'Why doesn't capital flow from rich to poor countries?' (R.E. Lucas, American Economic Review Vol 80, 1990). Explain Lucas' analysis and contrast this with other analyses on the one hand, and empirical evidence for flows since 1990 on the other.

Under neoclassical models of trade and growth, in which countries face the same constant returns to scale production function, homogenous capital and labor inputs, and completely open world capital markets, capital would flow from rich to poor countries because by the law of diminishing returns, the marginal product of capital would be higher in the less productive (poorer) economy. Assuming a production function of the form $y = Ax^{\beta}$, where y is income per worker and x is capital per worker, then the marginal product of capital would be $r = A\beta x^{\beta-1}$, equivalent to $r = \beta A^{1/\beta} y^{(\beta-1)/\beta}$, when expressed in terms of production per worker.[i] Lucas then compares the United States and India in 1988, concluding that the aforementioned formula would indicate that the marginal product of capital in India must be about 58 times that of the United States.

The fact that immense capital flows from rich to poor countries are not observed in practice, however, signifies important flaws in the validity of conventional classical assumptions. As shown in Figure 1, the Western Hemisphere receives substantial private direct investment and portfolio flows, while the poorest countries in Africa receive less than middle-income emerging Asia, contrary to expectations. Likewise, as shown in Figure 2, developed economies account for the majority of worldwide foreign direct investment, clearly contrasting with neoclassical predictions. Figure 3 summarizes the results graphically, showing that equity inflows per capita (FDI and portfolio equity investment) are substantially greater in rich than poor countries.

In general, the theoretical explanations for the "Lucas Paradox" fall into two categories. The first category pertains to differences in *fundamentals* relating to the overall production structure of the economy, including technological differences, lack of productive infrastructure and other elements affecting total factor productivity, missing factors of production, government policies (such as tariffs, taxes, capital controls, and non-trade barriers), and institutional structure. The second category relates to *international capital market imperfections*, such as information asymmetry (home bias), sovereign risk, and credit failures (financing frictions).[ii] This essay will explore the empirical evidence for some possible explanations from each category.

Fundamentals:

Missing Factors of Production – EX: Human capital

In order to reconcile the discrepancy, Lucas adopts a production function of the form $y = Ax^{\beta}h^{\gamma}$, where y is the income per effective worker and h is human capital per worker. In effect, h^{γ} can be interpreted as an external effect that multiples the productivity of a worker at any skill level h, similar in function as total factor productivity. Using a rough estimate of Denison's 1962 comparison of US productivity and then applying Kruger's 1959 cross-country estimates of relative human capital stocks, Lucas narrows the predicted rate of return ratio between India and the United States to near unity. Despite the intuitive appeal of adding a human capital externality that generates a Hicks-neutral productivity advantage for rich countries over poor countries, there is very limited empirical evidence about the actual magnitude of the human capital externality, its link to productivity, and its capability of fully reconciling the paradox.[iii] In general, whenever a factor of production is omitted (land, human capital, etc.) that positively affects the returns to capital, the conventional neoclassical approach will misrepresent the implied capital flow.

Lower Total Factor Productivity – EX: Institutions

Conventionally, discrepancies in total factor productivity are assumed to account for the Lucas paradox. Institutional weakness drives a wedge between expected returns and ex-post returns – even if technology is readily available to all countries, barriers to adoption or differences in efficient use of the technology can dramatically alter the return to capital. In such a case, equalization of returns $A_{it}f^1(k_{it}) = r = A_{jt}f^1(k_{jt})$ does not necessarily imply capital flows from rich to poor countries. One major contributor to total factor productivity is the quality of institutions, which has been empirically analyzed in different forms. A study by Alfaro, et al revealed that institutional quality is the leading causal variable explaining the Lucas Paradox, controlling for all other factors, including schooling, remoteness, income per capita, and average restrictions to capital (See OLS results in Figure 4). A recent study by Ju and Wei also illustrated the importance of the quality of property rights in explaining paradoxical global capital flows.[iv]

An interesting paper by Schularick and Steger compared rich to poor country capital flows in the first era of financial globalization (1880-1914) with the reversal to poor to rich country capital flows occurring at present time. Assuming that colonialization, the "empire effect", and informal imperialism helped mitigate the institutional and political risks of investment by increasing indirect political control, the authors argue that in the past, sovereign risk was lower and property rights better protected in comparison to current institutions. In light of this fact, the authors argue that deterioration in institutional quality between rich and poor countries accounts for the sharply divergent patterns of international capital movements (see graphical representation in Figure 5).[v]

These empirical studies, however, are subject to shortcomings. First, institutional quality is inherently difficult to measure – although cross-sectional analyses ignore important country fixed effects, panel data would fail to measure the impact of institutions in light of low variation over time. Second, the direction of causality is uncertain – although good quality institutions may encourage capital flow, capital flow itself may also foment the development of institutions, especially in light of the knowledge and technology transfer associated with FDI. Third, the mechanism by which institutions affect capital flows is often unknown. Nevertheless, policies that strengthen the protection of property rights, reduce corruption, increase government stability, improve bureaucratic quality, and assure contract enforcement are considered essential mechanisms to encourage investment.

International Capital Market Imperfections:

Costs of International Trade

According to Obstfeld and Rogoff, by explicitly introducing costs of international trade (transport costs, tariffs, non-tariff barriers, and other trade costs), the empirical Lucas problem is solved.[vi] In essence, trade costs drive a wedge between actual realized returns to capital compared to expected rate of return. In other words, $A_{it}f^1(k_{it})(1-\tau_{it}) = r = A_{jt}f^1(k_{jt})(1-\tau_{it})$, in which τ can represent taxes, capital controls, tariffs, transport costs, and other barriers to trade.

Likewise, according by Razin and Sadka, lumpy start-up costs offer a complimentary reconciliation to the Lucas Paradox. Due to set-up costs of investments, "small" investments do not break even, even though such investments may meet marginal productivity conditions that coincide with the first order equation for profit maximization. In short, although marginal productivity of capital determines *how much* to invest, a firm chooses whether to invest in the *first place* by analyzing total profitability.[vii]

Home Bias (Information Asymmetry)

Due to asymmetric information, intrinsic to capital markets, the neoclassical framework for analyzing capital flows no longer holds. In other words, if information is incomplete, capital will not flow from rich to poor countries, even if the expected return is higher. According to Ahearne et al's cross-sectional analysis of U.S. holdings of equities, information asymmetries due to the poor quality and low credibility of financial information in foreign countries have the strongest explanatory power in the home bias phenomenon. Utilizing the portion of a country's market that lists publically in the U.S. as a proxy for the reduction in information asymmetries, the authors demonstrate that foreign countries whose firms do not opt into the U.S regulatory environment are severely underweighted in U.S equity portfolios.[viii] Other studies have confirmed similar results – mutual fund managers worldwide strongly prefer to invest in equity of firms with a presence in the home country, attesting to the importance of informational barriers such as language, culture, and familiarity with governance structure, legal proceedings, and financial reporting standards, among other factors.[ix]

Vasileva's study on home bias in foreign direct investment, using data on 5,755 different bilateral country pairs and 50,000+ observations for FDI inflows and outflows from 1981-2005, estimated the following model $FDI_{i,j,t} = \alpha + \beta_1(\gamma_1)_{i,t} + \beta_2(\gamma_2)_{j,t} + \beta_3(\gamma_3)_{i,j,t} + \beta_4(\gamma_4)_{i,j,t}$, where γ_1 represents macroeconomic variables (GDP, GDP per capita, GDP growth rate, population, openness), γ_2 represents geographic proximity (distances, shared border, same continent), and γ_3 represents familiarity variables (common language, shared legal system origin, economic/political union membership, colonial relationship). The regression results on FDI corroborate the results from portfolio equity flows, indicating that corporate investors prefer to invest in countries near to their home country, or in countries within the same economic union or possessing a similar legal system.[x] As a result, it is unsurprising that capital flows go from rich to rich countries, rather than rich to poor countries, in which familiarity variables may be low.

In short, investors feel more optimistic and confident in investing in more familiar countries due to the informational advantage, despite potentially more attractive returns in developing countries. Especially since many of the poorest countries are very small with limited impact in the global marketplace, investors are often unwilling to pay the costs of research to understand a very different socio-cultural, political, and legal environment, all necessary before making an investment. As a result, even if the potential returns are attractive, the Lucas Paradox persists because of lack of information.

Sovereign Risk

Sovereign risk can be defined as any situation where a sovereign "defaults on loan contracts with foreigners, seizes foreign assets located within its borders, or prevents domestic residents from fully meeting obligations to foreign contracts."[xi] Reinheart and Rogoff argue that serial default constitutes the key explanation for why so little capital flows to poor countries. In essence, countries who default on their debts – often the poorest countries – have difficulty borrowing from the rest of the world. As shown in Figure 6, there is a very strong correlation between the percentage of total years in default since 1946 versus per capita income (1998-2002 average) – in fact, the poorest countries often default one-third to one-half of the time despite having borrowed little. Unsurprisingly, capital flows would be small.[xii] According to the authors, "the fact that so many poor countries are in default on their debts, that so little funds are channeled through equity, and that overall private lending rises more than proportionally with wealth, all strongly support the view that credit markets and political risk are the main reasons why we do not see more capital flows to developing countries." This evidence is very convincing in explaining the Lucas puzzle. In fact, the true paradox may not be that too little capital

flows from rich to poor countries, but that too much capital in the form of debt is channeled to serial defaulters.

Is there really a Lucas Paradox?

Abstracting from the discussion above, according to a study by Causa et al, the Lucas paradox simply arises from the use of PPP data to calculate the capital-output ratio. Since the relative price of outputs is low in low-income countries, the use of PPP prices overestimates the market value of the productivity of physical capital in the countries. When the authors empirically use market prices, they find that the capital-output ratios are surprisingly similar across countries (Appendix: See Figure 7). In short, no Lucas paradox exists when returns to capital are measured using market prices. Econometrically, the authors show that indeed, the elasticity of the capital output ratio to the relative price of capital is negative one (Appendix: See Figure 8).

The authors then focus on the question: why is the relative price of investment goods higher in poor countries? Appealing to the Balassa-Samuelson hypothesis, which states that poor countries have low productivity in the tradeable sector relative to the non-tradeable sector, Causa et al shows that empirically under a two sectors model, relative price differences are offset by total factor productivity differences. In other words, lower total factor productivity in manufacturing explains the higher relative price of capital in the poorest countries; the elasticity of the relative price of capital with respect to the difference between total factor productivity in the aggregate economy versus total factor productivity in manufacturing is equal to one. As a rough measure, the capital-output ratio is more than 40% lower in poorer countries than richer ones, approximately equal to the 40% discrepancy between total factor productivity in manufacturing relative to the aggregate economy in developing economies. The gap is thus translated nearly one to one into higher prices for equipment goods, thereby explaining capital scarcity in volume, but not in value terms in poorer countries.

The authors claim that when focusing on manufacturing, the initial paradox is turned into an 'anti-Lucas paradox' – surprisingly, the poorest countries have higher capital-output ratios. Turning to institutional quality as a potential explanation, Causa et al then demonstrate that lack of productive infrastructure explains the anti-paradox by hampering capital accumulation.

Similar studies of industrial productivity across countries likewise substantiate the results of the aforementioned paper, thus deflating theories about international capital market failures as a critical explanation of low level of capital flows.[xiii] Whether the Balassa-Samuelson hypothesis, however, holds true remains contestable. Applying a two-sector framework may be an oversimplifying assumption, and arguably, PPP measures of the capital-output ratio may be a more suitable measure than market exchange rates, which are very volatile and relevant for internationally traded goods only. Especially since non-tradeable goods may serve as intermediate inputs in manufacturing or foreign firms may invest in non-tradeable sectors as part of a strategy to tap the domestic market (EX: telecommunications), using market rates alone in the determination of the capital-output ratio may be misleading.

In reality, explanations of the Lucas Paradox are likely a combination of the factors identified above. The fact that immense capital flows from rich to poor countries are not observed in practice suggest the failure of conventional assumptions, in both market fundamentals, international capital markets, and methods of measurement / quantification of variables.

Appendix:

Figure 1. Emerging Market and Developing Countries: Net Capital Flows (Billions of USD)[xiv]

	1995-97	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
Total											
Private capital flows, net[2]	204.8	66.2	80.8	74.3	75.6	97.3	160.4	230.6	254.0	178.8	153.8
Private direct investment, net	120.3	159.0	177.6	167.5	180.3	149.5	157.5	184.3	212.3	220.6	217.5
Private portfolio flows, net	71.0	42.9	72.7	17.6	-70.6	-78.6	-3.7	34.5	38.5	-4.7	-3.2
Other private capital flows, net	13.5	-135.7	-169.5	-110.8	-34.1	26.5	6.6	11.8	3.2	-37.1	-60.5
Official flows, net	6.8	52.3	26.4	-46.0	-0.1	9.0	-61.5	-81.5	-138.6	-161.3	-163.6
Change in reserves[3]	-103.9	-29.5	-101.3	-128.3	-128.1	-194.7	-351.6	-515.4	-580.2	-584.2	-562.3
Memorandum											
Current account[4]	-88.3	-49.6	42.9	128.6	90.5	138.5	229.4	310.5	511.2	576.5	569.8
Africa											
Private capital flows, net[2]	4.1	7.6	9.0	--	5.7	4.9	4.6	13.0	30.4	16.6	21.1
Private direct investment, net	4.3	6.3	8.6	7.6	23.0	13.3	14.9	15.1	23.2	21.5	21.3
Private portfolio flows, net	4.8	4.3	9.1	-1.8	-7.6	-0.9	0.1	5.5	4.5	5.3	5.4
Other private capital flows, net	-4.9	-3.0	-8.7	-5.8	-9.6	-7.5	-10.4	-7.7	2.7	-10.2	-5.6
Official flows, net	0.3	5.3	3.8	2.7	-0.5	4.3	3.7	1.8	-6.6	3.2	4.2
Change in reserves[3]	-6.3	3.6	-0.4	-12.8	-9.8	-5.7	-11.4	-33.0	-42.1	-46.3	-54.7
Central and eastern Europe											
Private capital flows, net[2]	27.1	27.2	37.0	39.7	11.6	53.5	52.3	71.0	108.2	94.7	84.4
Private direct investment, net	11.7	19.3	22.8	24.2	24.2	25.6	16.6	34.0	41.3	41.3	39.7
Private portfolio flows, net	4.5	-1.3	5.7	3.2	0.5	1.8	6.1	27.4	28.8	27.2	25.0
Other private capital flows, net	10.9	9.1	8.6	12.3	-13.1	26.1	29.5	9.7	38.1	26.2	19.7
Official flows, net	0.3	1.0	-2.6	1.8	5.9	-7.7	-5.3	-6.8	-8.5	-2.7	-2.6
Change in reserves[3]	-15.6	-9.3	-11.9	-6.6	-4.4	-20.3	-12.4	-14.3	-41.0	-25.5	-12.7
Commonwealth of Independent States[5]											
Private capital flows, net[2]	14.4	-1.5	-13.1	-27.3	6.3	16.1	16.7	8.0	24.9	-13.7	-21.3
Private direct investment, net	4.6	5.6	4.7	2.3	5.0	5.2	5.4	13.7	5.2	2.8	3.5
Private portfolio flows, net	16.9	7.8	-0.9	-10.0	-1.2	0.4	-0.5	5.7	1.0	-5.1	-5.3
Other private capital flows, net	-7.1	-14.9	-16.9	-19.7	2.4	10.6	11.8	-11.4	18.7	-11.4	-19.6
Official flows, net	-1.1	1.7	-2.1	-6.3	-5.2	-10.7	-8.6	-7.7	-15.5	-3.7	-4.6
Change in reserves[3]	-1.3	12.7	-6.2	-20.4	-12.9	-16.2	-31.7	-56.0	-75.2	-88.0	-76.8
Emerging Asia[6]											
Private capital flows, net[2,7]	90.1	-53.8	3.1	6.5	19.6	20.8	63.5	120.3	53.8	55.2	51.6
Private direct investment, net	54.0	56.8	71.6	59.0	51.6	50.7	67.9	60.0	71.8	76.5	78.7
Private portfolio flows, net	20.6	8.8	56.9	20.2	-51.2	-59.9	4.4	3.8	-31.1	-24.5	-27.0
Other private capital flows, net[7]	15.4	-119.4	-125.4	-72.8	19.1	30.0	-8.8	56.4	13.1	3.3	-0.1
Official flows, net	-2.3	19.6	1.8	-11.7	-11.7	4.6	-17.6	1.8	5.0	-0.2	-10.4
Change in reserves[3]	-41.7	-53.1	-88.2	-53.7	-90.2	-148.8	-226.5	-340.1	-281.9	-302.2	-306.0
Middle East[8]											
Private capital flows, net[2]	4.0	15.6	0.2	5.5	9.2	4.1	7.9	12.2	11.4	-8.7	-10.1
Private direct investment, net	5.0	9.5	4.1	4.7	9.6	9.8	17.6	13.3	19.6	24.5	23.6
Private portfolio flows, net	-2.8	-2.3	0.7	3.3	-3.5	-5.1	-5.4	6.0	7.6	-11.5	-6.1
Other private capital flows, net	1.8	8.4	-4.6	-2.6	3.1	-0.6	-4.3	-7.1	-15.8	-21.7	-27.6
Official flows, net	4.3	10.5	19.0	-27.4	-14.9	--	-39.7	-63.6	-87.9	-148.8	-148.8
Change in reserves[3]	-13.9	8.3	-2.5	-32.1	-12.5	-1.4	-34.1	-47.7	-108.4	-72.9	-77.4
Western Hemisphere											
Private capital flows, net[2]	65.2	71.2	44.7	49.9	23.1	-2.1	15.5	6.0	25.2	34.6	28.1
Private direct investment, net	40.6	61.5	65.9	69.6	66.8	45.0	35.1	48.1	51.2	54.0	50.6
Private portfolio flows, net	27.2	25.6	1.3	2.6	-7.6	-14.9	-8.4	-13.9	27.6	3.9	4.8
Other private capital flows, net	-2.6	-15.9	-22.5	-22.3	-36.1	-32.2	-11.2	-28.1	-53.6	-23.4	-27.3
Official flows, net	5.2	14.2	6.4	-5.2	26.3	18.5	6.1	-7.1	-25.2	-9.2	-1.5
Change in reserves[3]	-25.2	8.4	7.9	-2.8	1.9	-2.2	-35.5	-24.3	-31.6	-49.2	-34.7
Memorandum											
Fuel exporters											
Private capital flows, net[2]	5.8	9.7	-23.2	-42.9	-1.3	10.7	12.9	5.4	4.9	-52.8	-60.6
Nonfuel exporters											
Private capital flows, net[2]	199.0	56.5	104.0	117.1	76.9	86.7	147.5	225.2	249.1	231.6	214.4

[1]Net capital flows comprise net direct investment, net portfolio investment, and other long- and short-term net investment flows, including

Figure 2. FDI Inflows, by host region and major host economy, 2006-2007 (Billions of USD)[xv]

Host region/economy	2006	2007 [a]	Growth rate (%)
World	**1 305.9**	**1 537.9**	***17.8***
Developed economies	**857.5**	**1 001.9**	***16.8***
Europe	566.4	651.0	*14.9*
European Union (25)	531.0	610.0	*14.9*
EU 15	*492.1*	*572.0*	*16.2*
France	81.1	123.3	*52.1*
Germany	42.9	44.8	*4.4*
Italy	39.2	28.1	*- 28.1*
Netherlands	4.4	104.2	*2 285.1*
United Kingdom	139.5	171.1	*22.6*
New EU members (10)	*38.9*	*38.0*	*- 2.3*
Czech Republic	6.0	7.6	*27.3*
Hungary	6.1	- 0.3	..
Poland	13.9	18.1	*30.3*
United States	175.4	192.9	*10.0*
Japan	- 6.5	28.8	..
Developing economies	**379.1**	**438.4**	***15.7***
Africa	*35.5*	*35.6*	*0.1*
Egypt	10.0	10.2	*1.6*
Morocco	2.9	5.2	*78.6*
South Africa	- 0.3	5.0	..
Sudan	3.5	2.2	*- 37.9*
Tunisia	3.3	1.0	*- 69.1*
Latin America and the Caribbean	*83.8*	*125.8*	*50.2*
Argentina	4.8	2.9	*- 39.6*
Brazil	18.8	37.4	*99.3*
Chile	8.0	15.3	*92.2*
Colombia	6.3	8.2	*30.5*
Mexico	19.0	36.7	*92.9*
Venezuela	- 0.5	0.4	..
Asia and Oceania	*259.8*	*277.0*	*6.6*
West Asia	59.9	52.8	*- 11.9*
Lebanon	2.8	2.1	*- 25.5*
Turkey	20.1	19.4	*- 3.7*
South, East and South-East Asia	199.5	224.0	*12.3*
China	69.5	67.3	*- 3.1*
Hong Kong, China	42.9	54.4	*26.9*
India	16.9	15.3	*- 9.4*
Indonesia	5.6	5.9	*6.3*
Malaysia	6.1	9.4	*54.4*
Philippines	2.3	2.5	*4.6*
Singapore	24.2	36.9	*52.6*
Thailand	9.8	10.0	*2.3*
Transition economies	**69.3**	**97.6**	***40.8***
Kazakhstan	6.1	8.3	*34.4*
Romania	11.4	9.0	*- 21.3*
Russian Federation	28.7	48.9	*70.3*

Figure 3. Total Equity Inflows per Capita to Rich and Poor Countries, 1970-2000

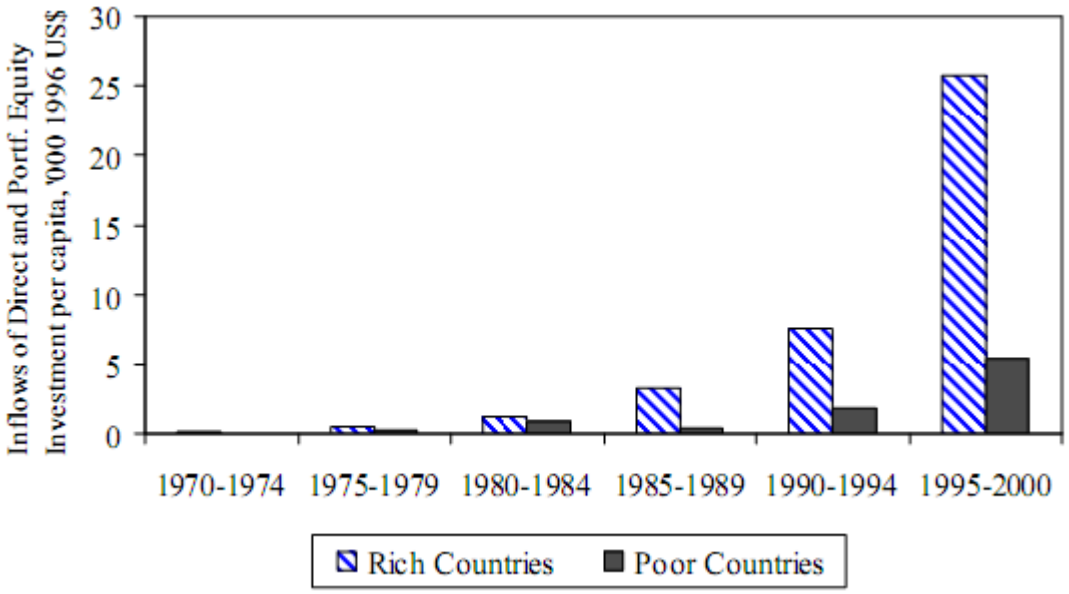

Figure 4. OLS Regressions of Capital Inflows per capita - KLSV Flows Data

Dependent Variable is Average Capital Inflows per capita, 1970–2000

	Whole World (1)	Whole World (2)	Base Sample (3)	Base Sample (4)	Base Sample (5)	Base Sample (6)	Base Sample (7)	Base Sample (8)	Base Sample (9)
Log GDP per capita (PPP) in 1970	4.89*** (0.73)	1.19 (0.79)	4.87*** (0.75)	0.85 (0.83)	3.09*** (0.84)	4.53*** (0.95)	3.65*** (0.72)	0.36 (0.83)	
Log GDP per capita (1990 $) in 1970									0.55 (0.34)
Average Institutional Quality, 1984–1997		2.39*** (0.41)		2.54*** (0.43)				2.16*** (0.52)	2.02*** (0.45)
Log Average Years of Schooling, 1970–1997					3.84*** (1.34)			0.85 (1.23)	0.74 (1.13)
Log Average Distantness, 1970–1997						−3.54 (3.90)		−1.60 (3.33)	−0.48 (2.92)
Average Restrictions to Capital Mobility, 1970–1997							−6.17*** (2.17)	−2.73 (2.04)	−2.49 (2.09)
R^2	0.49	0.64	0.48	0.64	0.51	0.49	0.52	0.65	0.66
Countries	61	61	58	58	58	58	58	58	58

Figure 5. Rate of Return Differentials in Response to Relative Property Rights

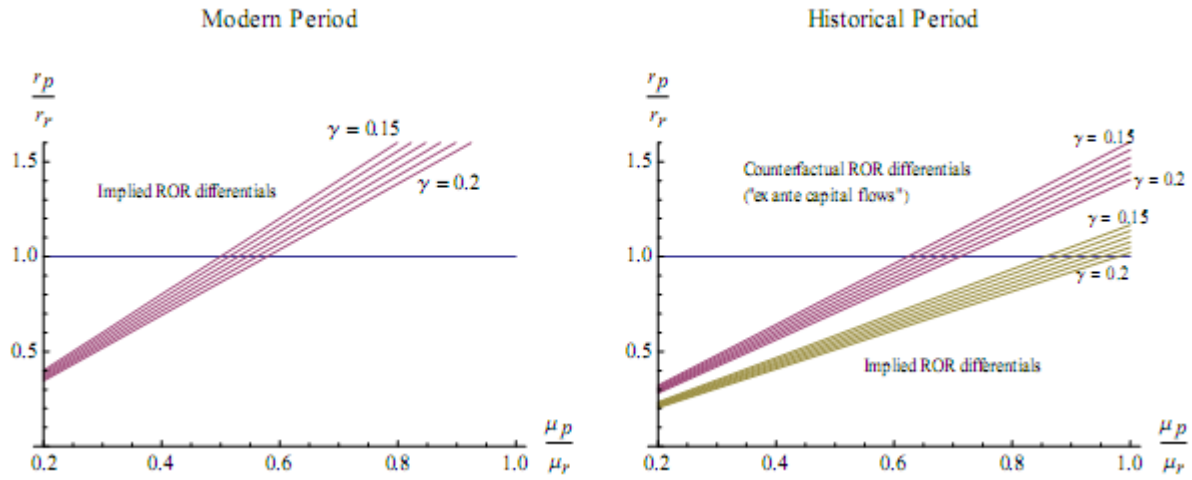

Figure 6. Share of Years in Default and Income Levels

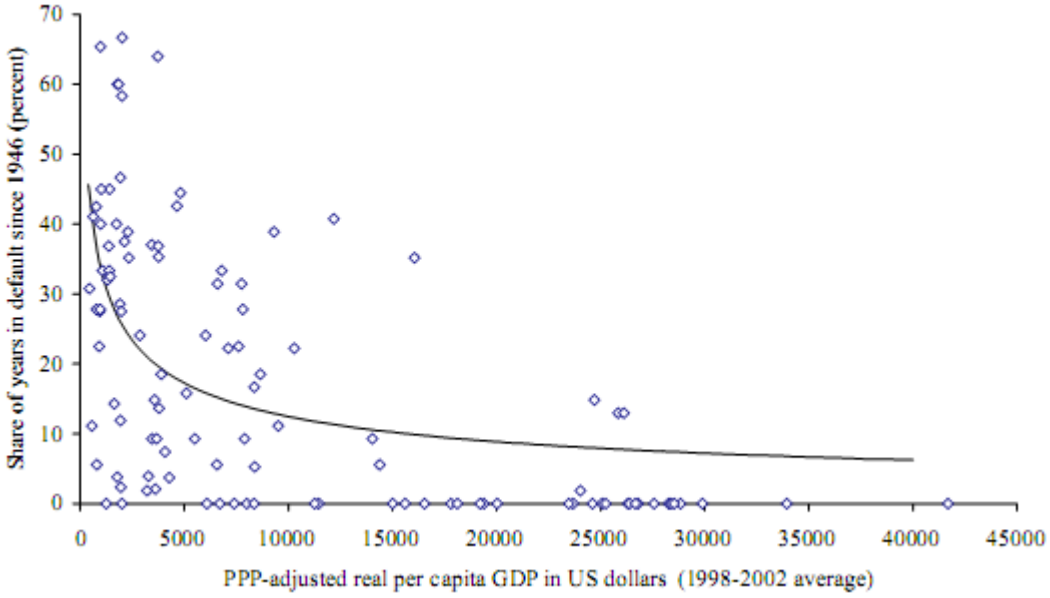

Figure 7. Capital-Output Ratio in the Manufacturing Sector

Reference	1.00
Other European	1.29
Non-high	1.43
Non-high w:o SSA	1.39
SSA	1.61
SEAP	1.54
MENA	1.57
LATINCA	1.27

Sources and country grouping: see appendix.

Figure 8. Econometric Evidence on the Anti-Lucas Paradox

Table 5. Regression of the capital-output ratio on the relative price of capital

	OLS	GMM	OLS	GMM
	(1)	(2)	(3)	(4)
Log (P_I/P_Q)	-1.002***	-1.208***	-1.076***	-1.152***
	(0.134)	(0.25)	(0.129).	(0.180)
Continental Dummies	Yes	Yes	No	No
R square	0.83	0.84	0.81	0.83
Overidentification test (p value)		p=0.71		p=0.51

Sources: see appendix.
Instruments: Percentage of land within 100km from the coast;
(log) Coastal population density in 1965- Sources: Gallup et al.(1999)
Robust standard errors in parenthesis. signficant at: * =10%, **=5%; ***=1%
In this table and in the sequel, we use two-step efficient generalized method of moments (GMM) estimator. See Baum, C.F., Schaffer, M.E., and Stillman, S.(2003)

Prices and Productivity

	GMM	GMM	GMM	GMM
Dependent variable	LPINV/PGDP	LPINV/PGDP	LPINV/PGDP	LPINV/PGDP
Explanatory variables :				
DIFFLTFP	-0.934*	-1.04**	-1.093*	-1.026**
	-0.333	-0.197	-0.295	-0.202
LNRGDPW		-0.278*		-0.149
		-0.126		-0.162
Geo controls	YES	YES	YES	YES
SSA included?	YES	YES	NO	NO
Sample	53	53	47	47
Year	1990	1990	1990	1990
R2	-	-	-	-
F statistic	-	-	-	-
GMM Estimation related tests:	0.033	0.0483	0.167	0.219
Hansen J Statistic	0.033	0.0483	0.167	0.219
(overidentification test).P-val				
Centred R2 (second stage)	0.299	0.205	0.056	0.1765
UnCentred R2 (second stage)	0.4389	0.364	0.185	0.288

Definition: see table 7; sources: see appendix
Robust standard errors in parenthesis. signficant at: * =10%, **=5%; ***=1%
Instruments: (log) ratio of physical capital on human capital in manufacturing and in the aggregate economy.

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