# The Determinants of Infrastructure Project Performance in low-income countries

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# Outline

- "What matters in getting infrastructure investment right?" → its determinants;
- Assemble a database of infrastructure projects financed by the World Bank and their ratings (1710, 1979-2008, 136 countries);
- Focus on three variables: Project Outcome, Borrower Performance and Bank Performance;
- Given some preliminary results, focus on an hypothesis.

# Variable Definition... (IEG)

- Outcome extent to which the operation's major relevant objectives were achieved efficiently.
- Bank Performance level to which services provided by the Bank ensured quality at entry of the operation and appropriate supervision.
- Borrower Performance degree to which the borrower ensured quality of preparation and implementation.

# Why?

- Infrastructure investment is essential to boost growth & development (post-crisis priority);
- Large macro literature on infrastructure and growth (Calderon, Moral-Benito and Serven 2011; Romp and de Haan 2005; Estache, and Shafik 2004);
- Growing micro literature using HH, ES and IE (Dinkelman 2008, Dethier, Hirn and Straub 2010, Newman et al 2002);

# Story & Setting

 An assumption: project success depends on the quality of implementation (borrower);

Borrower Performance  $\rightarrow$  Project Outcome

- But... endogeneity, simultaneity and projectlevel unobservable variables.
- To disentangle causality, assume the World Bank has an *indirect* role in project outcome (IV 2SLS)

Bank Perf.  $\rightarrow$  Borr. Perf.  $\rightarrow$  Project Outcome

#### Reasons

- World Bank is a financing and knowledge institution, no implementation (borrower);
- Bank Performance involves supervision and quality at entrance, less project specific;
- Its variability may be caused by task manager quality (Denizer, Kaufmann and Kraay 2011) or knowledge intensity (Fardoust and Flanagan 2011);

### Estimation

• We focus on the following:

 $\begin{aligned} OUTCOME_{ijt} &= a_1 BORR_{ijt} + a_2 SIZE_{ijt} + a_3 GDP_{j\bar{t}} + a_4 VOL_{j\bar{t}} + a_5 GROWTH \\ &+ a_6 INFR_{j\bar{t}} + a_7 INST_{j\bar{t}} + \eta_j + \eta_t + \varepsilon_{ijt} \end{aligned}$ 

- i indexes project, j country and t time ( $\bar{t}$ );
- Project and other Macro-Institutional controls;
- Country/year fixed effects (though R<sup>2</sup>...);

# Estimation (2)

- Borrower performance (ijt) is instrumented through:
- Bank Performance (ijt);
- Government Effectiveness (Kaufmann, Kraay and Mastruzzi 2010)

Govnt. Effect.  $\rightarrow$  Borr. Perf.  $\rightarrow$  Project Outcome

#### Data

 $OUTCOME_{ijt} = a_1BORR_{ijt} + a_2SIZE_{ijt} + a_3GDP_{j\bar{t}} + a_4VOL_{j\bar{t}} + a_5GROWTH$ 

 $+a_6 INFR_{j\bar{t}} + a_7 INST_{j\bar{t}} + \eta_j + \eta_t + \varepsilon_{ijt}$ 

- Project var.s: IEG ratings (1-6 scale);
- Macro data: WDI 2010;
- Infrastructure Index: Calderon, Moral-Benito and Serven 2011;
- Institutional: ICRG 2010 (Bureaucracy, Corruption, Accountability, Stability, Ethnic, Ext. conflict) – inverse variables.



#### Econometric methodology

- Ratings = ordered data → multinomial ordered probit/logit → problems of interpretation...
  what to do? "Pragmatic Approach" (literature).
- OLS/FE
- Ordered Probit/Logit
- IV 2SLS, IV probit, IV ordered probit
- Discussion/Comments/Ideas in the Q&A

# Estimation 1 - Table (1)

	_	-	-	_	-			
	OLS (1)	FE (2)	Ologit	Ologit FE	Oprobit	Oprobit FE		
	Outcome							
Borr.er	0.661***	0.658***	1.570***	1.656***	0.827***	0.881***		
	(0.014)	(0.014)	(0.056)	(0.060)	(0.026)	(0.028)		
Growth	0.277**	0.136	0.640***	0.187	0.377***	0.118		
	(0.106)	(0.179)	(0.282)	(0.488)	(0.158)	(0.274)		
Bure.cy	-0.009	-0.166***	0.004	-0.438***	-0.020	-0.271***		
	(0.030)	(0.058)	(0.079)	(0.175)	(0.044)	(0.096)		
C/Y FE		Yes/Yes		Yes/Yes		Yes/Yes		
Other Statistics								
Observ.	1710	1710	1710	1710	1710	1710		
L.Lik.d			-1743.19	-1653.01	-1760.34	-1665.08		
Ad/PsR <sup>2</sup>	0.588	0.603	0.271	0.309	0.264	0.303		

Controls: Size, GDP, Volatility, Infrastructure Index, Corruption, Accountability, Stability, Ethnic, Ext. Conflict

# Estimation 1 - Table (2)

	IV 2SLS		IV oprobit		IV oprobit*			
	II Outcome	l Borrower	II Outcome	I Borrower	II Outcome	I Borrower		
Borrower	0.926***		0.947***		1.007***			
	(0.027)		(0.027)		(0.029)			
Bank		0.701***		0.881***		0.873***		
		(0.02)		(0.03)		(0.03)		
Gvt. Effect.		0.210		0.260***		0.264**		
		(0.16)		(0.09)		(0.09)		
Corruption	-0.032	0.047	0.043	0.138**	-0.069	0.117***		
	(0.061)	(0.074)	(0.040)	(0.055)	(0.073)	(0.059)		
C/Y FE	Yes/Yes	Yes/Yes			Yes/Yes	Yes/No		
Other Statistics								
Observ.	1250	1250	1710		1710			
Ad. R <sup>2</sup> /Ps. R <sup>2</sup>	0.563	0.497	L.L.hood -2848.91		L.L.hood -2742.78			
Sargan Test	0.3	79						
Basmann Test	0.4	.04						

Controls: Size, GDP, Volatility, Growth, Infrastructure Index, Bureocracy, Accountability, Stability, Ethnic, Ext. Conflict

#### **Estimation 1 - Comments**

- "Well mannered results";
- Not invalid instrument (both Sargan & Basman);
- Instrument cause the borrower coefficient to grow between 20% (oprobit vs IV oprobit) and 40% (OLS/FE vs IV 2SLS)... why?
- Borrower performance outweights macro variables (without C/Y FE, R2 ~ 60%).

### Estimation 2 – Table 1

	IV oprobit, 1979-1989		IV oprobit,	1990-1999	IV oprobit, 2000-2008			
	II Outcome	l Borrower	II Outcome	l Borrower	II Outcome	l Borrower		
Borro.er	0.724***		0. 934***		1.679***			
	(0.062)		(0.032)		(0.102)			
Bank		0.715***		0.858***		1.358***		
		(0.12)		(0.04)		(0.10)		
Gvt. Eff.		-0.441		0.333***		0.305		
		(0.43)		(0.11)		(0.22)		
Corrup.on	-0.025	0.909***	0.081	0.135*	0.061	-0.205*		
	(0.119)	(0.316)	(0.051)	(0.071)	(0.127)	(0.131)		
Other Statistics								
Observ.	261		1179		270			
L.L.hood	-306.59		-1906.50		-472.13			
Prob(χ²)	0.00		0.00		0.00			

Controls: Size, GDP, Volatility, Growth, Infrastructure Index, Bureocracy, Accountability, Stability, Ethnic, Ext. Conflict

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#### **Estimation 2 - Comments**

- Similar results using IV 2SLS (with/out C/Y FE);
- "Well mannered results";
- Borrower Performance strikingly grows over time: 131% (IV 2SLS 60%);
- Bank Performance strikingly grows over time: 90% (IV 2SLS 45%);
- Corruption variable decreases and turns negative – corruption becomes good for infrastructure projects ?!?

# Hypothesis... (1)

- HP: WB anti-corruption stance affected bank performance (thus borr&proj);
- → this should be especially true in fragile/new States.
- So, select fragile/new states (Fragile states dummy), interact it with corruption and bank performance.

# Estimation 3 – Table 1

	IV oprobit 1979-1989		IV oprobit 1990-1999		IV oprobit 2000-2008	
	II Outcome	I Borrower	II Outcome	I Borrower	II Outcome	I Borrower
Borrower	0.724***		0.941***		1.679***	
	(0.062)		(0.032)		(0.103)	
Bank		0.715***		0.841***		1.322***
		(0.12)		(0.04)		(0.10)
Bank				0.074		0.282*
x Fragile				(0.077)		(0.180)
Gvt.Eff.		-0.441		0.309***		0.189
		(0.43)		(0.12)		(0.23)
Corrup.on	-0.025	0.909***	0.147**	0.063	0.061	-0.410***
	(0.119)	(0.316)	(0.062)	(0.085)	(0.127)	(0. 162)
Cor. x Frag.			-0.174*	0.197	0.170	0.455*
			(0.096)	(0.129)	(0.158)	(0.282)
Fragile			0.586**	-0.894*	-0.305	-2.589**
States			(0.267)	(0.481)	(0.275)	(1.012)

Controls: Size, GDP, Volatility, Growth, Infrastructure Index, Bureocracy, Accountability, Stability, Ethnic, Ext. Conflict

#### **Estimation 3 - Comments**

- Similar results using IV 2SLS (with/out C/Y FE);
- Results meet our ex-ante expectations;
- Bank Performance is differentially higher in Fragile States;
- In Fragile States there is positive relation between Corruption Risk and Project Outcome

### Conclusions

- B&B Performance seems to be fundamental for Project Success (+ History);
- Project variables explain Project success (little role for Macro variable) → "institutional argument" ?
- The WB anti-corruption strategy seems to have improved Bank performance;
- ... but what drives Bank performance?