

# Government Spending Multipliers in Developing Countries: Evidence from Lending by Official Creditors

Aart Kraay  
The World Bank

International Growth Center  
Workshop on Fiscal and Monetary Policy  
in Low-Income Countries

November 2-3, 2012

# Motivation

- How much does GDP increase when the government spends more?
  - perennial question in macroeconomic policymaking
  - renewed interest in context of the great recession
- Key identification challenge
  - need to find a source of variation in government spending uncorrelated with contemporaneous shocks to GDP
  - wide variety of empirical estimates based on range of identification strategies
  - existing evidence overwhelmingly from a few advanced economies (mostly United States)

# This Paper

- New evidence on short-run effects of government spending in a sample of 102 developing countries
- Novel loan-level dataset permits identification strategy based on time profile of disbursements on loans from official creditors to developing country governments
  - these loans are a major source of financing of government spending
  - there are substantial lags between commitments and eventual disbursements, linked to project implementation stages

*Develop an instrument for total government spending, based on disbursements on loans that were committed before contemporaneous shocks are known*

# Main Findings

- Benchmark estimates of the one-year spending multiplier are around 0.4 and are surprisingly-precisely estimated
  - standard error around 0.2
  - significantly (a bit) greater than zero and less than one
- Variety of robustness checks to address concerns about data and identifying assumptions
- Sufficient variation in large sample of 102 countries over 1970-2010 to reveal some evidence of systematic heterogeneity in estimated multipliers

# Related Literature

- Very large literature on estimating spending multipliers, mostly using US (or other industrial country) data
  - high-frequency VAR-based identification
  - wide variety of clever instruments
- This paper builds on a similar exercise using data from individual World Bank projects only, in Kraay (2012)
  - this paper uses data on lending from *all* official creditors
    - much stronger instrument in a much larger set of developing countries
- Also related to Leduc and Wilson (2012) who exploit lags between approval and disbursement of federal highway funds in the United States

# Estimating Spending Multipliers

- minimal empirical framework:

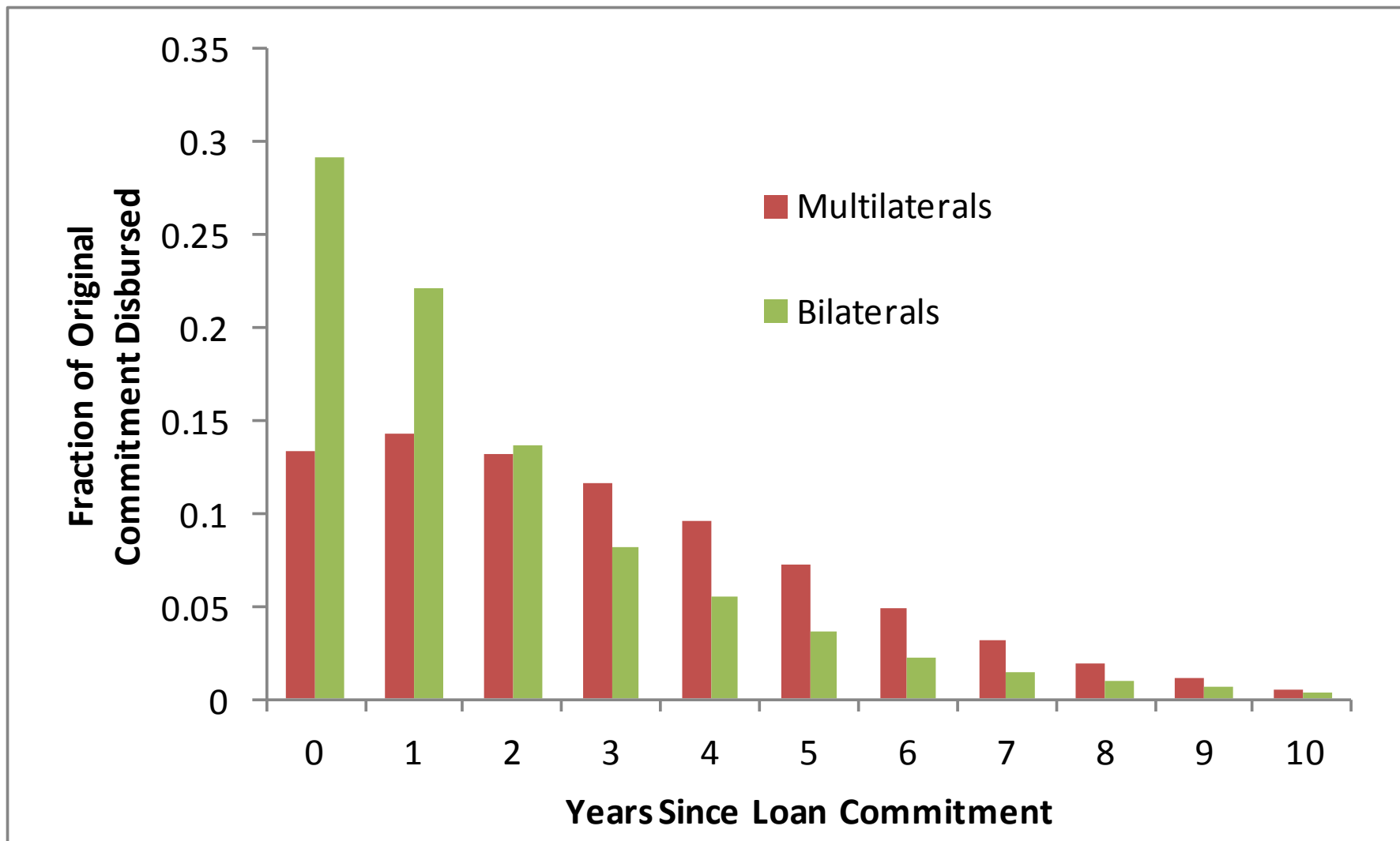
$$\frac{y_{it} - y_{it-1}}{y_{it-1}} = \beta \frac{g_{it} - g_{it-1}}{y_{it-1}} + \mu_i + \lambda_t + \varepsilon_{it}$$

- important caveat:  $\beta$  is *not* a deep structural parameter
- standard endogeneity concern: changes in government spending might be correlated with shocks to output
  - countercyclical (procyclical) spending response to shocks implies downward (upward) bias in OLS estimates of multipliers

# Identification Strategy

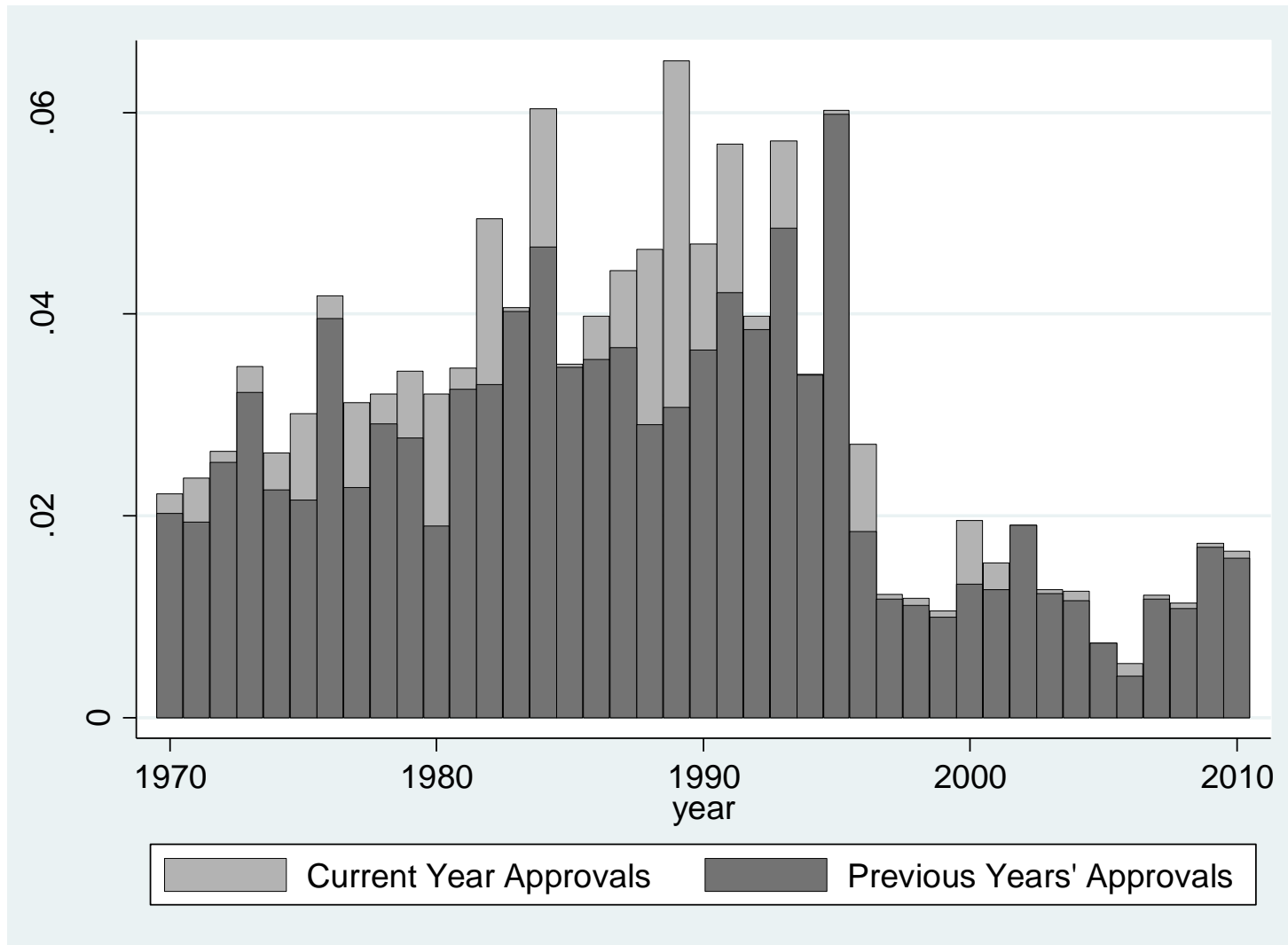
- identification strategy exploits lags between commitments and disbursements on individual loans from official creditors to developing country governments
- these loans on typically disburse over a long period (disbursement profile figure)
- this implies that most disbursements in a given country-year are associated with loan (and project) approvals made in previous years before current macroeconomic shocks are known (Kenya figure)

# Average Disbursement Profiles on Loans from Official Creditors





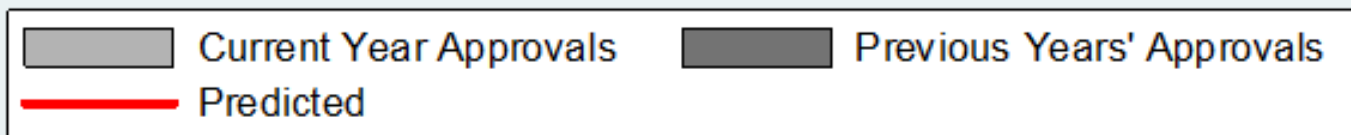
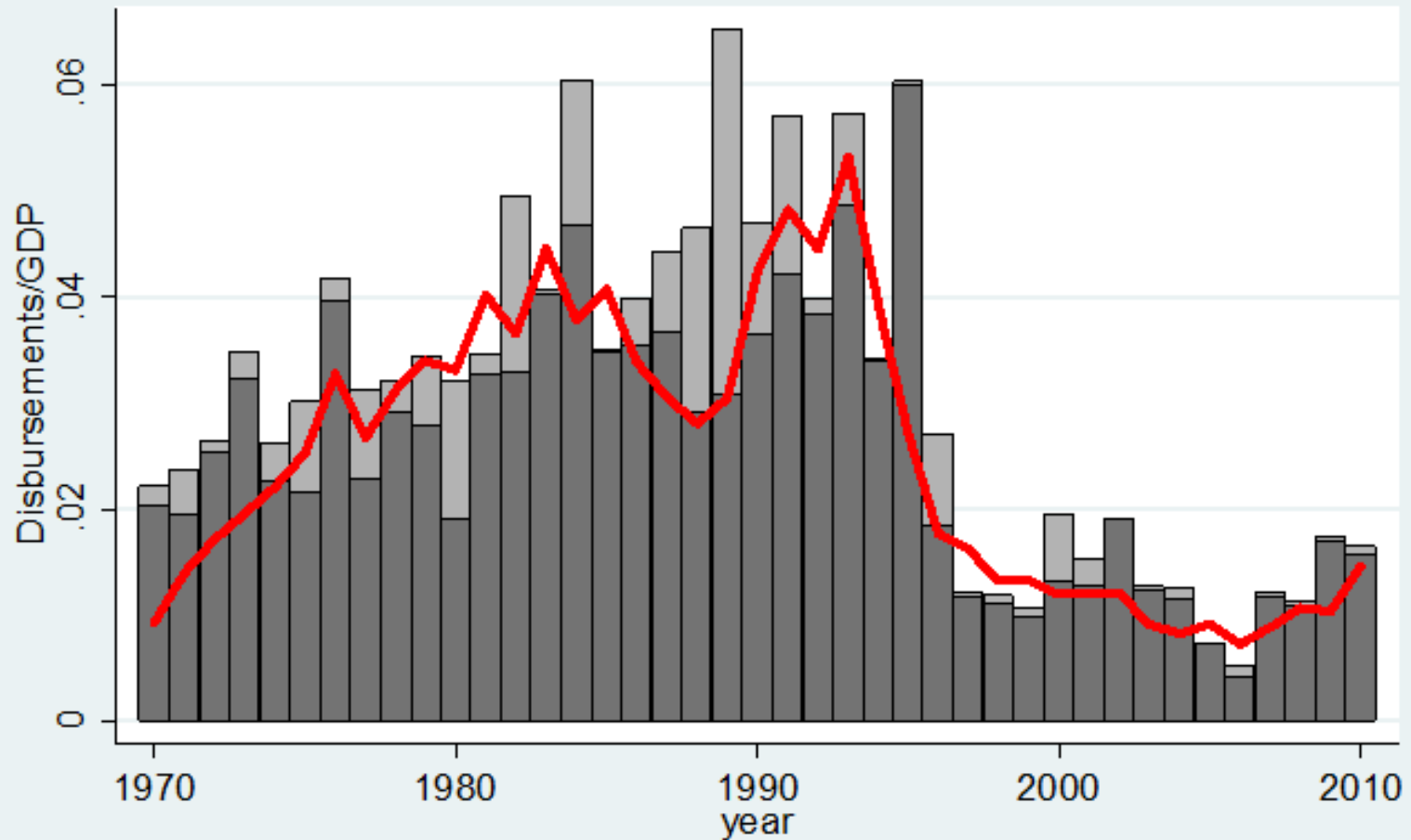
# Disbursements on Current and Previous Commitments: Kenya Example



# Identifying Assumption

- Basic Assumption: Loan commitment decisions in year  $t$  do not anticipate future shocks to growth in years  $t+1, t+2, \dots$ 
  - **IF** loans disburse as scheduled at time of commitment, then disbursements on previously-approved loans are also uncorrelated with current shocks
- Obvious Problem: disbursements on previously-committed loans may respond to contemporaneous shocks, e.g.
  - country falls into conflict – disbursements stop?
  - natural disaster – disbursements speed up?
- Solution: replace actual disbursements with *predicted* disbursements based on creditor-region-decade average disbursement rates applied to initial loan commitment

# Disbursements on Current and Previous Commitments: Kenya Example



# Data on Official Creditor Lending

- loan-level commitment and disbursement transactions data on approx 60,000 loans from official creditors to developing country governments
- data extracted from Debtor Reporting System (DRS) database maintained by the World Bank
  - in principle comprehensive since annual reporting on external debt is mandatory for all Bank clients
  - loan-level data is confidential, but country-level aggregates are basis for external debt data reported in GDF, WDI
- covers all official multilateral and bilateral creditors since 1970
  - declining share of bilaterals as many have shifted to grant financing of aid activities
  - exclude IMF because of its mostly countercyclical mandate

# Country Samples

- Success of identification strategy depends on strong first-stage relationship between changes in government spending and changes in predicted disbursements
  - so consider countries where official creditors are a major source of financing of government spending
- Largest sample of 102 countries where:
  - actual disbursements average at least 1% of GDP
  - at least 15 years of annual data on  $y$ ,  $g$ , and disbursements
- Two overlapping subsamples of interest where identification is stronger
  - 70 countries highly-dependent on official creditor financing (disbursements/spending > 10%)
  - 60 low-income countries eligible for IDA as of FY12

# Summary of Empirical Strategy

- First-stage regression of changes in government spending on changes in predicted disbursements (both scaled by lagged GDP)

$$\frac{g_{it} - g_{it-1}}{y_{it-1}} = \gamma \frac{pd_{it} - pd_{it-1}}{y_{it-1}} + \theta_i + \tau_t + u_{it}$$

- “Structural” regression of changes in GDP on changes in government spending (both scaled by lagged GDP)

$$\frac{y_{it} - y_{it-1}}{y_{it-1}} = \beta \frac{g_{it} - g_{it-1}}{y_{it-1}} + \mu_i + \lambda_t + \varepsilon_{it}$$

# Benchmark Results: First-Stage Regression

	(1)	(2)	(3)
Sample of Countries	<u>Full</u>	<u>IDA</u>	<u>Disb/G&gt;10%</u>
<b>Panel C: First-Stage Regressions</b>			
<i>(Dependent variable is Change in Total Government Spending)</i>			
Change in Predicted Disbursements	0.531*** (0.150)	0.796*** (0.150)	0.699*** (0.149)
First-Stage F-Statistic on Excluded Instrument	12.62	28.08	22.18
Number of Observations	2804	1508	1950
Number of Countries	102	60	70

- highly-significant first-stage relationship
  - especially in second and third samples
- first-stage F-statistics exceed Staiger-Stock threshold of 10, so no concerns about weak-instrument pathologies

# Benchmark Results: OLS and 2SLS

	(1)	(2)	(3)
Sample of Countries	<u>Full</u>	<u>IDA</u>	<u>Disb/G&gt;10%</u>
<b>Panel A: OLS Estimates</b>			
<i>(Dependent variable is Change in Real GDP)</i>			
Change in Total Government Spending	0.306***	0.259***	0.277***
	(0.0377)	(0.0501)	(0.0431)
<b>Panel B: 2SLS Estimates</b>			
<i>(Dependent variable is Change in Real GDP)</i>			
Change in Total Government Spending	0.375	0.408**	0.417**
	(0.248)	(0.197)	(0.204)
Weak Instrument Consistent 95% Confidence Int	[-0.058, 0.827]	[0.071, 0.774]	[0.082, 0.776]

- 2SLS estimates of multiplier precisely estimated around 0.4
  - more precise estimates in poorer part of sample
- (A bit) larger than OLS estimates – suggests modestly-countercyclical spending on average (or attenuation bias in OLS?)



# Battery of Robustness Checks

- multilateral versus bilateral creditors?
  - *identification comes mostly from multilateral lending*
- influential observations?
  - *similar point estimates, stronger identification*
- government spending vs. government purchases?
  - *hard to get good data*
- anticipation effects?
  - *matter, but multiplier remains similar*
- persistent shocks?
  - *control for lagged growth, similar multipliers*
- longer-run effects?
  - *can't identify differential effect of current vs lagged G*
- effects of concurrent policy reforms induced by lending?
  - *matter, but only slight upward bias in multipliers*

# Heterogeneity in Estimated Multipliers

- Large sample of countries/years in which official creditor lending is macroeconomically important makes it possible to investigate various plausible sources of heterogeneity in multipliers
  - state of business cycle ( $\beta$  bigger in recessions?)
  - extent of trade openness ( $\beta$  bigger in closed economies?)
  - exchange rate regime ( $\beta$  bigger under flexible exchange rates (and limited capital mobility)?)
  - concessionality of overall financing of spending ( $\beta$  bigger in less aid-dependent countries (where neoclassical wealth effects are more important)?)

# Heterogeneity: State of Business Cycle

	(1)	(2)	(3)	(4)	(5)	(6)
Sample of Countries	<u>Full</u>	<u>IDA</u>	<u>Disb/G&gt;10%</u>	<u>Full</u>	<u>IDA</u>	<u>Disb/G&gt;10%</u>
<b>Panel A: State of Business Cycle</b>		<u>Recession</u>			<u>Boom</u>	
<i>OLS Estimate</i>						
Change in Government Spending	0.195*** (0.0365)	0.186*** (0.0457)	0.204*** (0.0456)	0.101*** (0.0326)	0.0611 (0.0432)	0.0796** (0.0384)
<i>2SLS Estimate</i>						
Change in Government Spending	0.660* (0.353)	0.614* (0.328)	0.807** (0.383)	0.146 (0.265)	0.0398 (0.171)	0.00873 (0.215)
<i>First-Stage F-Statistic</i>	7.40	7.99	8.01	8.02	18.64	14.76
<i>Number of Observations</i>	1312	701	919	1492	807	1031

- Boom (recession) if annual GDP growth is above (below) country-decade average
- Multipliers substantially higher in recessions than booms
  - although differences not statistically significant
- Qualitatively consistent with Auerbach and Gorodnichenko (2012a,b) for United States

# Heterogeneity: Trade Openness

	(1)	(2)	(3)	(4)	(5)	(6)
Sample of Countries	<b>Full</b>	<b>IDA</b>	<b>Disb/G&gt;10%</b>	<b>Full</b>	<b>IDA</b>	<b>Disb/G&gt;10%</b>
<b>Panel B: Trade Openness</b>		<b><i>Closed</i></b>			<b><i>Open</i></b>	
<i>OLS Estimate</i>						
Change in Government Spending	0.337***	0.274***	0.319***	0.281***	0.236***	0.243***
	(0.0617)	(0.0723)	(0.0745)	(0.0465)	(0.0645)	(0.0526)
<i>2SLS Estimate</i>						
Change in Government Spending	0.634**	0.571*	0.712**	0.116	0.180	0.150
	(0.295)	(0.284)	(0.353)	(0.491)	(0.328)	(0.320)
<i>First-Stage F-Statistic</i>	10.23	13.42	8.71	4.42	13.75	10.95
<i>Number of Observations</i>	1398	750	966	1406	758	984

- Country-decade is open (closed) if Trade/GDP is above (below) pooled country-decade median for whole sample
- Multipliers larger in closed part of sample
  - but difference is not statistically significant
- Qualitatively consistent with textbook IS/LM
  - lower “leakages” into imports

# Heterogeneity: Exchange Rate Regime

	(1)	(2)	(3)	(4)	(5)	(6)
Sample of Countries	<u>Full</u>	<u>IDA</u>	<u>Disb/G&gt;10%</u>	<u>Full</u>	<u>IDA</u>	<u>Disb/G&gt;10%</u>
<b>Panel C: Exchange Rate Regime</b>		<b><u>Flexible</u></b>			<b><u>Fixed</u></b>	
<i>OLS Estimate</i>						
Change in Government Spending	0.320*** (0.0513)	0.301*** (0.0649)	0.308*** (0.0632)	0.269*** (0.0487)	0.209*** (0.0656)	0.244*** (0.0498)
<i>2SLS Estimate</i>						
Change in Government Spending	0.387 (0.304)	0.482** (0.199)	0.320 (0.208)	0.306 (0.371)	0.188 (0.280)	0.450 (0.342)
<i>First-Stage F-Statistic</i>	9.55	25.54	21.88	6.03	11.46	7.25
<i>Number of Observations</i>	1009	504	592	1795	1004	1358

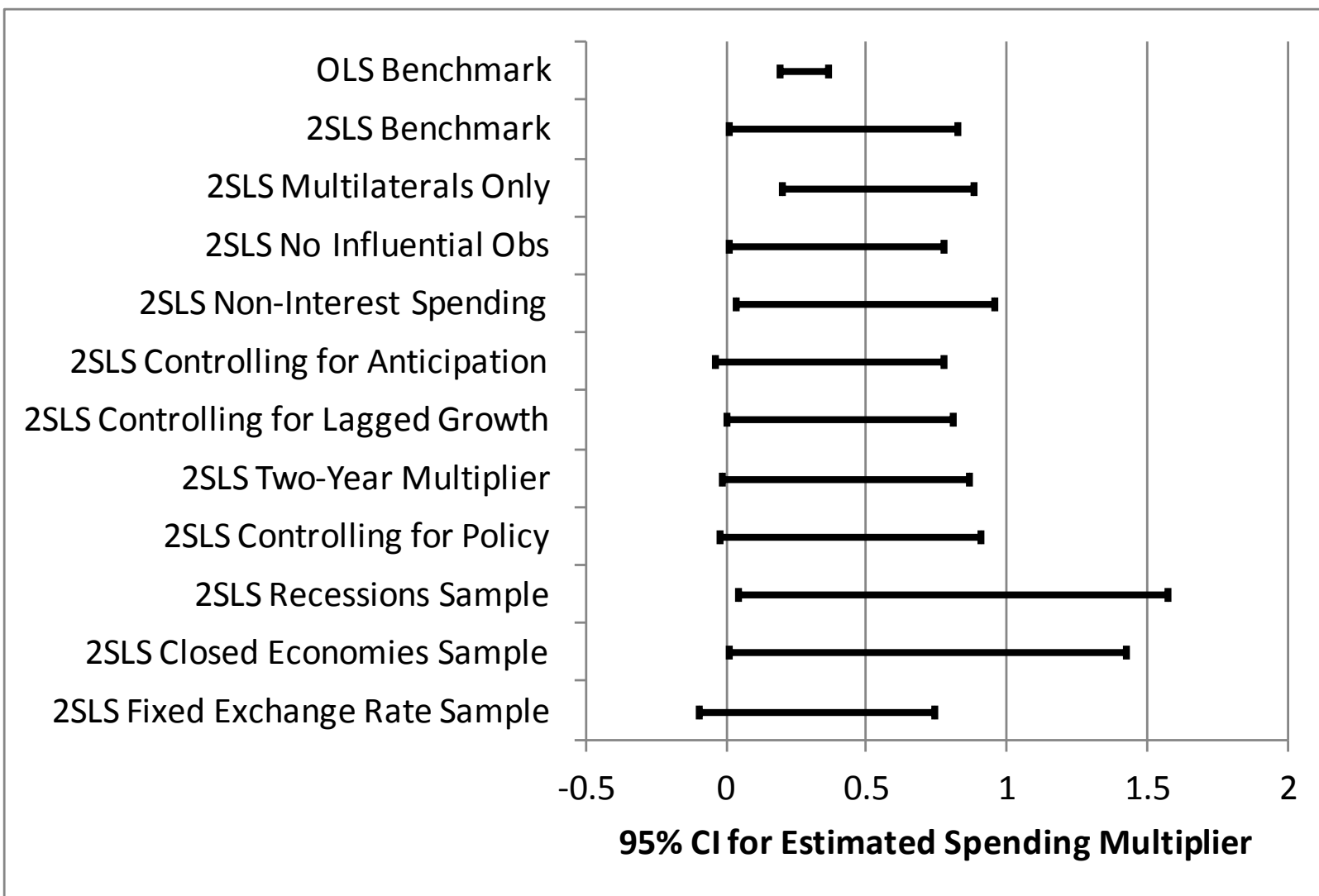
- Countries have fixed/flexible exchange rate regimes based on Ilzetki, Reinhart and Rogoff (2011) de facto classification
- Some mixed evidence that multipliers are a bit larger under flexible exchange rates (especially in IDA sample)
- Consistent with textbook IS/LM model (with limited capital mobility)
  - expansionary fiscal policy leads to depreciation which further stimulates output

# Heterogeneity: Aid Dependence

	(1)	(2)	(3)	(4)	(5)	(6)
Sample of Countries	<b>Full</b>	<b>IDA</b>	<b>Disb/G&gt;10%</b>	<b>Full</b>	<b>IDA</b>	<b>Disb/G&gt;10%</b>
<b>Panel D: Aid Dependence</b>		<b>Low</b>			<b>High</b>	
<i>OLS Estimate</i>						
Change in Government Spending	0.349*** (0.0603)	0.321*** (0.0818)	0.393*** (0.0716)	0.265*** (0.0388)	0.209*** (0.0538)	0.204*** (0.0433)
<i>2SLS Estimate</i>						
Change in Government Spending	-0.146 (0.951)	0.587* (0.343)	0.275 (0.750)	0.547** (0.224)	0.430* (0.255)	0.438** (0.173)
<i>First-Stage F-Statistic</i>	0.82	8.21	1.26	13.22	16.22	22.92
<i>Number of Observations</i>	1373	747	970	1431	761	980

- Countries are more/less aid dependent based on whether decade-average aid/GDP is above/below pooled decade average median
- Neoclassical theory suggests multiplier should be smaller the more spending is aid-financed – since present value of future taxes is lower
- Weak evidence that multiplier is larger in less aid-dependent setting in IDA sample
  - but identification is lousy in low-aid half of sample

# Summary of Estimated Multipliers



# Conclusions

- Delays between commitment and disbursement on loans from official creditors permits construction of an instrument for fluctuations in government spending
  - key identifying assumption: loan commitments don't anticipate future shocks to growth
- Rich loan-level commitment and disbursement data on universe of loans from official creditors in DRS enables implementation of this strategy
- Estimated multipliers are modest, around 0.4 after 1 to 2 years
  - quite small (cf. “consensus” range for US is [0.8,1.5])
  - not structural parameters, but rather a useful empirical fact
  - not about effects of aid on growth
- Does not imply that optimal fiscal response is to do *nothing*
  - e.g. scope for expanding safety nets during downturn even if little aggregate macroeconomic stimulus