



# **Infrastructure as an Investable Asset: An Investor Perspective**

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02 March 2018

NBER Economics of Infrastructure

(Based on work in progress of Aleksandar Andonov, Roman Kräussl, and Joshua Rauh)

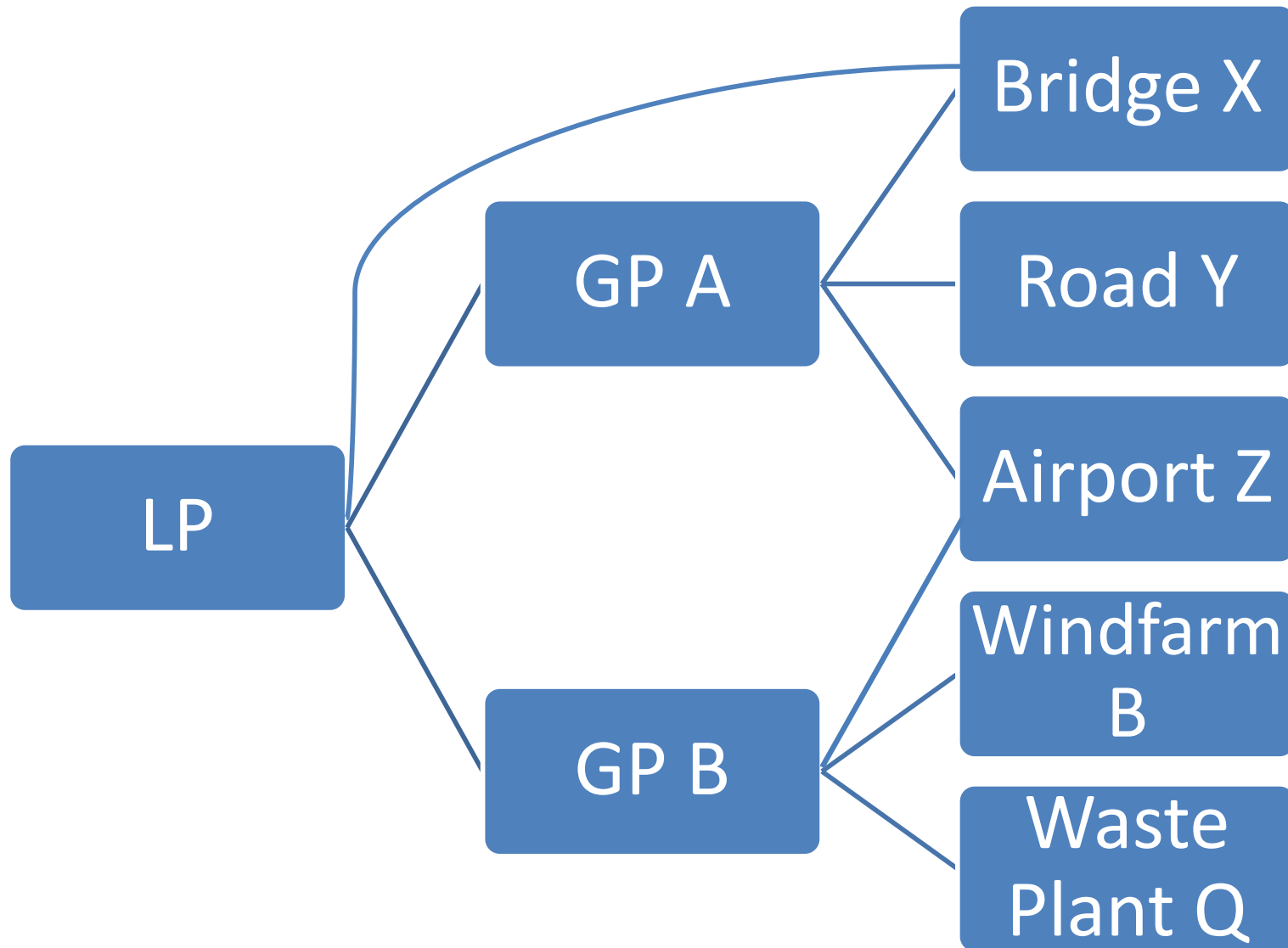
# Motivation

- More investments in infrastructure needed
- Where is the money going to come from? LPs?
- Infrastructure's social benefits may exceed expected financial return
- Still, many institutional investors include infrastructure in portfolio
  - CalPERS: 2008 2.0%, 2016 6.0%; Washington SIB: 0.7% to 3.8%
  - Number of infrastructure funds is increasing: 115 in 2016

## **What are the actual properties of infrastructure as an asset class?**

- Our data structure allows tracking of LP exposure to individual projects

# LP Exposure to Infrastructure Projects



# A Simple Deal: Chicago Parking Meters (2009)

**Description:** The Chicago Metered Parking System has approximately 36,000 on-street parking meters throughout the City of Chicago. In 2008, the City of Chicago offered private investors the opportunity to bid for a 75-year concession to operate the metered parking system.

<b>Investors</b>	<b>Fund</b>	<b>Stake</b>
Abu Dhabi Investment Authority		25.00
Allianz Capital Partners		24.90
Morgan Stanley Infrastructure	North Haven Infrastructure Partners I	50.10
<b>LP investors in North Haven Infrastructure Partners I</b>	<b>LP Type</b>	<b>LP Country</b>
PGB Pensioendiensten BV	Private Sector Pension Fund	Netherlands
Generali Deutschland	Insurance Company	Germany
Industry Pension Insurance	Private Sector Pension Fund	Denmark
Hartford Financial Services Group	Insurance Company	US
Teacher Retirement System of Texas	Public Pension Fund	US
Clwyd Pension Fund	Public Pension Fund	UK
Skandia Life Insurance Company	Insurance Company	Sweden
Helaba	Bank	Germany
Athene Annuity & Life Assurance Company of New York	Insurance Company	US
PKA AIP	Public Pension Fund	Denmark

## A More Complex Deal: Heathrow (2006-14)

**Description:** Heathrow, formerly BAA (British Airports Authority), is an airport operator headquartered in London. It's portfolio consists of London Heathrow Airport and it also owns and operates the Heathrow Express rail service between London the airport and Paddington Station, London.

Investor	Investment stake in % by date								
	Jun-06	Jul-07	Aug-07	Jun-08	Oct-11	Aug-12	Oct-12	Oct-13	Nov-14
CDPQ	28,94	21,62	21,18	21,18	21,18	15,55	13,29	13,29	12,62
Ferrovial	61,06	61,06	61,06	55,87	49,99	39,37	33,65	25,00	25,00
GIC Singapore	10,00	10,00	10,44	15,63	15,63	11,88	11,88	11,88	11,20
Alinda Infrastructure Fund I		7,32	7,32	7,32	10,26	10,26	9,25	9,25	9,25
Alinda Infrastructure Fund II					2,94	2,94	1,93	1,93	1,93
Qatar Investment Authority						20,00	20,00	20,00	20,00
China Investment Corporation							10,00	10,00	10,00
Universities Superannuation Scheme								8,65	10,00

# A Unique Infrastructure Sample

## Preqin database

- LPs: 339; GPs: 229
- Unique funds: 493; Direct investments: 749; Unique projects: 3,316
- Complete investor deal information: 29,540 (expected 50,000+)
- 115 countries; 10,700 deals within US (36.7%), UK (24.6%)
- Project stage: greenfield, brownfield, secondary
- Government involvement: primary, secondary, no concession
- Industry
- Geography: deal location, LP location, GP location
- Size, investment stake, total stake
- Number of investors, LP syndication

# Descriptive Statistics – All LPs (Investors)

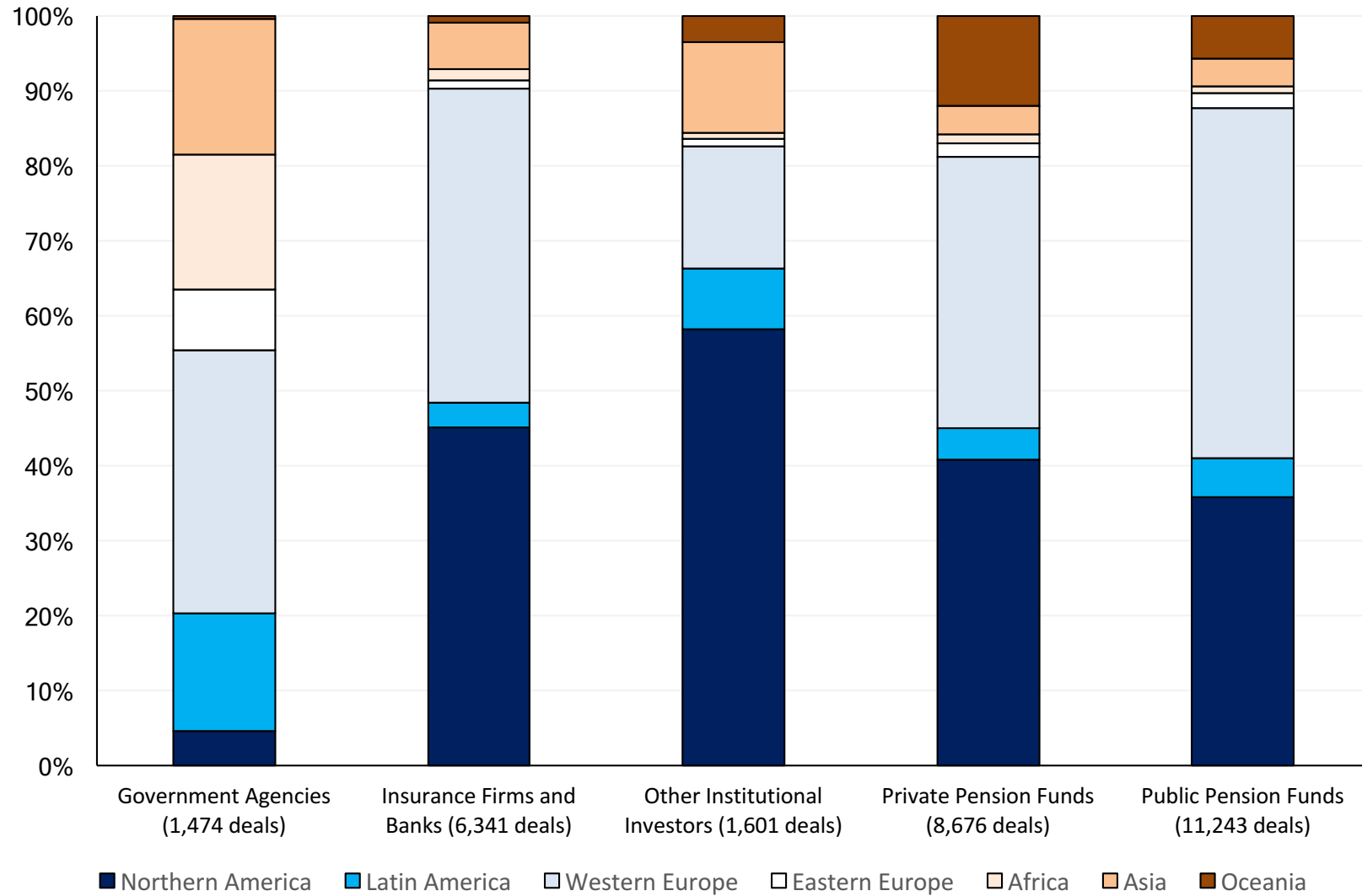
	Public Pension Funds	Private Pension Funds	Government Agencies	Insurance Firms and Banks	Other Institutional Investors
<b>Panel A: Investors in infrastructure</b>					
#Investors	128	99	23	64	25
Investor size (bn)	43.8	24.1	140.1	192.5	87.7
Year first infra	2005	2002	2003	2003	2004
#Funds	8.0	6.9	8.6	7.4	5.6
#Direct deals	1.5	1.4	6.8	2.4	4.4
<b>Panel B: Infrastructure deals</b>					
#Deals	88	88	66	101	64
%Greenfield	19.0%	17.9%	41.4%	22.8%	18.5%
%Brownfield	13.4%	13.8%	20.4%	12.7%	17.5%
%Secondary	67.6%	68.3%	38.1%	64.5%	64.0%
%Concessions	7.3%	8.4%	11.1%	10.3%	3.8%
%Home deals	50.2%	56.4%	22.1%	47.0%	56.8%

# US LPs (Investors) Only

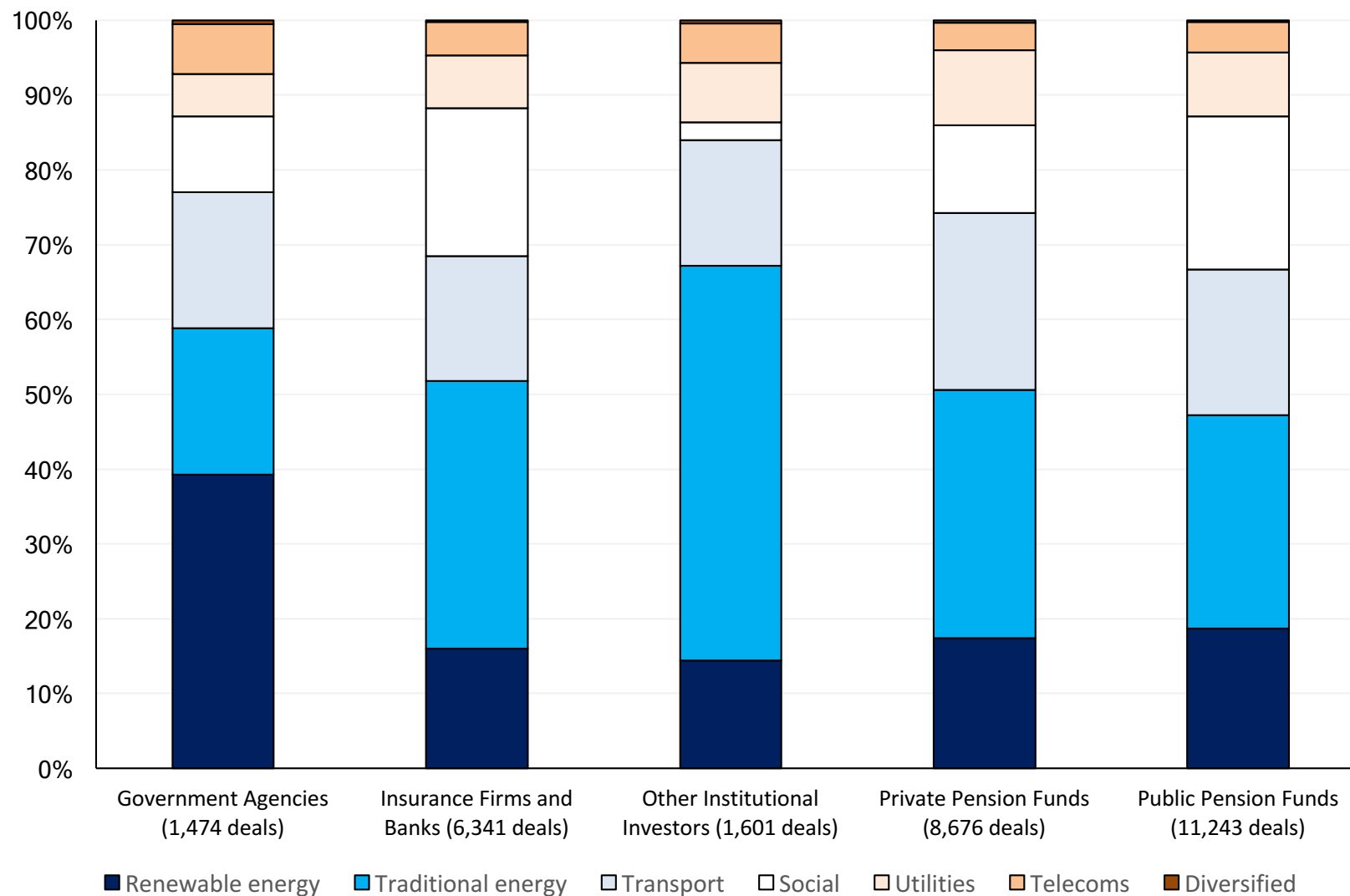
	Public Pension Funds	Private Pension Funds	Government Agencies	Insurance Firms and Banks	Other Institutional Investors
<b>Panel A: U.S. Investors in infrastructure</b>					
#Investors	62	47	1	28	18
Investor size (bn)	42.9	29.8	8.2	179.9	9.0
Year first infra	2006	2002	2005	2001	2003
#Funds	7.6	7.8	6.0	8.5	5.8
#Direct deals	0.2	0.2	0	1.3	0.1
<b>Panel B: Infrastructure deals</b>					
#Deals	63.7	92.5	26.0	103.9	64.6
%Greenfield	19.3%	18.7%	43.5%	18.2%	17.1%
%Brownfield	15.8%	14.3%	34.8%	12.8%	19.4%
%Secondary	64.9%	66.9%	21.7%	69.0%	63.5%
%Concessions	2.7%	2.8%	4.3%	3.1%	1.5%
%Home deals	64.9%	68.0%	3.8%	72.4%	73.0%



# LPs and Region of the Deal



# LPs and Industry of the Deal



# Cox-Hazard Regressions: Exit Probability

	(1)	(2)	(3)	(4)	(5)	(6)
U.S. Public PF	0.679***	0.700***	0.696***	0.700***	0.714***	0.730***
	[0.063]	[0.058]	[0.058]	[0.056]	[0.053]	[0.054]
Non U.S. Public PF	1.076	1.042	1.045	1.013	1.004	1.001
	[0.137]	[0.118]	[0.122]	[0.106]	[0.107]	[0.107]
Government agencies	1.117	1.118	1.005	1.122	1.289	1.383
	[0.478]	[0.463]	[0.395]	[0.430]	[0.461]	[0.487]
Log Investor Size	1.018	1.021	1.022	1.022	1.011	1.014
	[0.021]	[0.020]	[0.020]	[0.019]	[0.019]	[0.019]
Year first infra	1.001	1.001	1.006	1.004	1.006	1.004
	[0.008]	[0.008]	[0.008]	[0.008]	[0.008]	[0.008]
Direct investor	1.066	1.025	1.058	1.022	1.040	1.014
	[0.097]	[0.084]	[0.089]	[0.077]	[0.082]	[0.079]
Concession				2.268***	3.223***	2.676***
				[0.170]	[0.271]	[0.207]
Greenfield				0.750***	0.667***	0.661***
				[0.042]	[0.042]	[0.040]
Brownfield				0.622***	0.550***	0.559***
				[0.031]	[0.032]	[0.031]
Home Deal				0.962	0.937	0.996
				[0.070]	[0.070]	[0.073]
#Investors					0.923***	0.941***
					[0.015]	[0.013]
Investment Stake					0.998***	
					[0.001]	
Total Stake						1.000
						[0.001]
LP country FE	Yes	Yes	Yes	Yes	Yes	Yes
Deal region FE	No	Yes	No	Yes	Yes	Yes
Deal industry FE	No	No	Yes	Yes	Yes	Yes
Observations	29,016	29,016	29,016	28,816	23,098	25,054

# Performance: Net IRRs and Multiples

	Net IRR				Multiple of invested capital			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
U.S. Public PF	-1.555** [0.727]	-2.006*** [0.752]	-1.589** [0.755]	-2.105*** [0.742]	-0.080*** [0.026]	-0.074*** [0.026]	-0.083*** [0.024]	-0.082*** [0.024]
Non U.S. Public PF	-0.155 [1.094]	-0.261 [1.095]	0.008 [1.044]	-0.391 [1.061]	-0.064** [0.031]	-0.074** [0.031]	-0.051* [0.027]	-0.059** [0.027]
Log Investor Size	-0.255 [0.187]	-0.195 [0.196]	-0.265 [0.191]	-0.162 [0.195]	-0.004 [0.007]	-0.007 [0.008]	-0.006 [0.007]	-0.008 [0.007]
Year first infra	-0.017 [0.072]	-0.057 [0.072]	0.016 [0.072]	0.004 [0.072]	-0.010*** [0.003]	-0.010*** [0.003]	-0.008*** [0.003]	-0.008*** [0.003]
Direct investor	-1.925** [0.922]	-2.166** [0.957]	-1.441 [0.924]	-1.597* [0.894]	-0.074** [0.031]	-0.071** [0.031]	-0.054* [0.029]	-0.052* [0.029]
LP country FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
%Deal region	No	Yes	No	Yes	No	Yes	No	Yes
%Deal industry	No	No	Yes	Yes	No	No	Yes	Yes
Observations	1,139	1,139	1,139	1,139	1,582	1,582	1,582	1,582
R-squared	0.055	0.066	0.067	0.085	0.056	0.065	0.073	0.078

# Summing Up

## What Do We Know?

- US PPFs have much worse exit rates and substantially underperform
- US PPFs exposure to very similar projects, but are picking bad funds
- Promise of infrastructure as an asset class has so far failed for PPFs

## Next Steps

- Half of capital got provided by PPFs to infrastructure; we have to understand why they select so badly, **before** they stop investing
- Do we observe an in-country / in-state bias?
- PPFs look for assets with robust cash flow streams at relatively high yields, in exchange for locking up investments for long periods of time
- Potential misunderstanding: 10-year closed end infrastructure funds
- Flexible investment horizon: **Listed infrastructure funds**