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The Lucas Paradox in the Great Recession: Does the type of capital matter?

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Abstract

This paper is the first to examine the Lucas Paradox during the Great Recession. Results show that in the 2008-2015 period, the Paradox might be even more pronounced than in the previous decades. Moreover, our findings suggest that disaggregating capital flows by type of capital is important since trade flows are found to be a key determinant of Foreign Direct Investment (FDI) and credit to private sector mostly explains Portfolio Equity flows. The quality of institutions, although statistically significant, does not provide the solution for the Lucas puzzle.

1 Introduction

Why doesn't capital flow from rich to poor countries? is a key economic question, raised in Lucas (1990) seminal paper. More than three decades later, even though there has been a substantial number of empirical studies trying to provide an explanation to the Lucas Paradox, it remains relevant, and arguably, unresolved. The Paradox is clear, capital should flow from countries with low marginal returns of capital (i.e., rich economies) into countries where marginal returns are higher (i.e., poor economies). The surge of financial globalisation in the late 90s along with the recent financial crisis provide natural examples of the lack of flows from rich to poor countries. It has been argued that institutions explain the paradox by affecting ex-ante capital returns and hence capital inflows. Alfaro, Kalemli-Ozcan, and Volosovych (2008) (henceforth, AKV) found that institutional quality, not only is a strong determinant of capital inflows, but also accounts as a robust solution for the Lucas Paradox, since it removes the positive and significant relationship between the log of initial income per capita and aggregate capital inflows per capita. However, the validity of AKV results has been questioned by Azémar and Desbordes (2013) and Athtaruzzaman (2017), who claim that their model is missespecified. On the contrary, Göktan (2015) uses cross-banking statistics of the Bank of International Settlements (BIS) to argue that institutions solve the Paradox once country heterogeneity is controlled.

These empirical papers treat capital inflows as the sum of FDI and Portfolio Equity liabilities (PE, hereafter) for the period previous to the financial crisis. The contribution of this paper is twofold. First, the Lucas Paradox is evaluated in the Great Recession (2008-2015) using the latest available data for capital stock and institutional quality (Lane and Milessi-Ferreti 2017). Second, I check whether the Lucas puzzle still holds once we disaggregate data on capital inflows, studying separately FDI and PE. AKV argue that the reason for aggregating capital is data availability for PE flows. However, assuming that a country does not receive capital when in reality it is unknown or not reported, is a strong hypothesis. Empirical evidence shows heterogeneous patterns for FDI and PE flows across countries, which suggests that they might have different determinants.

Section 2 describes the data. Section 3 presents the empirical results and Section 4 concludes.

2 Data

The dependent variable is the average yearly change in foreign claims on domestic assets per capita over the 1970-2007 and 2008-2015 periods, reported in Lane and Milesi-Ferreti (2017). In line with Azémar and Desbordes (2013) and Akhtaruzzaman (2017), I take the log of the dependent variable to narrow its range. I examine FDI and PE data separately, as well as the aggregate sum. I employ the log of initial level of GDP per capita to account for the Lucas Paradox (measured in constant USD of year 2000). Following Rodrik *et al* (2002), institutional quality is measured using the Rule of Law Indicator included in the World Governance Indicators compiled in Kaufmann *et al* (2009).

Table I shows the descriptive statistics for 143 countries with available data for main

variables, excluding financial centers[1] and countries with less than half million population, as in AKV.

Table I: Summary Statistics

| | 1970-2007 | | 2008-2015 | |
	Mean	St.Dev	Mean	St.Dev
Average Rule of Law index	-0.112	0.94	-0.13	0.91
Log Income per capita initial year	8.30	1.20	8.76	1.32
Average Capital inflows per capita	584.86	1,775.31	900.57	2107.3
Average FDI inflows per capita	339.72	1,033.42	483.49	1,347.6
Average PE inflows per capita	242.22	1,057.78	417.08	1,104.58

On average per capita capital inflows have increased 53% during the Great Recession period. Per capita FDI inflows have increased by 42% and average portfolio equity by 72%. Also, there has been a decline in the average quality of institutions, measured by the Rule of Law index. Figure 1 provides some light supporting the lack of capital flows

Figure 1. The Lucas Paradox in the Great Recession
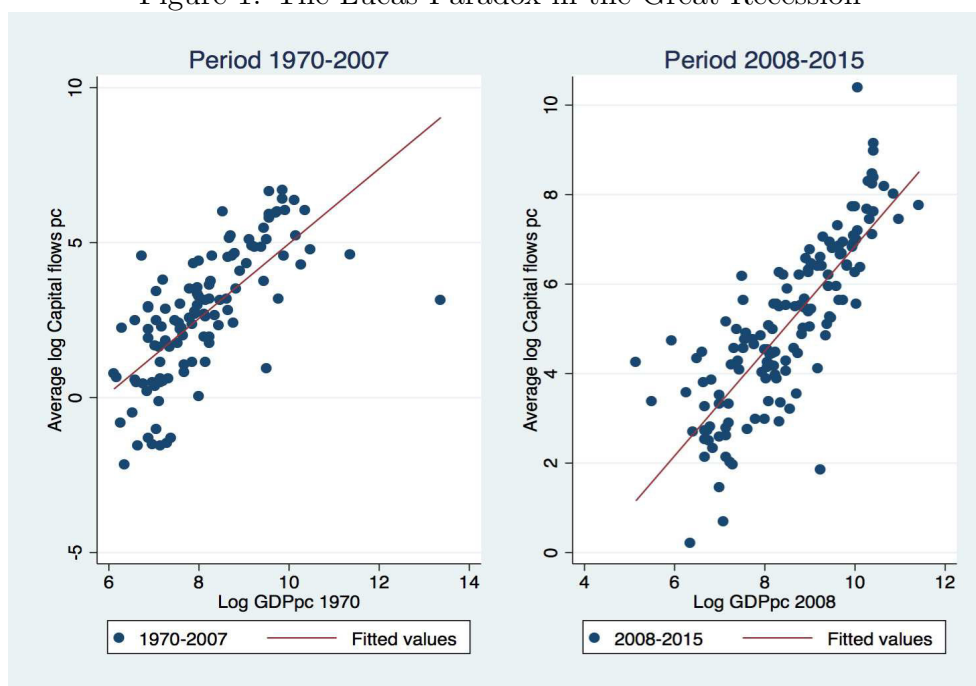
from rich to poor countries, both in the period (1970-2007) and in the Great Recession (2008-2015). It uses the average of the log of aggregate capital inflows, measured in per capita terms on the initial level of GDP (also in per capita terms). These positive slopes suggest that capital goes where capital is, and that during the Great Recession Period this pattern is even more pronounced.

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[1]Belgium, Hong Kong, Ireland, Luxemburg, Netherlands, Singapore, Switzerland, UK, Mauritius, Panama and Bermuda, as characterised in Lane and Milesi-Ferreti (2017).

3 Empirical results and discussion

OLS regressions are carried out through the estimation of several variants of the AKV model using two dependent variables (FDI and PE). Table II shows results for the 1970-2007 period taking FDI and PE as dependent variables in Columns 1-4, and 5-8, respectively. Column 1 demonstrates that there is a lack of FDI flows from rich to poor countries. The log of the initial GDP per capita is significant at the 1% level and has positive sign. In Columns 2 and 6 institutional quality is included. It enters with 1% level of statistical significance and a positive sign. This result suggests that institutional quality has a positive impact on both types of capital inflows but it is not enough to clear out the Lucas puzzle, since the log of initial GDP per capita remains statistically significant. I control for potential endogeneity of the institutions measure using an instrumental variable (IV) estimator. In line with Alcalá and Ciccone (2004) and Göktan (2015), I instrument institutional quality with distance from the equator.[2] F-statistic indicates for the excluded instrument, the rejection of weak instruments hypothesis in both model specifications, Columns 3 and 7. Results are similar to those found in Columns 2 and 6. Hence, IV exercise suggests that endogeneity is unlikely to be a problem.

Table II: The Lucas Paradox during the 1970-2007 period

	(1) FDI	(2) FDI	(3) FDI(IV)	(4) FDI	(5) PE	(6) PE	(7) PE(IV)	(8) PE	(9) Capital
Log(GDP)pc 1970	1.130***	0.699**	0.528*	0.557*	1.517***	0.831***	0.922**	0.797**	0.570**
	(0.205)	(0.213)	(0.222)	(0.224)	(0.235)	(0.212)	(0.298)	(0.269)	(0.217)
Rule of Law		0.904***	1.263***	0.895***		1.496***	1.296**	1.303***	0.910***
		(0.176)	(0.279)	(0.199)		(0.205)	(0.415)	(0.225)	(0.194)
Sch.Enroll (%)				0.002				0.003	0.001
				(0.005)				(0.009)	(0.004)
Trade/GDP				0.019***				0.013*	0.017***
				(0.004)				(0.006)	(0.004)
Credit/GDP				0.004				0.016***	0.008*
				(0.004)				(0.004)	(0.003)
Inflation				0.001				0.000	0.001
				(0.001)				(0.001)	(0.001)
Kaopen				0.136				-0.998	0.239
				(0.518)				(1.052)	(0.503)
Observations	115	115	115	111	106	106	106	103	111
R^2	0.470	0.591	0.571	0.676	0.474	0.650	0.646	0.686	0.718
$Fstat$	30.41	83.84	62.021	31.93	41.73	117.9	57.30	41.36	48.63

Dependent variable is the average of the log of FDI inflows per capita in Column 1-4, same for PE in Columns 5-8, and total capital in Column 9.

All regressions include a constant and are estimated by OLS, except Column 3 and 7 which are estimated by 2SLS.

F stat for 2SLS Columns 3 and 7, provides the F-statistic for the excluded instrument, with a p-value equal to 0.000.

Robust Standard errors in parentheses.

* , **, and *** denote statistical significance at 10%, 5% and 1% levels.

In Columns 4 and 8, I include a set of additional variables examined in AKV to test the robustness of results. Human capital is measured as the percentage of enrolment in secondary school. Trade openness is the sum of imports and exports over GDP. Financial development is obtained as the ratio of domestic credit to private sector as percentage of GDP. Macroeconomic stability is measured as the average rate of inflation, and capital openness indicator, Kaopen, is taken from Chinn and Ito (2008). Column 4 shows that among all other potential factors only trade seems to contribute, in statistical and

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[2]Data is taken from Dollar and Kraay (2003). Also, the exercise has been conducted using log of European settler mortality rate as instrument following Acemoglu et al (2001), results are available upon request.

economic terms, to the explanation of the lack of FDI from rich to poor countries, along with institutional quality, which remains significant at 1% level. The log initial income per capita is still statistically significant at 10% level, so the paradox is not fully solved. Column 8 reports results for the PE model and presents evidence on the importance of separating types of capital. Credit provided by the financial sector is a key factor for PE with 1% of statistical significance but it is not statistically significant in the FDI model. Also, Rule of Law remains significant at 1% level with a positive sign. The significance of the log of initial income has been reduced to 5% level, so it explains better the flows of PE than those of FDI. Column 9 reports results using the aggregation of FDI and PE as dependent variable as it is typically done in the related literature. Institutional quality and trade openness are statistically significant at 1% level, along with the log of initial GDP at 10% level. Results are robust to employing other measures for institutions (ICRG-PRS index), and human capital (total years of schooling and mortality rate at birth).[3]

Table III: The Lucas Paradox in the Great Recession (2008-2015)

	(1) Capital	(2) Capital	(3) Capital(IV)	(4) Capital	(5) FDI	(6) FDI	(7) FDI	(8) PE	(9) PE	(10) PE
Log(GDP)pc 2008	1.170***	0.840***	0.5162***	0.742***	1.061***	0.839***	0.733***	1.839***	1.017***	0.922***
	(0.087)	(0.122)	(0.1413)	(0.127)	(0.086)	(0.122)	(0.125)	(0.135)	(0.208)	(0.236)
Rule of Law		0.637***	1.366***	0.439*		0.429**	0.333		1.529***	1.252***
		(0.147)	(0.2523)	(0.179)		(0.148)	(0.187)		(0.264)	(0.339)
Sch. Enroll (%)				0.006			0.009			-0.001
				(0.005)			(0.005)			(0.011)
Trade/GDP				0.010***			0.011***			-0.001
				(0.003)			(0.002)			(0.005)
Credit/GDP				0.007***			0.003			0.011***
				(0.002)			(0.003)			(0.003)
Inflation				0.010			0.017			0.012
				(0.018)			(0.017)			(0.047)
Kaopen				0.343			0.498			0.012
				(0.319)			(0.306)			(0.606)
Observations	143	143	139	124	143	143	124	124	124	112
R^2	0.655	0.704	0.678	0.779	0.613	0.639	0.721	0.586	0.688	0.740
$F stat$	179.6	162.3	43.98	55.6	152.8	107.3	38.8	186.8	167.0	51.3

Dependent variable is the average of log capital inflows per capita in Column 1-4, same for FDI in Columns 5-7, and PE in Columns 8-10.

All regressions include a constant and are estimated by OLS, except Column 3 which is estimated by 2SLS.

F stat for 2SLS Column 3, provides the F-statistic for the excluded instrument with a 0.000 pvalue.

Robust Standard errors in parentheses.

* , **, and *** denote statistical significance at 10%, 5% and 1% levels.

Table III reports the OLS regressions for the 2008-2015 period. Column 1 confirms the Lucas Paradox during the Great Recession. The log of the initial GDP per capita is significant at the 1%, using aggregate capital as dependent variable. The coefficient on the log of the initial GDP per capita is greater than for the previous period. This is a preliminary result suggesting that the Lucas puzzle has become much more pronounced during the Great Recession. Institutions have strong explanatory power but they do not eliminate the positive significance of the log of initial income per capita as shown in Column 2. Column 3 suggests that this result is not subject to endogeneity issues, following the same procedure as in Table II. Column 4 shows that trade openness and credit to private sector, along with the log of the initial income per capita, seem to

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[3]These variables for the robustness checks have been taken from World Bank Open Data Base and The Quality of Governance Database.

be the main drivers of international capital flows and that the statistical significance of institutional quality is reduced from 1% to 10% level (compare across Column 9 in Table II). This result is better understood once capital flows are decomposed. Columns 5 to 7 do the same exercise taking FDI as dependent variable, while Columns 8-10 take PE. In fact, institutions are no longer statistically significant in the FDI model. Trade and the log of the initial GDP per capita are the most influential variables for FDI as Column 7 indicates. On the contrary, institutions remain an important factor in determining PE inflows (Column 9 and 10) along with the degree of financial development measured by credit over GDP. In both tables, school enrolment, inflation and capital openness present expected signs but have no explanatory power. The importance of disaggregating capital inflows is key to understand the true determinants of international capital flows across countries, specially when analysing the Great Recession period.

4 Conclusion

This paper is the first to show the importance of disaggregating capital inflows by the type of capital when analysing the Lucas Paradox. It shows that total trade flows are a key driver for FDI inflows, while total credit to private sector mostly determines PE inflows. Moreover, this result holds in the Great Recession Period and in the previous periods. Institutions, though still important, cannot solve the Lucas puzzle on their own. Hence, it seems rational to argue that foreign investors actually reward structural policies that improve the institutional atmosphere through increased investment. However, which structural reforms improve the quality of institutions goes beyond the scope of this study and it is left out for future research.

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