

Bilateral Lucas Paradox

Yasumasa Morito¹ Kenichi Ueda²

¹University of Wisconsin-Madison

²University of Tokyo, TCER, and CEPR

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- Lucas (1990) “Why Doesn’t Capital Flow from Rich to Poor Countries?”
- Literature primarily focuses on recipient side.
- Using bilateral investment data between 2009-2018, we investigate both investor and recipient countries sides.

Extensive margin

- For FDI markets, countries tend to invest in lower return destinations (strong paradox).
- Countries with better institutional qualities show complex association with participation decisions.

Intensive margin

- Across participating markets, the excess returns on foreign investments relative to the returns on domestic investments are higher for the rich.
- Returns as well as institutional qualities of investor countries do not seem to affect (non)arbitrage (weak paradox).

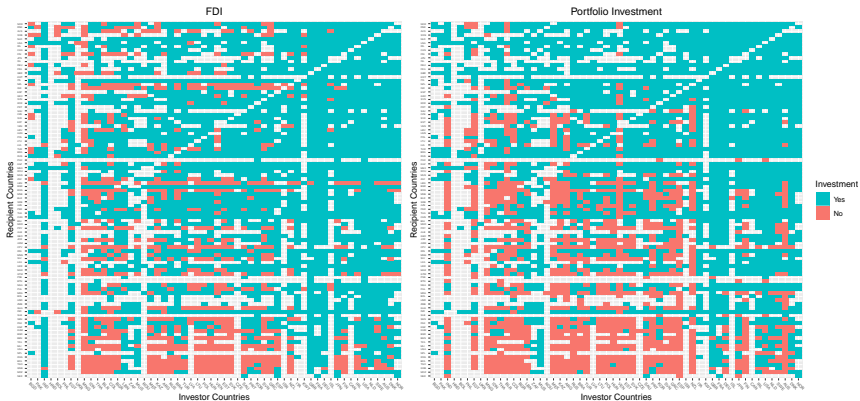
- Institutional qualities and capital flows
 - Alfaro, Kalemli-Ozcan, and Volosovych (2008): Recipient institution (esp. rule of law) is a key to determine capital flows.
 - Ju and Wei (2011): Less financially developed countries invest in more financially developed countries.
- Estimation of the marginal product of capital
 - Caselli and Feyrer (2007): MPK correcting for natural resources are equalized across countries.
 - Monge-Naranjo, Sánchez, and Santaaulalia-Llopis (2019): Lucas Paradox still exists if the assumptions used in Caselli and Feyrer (2007) are modified to include urban lands.
- Similarity affecting bilateral foreign investments
 - Portes and Rey (2005): Proximity of locations, both actual and within financial networks, affects bilateral equity flows.
 - Burchardi, Chaney, and Hassan (2019): FDI-recipient firms in the US are likely to receive investments from countries where ancestors came from.

- Time period: 2009-2018
- Bilateral investment data from the IMF.
 - FDI: Coordinated Direct Investment Survey (CDIS)
 - Portfolio Investment: Coordinated Portfolio Investment Survey (CPIS)
- Institutional qualities are from the World Bank.
 - General Institutions (Rule of law)
 - Borrower-Lender Rights (Legal rights index)
 - Corporate governance (Investor protection index)
- Similarities are from GeoDist of CEPII.
 - Distance, Common language, and Common religion

- Natural resources are important inputs: $Y = AM^\alpha L^\beta N^\gamma$
- PWT9.1 data except for natural resource share, which is from Monge-Naranjo, Sánchez, and Santaaulalia-Llopis (2019)
- capital share = 1 – the labor share – the natural resource share

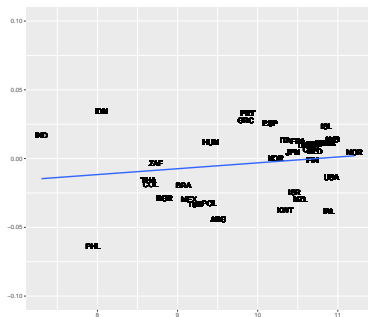
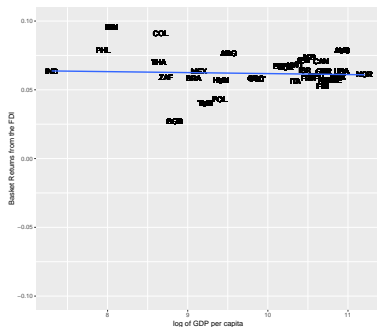
$$R_{j,t} = MPK = \frac{\alpha Y}{M}$$

Graphical Analysis of Extensive Margin



- Rich countries invest in a broader set of countries.
- Poor countries tend to invest in richer countries.

Average Basket Returns from FDI from 2009 to 2018

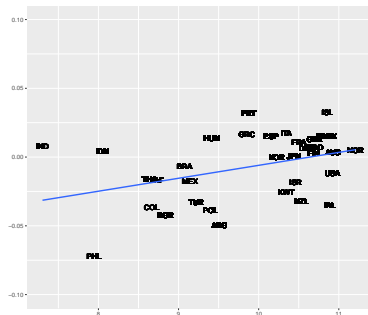
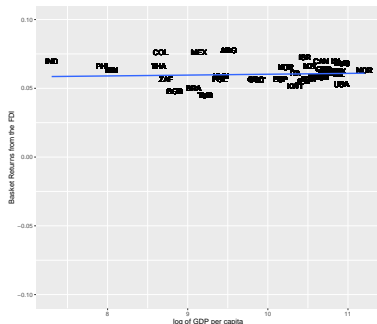


- The basket return of country i from outward investments in year t is

$$BR_{i,t} = \text{BasketReturn}_{i,t} = \frac{\sum_j a_{i,j,t} R_{j,t}}{\sum_j a_{i,j,t}}$$

- Left, BR_i : the average basket return of country i from investing abroad.
- Right, $BR_i - R_i$: the average **excess return** of country i from investing abroad.

Average Basket Returns from Portfolio Investment from 2009 to 2018



- Arbitrage seems to fail in developing countries in both FDI and portfolio investment.

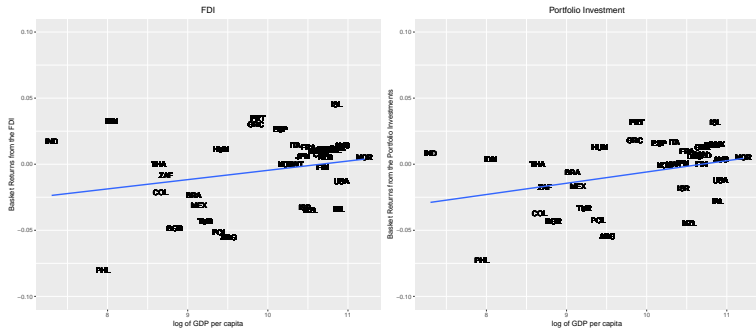
Relative Returns Correcting for Cyclical Risks

- Relative returns based on CCAPM to correct for cyclical risks (in a perfect market).
- They are determined not only the excess returns but also the correlation of the growth rates (of marginal utility).

$$RR_{i,j,t} = E_t [R_{j,t+1}] - E_t [R_{i,t+1}] + E_t \left[\frac{u'(c_{i,t+1})}{u'(c_{i,t})} \right]^{-1} \text{Cov} \left(\frac{u'(c_{i,t+1})}{u'(c_{i,t})}, R_{j,t+1} - R_{i,t+1} \right).$$

- If $RR_{i,j,t} > 0$, arbitrage, assuming a perfect market, fails.
- The source of the failure.
 - default and nationalization risks in recipient country j
 - liquidity needs of investor country i

Basket Relative Returns from FDI (Left) and Portfolio Investment (Right) Based on CCAPM



- $RR_{i,j}$ are constructed using all sample years (2009-2018)

- FDI or portfolio investments from i to j country are determined by

$$S_{i,j} = 1\{\alpha_1 RR_{i,j} + \alpha_2 \log GDP_{pc} + \mathbf{Z}'_i \boldsymbol{\gamma}_1 + \mathbf{Z}'_j \boldsymbol{\gamma}_2 + \mathbf{Z}'_{i,j} \boldsymbol{\gamma}_3 + \varepsilon_{0,i,j} \geq 0\}.$$

- \mathbf{Z}_i : institution and foreign reserve of investor country i
- \mathbf{Z}_j : institution and foreign reserve of recipient country j
- $\mathbf{Z}_{i,j}$: similarities of countries i and j

Estimation on Participation (Investor's Characteristics)

	1{FDI > 0}	1{PI > 0}
Rule of Law	1.502*** (0.318)	0.305 (0.282)
Legal Right Index	-0.187** (0.0728)	-0.178*** (0.0674)
Investor Protection	0.125 (0.0833)	0.125 (0.0803)
Financial Openness	0.00358 (0.0945)	-0.0698 (0.117)
Foreign Reserve	2.959 (2.833)	2.506 (3.377)
(Foreign Reserve) ²	-10.94* (6.346)	-3.701 (8.276)
log of GDP per capita	-0.548** (0.247)	0.297 (0.235)

- Legal rights index measures balancedness and efficiency in debt contract implementation (esp. in default). Higher score countries tend to less invest abroad.

Cont. Estimation on Participation (Recipient's Characteristics)

Rule of Law _j	-0.799*** (0.215)	0.138 (0.179)
Legal Right Index _j	0.0816 (0.0619)	0.0707 (0.0570)
Investor Protection _j	0.157* (0.0803)	0.127 (0.0935)
Financial Openness _j	0.154 (0.112)	-0.0906 (0.0859)
Foreign Reserve _j	-0.255 (1.740)	-6.165*** (1.718)
(Foreign Reserve) _j ²	-0.581 (2.581)	4.182** (1.879)

- Better general institutional quality (Rule of Law) makes country to have more FDI abroad but receive less FDI.

Cont. Estimation on Participation (Similarity)

Distance	-0.110*** (0.0210)	-0.103*** (0.0228)
Language	0.269 (0.403)	-0.0164 (0.362)
Religion	0.476 (0.440)	-0.979*** (0.350)
$RR_{i,j}$	-13.43*** (2.942)	0.615 (2.431)
Observations	1010	1010

- FDI is less for countries with higher $RR_{i,j}$
- For portfolio investments, $RR_{i,j}$ does not matter.

- $Y_{i,j}$: the share of outward investments from country i to country j , relative to the total investments by country i .

$$\begin{aligned} \ln Y_{i,j} = & \mathbf{X}'_{i,j}\boldsymbol{\beta}_1 + RR_{i,j}\beta_2 \\ & + RR_{i,j}\mathbf{X}'_i\boldsymbol{\beta}_3 + RR_{i,j}\mathbf{X}'_j\boldsymbol{\beta}_4 + RR_{i,j}\mathbf{X}'_{i,j}\boldsymbol{\beta}_5 \\ & + IMR_{i,j}\beta_6 + \varepsilon_{1,i,j}. \end{aligned}$$

- \mathbf{X}_i and \mathbf{X}_j : characteristics of country i and j .
- $\mathbf{X}_{i,j}$: similarities between countries i and j .

Estimation of Arbitrage (Similarity)

	log of the Share of FDI	log of the Share of Portfolio Investment
Distance	-0.245*** (0.0178)	-0.192*** (0.0177)
Language	1.534*** (0.208)	1.052*** (0.216)
Religion	1.710*** (0.271)	1.084*** (0.298)
$RR_{i,j}$	-68.41 (327.3)	830.2** (392.2)

- $RR_{i,j}$ does not matter for FDI.

Cont. Estimation of Arbitrage (Investor's Characteristics)

Rule of Law \times $RR_{i,j}$	5.536*	0.477
	(3.094)	(3.006)
Legal Right Index \times $RR_{i,j}$	-1.320	0.0392
	(0.940)	(1.029)
Investor Protection \times $RR_{i,j}$	1.430	0.670
	(1.219)	(1.329)
Financial Openness \times $RR_{i,j}$	0.840	0.0110
	(1.771)	(1.792)
Foreign Reserve \times $RR_{i,j}$	-79.29*	36.53
	(41.61)	(44.47)
(Foreign Reserve) ² \times $RR_{i,j}$	278.1**	-90.84
	(108.3)	(115.4)

- Institutional qualities of investor countries do not affect arbitrage strategy much.

Cont. Estimation of Arbitrage (Recipient's Characteristics)

Rule of Law _j × RR _{i,j}	-5.830*	0.868
	(3.160)	(3.501)
Legal Right Index _j × RR _{i,j}	2.180*	-1.066
	(1.195)	(1.284)
Investor Protection _j × RR _{i,j}	0.0384	1.058
	(1.615)	(1.707)
Financial Openness _j × RR _{i,j}	-2.176	-2.340
	(1.792)	(2.065)
Foreign Reserve _j × RR _{i,j}	-48.27	11.96
	(29.62)	(33.11)
(Foreign Reserve) _j ² × RR _{i,j}	22.54	-48.95
	(39.19)	(44.41)

- Institutional qualities of recipient countries do not affect arbitrage strategy much.

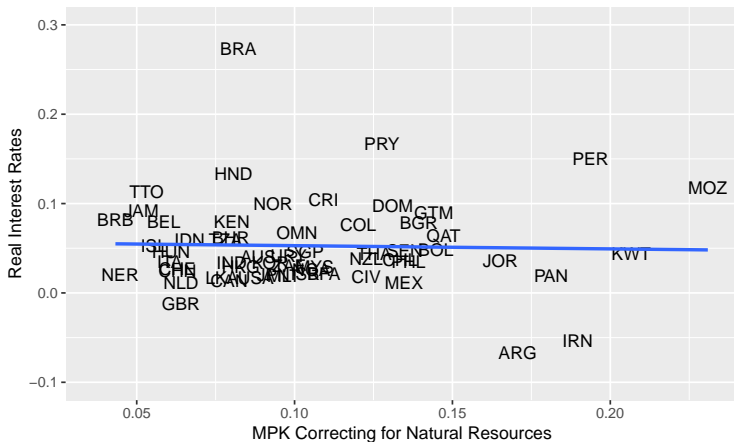
Cont. Estimation of Arbitrage (Similarity)

Distance \times $RR_{i,j}$	-0.603** (0.279)	0.165 (0.283)
Language \times $RR_{i,j}$	10.20** (4.350)	3.904 (4.719)
Religion \times $RR_{i,j}$	-15.75*** (4.495)	-2.813 (5.094)
Constant	-1.316*** (0.461)	-2.735*** (0.479)
IMR	-1.086 (0.782)	-0.112 (0.848)
Observations	1010	1010

- For robustness we use
 - other measures of institutional qualities
 - the returns on assets without natural resource adjustment
 - human capital
 - exchange rate
- Moreover, we exclude
 - more offshore financial centers
 - U.S. from recipient countries

- Using bilateral investment data, we study Lucas paradox in detail for extensive and intensive margins.
- Extensive margin
 - Rich countries tend to invest a broader set of markets, likely due to rule of law, not due to gdp per capita.
 - Poor countries tend to invest in richer countries.
 - Both investor and recipient institutions matter.
 - $RR_{i,j}$ does not matter for portfolio investment and has negative impact on FDI (stronger paradox).
- Intensive margin
 - Both investor and recipient institutions do not matter.
 - $RR_{i,j}$ does not matter for FDI (weak paradox), but it does matter for portfolio investments (i.e., Lucas Paradox does not exist here).
- Similarities (costs) matter for both margins.

Appendix, Correlation between MPK and Real Interest Rate



Appendix, Excluding USA (1st step, Investor's Characteristics)

	1{FDI > 0}	1{PI > 0}
Rule of Law	1.495*** (0.318)	0.303 (0.282)
Legal Right Index	-0.187** (0.0730)	-0.178*** (0.0674)
Investor Protection	0.129 (0.0838)	0.125 (0.0803)
Financial Openness	0.00281 (0.0950)	-0.0698 (0.117)
Foreign Reserve	3.073 (2.850)	2.508 (3.377)
(Foreign Reserve) ²	-11.20* (6.389)	-3.705 (8.277)
log of GDP per capita	-0.535** (0.249)	0.299 (0.235)

Appendix, Cont. Excluding USA (1st step, Recipient's Characteristics)

Rule of Law _{<i>j</i>}	-0.764***	0.138
	(0.214)	(0.179)
Legal Right Index _{<i>j</i>}	0.0812	0.0709
	(0.0615)	(0.0569)
Investor Protection _{<i>j</i>}	0.142*	0.126
	(0.0805)	(0.0935)
Financial Openness _{<i>j</i>}	0.142	-0.0909
	(0.111)	(0.0859)
Foreign Reserve _{<i>j</i>}	0.174	-6.140***
	(1.745)	(1.720)
(Foreign Reserve) _{<i>j</i>} ²	-1.040	4.159**
	(2.510)	(1.880)

Appendix, Excluding USA (1st step, Similarity)

Distance	-0.110*** (0.0211)	-0.103*** (0.0228)
Language	0.265 (0.409)	-0.0235 (0.363)
Religion	0.491 (0.438)	-0.976*** (0.350)
$RR_{i,j}$	-13.31*** (2.927)	0.609 (2.431)
Observations	977	977

Appendix, Cont. Excluding USA (2nd step, Similarity)

	log of the Share of FDI	log of the Share of PI
Distance	-0.253*** (0.0164)	-0.191*** (0.0172)
Language	1.593*** (0.216)	1.153*** (0.225)
Religion	1.710*** (0.272)	1.122*** (0.294)
$RR_{i,j}$	-51.92 (330.2)	741.7* (395.1)

Appendix, Cont. Excluding USA (2nd step, Investor's Characteristics)

Rule of Law \times $RR_{i,j}$	5.732*	0.521
	(3.058)	(3.001)
Legal Right Index \times $RR_{i,j}$	-1.395	0.0352
	(0.946)	(1.030)
Investor Protection \times $RR_{i,j}$	1.330	0.714
	(1.231)	(1.337)
Financial Openness \times $RR_{i,j}$	0.879	-0.00236
	(1.795)	(1.798)
Foreign Reserve \times $RR_{i,j}$	-78.31*	36.90
	(42.05)	(44.62)
(Foreign Reserve) ² \times $RR_{i,j}$	278.7**	-89.73
	(109.9)	(115.7)

Appendix, Cont. Excluding USA (2nd step, Recipient's Characteristics)

Rule of Law _j × RR _{i,j}	-6.175*	-0.447
	(3.161)	(3.536)
Legal Right Index _j × RR _{i,j}	2.356*	-0.535
	(1.207)	(1.296)
Investor Protection _j × RR _{i,j}	0.188	2.001
	(1.636)	(1.738)
Financial Openness _j × RR _{i,j}	-2.214	-2.224
	(1.795)	(2.072)
Foreign Reserve _j × RR _{i,j}	-53.90*	-9.999
	(30.26)	(33.95)
(Foreign Reserve) _j ² × RR _{i,j}	28.29	-25.54
	(39.78)	(45.20)

Appendix, Cont. Excluding USA (2nd step, Similarity)

Distance \times $RR_{i,j}$	-0.610**	0.0725
	(0.282)	(0.286)
Language \times $RR_{i,j}$	10.34**	2.956
	(4.377)	(4.796)
Religion \times $RR_{i,j}$	-16.12***	-3.083
	(4.511)	(5.123)
IMR	-0.977*	-0.165
	(0.555)	(0.666)
Observations	977	977