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Private Participation in Infrastructure in LMICs and SSA countries

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Collaboration among Government, Market, and Society
Forging Partnerships and Encouraging Competition
Fudan University, Shanghai, China
May 26, 2013

Outline

- ***Introduction***
- Background
- Methodology
- Data
- Findings

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Policy problem

- Significant infrastructure needs in Low and Middle Income Countries (LMICs) - particularly acute for Sub-Saharan Africa (SSA)
- Few governments have the ability to finance the needed infrastructure on their own
- Private Participation in Infrastructure (PPI) may provide part of the solution

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Research questions

- What are some of the determinants of PPI in LMICs overall?
- What are some of the determinants of PPI in Sub-Saharan Africa?
- How do they compare?

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Contribution to existing research

- Substantive
  - Utilizes a two-part model to separately estimate receipt of PPI as well as amounts of PPI received (given a country received PPI)
  - Specific case of Sub-Saharan Africa is explored
  - Extension of period of study to 2008
- Methodological
  - Controls for a large number of variables (includes time fixed effects)
  - Standard errors clustered by country (no assumption on the distributional form of the error terms)

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Defining the key terms

- Infrastructure refers to economic infrastructure
  - 4 sectors: telecom, transportation, power, water and sanitation

- Private participation in infrastructure: Private company or investor bears a share of the risk of the project's construction and/or operation

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The spectrum of PPI

Contract type	Private management and operation	Private sector assumes full commercial risk	Private entity commits new investment capital	Specified contract period	Full or partial private ownership
Management	X			X	
Lease	X	X		X	
Greenfield	X	X	X	X	
Concession	X	X	X	X	
Divestiture	X	X	X		X

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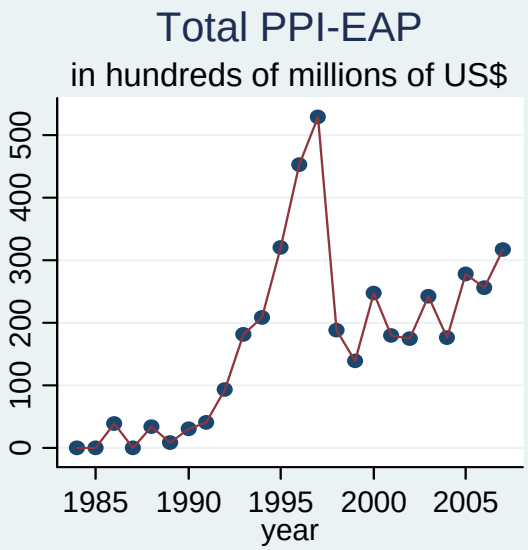
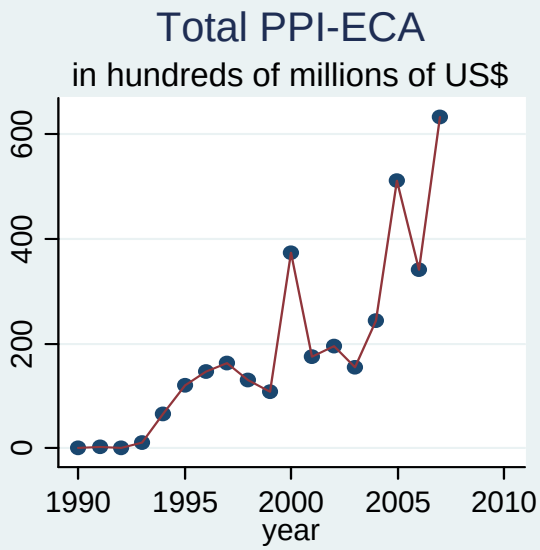
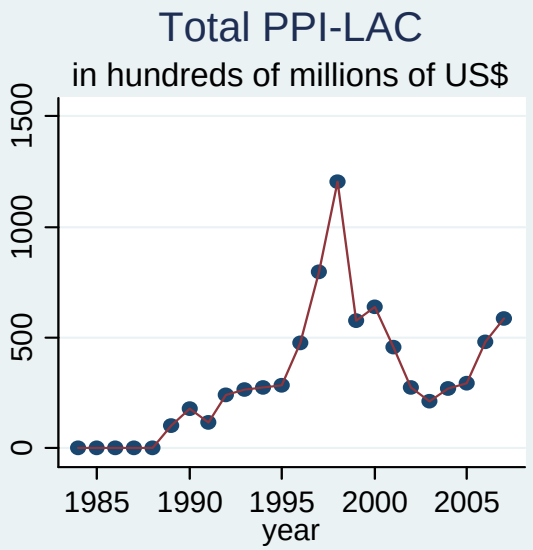
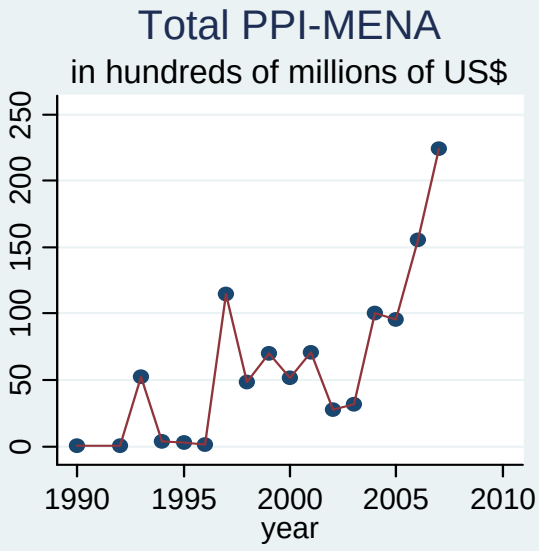
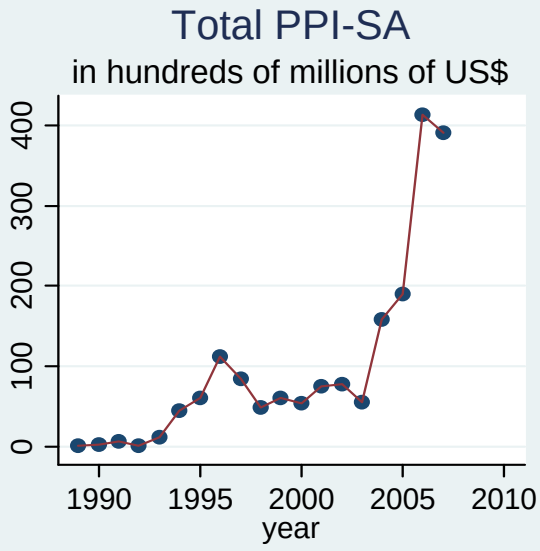
Total PPI (millions of US$) developing region

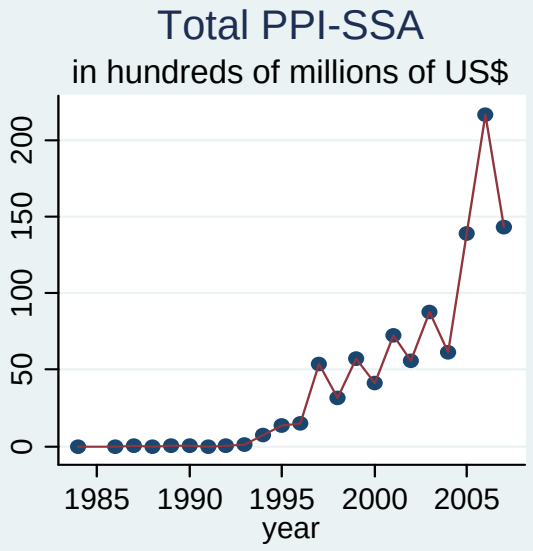




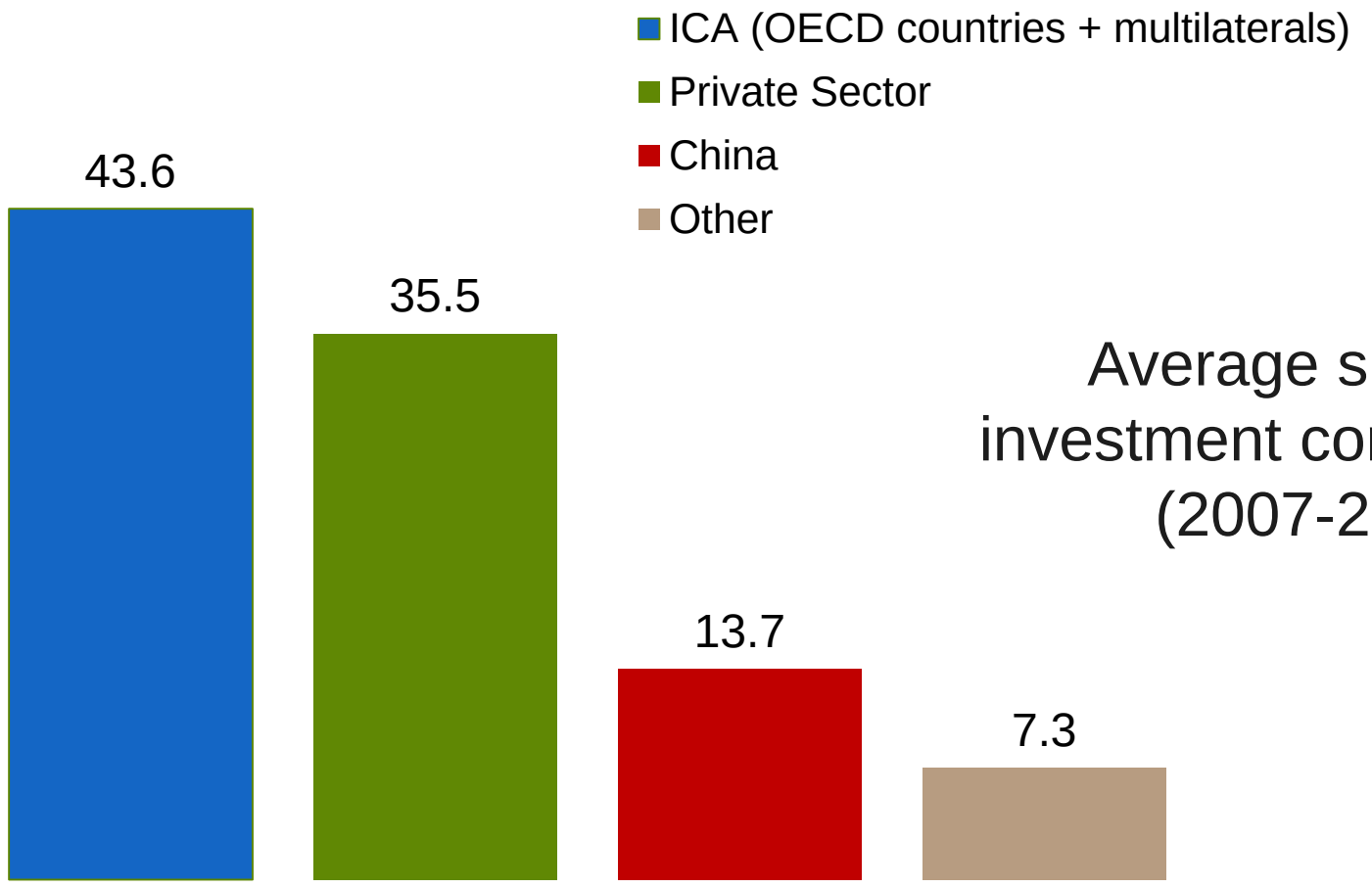








PPI in SSA relative to other external sources of financing



Average share of investment commitments (2007-2010)

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Empirical strategy

- Data: Panel cross-country regression framework
- Empirical specification
  - Two-part model
  - Year fixed effects
  - Standard errors clustered on countries

Part 1: Pr(PPI_{it}>0)= $\alpha_0 + \alpha_1 I_{it} + \alpha_2 X_{it} + \alpha_3 Y_{it} + \alpha_4 Z_{it} + \vartheta_t + \delta_{it} + \sigma_{it}$

Part 2: Pr(PPI_{it}|PPI_{it}>0)= $\gamma_0 + \gamma_1 I_{it} + \gamma_2 X_{it} + \gamma_3 Y_{it} + \gamma_4 Z_{it} + \vartheta_t + \rho_{it} + \eta_{it}$

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Factors potentially affecting PPI

	Factor identified in the literature
Government motivations	1. Ability of the government to finance infrastructure 2. Improved efficiency and tariff discipline in public utilities
Private firm motivations	1. Adequate regulatory framework and enforcement of laws 2. Independence of regulatory institutions and processes 3. Access to credit 4. Consumers' ability to pay for services 5. Government effectiveness and responsiveness 6. Political stability and public opinion on private provision of infrastructure services
Enabling environment	1. Macroeconomic environment 2. Institutional capacity to regulate PPPs 3. Structural characteristics of country

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Empirical strategy (ctd.)

- Limitations of cross-country regressions (Levine & Renelt 1992):
  - Mutlicollinearity among the independent variables
  - Results can be highly sensitive to the explanatory variables that are included in the regression
- Sensitivity checks
  - Vary the independent variables that are included in the model and investigate whether the coefficient estimates, their significance or their signs change dramatically
- Robustness checks
  - Vary the chosen independent variables to see if the specific proxy variables drive the results
  - For SSA, exclude potential outlier countries

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Data: outcome variable

- World Bank PPI database
  - Panel data (1995- 2008) on PPIs for 133 Low and Middle Income countries
  - By infrastructure sector: electricity, telecom, transportation, and water and sanitation

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PPI summary statistics (1995 – 2008)

Group	LMICs	SSA
Number of countries	133	44
Mean (millions of constant 2005 US$)	1,010.12	162.43
Standard deviation	4,568.86	570.51
Min (millions of constant 2005 US$)	0	0
Max (millions of constant 2005 US$)	101,236.70	6,106.45
Number of observations	1,862	616

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Explanatory variables

	Factor	Proxy indicator	Source
Government motivations	Ability of the government to finance infrastructure	Aid (% of gross capital formation)	WDI 2009
		Index of government size	IEF 2010
Private firm motivations	Adequate regulatory framework and proper enforcement of laws	Freedom from corruption index	
		Index of property rights protection	
	Access to credit	Domestic credit to private sector (% of GDP)	WDI 2009
	Market size and consumers' ability to pay for services	GDP per capita (constant 2005 international $)	
		Total Population	
	Government effectiveness and responsiveness	Index of investment freedom	IEF 2010
		Index of business freedom	
		Index of fiscal freedom	
	Political stability	Democracy	Hadenius & Teorell 2007
		Civil War	
		Ethnic fractionalization	Roeder 2001
		Regime durability	Polity IV database 2008
Enabling environment	Macroeconomic environment	Annual inflation in consumer prices (%)	WDI 2009
		Openness	
	Economic structure	Total natural resources rents (% of GDP)	
		Agriculture, value added (% of GDP)	
		Industry, value added (% of GDP)	
		Services, value added (% GDP)	

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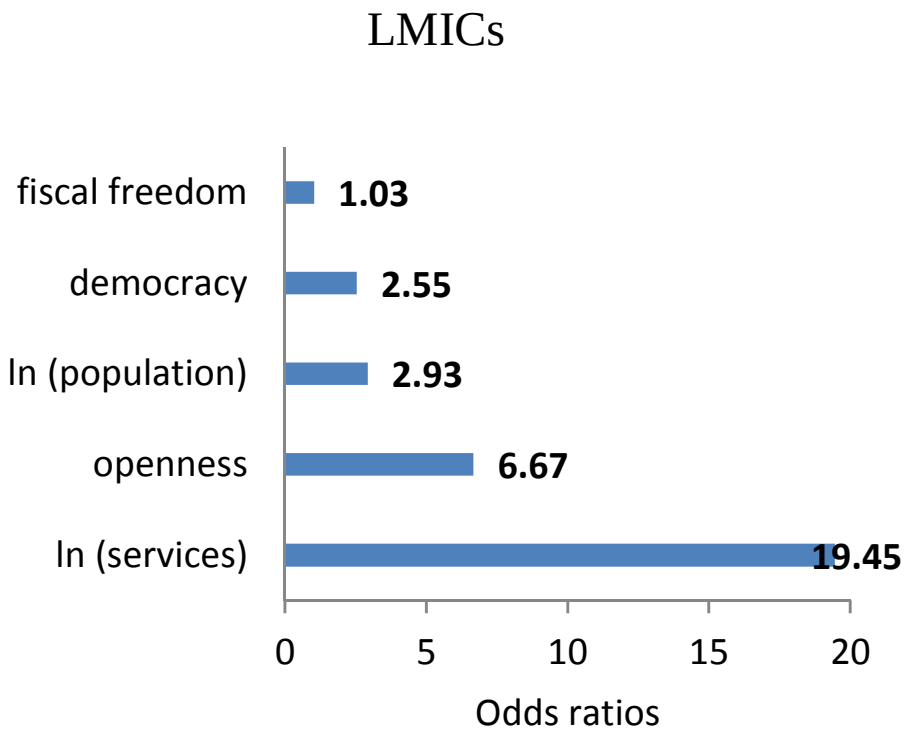
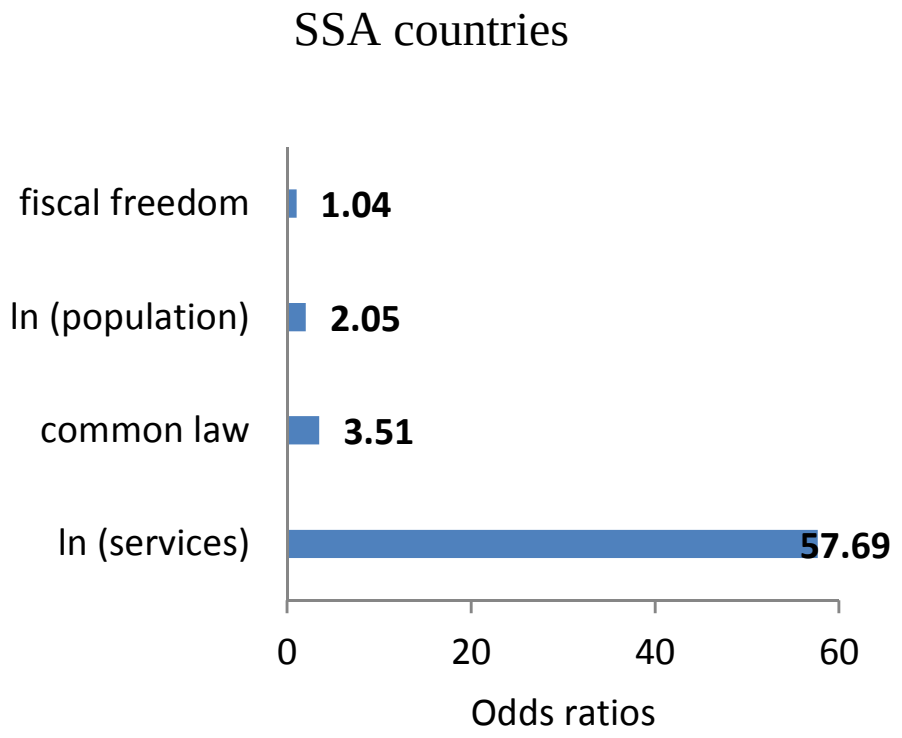
Factors associated with positive levels of PPI - SSA compared to LMICs





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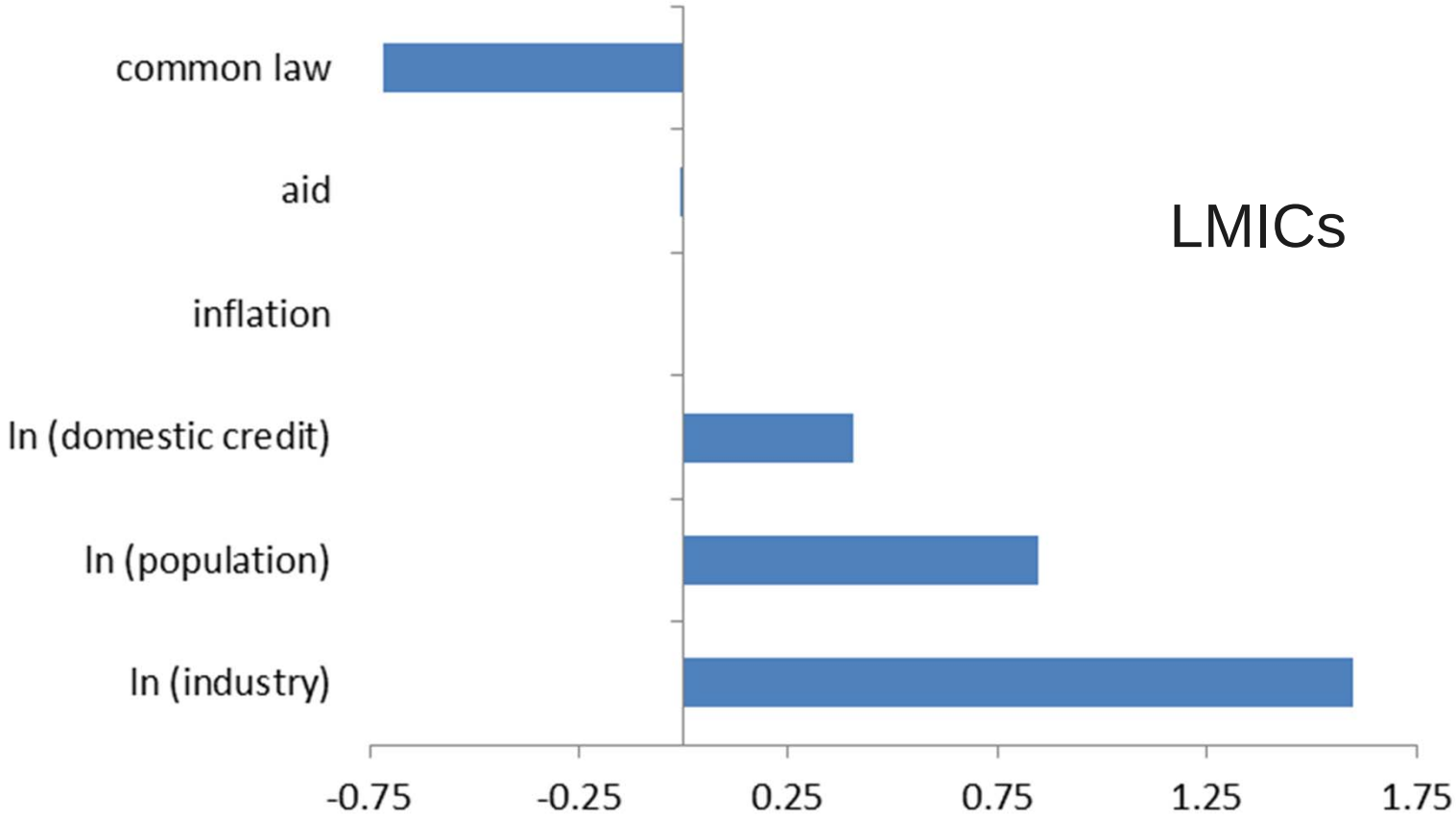
Factors associated with the amount of PPI received (LMICs)



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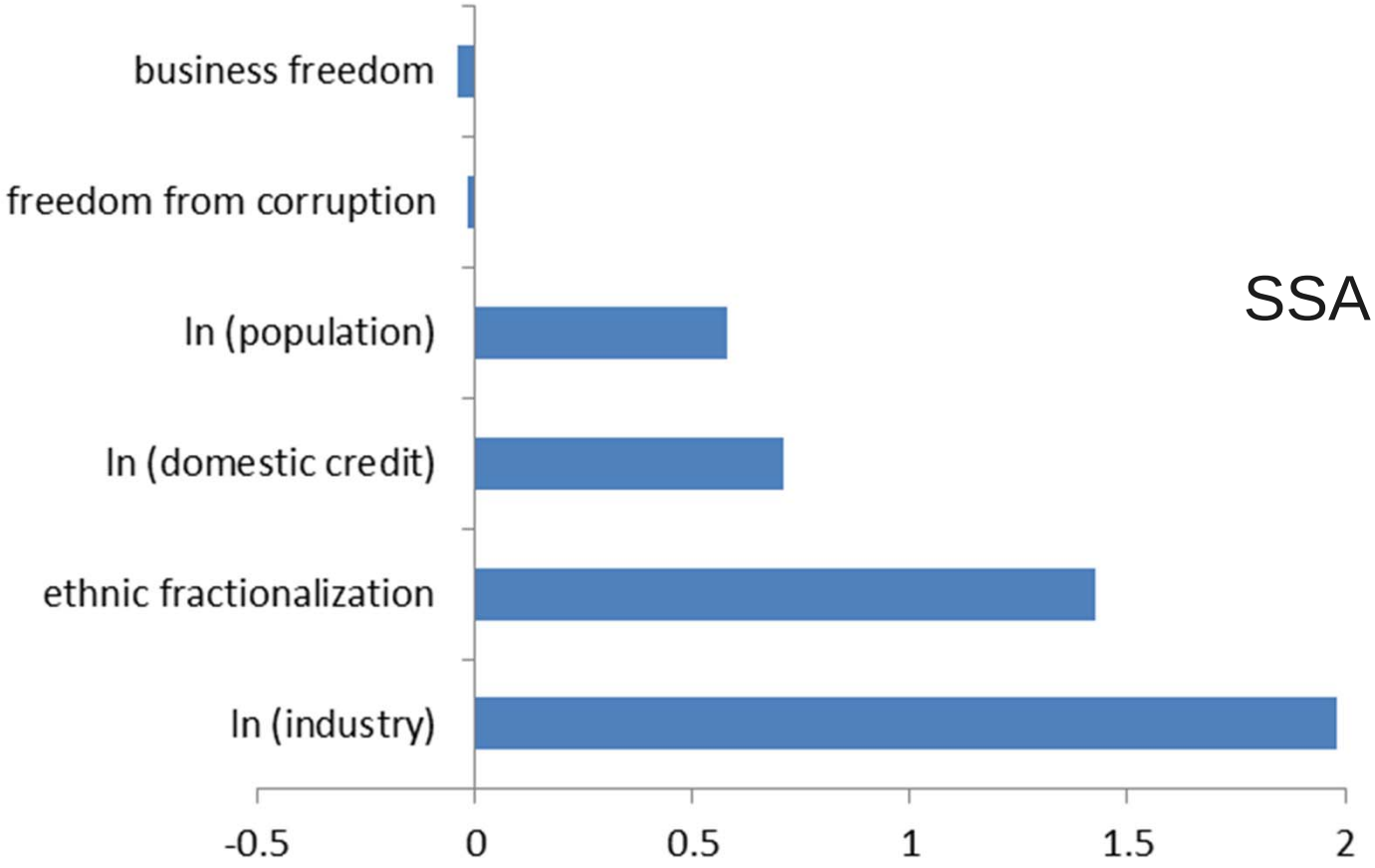
Factors associated with the amount of PPI received (SSA)



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Findings summary

- The size of the service sector in the economy is the largest predictor of the probability that a country gets PPI, with the effect being even more pronounced for SSA countries
- Larger market size and higher consumers ability to pay is also significantly associated with larger amounts of PPI
- The availability of domestic credit is significantly and positively correlated with larger PPI amounts
- More industrialized countries (i.e., larger contribution of industry to GDP) receive higher amounts of PPI

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Findings summary

- Where SSA differs from the average LMIC
  - Common law countries significantly more likely to receive PPI
  - Higher regulatory burden, lower government efficiency in the regulatory process, as well as higher corruption are positively (and statistically significantly) associated with greater amounts PPI received

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Policy implications

- Findings are reflective of SSA countries inexperience with PPI
- Concentrate future polices on
  - Building experience and institutional capacity
  - Improving the regulatory process

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BACKUP SLIDES

(1) Findings

(2) Robustness and sensitivity checks

(3) Alternative proxies used in the robustness checks

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	LMICS		SUB-SAHARAN AFRICA	
	Part 1	Part 2	Part 1	Part 2
gfcfconstant	2.96E-13	1.70e-12***	2.89E-12	1.78E-11
	(0.31)	(4.24)	(0.59)	(1.18)
Aid	-0.00445	-0.00574*	-0.0054	-0.00266
	(-1.38)	(-2.29)	(-1.75)	(-0.94)
Government size	0.0107	-0.00746	0.014	0.00823
	(0.95)	(-1.58)	(0.94)	(0.77)
ln (industry)	0.353	1.600***	0.773	1.982***
	(0.59)	(4.27)	(1.42)	(5.88)
ln (services)	2.968**	1.042	4.055***	0.515
	(3.15)	(1.75)	(3.66)	(0.66)
ln (resource rents)	0.00938	-0.1	0.145	-0.13
	(0.06)	(-1.30)	(1.03)	(-1.11)
ln (population)	1.074***	0.849***	0.719**	0.581***
	(4.81)	(10.29)	(2.96)	(3.44)
freedom from corruption	-0.00408	0.000417	0.00272	-0.0160*
	(-0.33)	(0.07)	(0.18)	(-2.20)
common law	0.279	-0.716***	1.255*	0.281
	(0.6)	(-3.39)	(2.54)	(0.75)
ethnic fractionalization	-1.211	0.492	-0.482	1.424**
	(-1.31)	(1.35)	(-0.45)	(3.00)

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	LMICS		SUB-SAHARAN AFRICA	
	Part 1	Part 2	Part 1	Part 2
democracy	0.937*	0.228	-0.338	0.302
	(2.33)	(1.64)	(-0.78)	(0.97)
civil war	23.77	-0.021	29.91	-0.685
	(0.00)	(-0.04)	(0.00)	(-1.60)
ln (domestic credit)	-0.255	0.405***	-0.245	0.708***
	(-1.01)	(4.3)	(-0.84)	(3.94)
Fiscal freedom	0.0325*	0.0129	0.0394**	0.0124
	(2.45)	(1.46)	(2.64)	(1.02)
business freedom	-0.00427	0.0108	-0.0315	-0.0397**
	(-0.27)	-1.29	(-1.72)	(-3.14)
investment freedom	0.0046	0.0075	-0.00274	0.0064
	(0.43)	(1.84)	(-0.21)	(0.55)
Inflation	-0.00191	-0.00101*	-0.0217	0.00592
	(-0.87)	(-1.99)	(-1.73)	-0.71
openness	1.898**	-0.276	0.882	-0.621
	(2.86)	(-0.99)	(1.34)	(-1.44)
_cons	-29.31***	-19.84***	-30.26***	-13.43***
	(-5.13)	(-6.07)	(-5.21)	(-3.39)
N	1051	854	340	225

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Robustness checks (1)

- *Regression (1):* Indicators of structural aspects of the country's economy (value added of services, industry and agriculture) and the level of aid received are substituted with the GDP per capita.

- *Regression (2):* In addition to substitutions made in (1), the indices of business and investment freedom are dropped, and the index of property rights protection from the IEF is added.

- *Regression (3):* Alternative measures from the WGI are used as proxies for political stability, government effectiveness and rule of law.
  - the indicators for civil war, regime durability, and ethnic fractionalization are replaced by the WGI's index for political stability and absence of violence, and the indices for business and investment freedom, and freedom from corruption are replaced by the WGI's government effectiveness, regulatory quality, and rule of law, and control of corruption indices.

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Robustness checks (2)

- *Regressions (4) and (5):* Alternative political stability measures are used in each regression.
  - (4) replace political stability measures from the "streamlined model" (civil war, regime durability, and ethnic fractionalization) with the US State Department's Political Terror Scale (PTS) measure of political violence and terror.
  - (5) replace political stability measures with the WGI political stability and absence of violence index.

- *Regression (6): Substitute* the business and investment freedom indices with an overall quality of government index from the International Country Risk Guide (ICRG).

- *Regression (7):* Exclude South Africa from the SSA countries considered

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Alternative measure for	Measure	Source
Civil war, regime durability, ethnic fractionalization	Political stability and absence of violence	Worldwide Governance Indicators (WGI), World Bank
	Political violence and terror	US State Department data
Business freedom, fiscal freedom and investment freedom	Government effectiveness	WGI, World Bank
	Regulatory Quality	WGI, World Bank
	Quality of government	International Country Risk Group (ICRG) ratings
Property rights protection	Rule of Law	WGI World Bank
Corruption	Control of corruption	WGI World Bank