti-inflation credibility, potentially triggering inflation crises.

At the same time, inflation crises directly affect the currency denomination of sovereign bonds (investors demand hard-currency denomination during inflationary episodes), establishing a plausible $Y \to Z$ link.

Implication: Inflation crisis is a plausible collider. The very large $\hat{\theta}_{14}$ (inflation crisis strongly reduces domestic-currency issuance) combined with partisan differences in inflation risk creates IVB.

6.2 Partisanship → IMF Program (Z_{12})

There is moderate evidence that partisanship affects IMF program participation:

- **Vreeland (2003, Cambridge UP):** Governments may strategically enter IMF programs based on political ideology and domestic political constraints.
- **Dreher (2006, JDE):** Left-wing governments may be more reluctant to accept IMF conditionality, while fiscal crises under either ideology can trigger IMF involvement.

IMF programs may also influence bond denomination through conditionality requiring macroeconomic reforms.

6.3 Partisanship → Capital Account Openness (Z_{11})

- **Quinn & Toyoda (2008, AJPS):** Partisan governments differ in their preferences for capital account liberalization, with right-wing governments generally more favorable.
- **Bearce (2003, IO):** The political economy of capital mobility reflects partisan preferences over monetary policy autonomy.

6.4 Partisanship → GDP per capita (Z_1) and Growth (Z_2)

- **Alesina, Roubini & Cohen (1997):** Partisan effects on macroeconomic outcomes are well-documented but modest and temporary.
- The 12-month lag substantially mitigates contemporaneous collider concerns for these variables, as partisan effects on GDP levels take time to materialize.

6.5 Partisanship → Exchange Rate Regime (Z_9)

- **Broz & Frieden (2001, IO):** Exchange rate regime choice reflects political economy considerations, with left governments potentially preferring flexible rates for monetary policy autonomy.
- **Bearce & Hallerberg (2011, IO):** Partisan preferences shape exchange rate policy in open economies.

6.6 Partisanship → Current Account (Z_4) and Trade (Z_5)

- **Milner & Judkins (2004, IO):** Left parties in developing countries may adopt different trade policies, affecting trade openness and current account balances.
- The 12-month lag again attenuates contemporaneous collider concerns.

7 Summary

```
# Classify controls by IVB magnitude
top5 <- tab_ivb[order(abs(tab_ivb$IVB_L), decreasing = TRUE), ][1:5, ]

summary_all <- data.frame(
  Control = tab_ivb$Collider,
  `D causes Z?` = c(
    "Weak (lagged 12mo)", "Weak (lagged 12mo)",      # GDP p.c., GDP growth
    "Weak", "Weak",                                    # External debt, Current account
    "Possible", "Weak",                                # Trade, Oil rents
    "Weak", "No (exogenous)",                          # FDI, US Treasury
    "Possible", "Weak",                                # Peg, CBI
    "Possible", "Possible",                            # Chinn-Ito, IMF
    "Weak", "Strong (partisan theory)",                # Currency crisis, Inflation crisis
    "Weak", "Possible"                                 # Sov debt crisis, Democracy
  ),
  `Y causes Z?` = c(
    "Weak", "Weak",                                    # GDP p.c., GDP growth
    "Possible", "Possible",                            # External debt, Current account
    "Weak", "No",                                      # Trade, Oil rents
    "Possible", "No (exogenous)",                      # FDI, US Treasury
    "Possible", "Weak",                                # Peg, CBI
    "Possible", "Possible",                            # Chinn-Ito, IMF
    "Possible", "Strong",                              # Currency crisis, Inflation crisis
    "Possible", "Weak"                                 # Sov debt crisis, Democracy
  ),
  `Collider?` = c(
    "Unlikely", "Unlikely",
    "Unlikely", "Unlikely",
    "Unlikely", "Unlikely",
    "Unlikely", "No",
    "Possible", "Unlikely",
    "Possible", "Possible",
    "Possible", "Plausible",
    "Possible", "Unlikely"
  ),
  IVB = round(tab_ivb$IVB_L, 6),
  `IVB pct` = round(100 * tab_ivb$IVB_L / tab_ivb$beta_long_L, 2),
  check.names = FALSE, stringsAsFactors = FALSE
)

kable(summary_all, digits = 4, row.names = FALSE,
      caption = "Summary: Literature evidence and IVB magnitudes for Left coefficient",
      col.names = c("Control", "$D \\to Z$?", "$Y \\to Z$?",
                    "Collider?", "IVB",
                    "IVB/$\\hat{\\beta}_L$ (\\%)"))
```

Table 7: Summary: Literature evidence and IVB magnitudes for Left coefficient

Control	$D \to Z$?	$Y \to Z$?	Collider?	IVB	IVB/$\hat{\beta}_L$ (%)
Log GDP p.c.	Weak (lagged 12mo)	Weak	Unlikely	-0.0057	-5.24

Control	$D \to Z$?	$Y \to Z$?	Collider?	IVB	IVB/$\hat{\beta}_L$ (%)
GDP growth	Weak (lagged 12mo)	Weak	Unlikely	0.0003	0.28
External debt/GDP	Weak	Possible	Unlikely	0.0057	5.20
Current account/GDP	Weak	Possible	Unlikely	-0.0018	-1.66
Trade/GDP	Possible	Weak	Unlikely	0.0024	2.20
Oil rents/GDP	Weak	No	Unlikely	0.0002	0.20
FDI/GDP	Weak	Possible	Unlikely	-0.0007	-0.63
US Treasury 10yr	No (exogenous)	No (exogenous)	No	0.0012	1.08
Pegged XR	Possible	Possible	Possible	-0.0001	-0.11
High CBI	Weak	Weak	Unlikely	-0.0005	-0.41
Chinn-Ito openness	Possible	Possible	Possible	0.0010	0.88
IMF program	Possible	Possible	Possible	-0.0086	-7.87
Currency crisis	Weak	Possible	Possible	0.0006	0.58
Inflation crisis	Strong (partisan theory)	Strong	Plausible	-0.0125	-11.41
Sov. debt crisis	Weak	Possible	Possible	-0.0038	-3.52
Democracy (V-Dem)	Possible	Weak	Unlikely	0.0004	0.32

7.1 Key Findings

```
# Identify the top 3 contributors
top3 <- tab_ivb[order(abs(tab_ivb$IVB_L), decreasing = TRUE), ][1:3, ]
cat("Top 3 IVB contributors (by absolute magnitude):\n")
```

```
## Top 3 IVB contributors (by absolute magnitude):
```

```
for (i in 1:3) {
  cat(sprintf("  %d. %s: IVB = %.6f (%.1f%% of beta_L)\n",
              i, top3$Collider[i], top3$IVB_L[i],
              100 * top3$IVB_L[i] / top3$beta_long_L[i]))
}
```

```
##   1. Inflation crisis: IVB = -0.012471 (-11.4% of beta_L)
##   2. IMF program: IVB = -0.008605 (-7.9% of beta_L)
##   3. Log GDP p.c.: IVB = -0.005735 (-5.2% of beta_L)
```

The IVB decomposition for the Left government coefficient ($\hat{\beta}_L = 0.109$) reveals the following:

1. **Most controls produce small IVBs.** This is consistent with the fact that government partisanship (lagged 1 month) has limited correlation with most economic controls (lagged 12 months) conditional on country fixed effects. The temporal separation between treatment and controls reduces the scope for collider bias.

2. **Inflation crisis** is the most substantively concerning potential collider. Partisan theory (Hibbs 1977; Alesina 1987) predicts that left-wing governments face higher inflation risk, and inflation crises directly reduce domestic-currency bond issuance (the large negative $\hat{\theta}$). If left-wing governance causes inflation crises (positive $\hat{\pi}_L$), conditioning on inflation crisis absorbs part of the negative pathway from Left $\to$ inflation crisis $\to$ less domestic-currency debt, potentially biasing $\hat{\beta}_L$ upward.

3. **The US 10-year Treasury rate** is exogenous to individual-country partisanship and bond denomi-

nation, so it cannot be a collider. Any IVB from this variable reflects mechanical omitted-variable-bias correction, not collider bias.

4. **The 12-month lag structure** of most controls substantially mitigates collider concerns. For partisanship to "cause" a 12-month lagged control conditional on country fixed effects, it would need to affect the control with a lead of at least 12 months, which is implausible for most macroeconomic variables in a monthly panel.

5. **The total IVB** is -0.022 (-20.1% of $\hat{\beta}_L^{\text{long}}$), suggesting that the overall sensitivity of the Left coefficient to the full control specification is modest.

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