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# Private Capital Flows to Low Income Countries: Country- Specific Effects and the Lucas Paradox

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**Private Capital Flows to Low Income Countries:**

Country- Specific Effects and the Lucas Paradox

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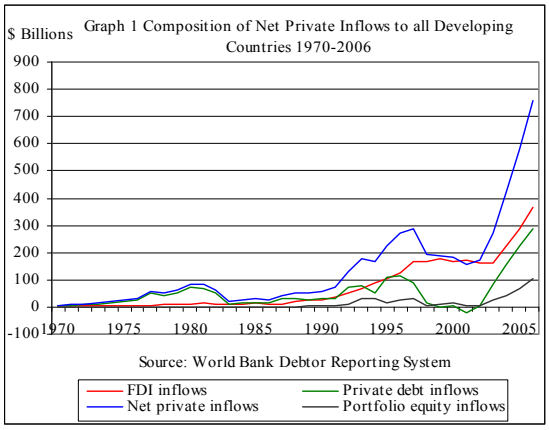
## Abstract

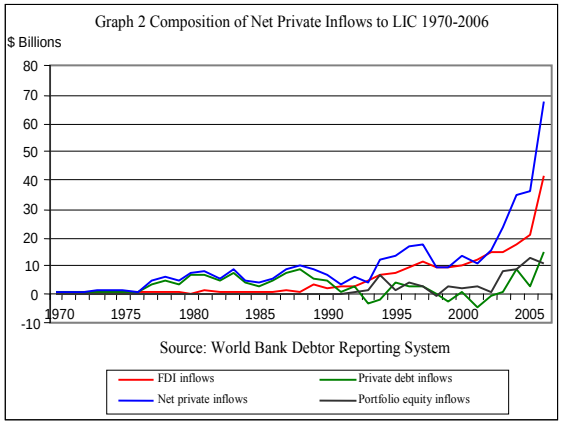
*This paper analyses Net Private Capital Flows to LICs incorporating the recent surge in FDI between 2000 and 2006. We show that including country-specific effects in a paneldata setup resolves the Lucas Paradox, at least for LICs. Our results suggest that openness is among the most important factors explaining country-specific performance in attracting Net Private Capital Flows.*

JEL codes: F21, G15

## 1. Introduction

Private Capital Flows to developing countries have increased sharply since the Brady debt renegotiations resolved the debt overhang blocking most private flows in the 1980s. Even LICs, previously largely excluded from private capital markets, benefited form this initiative. Private-source inflows to LICs have grown more than fourfold since the 1980s (Dorsey et al, 2008). Moreover, Net Private (capital) Flows (NPF) gained momentum in the period 2000-2006, when inflows rose by 21% for all developing countries and increased by 20% in LICs. Most remarkable is maybe the recent major increase in FDI flows to LICs that increased from a mere 10 billion in 2000 to 42 billion US$ in 2006.




This period of renewed capital market activity provides a new opportunity to investigate what since Lucas' pathbreaking article in 1990 has become known as the Lucas paradox. If capital intensity differences are the main factors behind income differences, capital should flow from rich to poor countries, since capital intensity is inversely related to the marginal productivity of capital in the Solow-Swan framework. This implies a negative

correlation between capital inflows and income differences, which, as Lucas observed in his by now classic paper, we do not seem to find in the empirical evidence. But the recent trend in NPFs to LICs may indicate a breakthrough in this pattern (Prasad et al, 2007).

There has in fact been relatively little work on the Lucas paradox. Lucas' work on growth set off a whole industry looking for other factors than capital accumulation explaining differences in per capita income. But most of the empirical work focused on explaining growth, not on clarifying the capital flows paradox that was also highlighted by Lucas.

Papers that focus on private capital inflows have distinguished internal and external drivers of capital inflows into developing countries. The external or 'push' factors include: integration of world financial markets, recessions/booms in major developed countries and the decline in the world interest rate during the nineties. 'Pull' or country specific factors that trigger capital inflow are: an abundance of natural resources, the quality of institutions and the degree of openness (Goldin and Reinert, 2006). Although low returns in developed countries may have played a role, regions like sub Saharan Africa hardly received any private capital inflows from 1990-1999, suggesting that "pull factors" internal to the receiving country play a more important role in LICs (see for a similar view Hoti, 2004). Alfaro et al (2008) empirically examined several possible explanations using data until 2000 and found that institutional quality is the main explanatory variable that resolves the Lucas paradox (i.e. reverses the sign on home per capital income). Because there was insufficient time variation in their data, they had to restrict themselves to a cross-section analysis. But the accelerating dynamics of NPFs in the period 2000-2006 suggest that by now there may be enough time variation in the data to go for a full panel analysis, which is what we do in this paper. We focus specifically on LICs because that is where the most radical increase in FDI flows has taken place, and that is where the paradox seemed to hold most starkly: the LICs are by definition the poorest countries, and should thus be the main recipients of FDI, but in fact they have been pretty much excluded until recently (cf fig.2 above).

In particular we will explore in this paper whether country specific factors can explain what on the surface seems to be a paradox. We first do this mechanically by including country-specific dummies in a panel data setup, otherwise using the framework for testing the Lucas paradox that has become customary in the literature (see for example Alfaro et al (2008)). We use data from 1981 through 2006, thus incorporating the recent surge in FDI between 1981 and 2006. Secondly, we explore which country specific structural variables are the main drivers behind the disappearance of the Lucas paradox for LICs once country specific effects are taken into account.

## 2. Conceptual framework

Lucas (1990) tested with a case study of India and the US (1909 – 1958) whether a difference in MPK (the marginal product of capital) triggers the movement of capital as predicted in neoclassical theory. India had a marginal productivity of capital 58 times higher than that of the USA. However, the findings of this study gave little evidence that capital was reallocated accordingly. Therefore Lucas rejected the neoclassical model and examined the underlying cause of the model's failure.

Explanations for the failure that have been pursued in the literature can be divided into two groups: model imperfections and international capital market imperfections. The model imperfections would be missing factors of production (human capital) or other factors impacting on total factor productivity change (productivity changes once capital and labor accumulation have been accounted for). Capital market imperfections include informational asymmetries and sovereign risk. We mention several factors that have been looked at in the literature.

***Size***

Do large economies receive a disproportionally higher level of capital inflows? The dynamics behind this variable is derived from the "gravity model", which argues that the intensity of capital flows between countries is dependent on the distance between these countries and their economic size (Papaioannou, 2004). In a panel of bilateral debt flows, the gravity model is often used. We analyse aggregate inflows into LICs, not bilateral flows, so we measure size by measures of the receiving country only.

***Debt, Reserves, Public Debt and HICP***

Highly indebted countries are less likely to attract investors. High prospective future debt service acts like a tax on new projects. Odedokun (2003) found that external public debt deters foreign investors, not private external debt, suggesting that it is the fear of future taxes that acts as a deterrent. Debt relief efforts, such as the HIPC initiative, can in such circumstances help to attract FDI. Foreign reserves offset external debt, but in addition provide liquidity and may therefore play a separate role.

***Openness***

The increase of capital flows to developing countries is one of the key features of global financial and trade integration (Prasad et al, 2003). However, do more open economies also attract more private capital Hausmann and Fernández-Arias (2000) find the opposite result for FDI, in contrast to other capital flows, namely that openness is negatively related to FDI. But others find contrasting results. For example Faria and Mauro (2004) find a positive (although insignificant) relation of openness to all types of private capital flows.

***Natural resources***

Firms or countries that want access to natural resources are likely to invest in countries where these assets are abundant. For this reason countries with resources are likely to attract more FDI. Furthermore, natural resources and the future cashflows they promise can serve as collateral for loans. This prediction is in line with empirical findings by André Faria and Paolo Mauro (2004) and Ricardo Hausmann and Eduardo Fernández-Arias

(2000), both show positive significant coefficients variable resource abundant on FDI and total equity inflows. We will investigate the impact on all NPFs onto LICs.

***Financial development***

Financial development may influence private capital flows through several channels. A more sophisticated financial sector may simply facilitate international transactions. It may also lead to a better allocation of capital, thereby raising the average marginal productivity. And better risk sharing will facilitate funding for investment projects. Faria and Mauro (2004) show that portfolio investments and debt are positively correlated with financial development, but find, somewhat surprisingly, that FDI is negatively correlated with financial development. Odedokun (2003) however finds a positive impact of financial sector development on all capital flows, including FDI. Some of the contradictory results may have been triggered by the fact that financial development promotes growth, but also makes a country more crisis-prone (Ranciere et al, 2008).

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***Human capital***

Educated workers are likely to be more productive, which increases the marginal productivity of physical capital in a country. That should lead to more capital inflows. Faria and Mauro (2004) show evidence that countries with a higher percentage of school attendance attract more FDI.

***Institutional quality***

Does a country's institutional quality effect investors' decisions? Although intuitively plausible, the empirical evidence is not conclusive. Alfaro et al. (2003, 2008) find that institutional quality is the most important variable in explaining all capital flows. But Hausmann and Fernandez-Arias (2000) find no explanatory power in explaining equity flows. Conversely Faria and Mauro (2004) find that relative to other types of capital flows, equity capital flows are more driven by institutional quality. It has to be stressed that these studies used different data sources.

***Macroeconomic stability***

Macroeconomic stability affects a country's ability to repay in the future. For example, high inflation rates have been found to discourage investments (Odedokun, 2003).

*Country specific effects and the Lucas Paradox*

Because the literature suggests different response patterns for different type of capital flows, we will distinguish between FDI, portfolio investments, debt. Cross-section analyses with fixed effects are employed as methodology to exploit the impact of country-specific elements on the Lucas Paradox[1]. In the cross-country time series analyses we regress twenty-four different explanatory variables on NPF to test their significance and their effect on the Lucas Paradox.

We first regress aggregate NPF to LIC on explanatory variables. We then repeat the same specification for the three components of NPF: debt, FDI and portfolio investment PI. Clearly, these four equations cannot be interpreted as four independent equations because of the adding up constraint linking the three component flows and their sum NPF. Rather, the component equations should be looked at as a more detailed analysis of the results summarized in the aggregate equation. The index "i" denotes countries and "t" time (1981-2006). Following Alfaro et al (2003, 2008), our main variable of interest to test the Lucas paradox is the logarithm *of GDP per capita* (CAP). When the coefficient of the variable (CAP) is tested positive and significant then the Lucas paradox prevails: countries with a higher income per capita attract a higher level of NPF. The base models will be tested for cross-section fixed effects using a standard fixed effect set up. Do countries with a lower GDP per capita still attract more capital once adjusted for country specific effects?

**Deleted:** Base models¶
$NPF_{i,t} = F(CAP_{i,t}, GDP_{i,t}, PUB_{i,t}, TRADE_{i,t}, NPF_{i,t-1})$

## 3. Empirical results

[1] We choose to use fixed effects instead of a random effects specification because of the presence of a lagged endogenous variable among the regressors.

***Impact of country specific effects and different capital flows***

Table 1 and table 2 present regression results on NPF and explanatory variables using a standard unconstrained OLS specification (Table 1) and a fixed effects specification (Table 2) respectively. The set of explanatory variables is in line with the existing literature. We link capital inflows to openness, total net public assets (Central Bank FX reserves minus foreign public debt), the size variable population (POP) and finally the per capita income term CAP which we interpret as the Lucas paradox variable. In Table 1 we assume a standard error term e(i,t) without country-specific effects.

**Table 1: Panel cross-section time series, non-fixed effects (1981-2006)**

| **Dependent variable** | **NPF (1)** | | **DEB (2)** | | **FDI (3)** | | **PI (4)** | |
|---|---|---|---|---|---|---|---|---|
| | Coef | t-value | Coef | t-value | Coef | t-value | Coef | t-value |
| **Constant** | -0.035 | -3.36* | -0.036 | -4.38* | -0.004 | -0.82 | -0.002 | -4.09* |
| **LOGCAP** | 0.015 | 3.66* | 0.017 | 5.10* | 0.001 | 0.51 | 0.0009 | 4.32* |
| **POP** | 1.77E-06 | 0.23 | -2.49E-06 | -0.41 | 1.81E-06 | 0.48 | 3.16E-06 | 7.42* |
| **PUB** | 0.00059 | 1.92 | 0.0004 | 1.64 | 2.35E-05 | 0.16 | -1.1E-05 | -0.71 |
| **TRADE** | 0.0001 | 2.56* | -7.34E-05 | -2.26* | 0.00013 | 6.08* | -9.3E-07 | -0.44 |
| **Lagged Dep** | 0.53 | 18.67* | 0.29 | 9.32* | 0.64 | 23.94* | 0.40 | 13.09* |
| **Observations** | 931 | | 931 | | 931 | | 944 | |
| **R-squared** | 0.35 | | 0.14 | | 0.50 | | 0.30 | |
| **DW** | 2.3 | | 2.10 | | 2.18 | | 2.22 | |

The results listed in Table 1 confirm Lucas' empirical results; (CAP) has a positive and significant coefficient with t-statistic 3.36, which implies a p-value of 0.0003. The Lucas term also shows up significantly and positively in the component equations for debt inflows and for portfolio investments; it turns out to be insignificant for FDI inflows.

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In Table 2, we present the results of estimating the same equations, but assuming country-specific fixed effects: an error term e(i) in addition to the term assumed in Table 1, e(i,t). With the fixed effects specification (we do not report the individual country

dummies), the coefficient of (CAP) becomes insignificant *(t=-1.41, p=0.016)*. Thus the introduction of fixed effects in itself reverses the results of the standard OLS exercise.

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**Table 2: Panel cross-section time series fixed effects (1981-2006)**

| **Dependent variable** | **NPF (1)** | | **DEB (2)** | | **FDI (3)** | | **PI (4)** | |
|---|---|---|---|---|---|---|---|---|
| | Coef | t-value | Coef | t-value | Coef | t-value | Coef | t-value |
| **Constant** | 0.037 | 1.88 | 0.016 | 1.01 | 0.007 | 0.65 | -0.0016 | -1.50 |
| **CAP** | -0.011 | -1.41 | -0.0022 | -0.35 | -0.003 | -0.66 | 0.0004 | 1.02 |
| **POP** | 3.81E-05 | 0.81 | -2.6E-05 | -0.68 | 2.2E-05 | 0.91 | 2.2E-05 | 8.31* |
| **PUB** | -0.00056 | -1.54 | -0.00052 | -1.76 | -5.8E-05 | -0.31 | -5.6E-08 | 0.003 |
| **TRADE** | 6.01E-05 | 0.80 | -9.9E-05 | -1.61 | 0.00012 | 3.07* | -1.9E-06 | -0.48 |
| **Lagged Dep** | 0.33 | 10.72* | 0.19 | 6.10* | 0.53 | 17.67`* | 0.23 | 7.11* |
| **Observations** | 931 | | 931 | | 931 | | 944 | |
| **R-squared** | 0.49 | | 0.22 | | 0.54 | | 0.39 | |
| **DW** | 2.1 | | 2.0 | | 2.1 | | 2.1 | |

In columns (2), (3) and (4) of Table 1 we present the results of running the same regression on the separate components of NPF, DEB, FDI and PI.[2] The results for the aggregate equation largely carry over to all three components. The test for the Lucas paradox comes out significantly for DEB and PI: the coefficient on CAP is significantly positive. CAP gets an insignificant coefficient in the FDI equation. Fixed effects added the Lucas paradox disappears for DEB and PI component equations (the CAP coefficients become insignificant; in fact their sign turns negative for DEB). Not surprizingly, adding fixed effects coefficients increases the proportion of the variance that the regressions can explain. In summary, these results suggest that introducing fixed effects makes the Lucas paradox disappear. The model performs best for FDI.

[2] Note again that these three are not independent of the results of column 1 because of the adding up constraint linking the left hand side variables.

### *4. Analyzing country specific effects*

Introducing fixed effects clearly shows the importance of country-specific factors, but sheds no light on what those factors are. To answer that question, we first follow the methodology used in Alfaro e.a. (2003, 2008): testing alternative variables one at a time. This has the advantage of bringing out relative performance very clearly, although it may create the problem of ommitted variables bias. We will investigate that issue further in section 4. Moreover/ However, we now focus exclusively on the LICs,. Table 3 and 4 show the results for 25 alternative explanatory variables. Each column presents a test for one explanatory variable in addition to (CAP) and (NPF (-1)).

The results reported in Table 3 show that only the variables *openness* (EX) and *abundance of natural resources* (OREEX) are positively and significantly associated with NPF. In both cases the coefficient (CAP) loses its significance: see column (7), a t-value of (*5.13**) for EX, and of (*0.75*) for (CAP); and in column (9) a t-value of (*2.13**) for OREEX, and a t-value of (*1.53*) for (CAP). These results again suggest that NPFs are not solely driven by external factors and that LICs with more natural resources or more open economies obtain more NPF. Simultaneously when including these explanatory variables, the regression results indicate that capital tends to flow to countries with a lower income per capita, so this would seem to resolve the Lucas Paradox.

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Various measures of institutional quality (adjusted time period 1996-2006, see Appendix 1[3] for a variable description) fail to show up significantly (see columns (14)-(20); neither does an aggregate measure (INST) weighing the six institutional quality measures equally (column (13). Equally, measures of school enrollment, taken to be proxies for human capital (SCH1 and SCH2), do not show up significantly.

[3] Available on request.

**Table 3: Panel cross-section time series results LIC's; no-fixed effects (1981-2006)**

| **Depended variable** | | **NPF** | | **NPF** | | **NPF** | | **NPF** | | **NPF** | | **NPF** | | **NPF** | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Coef | t-value | Coef | t-value | Coef | t-value | Coef | t-value | Coef | t-value | Coef | t-value | Coef | t-value |
| | | (1) | | (2) | | (3) | | (4) | | (5) | | (6) | | (7) | |
| **Category** | Constant | -0.019 | -2.14* | -0.019 | -2.14 | -0.019 | -2.13 | -0.025 | -2.46* | -0.032 | -3.11* | -0.028 | -2.31* | -0.003 | -0.29 |
| **Lucas** | CAP | 0.016 | 3.276* | 0.56 | 22.00 | 0.56 | 21.99 | 0.014 | 3.44* | 0.017 | 4.076* | 0.016 | 3.48* | 0.003 | 0.75 |
| **Herding** | NPF(-1) | 0.56 | 22.02* | 0.012 | 3.26 | 0.012 | 3.28 | 0.57 | 21.75* | 0.57 | 21.15* | 0.40 | 11.23* | 0.53 | 19.90* |
| **Size** | GDP | | | -2.55E-09 | -0.15 | | | | | | | | | | |
| | POP | | | | | -3.01E-06 | -0.40 | | | | | | | | |
| **Debt &Res** | RES | | | | | | | 1.57E-08 | 0.72 | | | | | | |
| | GOV | | | | | | | | | -7.5E-10 | -0.066 | | | | |
| | TDS | | | | | | | | | | | -0.00012 | -1.30 | | |
| **Openness** | EX | | | | | | | | | | | | | 0.01 | 5.14* |
| | | Obs 1066 | R² 0.34 | Obs 1066 | R² 0.34 | Obs 1066 | R² 0.34 | Obs 986 | R² 0.37 | Obs 972 | R²0.37 | Obs 710 | R² 0.19 | Obs 1016 | R² 0.34 |
| | | (8) | | (9) | | (10) | | (11) | | (12) | | (13) | | (14) | |
| | Constant | -0.019 | -2.12* | -0.015 | -1.086 | -0.052 | -2.13* | -0.024 | -1.079 | -0.0090 | -0.45 | -0.012 | -0.71 | -0.017 | -1.06 |
| **Lucas** | CAP | 0.0098 | 2.69* | 0.0083 | 1.53 | 0.024 | 2.41* | 0.014 | 1.55 | 0.0063 | 0.76 | 0.0092 | 1.5 | 0.01 | 1.7 |
| **Herding** | NPF(-1) | 0.54 | 20.73* | 0.66 | 19.68* | 0.39 | 6.067* | 0.53 | 10.3* | 0.55 | 11.6* | 0.64 | 17.8* | 0.64 | 17.55* |
| **Openness** | TRADE | 6.21E-05 | 2.036* | | | | | | | | | | | | |
| **Resources** | OREEX | | | 0.00017 | 2.13* | | | | | | | | | | |
| **Fin Dev.** | Mark | | | | | 9.89E-05 | 0.877 | | | | | | | | |
| **Human Ca** | SCH1 | | | | | | | -7.2E-05 | -0.5 | | | | | | |
| | SCH2 | | | | | | | | | 0.00016 | 1.2 | | | | |
| **Institutions** | INST | | | | | | | | | | | -0.00011 | -0.028 | | |
| | VOI | | | | | | | | | | | | | -0.0023 | -0.86 |
| | | Obs 1035 | R² 0.33 | Obs 526 | R² 0.49 | Obs 213 | R² 0.31 | Obs 240 | R² 0.35 | Obs 276 | R² 0.36 | Obs 455 | R² 0.44 | Obs 459 | R² 0.44 |
| | | (15) | | (16) | | (17) | | (18) | | (19) | | (20) | | (21) | |
| | Constant | -0.011 | -0.68 | -0.017 | -1 | -0.012 | -0.75 | -0.012 | -0.78 | -0.013 | -0.78 | -0.025 | -2.54 | -0.018 | -2.20 |
| **Lucas** | CAP | 0.0096 | 1.57 | 0.01 | 1.68 | 0.0096 | 1.56 | 0.0097 | 1.59 | 0.0091 | 1.48 | 0.56 | 21.51 | 0.56 | 22.07 |
| **Herding** | NPF(-1) | 0.64 | 17.79* | 0.64 | 17.65* | 0.64 | 17.85* | 0.64 | 17.85* | 0.64 | 17.77* | 0.014 | 3.57 | 0.012 | 3.31 |
| | POL | 0.0024 | 1.12 | | | | | | | | | | | | |
| | EFF | | | -0.00247 | -0.59 | | | | | | | | | | |
| | REG | | | | | 0.00063 | 0.19 | | | | | | | | |
| | LAW | | | | | | | 0.00075 | 0.21 | | | | | | |
| | COR | | | | | | | | | -0.0018 | -0.430 | | | | |
| **Macro eco** | INF | | | | | | | | | | | 2.10E-05 | 0.92 | | |
| | | | | | | | | | | | | | | 6.2E-05 | 1.30 |
| | | Obs 455 | R² 0.44 | Obs 459 | R² 0.44 | Obs 459 | R² 0.44 | Obs 459 | R² 0.44 | Obs 459 | R² 0.44 | Obs 1039 | R² 0.34 | Obs 1062 | R² 0.35 |

In table 4 we show further results. Official development aid fails to show up significantly, and neither does a dummy for military regimes. But column (3) and (4) in table 4 show a significantly positive impact of democracy (t-value 2.66) and, interestingly, HIPC eligibility (t-value *2.63**). However, the Lucas paradox variable (CAP) also gets a positive and significant coefficient (t-values of *2.45** and *3.50** respectively). These results indicate that it is possible to put some structure in the fixed effect dummies: democracy, HIPC eligibility, openness and natural resource abundance all have a positive impact on NPF. But the results on resolving the Lucas paradox become mixed however: with democracy and HIPC eligibility introduced individually the paradox re-emerges.

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**Table 4: Panel cross-section time series results LIC's no-fixed effects (1981-2006)**

| **Dependent variable** | | **NPF** | | **NPF** | | **NPF** | | **NPF** | |
|---|---|---|---|---|---|---|---|---|---|
| | | Coef | t-value | Coef | t-value | Coef | t-value | Coef | t-value |
| | | (1) | | (2) | | (3) | | (4) | |
| | Constant | -0.02 | -2.21* | -0.019 | -2.07* | -0.018 | -1.70 | -0.023 | -2.50* |
| **Lucas** | CAP | 0.012 | 3.35* | 0.012 | 3.25* | 0.012 | 2.45* | 0.012 | 3.50* |
| | NPF(-1) | 0.56 | 21.88* | 0.56 | 21.96* | 0.58 | 19.78* | 0.55 | 21.48* |
| **Other** | ODA | -4.56E-07 | -0.19 | | | | | | |
| | MIL | | | -0.0007 | -0.32 | | | | |
| | DEMO | | | | | 0.008 | 2.66* | | |
| | HIPC | | | | | | | 0.0068 | 2.63* |
| **Observations** | | 1062 | | 1062 | | 806 | | 1066 | |
| **R-squared** | | 0.34 | | 0.34 | | 0.38 | | 0.35 | |
| **DW** | | 2.3 | | 2.3 | | 2.3 | | 2.3 | |

## *5. Checks for Robustness*

The analysis sofar has followed the approach taken in the relevant literature (OLS and testing variables individually); this procedure has the advantage of clarity but may also lead to some econometric problems. We investigate three: endogeneity, specification bias and aggregation bias. Endogeity is most likely to be a problem for the paradox variable

CAP. Specification bias may arise because of the procedure of testing variables individually and one at a time. If a variable shows up significantly in one equation, the other equations, where that variable is omitted, may well suffer from omitted variable bias[4]. And aggregation bias may arise if constituent flows do not respond alike. Therefore explanatory variables will be tested on the different components of NPF separately: Debt, Foreign Direct Investment (FDI) and Portfolio Investment PI.

### 5.1. Endogeneity

The most likely source of endogeneity problems is of course the variable CAP. A good instrumental variable should have explanatory power for CAP but not be correlated with NPF. We use life expectancy at birth. Life expectancy is higher in richer countries and has been increasing in most individual countries in line with rising GDP, but is calculated from past data and is a too slow moving variable to expect correlation with contemporaneous capital flows.

**Table 5: Panel cross-section time series LIC's robustness check (non fixed effects, IV (LIFE) (1981-2006)**

| **Dependent variable** | | **NPF** | | **NPF** | | **NPF** | | **NPF** | | **NPF** | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Coef | t-value | Coef | t-value | Coef | t-value | Coef | t-value | Coef | t-value |
| | | (1) | | (2) | | (3) | | (4) | | (5) | |
| | Constant | -0.004 | -0.67 | -0.007 | -1.08 | -0.007 | -1.08 | -0.009 | -1.32 | -0.0004 | -0.04 |
| **Lucas** | LIFE | 0.0003 | 2.20* | 0.0002 | 1.84 | 0.0002 | 1.79 | 0.0003 | 1.95 | 0.0001 | 0.64 |
| | NPF(-1) | 0.57 | 22.2* | 0.53 | 20.1* | 0.53 | 20.07* | 0.54 | 19.5* | 0.59 | 15.4* |
| **Openness** | EX | | | 0.01 | 5.26* | 0.01 | 5.27* | 0.02 | 5.50* | 0.016 | 3.83* |
| **Size** | POP | | | | | 3.8E-06 | 0.50 | | | | |
| **Debt &res** | GOV | | | | | | | -3.3E-09 | -0.27 | | |
| **Institution** | INST | | | | | | | | | 0.001 | 0.24 |
| **Observations** | | 1052 | | 1017 | | 1016 | | 932 | | 442 | |
| **R-squared** | | 0.32 | | 0.34 | | 0.34 | | 0.36 | | 0.44 | |
| **DW** | | 2.3 | | 2.2 | | 2.2 | | 2.2 | | 2.3 | |

[4] As is well known, this bias will emerge if the omitted variable is correlated with included variables.

Table 5 and table 6 show the results on including (LIFE) as IV for (CAP) to correct for possible endogeneity. The IV regression gives similar outcomes on all explanatory variables. The variables (EX), (OREEX), (DEMO) and (HIPC) remain significant whereas ( (CAP) is insignificant when variables (EX), (OREEX), (INST) and (SCH1) are included in the regression table 6. So taking into account endogeneity of CAP does not change the conclusions[5].

**Table 6 : Panel cross-section time series LIC's robustness check natural resources (OREEX), Institutions (INST), Human Capital (SCH1), and Others (DEMO) and (HIPC) non-fixed effects, IV (LIFE) (1981-2006)**

| **Dependent variable** | | **NPF** | | **NPF** | | **NPF** | | **NPF** | | **NPF** | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Coef | t-value | Coef | t-value | Coef | t-value | Coef | t-value | Coeff | t-value |
| | | (1) | | (2) | | (3) | | (4) | | (5) | |
| | Constant | -0.009 | -1.15 | 0.001 | 0.09 | -0.02 | -1.27 | -0.01 | -1.34 | -0.007 | -1.04 |
| **Lucas** | LIFE | 0.0002 | 1.04 | 0.0002 | 1.11 | 0.0006 | 2.32* | 0.0003 | 2.46* | 0.0003 | 2.40* |
| | NPF(-1) | 0.60 | 16.83* | 0.64 | 17.75* | 0.53 | 10.20 | 0.59 | 20.19 | 0.56 | 21.8* |
| **Nat Res** | OREEX | 0.02 | 5.37* | | | | | | | | |
| **Institution** | INST | | | 0.0008 | 0.20 | | | | | | |
| **Human cap** | SCH1 | | | | | -0.0001 | -0.75 | | | | |
| **Other** | DEMO | | | | | | | 0.008 | 2.60* | | |
| | HIPC | | | | | | | | | 0.006 | 2.22* |
| **Observations** | | 499 | | 445 | | 233 | | 796 | | 1052 | |
| **R-squared** | | 0.50 | | 0.42 | | 0.33 | | 0.36 | | 0.33 | |
| **DW** | | 2.3 | | 2.4 | | 2.4 | | 2.3 | | 2.2 | |

### 5.2. Omitted variables

Following Alfaro e.a. (2008), we have used a methodological approach that tests variables one at a time; while this approach provides clear focus, there is a chance it suffers from omitted variable bias. A variable that is significant but excluded when another variable

[5] In an earlier version we also used IV on the institutional quality variable INST following Faria and Mauro (2004) and Alfaro et al (2003), to no significant effect. Hausmann and Fernandez-Arais (2000) also conclude that good institutions are leading the way in attracting capital and therefore do nt correct for IV.

is tested for significance will cause such a bias, if there is any correlation at all between de omitted variable and those that are included.

The economic openness and abundance of natural resources variables (respectively EX and OREEX) create another problem due to their high correlation (0.87). Each individually is highly significant Table 3, but when included with control variable or both are included, OREEX does not show up significantly anymore. Multicollinearity apparently prevents precise estimation of both variables' coefficients, or, possibly, OREEX is really insignificant. We therefore continue with EX only.

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**Table 7. Panel cross-section time series LIC's robustness check natural resources (EX) and (OREEX) non-fixed effects (1981-2006)**

| **Dependent variable** | | **NPF** | | **NPF** | | **NPF** | | **NPF** | |
|---|---|---|---|---|---|---|---|---|---|
| | | Coef | t-value | Coef | t-value | Coef | t-value | Coef | t-value |
| | | (1) | | (2) | | (3) | | (4) | |
| | Constant | -0.04 | -3.42* | -0.02 | -1.63 | -0.02 | -1.63 | -0.002 | -0.11 |
| **Lucas** | CAP | 0.02 | 4.43* | 0.01 | 1.94 | 0.01 | 1.98 | -9.8E-05 | -0.01 |
| **Herding** | NPF(-1) | 0.54 | 19.36* | 0.51 | 17.69* | 0.64 | 17.76* | 0.58 | 15.46* |
| **Openness** | EX | | | 0.02 | 5.07* | | | 0.03 | 5.67* |
| **Nat Res** | OREEX | | | | | 0.00016 | 1.87 | 0.0001 | 1.32 |
| **Other** | HIPC | 0.007 | 2.41* | 0.006 | 2.14* | 0.006 | 1.58 | 0.003 | 0.74 |
| | MIL | -0.002 | -0.85 | -0.003 | -1.06 | -0.002 | -0.60 | -0.005 | -1.36 |
| **size** | POP | -2.1E-06 | -0.27 | 4.8E-06 | 0.61 | -1.2E-07 | -0.01 | 7.0E-06 | 0.87 |
| **Debt &res** | PUB | 0.0006 | 1.81 | 0.0004 | 1.35 | 0.0004 | 1.22 | 0.0001 | 0.41 |
| **Macro** | INF | -1.4E-05 | -0.36 | -1.1E-07 | 0.003 | 3.8E-05 | 0.65 | 5.0E-05 | 0.87 |
| **Observations** | | 945 | | 904 | | 508 | | 481 | |
| **R-squared** | | 0.36 | | 0.36 | | 0.49 | | 0.50 | |
| **DW** | | 2.3 | | 2.2 | | 2.4 | | 2.3 | |

In the next table we address the omitted variable bias issue. The right way of doing that is to include all variables the theory suggests should be in and then removing one by one the least significant. While there is always the possibility of Type-II errors (unduly rejecting significance), this procedure gives at least statistically confidence that omitted variable bias does not arise. Column 1 of table 10 shows the regression results with all variables included

that show up significantly in section 3, plus some more that the literature has suggested. We then remove the least significant variables stepwise, to arrive at the final equations, in column (3) and (4) of table 8. The HIPC variable remains significant at a t-statistic of 2.08and is left with openness as significant variables. The Lucas critique variable CAP has lost significance, so these results, like the more mechanical fixed effects estimations, suggest the puzzle is resolved once more country-specific information is included. Of course the fact that CAP is insignificant also does not fit in with what one would expect on the basis of standard neoclassical growth theory: there CAP should not be insignificant, but significantly negative.

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**Table 8 Panel cross-section time series LIC's (NPF) robustness check openness (EX) non-fixed effects (1981-2006)**

| **Dependent variable** | | **NPF** | | **NPF** | | **NPF** | | **NPF** | |
|---|---|---|---|---|---|---|---|---|---|
| | | Coef | t-value | Coef | t-value | Coef | t-value | Coef | t-value |
| | | (1) | | (2) | | (3) | | (4) | |
| | Constant | -0.02 | -1.62 | -0.02 | -1.63 | -0.02 | -1.62 | -0.007 | -0.68 |
| **Lucas** | CAP | 0.01 | 1.92 | 0.01 | 1.91 | 0.01 | 1.95 | 0.004 | 1.02 |
| | NPF(-1) | 0.51 | 17.65* | 0.51 | 17.68* | 0.51 | 17.74* | 0.52 | 19.56* |
| **Openness** | EX | 0.02 | 5.03* | 0.02 | 5.12* | 0.02 | 5.07* | 0.01 | 5.08* |
| **Other** | HIPC | 0.006 | 2.19* | 0.006 | 2.23* | 0.006 | 2.12* | 0.006 | 2.08* |
| **Debt &res** | PUB | 0.0004 | 1.35 | 0.0004 | 1.35 | 0.0004 | 1.36 | | |
| **Other** | MIL | -0.003 | -1.07 | -0.003 | -1.10 | -0.003 | -1.17 | | |
| **Size** | POP | 5.0E-06 | 0.60 | 4.9E-06 | 0.64 | | | | |
| **Push** | Recession | 0.003 | 0.54 | 0.002 | 0.51 | | | | |
| **Other** | ODA | -9.3E-08 | -0.02 | | | | | | |
| **Macro** | INF | 2.3E-07 | 0.01 | | | | | | |
| **Observations** | | 904 | | 905 | | 905 | | 1016 | |
| **R-squared** | | 0.35 | | 0.36 | | 0.36 | | 0.34 | |
| DW | | 2.2 | | 2.2 | | 2.2 | | 0.34 | |

**Push or Pull**

In theory, capital flows from rich to poor countries should respond to *differences* between rich and poor countries, and as such rich countries' variables could reasonably be expected to play a role. We therefore test whether so called push or origin country variables play a role: omitting them could possibly lead to omitted variable bias as well. Table 9 presents regression outcomes including as push factors of 10-year US government bond yields and a recession in US economy dummy. See Worldbank (2004) for a similar approach where such factors were found to be significant. However the results listed below do not reproduce that result. Push factors do not show up significantly.

**Table 9 Panel cross-section time series LIC's robustness check push factors (non fixed effects) (1984-2006)**

| **Dependent variable** | | **NPF** | | **NPF** | | **NPF** | | **NPF** | |
|---|---|---|---|---|---|---|---|---|---|
| | | Coef | t-value | Coef | t-value | Coef | t-value | Coef | t-value |
| | | (1) | | (2) | | (3) | | (4) | |
| | Constant | 0.006 | 0.37 | 0.009 | 0.59 | -0.02 | -1.86 | -0.007 | -0.68 |
| **Lucas** | CAP | -7.20E-05 | -0.01 | -0.0002 | -0.03 | 0.01 | 2.07* | 0.004 | 1.02 |
| | NPF(-1) | 0.40 | 12.34* | 0.40 | 12.44* | 0.51 | 17.75* | 0.52 | 19.56 |
| | EX | 0.02 | 4.86* | 0.01 | 4.75* | 0.01 | 5.08* | 0.01 | 5.08* |
| | HIPC | 0.005 | 1.58 | 0.004 | 1.40 | 0.006 | 2.18* | 0.0056 | 2.08* |
| **Debt &res** | PUB | 0.007 | 8.32* | 0.007 | 8.29* | 0.0004 | 1.27 | | |
| **Push** | Recession | 0.005 | 0.77 | 0.005 | 0.77 | 0.002 | 0.44 | | |
| | Interest 10 | -0.0003 | -0.39 | -0.0004 | -0.56 | | | | |
| **Other** | MIL | -0.003 | -1.22 | -0.004 | -1.48 | | | | |
| **Size** | POP | 5.4E-06 | 0.65 | | | | | | |
| **Macro** | INF | 2.4E-05 | 0.64 | | | | | | |
| **Other** | ODA | 2.2E-06 | 0.54 | | | | | | |
| **Observations** | | 817 | | 818 | | 907 | | 1016 | |
| **R-squared** | | 0.42 | | 0.42 | | 0.36 | | 0.34 | |
| **DW** | | 2.2 | | 2.2 | | 2.2 | | 2.2 | |

### 5.3. Aggregation Bias

A final issue concerns the level of aggregation used so far (and in the literature on the Lucas paradox). Net Private Capital Inflows consist of debt flows, portfolio investment and Foreign Direct Investment. These involve very different actors, different risk sharing conditions and could thus respond differently to various incentives. We therefore repeat the analysis for these three components separately (Tables 10-12) .Table 10 gives the results for debt flows. The HIPC variable fails to come up significantly, as do the variables ODA, INF and MIL. What may be even more surprising is the insignificance of public assets PUB: one might have expected public indebtedness to be a deterrent to private debt issue as high public debt today may be a predictor of higher taxes tomorrow. Yet the data fail s to show such a relation. Openness does show up significantly, as it did in the aggregate equations. The recession variable has a counterintuitive sign.

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**Table 10 Panel cross-section time series LIC's DEB (1981-2006)**

| **Dependent variable** | | **DEB** | | **DEB** | | **DEB** | | **DEB** | |
|---|---|---|---|---|---|---|---|---|---|
| | | Coef | t-value | Coef | Coef | t-value | t-value | Coef | t-value |
| | | (1) | | (2) | | (3) | | (4) | |
| | Constant | -0.02 | -2.12* | -0.02 | -2.46* | -0.03 | -2.57* | -0.01 | -1.58 |
| **Lucas** | CAP | 0.009 | 2.26* | 0.009 | 2.42* | 0.01 | 2.50* | 0.005 | 1.64 |
| | DEB(-1) | 0.29 | 9.32* | 0.29 | 9.37* | 0.29 | 9.42* | 0.29 | 9.94* |
| | EX | 0.005 | 2.30* | 0.006 | 2.43* | 0.005 | 2.41* | 0.005 | 2.56* |
| **Debt &res** | PUB | 0.0005 | 1.93 | 0.0005 | 1.90 | 0.0005 | 1.90 | | |
| **Push** | Recessio n | 0.007 | 1.87 | 0.007 | 1.93 | 0.007 | 1.95 | | |
| **Macro** | INF | -2.4E-05 | -0.78 | -2.1E-05 | -0.70 | | | | |
| **Size** | POP | 4.6E-06 | 0.69 | 3.7E-06 | 0.61 | | | | |
| **Other** | ODA | -1.93E-06 | -0.60 | | | | | | |
| | MIL | -0.001 | -0.51 | | | | | | |
| | HIPC | -0.0005 | -0.23 | | | | | | |
| **Observations** | | 904 | | 906 | | 907 | | 1016 | |
| **R-squared** | | 0.14 | | 0.14 | | 0.13 | | 0.11 | |
| **DW** | | 2.1 | | 2.1 | | 2.1 | | 2.1 | |

**Table 11: Panel cross-section time series LIC's PI (1981-2006)**

| Depended variable | | PI | | PI | | PI | | PI | |
|---|---|---|---|---|---|---|---|---|---|
| | | Coef | t-value | Coef | Coef | t-value | t-value | Coef | t-value |
| | | (1) | | (2) | | (3) | | (4) | |
| | Constant | -0.0006 | -1.23 | -0.002 | -4.26* | -0.002 | -4.14* | -0.002 | -4.11* |
| **Lucas** | CAP | 0.0003 | 1.46 | 0.0008 | 4.41* | 0.0008 | 4.39* | 0.0007 | 4.28* |
| | PI(-1) | 0.44 | 14.31* | 0.40 | 13.83* | 0.4 | 13.97* | 0.4 | 14.19* |
| **Size** | POP | 3.3E-06 | 9.44* | 3.5E-06 | 8.60* | 3.5E-06 | 8.53* | 3.3E-06 | 8.43* |
| | HIPC | 0.0002 | 1.61 | 0.0003 | 2.11* | 0.0003 | 2.19* | 0.0003 | 2.08* |
| **Other** | ODA | -2.4E-07 | -1.57 | -1.8E-07 | -1.47 | -2.0E-07 | -1.65 | | |
| | MIL | 8.9E-05 | 0.95 | 0.0001 | 1.33 | | | | |
| **Push** | Recession | -0.0001 | -0.76 | -2.4E-05 | -0.12 | | | | |
| | EX | -7.3E-05 | -0.65 | | | | | | |
| **Macro** | INF | -8.3E-07 | -0.58 | | | | | | |
| **Debt &res** | PUB | -4.1E-06 | -0.35 | | | | | | |
| **Observations** | | 917 | | 1072 | | 1075 | | 1079 | |
| **R-squared** | | 0.38 | | 0.30 | | 0.30 | | 0.30 | |
| **DW** | | 2.3 | | 2.2 | | 2.2 | | 2.2 | |

The same regressions show rather different results for portfolio investment. Democracy, recession in the US, development aid ,military regime indicators, none show up significantly. The HIPC indicator does, however: apparently portfolio investment flows are sensitive to debt relief, contrary to debt flows. And, finally, the Lucas paradox does emerge again: portfolio investment tends to go to countries with higher per capita income. Openness does not show up significantly.

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**Table 12: Panel cross-section time series LIC's FDI (1981-2006)**

| Dependent variable | | FDI | | FDI | | FDI | | FDI | |
|---|---|---|---|---|---|---|---|---|---|
| | | Coef | t-value | Coef | Coef | t-value | t-value | Coef | t-value |
| | | (1) | | (2) | | (3) | | (4) | |
| | Constant | 0.0007 | 0.11 | -9.91E-05 | -0.02 | 0.0001 | 0.02 | 0.005 | 1.00 |
| **Lucas** | CAP | 0.0004 | 0.15 | 0.000524 | 0.21 | 0.0006 | 0.23 | -0.001 | -0.58 |
| | FDI(-1) | 0.67 | 24.78* | 0.66726 | 24.82* | 0.67 | 24.97* | 0.70 | 28.49* |
| | EX | 0.007 | 4.65* | 0.007108 | 4.72* | 0.007 | 4.67* | 0.006 | 4.38* |
| | HIPC | 0.005 | 3.07* | 0.004594 | 3.18* | 0.005 | 3.35* | 0.005 | 3.44* |
| **Macro** | INF | 2.0E-05 | 1.07 | 2.16E-05 | 1.14 | 2.1E-05 | 1.11 | | |
| **Debt &res** | PUB | -0.0001 | -0.87 | -0.00014 | -0.92 | -0.0001 | -0.94 | | |
| **Push** | Recession | -0.002 | -0.81 | -0.00197 | -0.83 | | | | |
| **Other** | ODA | 1.5E-06 | 0.74 | 1.60E-06 | 0.86 | | | | |
| | MIL | -0.0008 | -0.67 | | | | | | |
| **Size** | POP | -7.2E-07 | -0.17 | | | | | | |
| **Observations** | | 904 | | 906 | | 906 | | 1016 | |
| **R-squared** | | 0.50 | | 0.50 | | 0.50 | | 0.51 | |
| **DW** | | 2.2 | | 2.2 | | 2.2 | | 2.2 | |

The final set of regressions deals with what may be the most interesting component of capital flows, FDI. The Lucas paradox variable does not show up significantly (coefficient on CAP). Openness and HIPC eligibility are the two most relevant variables. Openness stimulates FDI according to our results, so tariff jumping does not seem to be the driver of FDI into poor countries (LICs). And HIPC, the indicator signaling eligibility for the HIPC debt relief program for World Bank and IMF debt, shows up very significantly. Debt relief seems to have triggered FDI inflows!!!

## 6. Conclusions

Lucas (1990) has posed the challenging question: why do the data on international capital flows not conform with the predictions of the neoclassical growth model, i.e. why does it seem not to be true that capital flows from rich to poor countries? And if this is not because of productivity differences, what does explain capital inflows into poor countries? Little capital flowing from 'rich' to 'poor' countries has become known as the Lucas paradox. Until recently, there was not enough time variation in the relevant data, so researchers have had to work with cross country regressions without time dimension (cf for example Alvaro et al 2008). But since 2000, private capital flows into developing countries have increased enormously, and not just to the more advanced emerging markets. The LICs in particular have seen a substantial increase in FDI inflows. For that reason we concentrate on the LICs. Increased time variation in turn allows the use of paneldata, which is what we have done in this paper.

We first reproduced the findings of earlier researchers: without using fixed effects, the Lucas paradox emerges in our data also: capital inflows seem to depend positively on per capita income of the recipient country. We then show, however, that introducing country-specific effects in the paneldata destroy that finding. The paradox variable CAP (per capita GDP as a proxy for productivity) loses its positive sign and significance. In other words, when correcting for country specific effect, the Lucas Paradox is resolved for LICs: the CAP variable gets a negative and significant variable once country specific effects are included.

Of course these results beg the next question: what is behind these country specific effects? Which country specific factors can be identified as main drivers of capital inflows? To answer that question, we omitted the fixed effect dummies but added more plausible variables in the cross country/time series regression. Testing new variables individually (i.e. including them individually and alternatively, following in particular Alvara et al (2008)) we find, like others have done, that openness measured by export-to-GDP shares plays an

important and positive role. The positive coefficient suggests that capital inflows cannot be explained by so called "tariff jumping"; they are not induced by the factor price impact of tariffs protecting capital intensive sectors. This matters from a welfare point of view: tariff jumping capital inflows can be welfare deteriorating. This paper reveals that openness and natural resources are the most important determinants in attracting NPF to poor countries.

Variables proxying for human capital fail to show significance however. Neither do measures of institutional development show up significantly, contrary to the results reported in Alvaro et al (2008). We do find a positive and significant impact of a democracy indicator: apparently democratic regimes tend to attract more capital inflows, other things being equal, than regimes that are not democratic. And importantly, the measure of HIPC eligibility shows strong significance. This suggests that (the prospect of) debt relief is effective in removing a debt overhang, thereby again unlocking international capital markets for the countries concerned. But the results on the Lucas paradox seemingly became mixed again: both when the HIPC eligibility variable and when and other control variables are included, the Lucas paradox re-emerged. Note however that in this part of the paper variables are introduced to the exclusion of the other variables tested.

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We then tested the results for robustness against a variety of potential problems: endogeneity bias, omitted variable bias and aggregation bias. Endogeneity in particular might be a problem for the key variable of the whole exercise, per capita income CAP, the variable whose coefficient is considered the key indicator of whether the Lucas paradox pertains or not. Although correcting for endogenity through the use of instrumental variables affects coefficient values, the key results turned out not to be affected: the Lucas paradox still disappears once country specific effects are included in the panel approach.

The most important robustness check deals with another potential problem, omitted variable bias. By introducing potentially relevant variables one at a time to the exclusion of the other variables tested, the results might have suffered from this bias. If one variable is significant, but then excluded when another is tested, omitted variable bias will arise whenever the significant but excluded variable is correlated with the variables that are

included. We therefore re-tested in a way that resolves this problem, by including all variables tested and removing step by step the most insignificant ones until only significant variables are left over. Since in this way no significant variable is ever excluded, no omitted variable bias can arise. Interestingly enough we end up with the same set of significant variables: openness and the HIPC eligibility indicator. The Lucas paradox indicator failed to become significant, once again indicating that the strong version of the Lucas paradox (a positive and significant coefficient on the per capita income variable) disappears with country-specific effects/variables.

The final robustness check concerned aggregation bias. Throughout the robustness check section we have used a variable representing all private capital inflows, whether they were debt, portfolio investment or FDI. We finally tested those three categories separately, and found substantial differences between the three as to their most significant determinants. For all three categories the procedure designed to avoid omitted variable bias was followed. For debt flows, openness continued to perform well, but the HIPC eligibility indicator failed to achieve any significance at all. But for portfolio investments PI, a very different set of variables emerged from the selection procedure. Large countries tend to receive more of it than small countries (as measured by population size); while HIPC eligibility stimulates PI. And finally Foreign Direct Investment. Open countries receive more FDI. And HIPC elibility clearly has a strong signal value for FDI: FDI responds strongly (and positively) to HIPC eligibility, as one would expect if HIPC indeed removes debt overhang. As debt flows and FDI, the Lucas paradox variable per capita income failed to show up significantly. For portfolio investments it did show up significantly and with a positive sign. So the paradox persists for portfolio investments, but not for debt flows or FDI.

Summarizing the results: using panel data to exploit time variation has yielded substantial information on the determinants of private capital inflows. And we found that disaggregating capital inflows is necessary: the drivers for debt flows are very different from the factors that drive FDI or portfolio investments. The ambiguous results on the Lucas

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**Deleted:** ODA (Official Development Assistance) is negatively correlated with portfolio investment flows,

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paradox are clarified when disaggregated data are being used: portfolio investments tend to flow to large countries, but the paradox disappears for debt and FDI flows.

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**Appendix 1 Data description**

**Dependent variable**

| Var | Description | Source |
|---|---|---|
| $NPF_{i,t}$ | Gross private capital inflows in millions of dollars divided by total GDP in millions of dollars. | **World Bank Debtor Reporting System (WB)** |
| $FDI_{i,t}$ | Total Foreign Direct Investment flows in millions of dollars divided by total GDP in millions of dollars. | **World Bank Debtor Reporting System (WB)** |
| $PI_{i,t}$ | Total of Portfolio Investments flows in millions of dollars divided by total GDP in millions of dollars. | **World Bank Debtor Reporting System (WB)** |
| $DEB_{i,t}$ | Total of debt flows in millions of dollars divided by total GDP in millions of dollars. | **World Bank Debtor Reporting System (WB)** |

*Net private flows (NPF)*

The central dependent variable is the sum of private Debt flows, Foreign Direct Investments and Portfolio investments. All NPF are adjusted for size effects by dividing a countries total GDP. These flows will be discussed individually.

*Private debt flows (DEB)*

Private debt flows ($DEB_{i,t}$) can be separated into net short-term, medium- term and long-term debt flows of bonds, commercial bank lending, and other private credits.

*Foreign direct investments (FDI)*

The depended variable ($FDI_{i,t}$) is defined by using the convention net FDI inflows which are gross inflows less repatriated profits, as opposed to FDI inflows less outflows. Literature provides several definitions on FDI. According to the WB, FDI is defined as follows: *net inflows of investment to acquire a lasting management interest (10 percent or more of voting stock) in an enterprise operating in an economy other than that of the investor (IMF, 2008).*

*Portfolio investments (PI)*

Data on portfolio investment assets ($PI_{i,t}$ ) of the World Bank Debtor Reporting System are derived form the IMF Coordinated Portfolio Investment Survey (CPIS). Portfolio investments are defined by IMF as: *net flows and include non-debt-creating portfolio equity flows (the sum of country funds, depository receipts, and direct purchases of shares by foreign investors) and portfolio debt flows (bond issues purchased by foreign investors) (WDI,2008).*

**Independent variables**

| Category | Var | Description | Source |
|---|---|---|---|
| **Lucas Paradox** | $CAP_{I,t}$ | The natural logarithm of GDP per capita. | **International Financial Statistics (IMF)** |
| | $LIFE_{I,t}$ | Life expect at birth | **World Development Indicators (WB)** |
| **Herding** | $NPF_{I,t-1}$ | Lagged variable of the $NPF_{I,t}$ | **World Bank Debtor Reporting System (WB)** |
| **Size** | $GDP_{i,t}$ | Natural logarithm of GDP | **International Financial Statistics (IMF)** |
| | $POP_{i,t}$ | Total population in number of persons | **International Financial Statistics (IMF)** |
| **Debt & Reserves** | $RES_{I,t}$ | Total reserves as percentage of GDP | **International Financial Statistics (IMF)** |
| | $GOV_{I,t}$ | Claims on the central government as percentage of GDP | **International Financial Statistics (IMF)** |
| | $PUB_{I,t}$ | Total reserves minus Claims on the central government as a percentage of GDP | **International Financial Statistics (IMF)** |
| | $TDS_{I,t}$ | Debt service as percentage of exports | **World Development Indicators (WB)** |
| **Openness** | $TRADE_{I,t}$ | Total trade as percentage of GDP | **International Financial Statistics (IMF)** |
| | $EX_{I,t}$ | Exports as percentage of GDP | **World Development Indicators (WB)** |

| | | | |
|---|---|---|---|
| **Natural Resources** | OREEX $_{I,t}$ | Ore and metals exports as percentage of merchandise exports | **World Development Indicators (WB)** |
| **Financial Sec Dev** | MARK $_{I,t}$ | Market capitalization of listed companies as percentage of GDP | **World Development Indicators (WB)** |
| **Human Capital** | SCH1 $_{I,t}$ | School enrolment, pre-primary school as percentage of gross | **World Development Indicators (WB)** |
| | SCH2 $_{I,t}$ | School enrolment, secondary school as percentage of gross | **World Development Indicators (WB)** |
| **Institutional Quality** | INST I$_{,}$ | Institutional quality as a average of six institutional quality indicators | **World Bank governance indicators (WB)** |
| | VOI $_{I,t}$ | Voice and Accountability | **World Bank governance indicators (WB)** |
| | POL $_{I,}$ | Political Stability and Absence of Violence | **World Bank governance indicators (WB)** |
| | EFF $_{I,t}$ | Government Effectiveness | **World Bank governance indicators (WB)** |
| | REG $_{I,t}$ | Regulatory Quality | **World Bank governance indicators (WB)** |
| | LAW $_{I,t}$ | Rule of Law | **World Bank governance indicators (WB)** |
| | COR $_{I,t}$ | Control of Corruption | **World Bank governance indicators (WB)** |
| **Macro Eco indicators** | INF $_{I,t}$ | Inflation, average consumer prices, annual percentage | **World Economic Outlook (IMF)** |
| | STGWT $_{I,t}$ | standard deviation of GDP growth | **International Financial Statistics (IMF)** |
| **Other Control Variables** | ODA $_{I,t}$ | Official development assistance received | **OECD** |

| | | | |
|---|---|---|---|
| **Other Control Variables** | MIL $_{I,t}$ | Military rule | **Database for Political Institutions (WB)** |
| | DEMO $_{I,t}$ | Level of democracy, vote fraud or candidate intimidation serious enough to affect outcome of election | **Database for Political Institutions (WB)** |
| | HIPC $_{I,t}$ | Potentially HIPC eligible | **HIPC Initiative-Country Status of implementation (IMF)** |
| **Push** | Interest 10 | Interest on 10-year US government bond yields | **Thomson Datastream** |
| | Recession | Recession in US economy | **Thomson Datastream** |

*Lucas Paradox*

Chapter 3 provides the theoretical background of the Lucas paradox. The difference in MPK triggers capital flows from rich to poor. The most direct approach would be to compare the rate of return of capital (Obstfeld, 1995) or even MPK cross-section. Unfortunately, data is poorly available and difficult to compare on (after-tax) returns to capital and MPK on developing countries. Therefore, income per capita is used to test the Lucas paradox. Total income is adjusted for size effects between countries by dividing by the total population. The logarithm of GDP per capita (CAP) is calculated by the sum of value added by all domestic producers and product taxes of a country divided by the population. The Atlas method of the World Bank is used to express gross national product of the different countries in US dollars (WDI, 2008).

In empirical research, the Lucas paradox is the variable of interest, so closely attention will be given to this independent variable. Chapter 6 presents evidence of model misspecification and present proof that (CAP) is endogenous. Life expectancy at birth (LIFE) is used as an instrumental variable for (CAP). Subsequently, Chapter 6 will provide an extended explanation on the topic of model estimations. The variable is

defined as: at the moment of birth, the number of years an infant would live if the current pattern of death at the time of its birth were to stay identical during the life span of the infant. The variable (LIFE) is based on the World Development Indicators which collects its data from sound data sources including the United Nations Population Division's World population prospects and National agencies.

*Herding*

The lag (-1) of (NPF) is included in each model, this is in order to correct for autocorrelation, an extended explanation on this topic will be give in chapter 6. NPF over the previous period is expressed as a percentage of GDP. Underlying reason for lag NPF is that time strikes before an actual investment is made. In the case of FDI when investment decisions are made to build a factory, administrative and processing can be very timely. Furthermore, when investors move together as in a herd, the investment decisions taken could be irrational and are often based on the increase in investment in for the previous periods.

*Size*

The variable (CAP) corrects for size effects; nevertheless size itself (GDP) and (POP) could be of explanatory power. The logarithm of gross domestic product (GDP) is a measure of the size of the economy. The variable (POP) is used to express the effect of population size on private capital flows. Population is the total number of persons expressed in millions. The sum of population includes permanent residents regardless as to their citizenship or legal status. Refugees are excluded form this calculation. The World Development Indicators extract these numbers from the United Nations Population Division's World Population Prospects

*Debt and Reserves*

This variable can be reflected by various methods and measurement. The variable (GOV) reflects the total claims on the State and Local Government. Claims on savings banks are being excluded for claims on the government. Total Debt as percentage of exports (TDS) includes interest expenses as a share (WDI, 2008). Exports are extracted

from the IMF's balance of Payment database. Total debt service, includes both long term and short term debt and is a calculation of principal repayments of interest actually paid in goods, services and in foreign currency. A country's reserves (RES) are the sum of foreign government securities, domestic government securities, foreign currency assets and domestic currency assets (IFS, 2008).

*Degree of openness*

The variables (EX) and (TRADE) represent the degree of openness. Total export and total trade are measures expressed in a percentage of total GDP, both expressed in millions in local currency. The sum of exports and imports of services and goods is the total number of trade. The World Development Indicator extracts this data from the OECD National Accounts data files as well as World Bank accounts statistics. The data on (EX) expresses the total value of all sales of services and goods provided to other countries. These numbers include the following values: license fees, freight, insurance, travel transport, royalties, financial, business, construction personal, communication, government services and information. The total number of exports excludes property income, labor and transfer payments.

*Resources*

Mineral rich countries have a higher percentage of ore and metals of total merchandise exports (OREEX). Data is provided by WDI which uses the Standard International Trade Classification (SITC) of the United Nations as a classification of exported goods. Ore and metal include several commodities described by SITC, namely: crude materials, fertilizers, crude, Stone, sand, gravel, natural abrasives, iron ore, nickel ores, aluminum ore, uranium, tin, zinc, lead, aluminum, nickel, copper, silver and platinum. The merchandise shows the Free On Board (FOB) value of the goods exported (WDI, 2008)

*Financial development*

The model expresses market capitalization (MARK) in measures that give an indication of a countries level of financial development. The number is given by the number of

shares outstanding, multiplied by the share price. Listed domestic companies are the incorporated companies listed on the country's stock exchanges at the end of the year. Mutual funds, investment companies or other collective investment vehicles are not included in this calculation.

*Human capital stock*

The variables (SCH1) and (SCH2) are indicators of the level of human capital of a country. Both of the variables are number of gross enrolment ratios. This is the total enrolment of students in primary (SCH1) and secondary (SCH2) education. The variables are not influenced by student ages.

Secondary education provides more advanced education and is based on a minimum of four years of primary education. Secondary education can also be described as middle or high school. These classifications of the WB WDI data relating to the educational system are based on the UNESCO categorizations. Preferable lagged variables of (SCH1) and (SCH2) should be included. Pay-off of the level of human capital will enter the labour market after graduation or finishing elementary or secondary school. For this reason it is preferable that lagged variables should be include. However, due to econometrical restrains, autocorrelation, lagged variables of (SCH1) and (SCH2) could not be included.

*Institutional quality*

This variable is based on World Bank Governance Indicators as an average of six different indicators: Voice and accountability (VOI), Political Stability and Absence of Violence (POL), Government Effectiveness (EFF), Regulatory Quality (REG), Rule of Law (LAW), and Control of Corruption (COR).

Data is provided by World Bank Governance Indicators (WB) that reports on institutional quality between 1996 and 2007. The time series are limited, however (INST) is indicated by theory as an important explanatory variable. The World Bank Governance Indicators scale the level of corruption by addressing several individual indicators that offer a control for corruption such as: African Development Bank

Country Policy and Institutional Assessment, the Asian Development Bank country policy and Institutional Assessment and Afro barometer. Data sources differ for different regions and countries. The Higher the rating value the better the institution. Due to restricted accessibility of other institutional quality indicators, these could not be exploited. Such as the International Country Risk Guide, this index was used by the majority of empirical research in this field.

*Macro Economic Stability*

The variables inflation (INF) and stability of GDP growth (STGWT) embody the level of macro economic stability in this thesis. Inflation is defined by IMF: *as the is the annual percentage change in the cost to the average consumer of acquiring a basket of goods and services that may be fixed or changed at specified intervals, such as yearly. The Laspeyres formula is generally used. (IMF, 2008).* The standard deviation of GDP growth (STGWT) is calculated by taking the standard deviation of annual percentage growth of GDP at market prices based on constant local exchange.

*Other control variables*

Four control variables will be tested (ODA), (MIL), (DEMO) and (HIPC). These control variables are selected based on their likelihood to have additional explanatory power and are suitable for LIC. Official Development Assistance (ODA) expresses the amount of development aid donated from developed countries to developing countries. Note that ODA is not included in (NPF), their pair -wise correlation COR ($ODA_{i,t}$ ,$NPF_{i,t}$ ) = -0.040006. The final three independent variables are dummy variables (MIL), (DEMO) and (HIPC). Political stability and level of democracy are measured by the variables of military rule (MIL) and vote fraud (DEMO) provided by World Bank Database of Political Institutions (Beck, Keefer and Clarke 2008).

Like institutional quality, democracy has become an increasingly important research tool on development and inflow of private capital. The variable (DEMO) conveys that the vote fraud or candidate intimidation is serious enough to affect the outcome of an election. The last variable is very specific to LIC countries. The Heavily Indebted Poor

Countries (HIPC) initiative was started by IMF and World Bank to reduce unsustainable debt burdens and fight poverty. To qualify countries needed to meet certain build up a to a large extent macroeconomic track record. In the time series, several specific time moments within the HIPC program could be chosen, such as: the time of HIPC completion of a requirement or the moment of HIIPC eligibility. The variable (HIPC) is a dummy for potential HIPC eligibility, starting from year in which a country first could potential eligible, although it still had to build up a track record. Data is derived from: IMF HIPC Initiative implementation status (1999-2008), IMF initiative for HIPC review and outlook (1998) and ADB Proposal on Bank group contributions to the Debt initiative for HIPC (1996). HIPC initiative implementation status for the year 1997 is not provided.

**Appendix 2: Categories of developing countries income groups**

| Classification income group World Bank 2008 | Level of GNP per capita | World bank Classification |
|---|---|---|
| **Low-income countries** | $ 935≥ GNP per capita | Developing country |
| **Lower middle income** | $ 936 ≤ GNP per capita ≤ $3.705 | Developing country |
| **Upper middle income** | $3.705≤ GNP per capita ≤ $11.455 | Developing country |
| **High income** | $11.455≤ GNP per capita | Developed country |

| Country | Income group | Country | Income group | Country | Income group |
|---|---|---|---|---|---|
| **Bangladesh** | LIC | **Albania** | LMIC | **Argentina** | UMIC |
| **Burkina Faso** | LIC | **Algeria** | LMIC | **Belize** | UMIC |
| **Burundi** | LIC | **Angola** | LMIC | **Botswana** | UMIC |
| **Cambodia** | LIC | **Armenia** | LMIC | **Brazil** | UMIC |
| **Central African Republic** | LIC | **Belarus** | LMIC | **Bulgaria** | UMIC |
| **Chad** | LIC | **Bhutan** | LMIC | **Chile** | UMIC |
| **Comoros** | LIC | **Bolivia** | LMIC | **Costa Rica** | UMIC |
| **Cote d'Ivoire** | LIC | **Cameroon** | LMIC | **Croatia** | UMIC |
| **Eritrea** | LIC | **Cape Verde** | LMIC | **Dominica** | UMIC |
| **Ethiopia** | LIC | **China** | LMIC | **Equatorial Guinea** | UMIC |
| **Gambia,The** | LIC | **Congo, Rep.** | LMIC | **Gabon** | UMIC |
| **Ghana** | LIC | **Dominican Republic** | LMIC | **Grenada** | UMIC |
| **Guinea** | LIC | **Ecuador** | LMIC | **Hungary** | UMIC |
| **Guinea-Bissau** | LIC | **Egypt, Arab Rep.** | LMIC | **Kazakhstan** | UMIC |
| **Haiti** | LIC | **El Salvador** | LMIC | **Latvia** | UMIC |
| **India** | LIC | **Fiji** | LMIC | **Lithuania** | UMIC |
| **Kenya** | LIC | **Georgia** | LMIC | **Malaysia** | UMIC |
| **Lao PDR** | LIC | **Guatemala** | LMIC | **Mauritius** | UMIC |
| **Madagascar** | LIC | **Guyana** | LMIC | **Mexico** | UMIC |

| Country | Income group | Country | Income group | Country | Income group |
|---|---|---|---|---|---|
| **Malawi** | LIC | **Honduras** | LMIC | **Oman** | UMIC |
| **Mali** | LIC | **Indonesia** | LMIC | **Panama** | UMIC |
| **Mauritania** | LIC | **Iran, Islamic Rep.** | LMIC | **Poland** | UMIC |
| **Mongolia** | LIC | **Jamaica** | LMIC | **Romania** | UMIC |
| **Mozambique** | LIC | **Jordan** | LMIC | **Russian Federation** | UMIC |
| **Myanmar** | LIC | **Lesotho** | LMIC | **Seychelles** | UMIC |
| **Nepal** | LIC | **Macedonia, FYR** | LMIC | **South Africa** | UMIC |
| **Country** | **Income group** | **Country** | **Income group** | **Country** | **Income group** |
| **Niger** | LIC | **Maldives** | LMIC | **St. Kitts and Nevis** | UMIC |
| **Nigeria** | LIC | **Moldova** | LMIC | **St. Lucia** | UMIC |
| **Pakistan** | LIC | **Morocco** | LMIC | **St. Vincent and the Grenadines** | UMIC |
| **Papua New Guinea** | LIC | **Paraguay** | LMIC | **Turkey** | UMIC |
| **Rwanda** | LIC | **Peru** | LMIC | **Uruguay** | UMIC |
| **Senegal** | LIC | **Philippines** | LMIC | **Venezuela, RB** | UMIC |
| **Sierra Leone** | LIC | **Sri Lanka** | LMIC | | |
| **Solomon Islands** | LIC | **Swaziland** | LMIC | | |
| **Sudan** | LIC | **Syrian Arab Republic** | LMIC | | |
| **Tanzania** | LIC | **Thailand** | LMIC | | |
| **Togo** | LIC | **Tunisia** | LMIC | | |
| **Uganda** | LIC | **Ukraine** | LMIC | | |
| **Vietnam** | LIC | **Vanuatu** | LMIC | | |
| **Yemen, Rep.** | LIC | | | | |
| **Zambia** | LIC | | | | |
| **Zimbabwe** | LIC | | | | |

**Appendix 3 Robustness checks and additional explanatory variables**

Table 1: Panel cross-section time series LIC's robustness check (INST) non-fixed effects (1969-2006)

| **Dependent variable** | | **NPF** | | **NPF** | | **NPF** | | **NPF** | |
|---|---|---|---|---|---|---|---|---|---|
| | | Coef | t-value | Coef | t-value | Coef | t-value | Coef | t-value |
| | | (1) | | (2) | | (3) | | (4) | |
| | Constant | -0.009 | -0.57 | -0.01 | -0.72 | -0.02 | -0.99 | -0.02 | -0.98 |
| **Lucas** | CAP | 0.009 | 1.32 | 0.009 | 1.52 | 0.01 | 1.77 | 0.011 | 1.749 |
| | NPF(-1) | 0.63 | 16.6* | 0.64 | 17.72* | 0.65 | 17.62* | 0.65 | 17.98* |
| **Institutions** | INST | -0.0003 | -0.06 | 0.0003 | 0.06 | 0.0004 | 0.09 | 0.001 | 0.36 |
| **Control: Size** | POP | | | -6.8E-06 | -0.57 | | | | |
| **Debt &res** | GOV | | | | | -5.81E-09 | -0.47 | | |
| **Macro eco** | INF | | | | | | | 7.67E-05 | 2.41* |
| **Observations** | | | 414 | | 455 | | 442 | | 455 |
| **R-squared** | | | 0.43 | | 0.44 | | 0.45 | | 0.46 |

Table 2: Panel cross-section time series LIC's robustness check (SCH1) non-fixed effects (1991-2006)

| **Dependent variable** | | **NPF** | | **NPF** | | **NPF** | | **NPF** | |
|---|---|---|---|---|---|---|---|---|---|
| | | Coef | t-value | Coef | t-value | Coef | t-value | Coef | t-value |
| | | (1) | | (2) | | (3) | | (4) | |
| | Constant | -0.02 | -1.07 | -0.03 | -1.13 | -0.04 | -1.57 | -0.03 | -1.25 |
| **Lucas** | CAP | 0.01 | 1.55 | 0.015 | 1.61 | 0.02 | 1.96* | 0.02 | 1.68 |
| | NPF(-1) | 0.53 | 10.23* | 0.53 | 10.07* | 0.52 | 9.74* | 0.54 | 10.32* |
| **Other** | SCH1 | -6.6E-05 | -0.46 | -8.2E-05 | -0.56 | -0.0001 | -0.8 | -9.80E-05 | -0.67 |
| **Control: Size** | POP | -4.6E-06 | -0.38 | | | | | | |
| **Debt &res** | GOV | | | -7.2E-09 | -0.43 | | | | |
| **Institutions** | INST | | | | | -0.004 | -0.66 | | |
| **Macro eco** | INF | | | | | | | 7.00E-05 | 0.95 |
| **Observations** | | | 240 | | 236 | | 220 | | 240 |
| **R-squared** | | | 0.35 | | 0.35 | | 0.35 | | 0.35 |

Table 3: Panel cross-section time series LIC's robustness check (DEMO) non-fixed effects (1981-2006)

| **Dependent variable** | | **NPF** | | **NPF** | | **NPF** | | **NPF** | |
|---|---|---|---|---|---|---|---|---|---|
| | | Coef | t-value | Coef | t-value | Coef | t-value | Coef | t-value |
| | | (1) | | (2) | | (3) | | (4) | |
| | Constant | -0.018 | -1.69 | -0.03 | -2.18* | -0.02 | -0.96 | -0.03 | -2.13 |
| **Lucas** | CAP | 0.01 | 2.45* | 0.01 | 2.85* | 0.01 | 1.60 | 0.01 | 2.77 |
| | NPF(-1) | 0.58 | 19.76* | 0.57 | 18.64* | 0.64 | 16.03* | 0.58 | 19.30 |
| **Other** | DEMO | 0.008 | 2.63* | 0.008 | 2.48* | 0.007 | 1.79 | 0.008 | 2.58 |
| **Control: Size** | POP | -1.3E-06 | -0.16 | | | | | | |
| **Debt &res** | GOV | | | -6.1E-09 | -0.43 | | | | |
| **Institutions** | INST | | | | | 0.002 | 0.46 | | |
| **Macro eco** | INF | | | | | | | 3.1E-05 | 1.30 |
| **Observations** | | 806 | | 749 | | 381 | | 783 | |
| **R-squared** | | 0.37 | | 0.37 | | 0.46 | | 0.38 | |

**Appendix 4 Robustness checks and composition of capital flows**

Table 1: Panel cross-section time series LIC's robustness check natural (OREEX) non-fixed effects, different capital flows(1981-2006)

| **Dependent variable** | **NPF (1)** | | **DEB (2)** | | **FDI (3)** | | **PI (4)** | |
|---|---|---|---|---|---|---|---|---|
| **Country** | 40 | | 40 | | 40 | | 40 | |
| | Coef | t-value | Coef | t-value | Coef | t-value | Coef | t-value |
| **Constant** | -0.01 | -1.09 | -0.03 | -2.53 | 0.0003 | 0.05 | -0.003 | -3.17* |
| **CAP** | 0.008 | 1.53 | 0.01 | 2.67 | 0.001 | 0.46 | 0.001 | 3.54* |
| **Lagged(Dep)** | 0.66 | 19.69* | 0.4 | 10.20* | 0.82 | 28.8* | 0.47 | 11.30* |
| **OREEX** | 0.0002 | 2.13* | 6.49E-05 | 1.0 | 8.93E-05 | 2.69* | -2.14E-07 | -0.04 |
| **Observations** | | 526 | | 526 | | 526 | | 531 |
| **R-squared** | | 0.49 | | 0.23 | | 0.65 | | 0.25 |

Table 2: Panel cross-section time series LIC's robustness check (EX) non-fixed effects, different capital flows (1981-2006)

| **Dependent variable** | **NPF (1)** | | **DEB (2)** | | **FDI (3)** | | **PI (4)** | |
|---|---|---|---|---|---|---|---|---|
| **Country** | 39 | | 39 | | 39 | | 39 | |
| | Coef | t-value | Coef | t-value | Coef | t-value | Coef | t-value |
| **Constant** | -0.003 | -0.29 | -0.013 | -1.58 | 0.008 | 1.64 | -0.0003 | -0.74 |
| **CAP** | 0.003 | 0.75 | 0.005 | 1.64 | -0.002 | -1.05 | 0.0002 | 1.31 |
| **Lagged(Dep)** | 0.53 | 19.90* | 0.29 | 9.94 | 0.72 | 29.93 | 0.58 | 21.55 |
| **EX** | 0.01 | 5.14 | 0.005 | 2.56 | 0.006 | 4.35 | -0.0002 | -1.76 |
| **Observations** | 1016 | | 1016 | | 1016 | | 1029 | |
| **R-squared** | 0.34 | | 0.11 | | 0.51 | | 0.32 | |

**Table 3: Panel cross-section time series LIC's robustness check (CAP) non-fixed effects, different capital flows (1981-2006)**

| Dependent variable | NPF (1) | | DEB (2) | | FDI (3) | | PI (4) | |
|---|---|---|---|---|---|---|---|---|
| **Country** | 42 | | 42 | | 42 | | 42 | |
| | Coef | t-value | Coef | t-value | Coef | t-value | Coef | t-value |
| **Constant** | -0.02 | -2.50 | -0.02 | -3.16 | -0.002 | -0.36 | -0.001 | -3.10 |
| **CAP** | 0.01 | 3.50 | 0.01 | 3.73 | 0.002 | 1.31 | 0.0006 | 3.56 |
| **Lagged(Dep)** | 0.55 | 21.48 | 0.3 | 10.70 | 0.721 | 30.79 | 0.49 | 17.61 |
| **HIPC** | 0.007 | 2.63 | -0.001 | -0.70 | 0.005 | 3.92 | 0.0001 | 0.95 |
| **Observations** | 1066 | | 1066 | | 1066 | | 1079 | |
| **R-squared** | 0.35 | | 0.12 | | 0.52 | | 0.25 | |

**Table 4: Panel cross-section time series LIC's robustness check (DEMO) non-fixed effects, different capital flows (1981-2006)**

| Dependent variable | NPF (1) | | DEB (2) | | FDI (3) | | PI (4) | |
|---|---|---|---|---|---|---|---|---|
| **Country** | 40 | | 40 | | 40 | | 40 | |
| | Coef | t-value | Coef | t-value | Coef | t-value | -0.001 | -1.94 |
| **Constant** | -0.02 | -1.70 | -0.02 | -2.32 | -0.001 | -0.22 | 0.0005 | 2.47 |
| **CAP** | 0.01 | 2.45 | 0.008 | 2.57 | 0.002 | 1.17 | 0.50 | 16.07 |
| **Lagged(Dep)** | 0.58 | 19.78 | 0.32 | 9.76 | 0.72 | 26.40 | -0.0001 | -0.77 |
| **DEMO** | 0.008 | 2.66 | 0.004 | 1.71 | 0.002 | 1.27 | -0.001 | -1.94 |
| **Observations** | 806 | | 806 | | 806 | | 818 | |
| **R-squared** | 0.38 | | 0.13 | | 0.49 | | 0.26 | |

Table 5: Panel cross-section time series LIC's robustness check (INST) non-fixed effects, different capital flows (1996-2006)

| **Dependent variable** | **NPF (1)** | | **DEB (2)** | | **FDI (3)** | | **PI (4)** | |
|---|---|---|---|---|---|---|---|---|
| **Country** | 42 | | 42 | | 42 | | 42 | |
| | Coef | t-value | Coef | t-value | Coef | t-value | Coef | t-value |
| **Constant** | -0.01 | -0.71 | -0.02 | -1.81 | 0.001 | 0.16 | -0.002 | -2.28* |
| **CAP** | 0.009 | 1.48 | 0.007 | 1.67 | 0.004 | 1.09 | 0.0009 | 2.85* |
| **Lagged(Dep)** | 0.64 | 17.8* | 0.34 | 7.91 | 0.71 | 19.65* | 0.56 | 13.67* |
| **INST** | -0.0001 | -0.03 | -0.006 | -1.97* | 0.003 | 1.47 | 0.0001 | 0.67 |
| **Observations** | 455 | | 455 | | 455 | | 457 | |
| **R-squared** | $R^2$ | | $R^2$ | | $R^2$ | | $R^2$ | |
| | 0.43 | | 0.14 | | 0.48 | | 0.33 | |

Table 6: Panel cross-section time series LIC's robustness check (SCH1) non-fixed effects, different capital flows (1991-2006)

| **Dependent variable** | **NPF (1)** | | **DEB (2)** | | **FDI (3)** | | **PI (4)** | |
|---|---|---|---|---|---|---|---|---|
| **Country** | 40 | | 40 | | 40 | | 40 | |
| | Coef | t-value | Coef | t-value | Coef | t-value | Coef | t-value |
| **Constant** | -0.02 | -1.08 | -0.02 | -1.44 | -0.01 | -0.8 | 0.0009 | 0.85 |
| **CAP** | 0.01 | 1.55 | 0.01 | 1.56 | 0.007 | 1.34 | -0.0002 | -0.56 |
| **Lagged(Dep)** | 0.53 | 10.30* | 0.29 | 4.96* | 0.62 | 12.87* | 0.44 | 8.84* |
| **SCH1** | -7.2E-05 | -0.5 | -0.0001 | -1.31 | 3.23E-05 | 0.39 | -5.3E-06 | -0.76 |
| **Observations** | 240 | | 240 | | 240 | | 240 | |
| **R-squared** | 0.35 | | 0.12 | | 0.43 | | 0.25 | |