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Diskussionsbeiträge des Fachbereichs Wirtschaftswissenschaft  
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**The Lucas Paradox and the Quality of Institutions: Then  
and Now**

Moritz Schularick und Thomas M. Steger

# The Lucas Paradox and the Quality of Institutions: Then and Now<sup>°</sup>

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In the first era of financial globalization (1880-1914), global capital market integration led to substantial net capital movements from rich to poor economies. The historical experience stands in contrast to the contemporary globalization where gross capital mobility is equally high, but did not incite a substantial transfer of savings from rich to poor economies. Using data for the historical and modern periods we extend Lucas' (1990) original model and show that differences in institutional quality between rich and poor countries can account for the sharply divergent patterns of international capital movements.

*Keywords:* capital market integration; financial globalization; economic history.

*JEL classification:* F15; F21; F30; N10; N20; O11; O16

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## 1. Introduction

During the first era of financial globalization between 1880 and 1914 international capital mobility was as high as today. The Feldstein-Horioka (1980) test even suggests that capital movements were higher in the historical era (Bayoumi, 1990; Eichengreen, 1990; Taylor, 1996; Jones and Obstfeld, 1997). Yet the patterns of international capital flows differ markedly between the two periods of largely unrestricted capital mobility. Before WW1 capital flows were predominantly one-directional in the sense that capital flowed from the rich core economies in Europe to the poorer periphery on a net basis. As a consequence, the rich creditor nations in the core had built up substantial net foreign asset positions of around 20 percent of their aggregate GDP, and by 1914 foreign capital to output ratios averaged more than 100 percent in developing countries (Edelstein, 1982; Obstfeld and Taylor, 2004; Schularick, 2006). In the contemporary globalization, gross capital mobility is equally high, but does not lead to substantial net capital flows between rich and poor economies. As a result, the Lucas (1990) paradox of missing rich-poor capital flows is more pronounced than in the first globalization.<sup>1</sup> In their important study, Obstfeld and Taylor (2004, p. 55) concluded that the contemporary financial globalization was characterized by “diversification finance” as opposed to “development finance” before WW1:

*Today’s foreign asset distribution is much more about asset “swapping” by rich countries – diversification – than it is about the accumulation of large one-way positions—a critical component of the development process in poorer countries in standard textbook treatments.*

How can we account for these differences between now and then? Why was capital market integration before 1914 marked by massive net capital flows to poor economies while the contemporary globalization is characterized by diversification finance and limited net capital movements? In this paper, we aim to sketch a potential theoretical explanation for this phenomenon along the lines of Lucas’ thinking about determinants of rate of return differentials between developed and less developed economies. In his seminal paper, Lucas (1990) argued that differences in the relative human capital endowments could be an

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<sup>1</sup> While Clemens and Williamson (2004) found that the wealth bias of financial investment was as strong before 1914, other studies have questioned the robustness of this result after controlling for outliers and pointed to a much less pronounced “wealth bias” in international capital flows before WW1 (Obstfeld and Taylor, 2004; Schularick, 2006). This also mirrors the earlier findings by Edelstein (1982) who had shown substantial net investment flows from Europe to overseas areas.

explanation for the absence of substantial net capital movements from rich and poor countries during the post-WW2 period. In Lucas' original line of thought, physical capital is comparably unproductive in poor countries because complementary factors such as human capital are missing. This perspective can be referred to as the "unproductive capital view". The alternative position, the "capital market failure view", stresses factors such as asymmetric information, distorting policies, and unenforceable property rights. This strand of the literature highlights the quality of institutions – such as the protection of creditors and the enforcement of property rights across international borders – as a necessary condition for net investment flows and the buildup of sizeable net foreign asset positions (Shleifer, 2003).

Recent empirical studies have pointed to the important contribution legal and political arrangements made to development finance before 1913 by increasing creditor protection and borrowers willingness to pay (Ferguson, 2003; Mitchener and Weidenmier, 2005a; Ferguson and Schularick, 2006). Weak institutions have also been made responsible for the paucity of rich-poor capital flows in the contemporary globalization. The cross-country study by Alfaro et al. (2003) concluded that weak institutional quality was the most important variable for explaining the paucity of rich-poor capital flows between 1971 and 1998. More recently Ju and Wei (2006) have shown how the quality of property rights can be a cause for the observed paradoxes in global capital flows.

The "unproductive capital view" and the "capital market failure view" are by no means mutually exclusive. We therefore ask whether a combination of these two approaches is capable of explaining the different patterns of international capital flows during the two eras of financial globalization within a unified framework. In a first step, we extend Lucas' (1990) original model to account for the impact of institutional quality on rate of return differentials between rich and poor countries. In a second step, we evaluate the model using modern and historical data to see what difference in the quality of institutions between rich and poor countries could explain the observed patterns of capital flows. Finally, we check the plausibility of these results against the available evidence on differentials in institutional quality between rich and poor countries in both eras of financial globalization.

This exercise shows that it is possible to explain why rich-poor capital movements are negligible in modern times but were substantial before WW1: we find a considerably higher rate of return differential between rich and poor countries for the historical period than for today.

## 2. An extended Lucas exercise

We start by extending the original Lucas (1990) framework to incorporate the effects of differences in institutional quality on rate of return differentials between rich and poor countries. Lucas himself proposed that institutional factors could play an important role for the paucity of capital flows from rich to poor (1990, pp. 94/95):

*Until around 1945, much of the Third World was subject to European-imposed legal and economic arrangements, and had been so for decades or even centuries. A European lending to a borrower in India or the Dutch East Indies could expect his contract to be enforced with exactly the same effectiveness and by exactly the same means as a contract with domestic borrowers.*

Assume, following Lucas (1990), that the production technology is  $Y = A(hL)^{1-\alpha} K^\alpha h^\gamma$ , where  $Y$  is final output,  $A > 0, 0 < \alpha < 1, \gamma > 0$  denote constant technology parameters,  $h$  is human capital per capita,  $L$  (unskilled) labor,  $K$  represents the stock of physical capital, and  $h^\gamma$  captures a production externality. Output per effective labor,  $y := Y/(hL)$ , is given by  $y = Ak^\alpha h^\gamma$ , where  $k := K/(hL)$ . The competitive and private rate of return on capital may then be expressed as  $r = \mu\alpha Ak^{\alpha-1} h^\gamma$ , where  $0 \leq \mu \leq 1$  captures the degree of property rights protection. By solving  $y = Ak^\alpha h^\gamma$  for  $k$  and plugging the result into the previous expression for the rate of return, we get  $r = \mu\alpha A^{1/\alpha} y^{(\alpha-1)/\alpha} h^{\gamma/\alpha}$ . Hence, the ratio of the rate of returns on capital in poor and rich countries may be expressed as follows:

$$\frac{r_p}{r_r} = \frac{\mu_p}{\mu_r} \left( \frac{y_p}{y_r} \right)^{(\alpha-1)/\alpha} \left( \frac{h_p}{h_r} \right)^{\gamma/\alpha} = \frac{\mu_p}{\mu_r} \left( \frac{Y_p/L_p}{Y_r/L_r} \frac{h_r}{h_p} \right)^{(\alpha-1)/\alpha} \left( \frac{h_p}{h_r} \right)^{\gamma/\alpha}, \quad (1)$$

where the subindex  $p$  stands for “poor” and  $r$  for “rich”. Equation (1) shows that the rate of return differential,  $r_p/r_r$ , depends on the relative protection of property rights,  $\mu_p/\mu_r$ , on relative output per capita,  $(Y_p/L_p)/(Y_r/L_r)$ , and on the relative stocks of human capital per capita,  $h_p/h_r$ .

To evaluate the model we need information on the terms appearing on the right hand side. The baseline set of parameters is discussed in the next section. The human capital externality parameter is set to  $\gamma = 0.175$ . While Lucas (1990) uses  $\gamma = 0.36$ , Ciccone and

Peri (2006) have shown in the meantime that the standard estimates are heavily upward biased. Benhabib and Perli (1996) even use  $\gamma = 0.1$ . Since this parameter is hard to specify with certainty, we decided to let  $\gamma \in [0.15, 0.2]$ .

### 3. Data sources and parameter specification: now and then

With regard to the underlying data, we make a few adjustments to Lucas' original numerical exercise. First, unlike Lucas we don't look at just two countries, the US and India, but use a broader sample of developed and developing countries. For the historical and the modern period our dataset covers 54 respectively 24 economies. Second, for both periods, we split the sample into a rich and a poor half by classifying all countries as poor if their GDP per capita is less than the sample mean. Finally, we average the relevant data across the "rich" and "poor" parts of the world economy in 1913 and 2002. We use these averages to construct two ratios for relative human capital endowment and relative GDP per capita which we plug into the extended Lucas-model.

The data for the contemporary period come from commonly used sources such as the World Development Indicator database (World Bank, 2005). Inflows of portfolio and equity capital over GDP are taken from the International Financial Statistics (IMF, 2005). Data on educational attainment (average years of schooling) as a proxy for human capital endowments are taken from the updated Barro-Lee dataset (Barro and Lee, 2000). In total, we count observations for 54 countries for the contemporary period (1980-2002) covering a large number of developing and developed countries. Our analysis of the historical period builds on three recently compiled datasets for the first era of financial globalization (Obstfeld and Taylor, 2003; Clemens and Williamson, 2004; Ferguson and Schularick, 2006). From these datasets come all economic variables such as the human capital proxy (primary school enrollment). Real GDP data come from the seminal work of Angus Maddison (Maddison 1995, 2001). Capital flow and foreign investment stock data are taken from the work of Stone (1999) as well as Feis (1965) and Woodruff (1966). A detailed data appendix is available from the authors on request. In total, we have assembled data for 24 countries over 1880-1914 covering more than 80 percent of global GDP in 1914.<sup>2</sup>

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<sup>2</sup> Among the major economies, the only large country missing in the historical sample is China for which GDP series do not exist. The historical dataset comprises of European countries (Austria-Hungary, Denmark, France, Germany, Greece, Italy, Norway, Portugal, Russia, Spain), North

Constructing average values for the rich and the poor half of the world results in a slightly higher relative human capital endowment in the historical period with poor-to-rich ratios of 0.45 back then versus 0.41 today. With regard to output differentials, we work with actual GDP per capita data for the modern period which show a rich-to-poor GDP per capita ratio of 0.25. However, this approach is problematic for the historical period as we know that substantial net capital movements between rich and poor haven taken place during the period. As these flows are likely to have lowered the initial gap in output per capita, we need to adjust output per capita for the effects of the capital transfers.

Two additional assumptions are necessary. First, we follow Twomey (2000) and Schularick (2006, table 2) by assuming that the stock of physical capital in poor countries owned by foreign investors averaged 100 percent of GDP in developing countries in 1913. Second, we assume a capital-output ratio of three. On the basis of this information, we can calculate differences in GDP per capita between rich and poor countries under the counterfactual assumption that no capital had flown from rich to poor.<sup>3</sup> The calculation yields an original ex-ante output differential between poor and rich countries of 0.31. We also present our simulations below with the ex-post differences in GDP per capita of 0.36 to demonstrate the impact of these counterfactual assumptions.

It is inherently difficult to quantify the difference in institutional quality between rich and poor economies. In this paper, we consequently abstain from making direct assumptions, but look to the model to tell us what differentials could explain the observed patterns of capital flows. Nonetheless, a few preliminary considerations are helpful. For the contemporary period, we can use data on property rights and legal protection such as the International Property Rights Index, the property rights index compiled by the Heritage Foundation and the quality of the legal system measured by the International Country Risk Guide. Despite different sources and compilation methods, all these indicators show that property rights protection in the average developing country is only about half as effective as in the OECD countries (IPRI, 2007; Heritage Foundation, 2006; Dollar, 2002).

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American and Australasian settler economies (Canada, USA, Australia, New Zealand) as well as South American (Argentina, Brazil, Chile, Mexico, Uruguay), Asian (Ceylon, India, Japan) and Middle Eastern (Egypt, Turkey/Ottoman Empire) economies.

<sup>3</sup> A similar procedure has been recently applied in a historical study focusing on the effect of capital movements and mass migration on wage differentials by Hatton and Williams (2006).



For the historical period, there are no detailed country-by-country assessments of institutional quality that could serve as comparable signposts to approximate the differences in institutional quality. However, it is clear that on the eve of WW1, most of Asia and Africa was under colonial rule by the European powers. European rule could have had an impact on contract enforcement by foreign investors as Lucas himself noted in the quote above. Did colonial status improve property rights and legal protection for foreign investors?

Ferguson and Schularick (2006) have shown that country risk implied by risk premia in the bond market was 60 percent lower for British colonies than for independent developing countries – after controlling for differences in economic development, debt levels and other solvency indicators. Moreover, this “Empire Effect” remained present in a sample that included rich core economies alongside poor colonies. In other words, after controlling for economic fundamentals and solvency indicators, in the eyes of British investors the residual institutional and political risks in poor colonies were actually *lower* than in more advanced economies such as the US, France or Germany.

Looking with Lucas at the US and India in the year 1913 clarifies the picture. By 1913, the US were the largest and on a per capita basis among the richest economies in the world. India, however, was among the poorest parts of the British Empire with a significant public debt burden and a real per capita income of 12 percent of the US. The country risk premium for US government bonds in the year 1913 was 52 basis points over British Consols. Without formal guarantees by the British government, India’s country risk premium as charged by the international bond market was two basis points lower than in the US – 50 basis points. The average of the less-developed parts of the British Empire (including many poor African colonies) was 46 basis points. It seems therefore likely that colonial status contributed significantly to equalizing institutional and legal investment risks between rich and poor economies.

As for the other parts of the developing world that were not under formal colonial rule before WW1 such as Latin America and Eastern Europe, the recent literature argues that the European powers and the US policed and protected property rights by way of an informal imperialism (Kelly, 1998; Goetzmann and Ukhov, 2001). In particular Mitchener and Weidenmier (2005a,b) show that military pressure and political control were an important and commonly used enforcement mechanism for international debt transactions in 1870-1913. It seems plausible to assume that such interventions and indirect political control have lowered

sovereign risk and resulted in a higher relative degree of property rights protection in the periphery than today.

#### 4. Evaluating the extended Lucas model

Using the parameters presented in table 1, we evaluate the model and plot the resulting rate of return differentials over the different ratios for institutional quality in graph 1. Looking at the modern period, lower GDP per capita in poor countries as implied by  $(Y_p^m / L_p^m) / (Y_r^m / L_r^m) \cong 0.25$ , together with diminishing returns to capital creates a positive rate of return differential. Yet, as Lucas argued before, weaker human capital endowment reduces the rate of return differential.<sup>4</sup> However, the new insight from figure 1 is that in an extended Lucas framework, i.e. accounting for differences in property rights protection, a positive rate of return differential between rich and poor economies appears only if the differential in property rights protection is at or above 0.6. Assuming the level of property rights protection in the periphery is 60 percent of the level developed world, rates of return in the periphery would be a mere 11 percent higher than in the core. Given the margin of error of our approximations in table 1, the resulting differential is hardly enough to conclude that ex ante rate of return differentials in the contemporary world economy are large enough to incite large capital flows. If the rate of return in the typical rich country amounts to, say, 5 percent, the rate of return in the typical poor country would be 5.55 percent. In addition, the evidence on relative property rights protection discussed above even indicates that the differential could have been lower, maybe only around 0.55. In this case, the rate of return differential between rich and poor economies over the past 25 years would have been a rather insignificant 2 percent. A figure low enough to explain the observed paucity of capital flows from rich to poor countries.

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<sup>4</sup> This result is qualitatively similar to Lucas (1990, p. 94). The reason is that we set  $h_p^m / h_r^m \cong 0.41$  whereas Lucas employs  $h_p^m / h_r^m \cong 0.2$ . On the other hand, Lucas sets  $(Y_p^m / L_p^m) / (Y_r^m / L_r^m) \cong 0.067$ , whereas we have  $(Y_p^m / L_p^m) / (Y_r^m / L_r^m) \cong 0.25$ .

Table 1: Baseline set of parameters

Technology	$\alpha = 0.3; \gamma = 0.175$
Relative human capital <sup>a</sup>	$h_p^m / h_r^m \cong 0.41; h_p^h / h_r^h \cong 0.45$
Relative GDP per capita <sup>a</sup>	$(Y_p^m / L_p^m) / (Y_r^m / L_r^m) \cong 0.25$ (modern period; actual)
	$(Y_p^h / L_p^h) / (Y_r^h / L_r^h) \cong 0.36$ (historical period; actual)
	$(Y_p^h / L_p^h) / (Y_r^h / L_r^h) \cong 0.31$ (historical period; counterfactual) <sup>b</sup>

(a) The underlying data set is described in section 3. (b) The construction of the counterfactual relative GDP per capita is described in a technical appendix available from the authors.

Evaluating (1) with data for the historical period, we ask the same question what assumptions we need to make for relative property rights protection to have sufficient incentives for capital movements given the discussed differentials in output and human capital endowment. The gap in (counterfactual) per capita incomes,  $(Y_p^h / L_p^h) / (Y_r^h / L_r^h) \cong 0.31$ , is somewhat smaller than in the contemporary period which depresses the rate of return differential. Yet this effect is tamed by a higher relative human capital endowment of poor countries before WW1 than today, indicated by  $h_p^h / h_r^h \cong 0.45$ . This being said, the rate of return differential could have been even larger if the impact of pre-WW1 migration on human capital levels (Hatton and Williamson, 2006, Table 1; Ferguson, 2003, pp. 11/12) was taken into account. In this case, there are reasons to assume that the human capital proxy underestimates the human capital endowment in poor countries before 1914.

Figure 1 demonstrates that starting from a property rights differential in the vicinity of 0.75 a substantial ex ante rate of return differential appears for the historical period. The rate of return differential grows to almost 50 percent as we move closer towards the assumption of equal institutional quality in rich and poor countries ( $\mu_p / \mu_r = 1$ ) which could have been the case under colonial rule. Hence, even if transaction costs and risk aversion are taken into account, the ex ante rate of return differential before 1914 was large enough to explain the observed capital movements from rich to poor during that period. Interestingly, using actual instead of counterfactual data on per capita income yields a small rate of return differential of only around 1.04 (assuming  $\gamma = 0.175$ ) at high levels of relative institutional quality, i.e. assuming  $\mu_p / \mu_r = 0.95$ . As there were no impediments to capital mobility during the first

era of globalization, this could be an indication that capital movements had eliminated substantial rate of return differentials by the end of the period.

Summing up, with higher relative institutional quality in the periphery before 1914 than today, an extended Lucas model suggests a substantial ex ante rate of return differential. While difficult to quantify precisely, the assumption of higher institutional standards carries a high plausibility in light of the evidence presented on the “Empire Effect” and informal arrangements that enhanced creditor protection. For instance, if we generalize the above example of equal country risk premia for the US and India before WW1, the resulting ex ante rate of return differential between rich and poor countries in the first era of globalization reaches more than 50 percent. Assuming a not unrealistic differential of 0.9 still yields a substantial rate of return differential of 35 percent – high enough to incite substantial capital transfers from rich to poor before WW1 and hence explain the different patterns of financial globalization then vs. now.

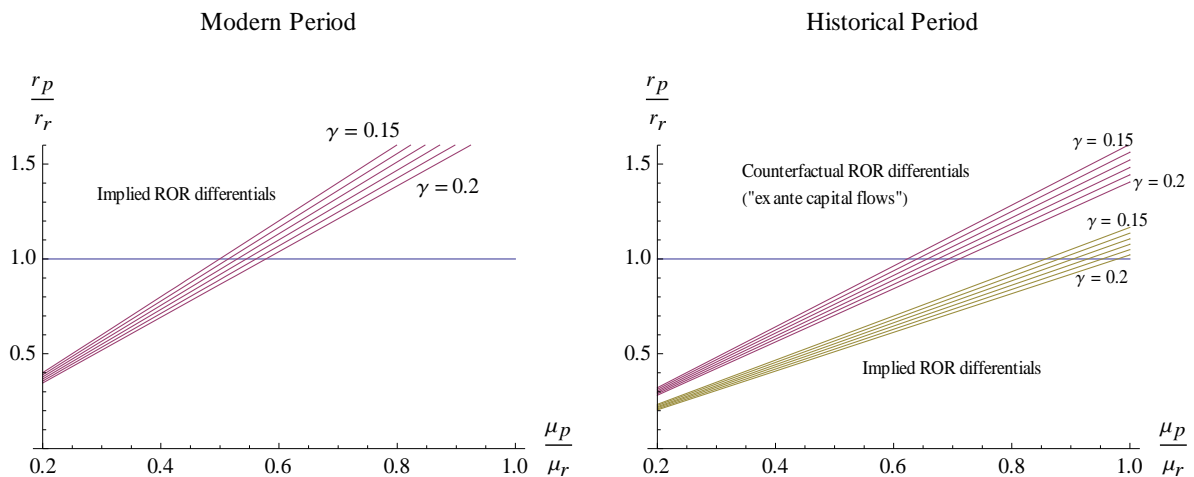


Figure 1: Rate of return differentials in response to relative property rights.

#### 4. Summary

The markedly different patterns of international capital mobility during the historical and the modern era can be explained within an extended Lucas (1990) framework that combines the “unproductive capital” and the “capital market failure” views. Two assumptions are critical: (1) the human capital externality in both periods is in the range  $\gamma \in [0.15, 0.2]$ ; (2) the differential in institutional quality between rich and poor countries in the historical period was considerably higher than today, possibly around 0.9. While direct evidence on this last

assumption is limited, available data and narrative historical accounts make this seem plausible. In the light of the historical experience and the rate of return implications of an extended Lucas model, improvements in institutional quality are a key precondition for larger capital flows to developing countries

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