WPS4210

POST-CONFLICT TRANSITIONS WORKING PAPER NO. 13

# Capital Flight and War

**Victor A.B. Davies**
Centre for the Study of African Economies
& Department of Economics
University of Oxford

Abstract

*This paper provides empirical evidence on the effects of inflation on post-war capital flight flows. I test the hypothesis that inflation has a positive additional impact on capital flight flows after war. I use a new panel dataset of 77 developing countries, of which 35 experienced at least one episode of war between 1971 and 2000. I use a range of estimation methods and four capital flight measures – Cline, World Bank Residual, Morgan Guarantee and Dooley. The results consistently support the research hypothesis: Post-war inflation increases annual capital flight flows by about 0.005 to 0.01 percentage points of GDP. This effect is substantial in total at high inflation rates. The implication is that low inflation helps to curb capital flight in post-conflict economies.*

World Bank Policy Research Working Paper 4210, April 2007

## 1. INTRODUCTION

To what extent does inflation affect capital flight flows after war? I investigate this question using a new panel dataset of 77 developing countries, of which 35 experienced at least one episode of war between 1971 and 2000, and 42 did not. I test the hypothesis that inflation has an additional positive impact on capital flight after war. The paper provides a detailed analysis of the relationship between capital flight and inflation post-war, which, to my knowledge, has not yet been studied. Furthermore, I use a recent worldwide panel dataset on capital flight, the most recent of its kind, to my knowledge.

Portfolio-choice theory suggests that capital flight is driven by relative risk-adjusted expected return. Inflation lowers the return to non-indexed assets and increases the opportunity cost of holding money. Consequently, inflation would stimulate capital flight in all circumstances. I hypothesize that capital flight is differentially sensitive to inflation after war. Information asymmetry leaves the government better placed than the public to assess the risks of a return to warfare. The public may rationally use the inflation rate which rises during war to gauge such risks, increasing the sensitivity of capital flight to inflation.

I test the hypothesis on a panel of 77 countries of which 35 experienced at least one episode of war. The rest were always at peace. I use Ordinary Least Squares, Within-Group, Generalized Least Squares, Two-Stage Least Squares and Arellano-Bond GMM estimation methods on annual data and four different measures of capital flight: the World Bank Residual, Cline, Dooley and Morgan measures. The results provide consistent evidence in support of the research hypothesis: Post-war inflation increases annual capital flight flows by about 0.005 to 0.01 percentage points of GDP. Relative to the average level of capital flight flows and the high inflation rates in post-conflict economies, the total effect could be substantial. The implication is that low inflation helps to curb capital flight in post-conflict economies. Low inflation might also induce domestic investment, generating tax revenues for the government and offsetting over time the loss of seigniorage revenues due to low inflation.

In Section 2 I discuss conceptual and measurement issues relating to capital flight. In Section 3 I define and quantify war. I analyze the data in Section 4, undertake the econometric analysis in Section 5 and conclude in Section 6.

## 2. CAPITAL FLIGHT ISSUES

I discuss key issues in empirical work on capital flight.

### 2.1 What Drives Capital Flight?

Portfolio-choice theory suggests that maximizing relative risk-adjusted expected return drives the choice between domestic assets and foreign assets (flight capital). The domestic determinants of relative expected return include risks, capital productivity, and their underlying determinants, notably the macroeconomic environment. The tax level

determines net return to capital. Ndikumana and Boyce (2003), Collier *et al* (2001), and Lensink *et al* (2000) report the debt stock to GDP ratio, which can be used to gauge future tax policy, as a significant positive determinant of capital flight. External borrowing could provide the resources for capital flight while capital flight can also induce external borrowing by reducing tax revenues and foreign exchange.

The institutional environment facing private agents affects capital productivity notably through transactions costs. Bureaucratic corruption operates as a tax on investment. Exchange rate overvaluation induces devaluation expectations which could induce capital flight for hedging purposes. Ndikumana and Boyce (2003), Mikkelson (1991) and Vos (1992) and others have reported path dependence in capital flight: High levels of capital flight could generate expectations of a rise in taxes to offset the ensuing decline in tax revenues. Income growth might impact positively on expectations of the return to investment. The flight capital base – the quantity of capital that could potentially flee the economy – also matters. This could depend on external resource inflows and income levels. Lastly, sometimes the motivation for capital flight may be safekeeping of embezzled funds especially under some kleptocratic governments (Ndikumana and Boyce 1988, and Boyce 1992, 1993).

War could stimulate capital flight directly by increasing political risk; and indirectly, through other variables that induce capital flight such as inflation and public debt. War termination could reduce capital flight by reducing political risks and providing new investment opportunities. However, fears of war resumption could heighten perceived risks. Aid inflows could also provide resources for capital flight. War termination's effect on capital flight is therefore unpredictable. However, as peace endures capital flight is likely to decrease as perceived risks diminish.

## 2.2 Key Issues in Capital Flight Estimation

### 2.2.1 Conceptual issues

There is no consensus definition of capital flight which broadly speaking, refers to private capital outflows from developing countries. Table 1, taken from Claessens and Naudé (1993), serves to illustrate key definitions and estimation methods.

**Table 1: Stylized Balance of Payments**

| |
|---|
| A. Current Account<br>A1. Travel: credit<br>A2. Reinvested earnings on direct investment abroad<br>A3. Reinvested earnings on direct investment domestically<br>A4. Other investment income: credit |
| B. Net Equity Flows<br>B1. Net Foreign Direct Investment<br>B2. Portfolio Investment: Corporate equities |
| C. Other short-term capital of other sectors (net) |
| D. Portfolio investment |
| E. Change in deposit money banks' foreign assets |
| F. Reserves |
| G. Net Errors and omissions |
| H. Other long-term capital of resident official sector |
| H′. Change in external debt |

According to the balance of payments identity:

$$A + B + C + D + E + F + G + H = 0.$$

or

$$C + D + E + G = -(A + B + F + H)$$

"Residual" measures estimate capital flight as the residual between an economy's sources and uses of foreign exchange. In Table 1 this is given by (A + B + F + H) where sources of funds are net equity flows B, and changes in "other long-term capital of resident official sector" H, otherwise measured as change in external debt H′. Uses of foreign exchange are the current account balance A, and the change in foreign reserves, F. World Bank (1985), Morgan Guarantee (1986), Erbe (1985), Cline (1995), and Collier *et al* (2001 & 2004) are variants of the residual measure. For World Bank (1985), changes in gross foreign public debt and net foreign investment are the sources of funds. Morgan Guarantee (1986) subtracts the increase in short-term foreign assets of the banking system from World Bank to estimate the acquisition of foreign assets by the non-bank private sector. Collier *et al* (2001 & 2002) add repayment of private non-guaranteed debt to World Bank. Cline (1994) excludes private capital income retained abroad from the current account balance. Specifically, it subtracts travel (credit), reinvested foreign direct investment income (abroad and domestically), and other investment income (credit) items, often producing a smaller current account balance (bigger deficit), and smaller capital flight estimates. For all the above measures, the current account balance (however defined) and increase in reserves, constitute uses of foreign exchange. World Bank, Cline and Morgan Guarantee are computed as follows:

World Bank: A + B + F + H'
Cline: A – (A1 + A2 + A3 + A4) + B + E + F + H'
Morgan: A + B + E + F + H'

Non-residual measures include Dooley (1986) who defines capital flight as illegitimate or undeclared foreign assets, that is the part of a country's stock of foreign assets that does not generate income reported to the domestic authorities. For Cuddington (1986), capital flight is "hot money" fleeing political and financial crisis, heavier taxes, capital controls, currency devaluation, or hyperinflation. Collier *et al* (2004) estimate human capital flight – flight of educated human resource. Human capital flight estimation poses additional data and conceptual challenges.

2.2.2 Practical Issues

Capital flight is unobservable and therefore has to be estimated. In principle this could be done by summing up relevant balance of payments outflows. However, data constraints have led to proxies for some transactions. Moreover, some capital flight measures involve off-balance of payments transactions such as illegal activities with the Dooley measure. In some countries capital movement is illegal and therefore necessarily clandestine. However, the sheer illegality of capital flight is likely to affect its estimation but not its economic consequences.

2.2.3 Difficult Choices

Estimating capital flight involves the following difficult decisions:

Accumulation issues

An issue is whether to focus on stocks or flows. Flow estimates are common. Estimating stocks poses additional problems. Stocks are usually obtained by capitalizing the flows using a benchmark interest rate such as the US Treasury Bill rate. However, errors could result if that is not the actual interest rate applied to foreign assets. Most stock estimates ignore capital consumption. Flows may be more sensitive to war since they represent capital currently "fleeing" the domestic economy. Stocks also depend on external factors such as foreign interest rates. Data gaps further complicate stock estimation. Collier *et al* (2001 & 2004) view stocks as the relevant measure, arguing that capital flight is part of a wider portfolio decision involving total wealth stock, including foreign-based. However, estimating private wealth in developing countries is particularly challenging.

Components issues

Components issues bear on what to include or exclude in the estimates. An issue is whether to take into account the circumstances inducing capital flight such as economic or political crisis. Some definitions exclude "normal" outflows occurring in the absence of a crisis.

Another question is whether to include private non-guaranteed debt. It may be argued that the simultaneous acquisition of a foreign asset and an offsetting foreign liability is not capital flight as the private sector's net claims on foreign assets held abroad remains unchanged. However, Collier *et al* (2001) argue that the claims and liabilities generally do not refer to the same agents.

Sometimes trade misinvoicing is included since underinvoicing of exports and overinvoicing of imports, with the discrepancy held abroad, constitute capital flight. However, import misinvoicing is subject to conflicting temptations (Cardoso and Dornbusch 1989): underinvoicing for tariff or quota avoidance, and overinvoicing for

capital flight. Thus, funds labelled capital flight may actually have financed unreported imports (Chang *et al* 1997).

Data-related issues

The US consumer price index is a common deflator to convert from nominal to real estimates. This assumes that the flight capital is held in the US. Using the ratio of nominal capital to nominal GDP obviates conversion. Also, exchange rate fluctuations can bias the estimates if flight capital stock is held outside the US.

Negative values of capital flight are ambiguous: flight capital repatriation or unrecorded capital inflows? Negative stocks are even more problematic. Collier *et al* (2001, 2004) set a zero lower bound for their stock estimates because it is "gross of indebtedness". This assumes that the negative values are due to indebtedness. They could be due to data error. Another issue is whether to capture changes in the debt stock that are not reflected in net flows of borrowings due to capitalization of arrears, rescheduling of principal or interest payments due, capitalization of penalties imposed, and debt forgiveness. Cash versus accruals accounting is another issue. Cash accounting raises the current account deficit, and lowers the capital flight estimates, if some private income earnings are retained abroad.

## 3 WAR ISSUES

Definition and coverage

Gleditsch *et al* (2002) define armed conflict as a contested incompatibility that concerns government and/or territory where the use of armed force between two or more parties, of which at least one is the government of a state, results in an accumulated total of at least 25 battle-related deaths per year. The authors distinguish three categories of conflict intensity based on the number of battle-related deaths:

* Minor armed conflict: fewer than 1,000 battle-related deaths during the course of the conflict.
* Intermediate armed conflict: an accumulated total of at least 1,000 battle-related deaths, but fewer than 1,000 per year.
* War: at least 1,000 battle-related deaths per year.

I adapt the above definition of conflict by excluding minor armed conflicts as these are unlikely to trigger significant capital flight. I cover interstate armed conflict occurring between two or more states; and civil war occurring between the government of a state and internal opposition groups, with or without external intervention. Only host countries to conflict are considered to be at war, since a conflict fought abroad may not have the same effect on capital flight as a home conflict. I exclude colonial wars because colonial-period data are typically lacking.

Quantification

I capture war through a "war" dummy variable with a value of 1 for countries experiencing war in a given year, and zero otherwise. Similarly, I capture the post-war period through a "postwar" dummy variable with a value of 1 if a country is in a post-war year and zero otherwise. I assume that the post-war period lasts for ten years after which

a country reverts to peace status. Table 2 shows that civil war is by far the most common type of conflict in the sample, accounting for about 76% of all conflict episodes. Next is internationalized civil war with about 19%. Inter-state war takes up the remaining 5%.

**Table 2: Conflict Statistics**

| Type | Frequency |
|---|---|
| Inter-state war | 21 |
| Civil war | 364 |
| Post-war | 271 |
| Peace | 1669 |
| Total | 2325 |

## 4. THE DATA

The estimation is based on annual data for a sample of 77 developing countries of which 35 experienced at least one episode of war between 1971 and 2000, and 42 did not. The sample yields a total of over 2000 annual observations, of which there are about 360 war, and 270 post-war, observations. Appendix 1 lists the countries and Appendix 2 defines the variables and gives the data sources.

I focus on four capital flight flow measures: Cline, Morgan, World Bank Residual and Dooley, whose computation is explained in Section 2. I consider flow estimates more appropriate than stocks to investigate the research question. Table 3 reports positive correlation coefficients ranging from 0.75 to 0.96 across the four measures. Table 4 gives sample means for the four measures. Unsurprisingly, the broadest, World Bank, measure gives the highest mean of 1.5% of GDP. That Cline gives the lowest and a negative mean estimate of -1.3% of GDP suggests that private capital income retained abroad, which Cline excludes, may be substantial. Capital flight is highest post-war for all measures except Dooley. For the World Bank and Dooley measures, capital flight falls slightly from peacetime to wartime: by 0.1 and 0.2 percentage points of GDP.

**Table 3: Correlations: Capital Flight Flow (% GDP) measures**

| Pair of Measures | Correlation |
|---|---|
| World Bank – Morgan | 0.96 |
| World-Bank – Cline | 0.86 |
| World-Bank – Dooley | 0.79 |
| Morgan-Cline | 0.94 |
| Morgan-Dooley | 0.75 |
| Cline-Dooley | 0.70 |

**Table 4: Mean Annual Capital Flight Flows (% GDP)**

| Capital flight measure | Conflict countries | | | | Non-conflict countries | All countries | |
|---|---|---|---|---|---|---|---|
| | Peacetime | Wartime | Post-war period | All period average | | Mean | Coefficient of variation % |
| Cline | -0.95 | -0.12 | 0.04 | -0.41 | -2.0 | -1.3 | -743 |
| World Bank | 1.7 | 1.6 | 2.3 | 1.8 | 1.1 | 1.5 | 595 |
| Morgan | 0.94 | 1.1 | 1.7 | 1.2 | 0.76 | 0.96 | 909 |
| Dooley | 1.8 | 1.6 | 1.6 | 1.6 | 0.60 | 1.1 | 1011 |
| Observations | 380 | 320 | 250 | 950 | 1100 | 2100 | 2100 |

Table 5 presents annual inflation by war status. Large levels and changes in the levels of inflation occur during and after war. Mean annual inflation more than triples from 34 percent pre-war to 117 percent during wartime. It decreases to 67 percent post-conflict, which is almost twice its peacetime level of 34 percent in conflict countries.

**Table 5: Mean Annual Inflation (%)**

| Conflict countries | | | | Non-conflict countries | All countries |
|---|---|---|---|---|---|
| Peacetime | Wartime | Post-war period | All period average | | |
| 34 | 117 | 67 | 73 | 41 | 56 |

## 5. ECONOMETRIC ANALYSIS

I estimate variants of the following baseline equation:

$$\mathbf{CF_{it} = \beta_1 war_{it} + \beta_2 postwar_{it} + \beta_3 inflpwar_{it} + \beta_4 M + \beta_5 pD + \sum_{n=1}^{j} \lambda_i CF_{it-n}} \qquad \mathbf{(1)}$$

i and t are country and time indices.
CF is capital flight flows (% GDP).
war is a dummy variable for a war episode.
postwar is a dummy variable for a post-war period.
inflpwar is an interaction term between inflation and the post-war variable.
M is a vector of regressors
D is a vector of dummy variables.
The β's are parameters or vectors of parameters

The dependent variable is in turn the Cline, World Bank, Morgan and Dooley capital flight flow measures. The war and post-war dummies capture the direct impact of war and its aftermath on capital flight. An indirect effect might also operate through other

regressors. I do not use the Institutional Investor Risk Rating index, another measure of risk, because it shrinks the data. I expect inflation, which tends to be correlated with political risks, and the war and post-war dummies, to help capture political risks. The World Bank's Country Policy and Institutional Assessment index, an indicator of the institutional environment, is unavailable to outside researchers. However, such indices tend to be highly correlated with other capital flight determinants (Collier *et al* 2001), mitigating the effects of their omission.

"Inflpwar" is an interaction term of inflation and "postwar". Its coefficient, $\beta_3$, has to be positive under the hypothesis that inflation has a positive additional impact on capital flight after war. M is a vector of controls comprising inflation, the Dollar real exchange rate overvaluation index, investment, per capita income, GDP growth and aid. I expect a positive inflation coefficient. The Dollar real exchange rate overvaluation index captures expectations of currency depreciation. By construction, the degree of overvaluation increases with the index (Dollar 1992). Thus, I expect its coefficient to be positive[1]. I exclude the black market premium, a possible indicator of macroeconomic stability and the quality of governance, because it shrinks the data. Per capita income captures the flight capital base while GDP growth captures expectations of capital productivity. I control for aid using the aid to GNI ratio. $\sum_{n=1}^{j} \lambda_i CF_{it-n}$ is lagged capital flight capturing path dependence. j is the longest lag. I also include time dummies in all the estimations.

I use an annual worldwide unbalanced panel dataset of 77 countries over 1971-2000, from the IMF. I first test for stationarity of the variables using the Augmented Dickey Fuller and Philips Perron unit roots tests for panel data. The results, presented in Appendix 3, indicate that only per capita income is non-stationary. I therefore use instead the log of per capita income, which is stationary.

Ordinary Least Squares estimation

I start with Ordinary Least Squares robust estimation. Table 6 presents the Cline results and Appendices 4a-4c the others. As hypothesized, the inflation post-war interaction term coefficient is positive in all the regressions. Its coefficient ranges from 0.007 to 0.01 and is significant at 1%. In columns 5 and 6, I interact inflation with dummies for the first and second five post-war years. The interaction term for the first five post-war years is significant at 1% with coefficients ranging from 0.005 to 0.008 in all the regressions. The

[1] The Dollar index measures the extent to which the real exchange rate is distorted away from its free trade level by the trade regime. The index is based on international comparisons of price levels on the same basket of goods compiled for 121 countries by Summers and Heston (1988). The Summers and Heston measure of country i's relative price level (RPL) is given by:

$RPL_i = 100 \times eP_i/P_{US}$

where e is the exchange rate (dollars per unit of domestic currency) and $P_i$ is the consumption price index for country i and $P_{US}$ is US consumption price level. Dollar corrects for variations due to differences in factor endowment in the Summers and Heston indices by regressing the price levels (RPLi) on factor endowments, captured by per capita GDP and population density. The residuals from that regression indicate the extent to which a country's prices are high or low, given its endowments. The higher the residuals the higher is the degree of inward orientation.

second five post-war years interaction term is insignificant in the World Bank and Morgan regressions, suggesting that for these measures, the positive additional impact of inflation is in the first five post-war years. For the Cline and Dooley measures the interaction term is significant at less than 10% with coefficients ranging from 0.005 to 0.006.

The war dummy is significant at less than 10% in the Cline regressions with a coefficient of 0.95 to 2.1. This suggests that by the Cline measure, capital flight flows are 0.95 to 2.1 percentage points of GDP higher during wartime relative to peacetime. This effect is relatively large, given a Cline panel mean of -1.3% of GDP. The war dummy is significant only in the Cline regressions. The post-war dummy is mostly insignificant across the four capital flight measures. This suggests that after controlling for other determinants, wartime and peacetime capital flight flows are not significantly different.

Lagged capital flight is significant in all the Cline and Dooley regressions, with coefficients ranging from around 0.3 to 0.4 (Cline) and 0.15 to 0.2 (Dooley). The implied degree of persistence in capital flight flows is of the order of 0.3 to 0.4, and 0.15 to 0.20, percentage points of GDP respectively. This is relatively high, given the panel average level of annual capital flight flows of -1.3% of GDP (Cline) and 1.1% of GDP (Dooley). The second and higher lags of the dependent variable were dropped, being insignificant in all the regressions, suggesting that any persistence is short-lived.
Current investment is negatively significant at less than 10%, with a coefficient of about -0.05 to -0.08 in the Cline regressions. The implied negative relationship accords with expectations: Higher relative rates of return in the domestic economy encourage investment and discourage capital flight. Lagged investment is generally insignificant across all measures except for Cline regression 5 where it is negatively significant at 9%. Current and lagged aid are insignificant in all the regressions, suggesting that there is no "round tripping" of capital flight flows wherein aid funds end up as flight capital. Current inflation is positively significant at less than 10% in the Morgan regressions. It is insignificant in the Dooley and World Bank regressions and significant in one of the two Cline regressions which control for it. The Dollar real exchange rate overvaluation index and its lag are insignificant in all the regressions. This implies that either the real exchange rate distortion from its free trade level, which the index purports to capture, has no net effect on capital flight flows; or the index does not really capture the distortion.

Generalized Least Squares

The final rows in the tables give the F statistic of the Wooldridge test for first order serial correlation in the regression residuals. Except for regressions 1 and 2 of the Cline, World Bank and Morgan regressions, the null of no serial correlation is rejected at 5%. I therefore undertake Generalized Least Squares estimation to correct for the serial correlation. The Cline results are presented in Table 7, and the others in Appendices 5a-5c. The size and significance of the inflation post-war interaction term coefficient is largely unchanged relative to the preceding estimations: It is always significant at 1% with a coefficient of 0.005 to 0.009. The interaction term between inflation and the first five post-war years dummy is also significant at 5% with a coefficient of 0.006 to 0.01
The post-war dummy in the Cline regressions is now significant at less than 5% with a coefficient of 1.3 to 1.8 while the war dummy is mostly significant at less than 10%. The war dummy is insignificant for the other capital flight measures. Lagged capital flight is

now positively significant at less than 5% across the Cline, Morgan and Dooley regressions; and also at less than 10% in all but one of the World Bank regressions. Investment, current or lagged, is also now positively significant at less than 1% in the Cline regressions. Lagged investment is insignificant in the World Bank, Morgan and Dooley regressions. Lagged aid is negatively significant at 1% across all four capital flight measures with a coefficient of -0.06 to -0.07. This suggests that a one percentage point increase in the aid to GNI ratio is associated with a 0.06 to 0.07 percentage point decrease in the capital flight flows to GDP ratio.

Within-Group estimation

The omission of unobserved country-specific factors could bias the OLS and GLS estimates. Random effects, within-group and first-differenced GMM estimation methods could address this source of endogeneity. However, random effects estimation is inappropriate when lags of the dependent variable are used as regressors because of their correlation with the unobserved country-specific effect. First-differenced GMM might also be inappropriate when the time span is long because it produces a large instrument set, leading to "over-fitting" and undesirable closeness to the OLS coefficients (see Alvarez and Arellano 2003). I therefore implement Within-Group estimation to control for unobserved country-specific factors. Within-Group estimation's drawback, however, is that the mean differencing of the variables could sweep away much of the variation from the slow-changing regressors, reducing significance levels.

Table 8 and Appendices 6a-6c contain the estimation results. The inflation and post-war interaction term estimates are generally similar to the preceding OLS estimates. The interaction term is always significant at 1% with a coefficient of 0.005 to 0.009. The estimates for the interaction term of the post-war half decadal dummies and inflation are also similar to the OLS estimates. Current investment is now statistically significant at less than 5% in all the regressions with a coefficient of -0.11 to -0.22. Lagged capital flight is significant at less than 5% in the Cline and Morgan Guarantee regressions with a coefficient of 0.15 to 0.24 while it is mostly insignificant in the World Bank and Dooley regressions.

Two-Stage Least Squares estimation

The preceding estimation methods fail to address the possibility of simultaneity between capital flight and some of the regressors. For instance simultaneity can occur if capital flight shrinks the tax base and increases reliance on aid. To investigate whether indeed aid is endogenous, I carry out Two-Stage Least Squares estimation, following Tavares (2003) to instrument for aid. Tavares' underlying idea is that bilateral donor governments provide aid to an extent according to historical ties and domestic budgetary circumstances that are unrelated to circumstances in the recipient country. I proceed as follows: For each of the five largest OECD aid donors – United States, United Kingdom, Japan, Germany and France – I compute three variables capturing proximity between the donor and each country in the sample. The first variable is physical proximity given by the inverse of the distance between aid donor and aid recipient capital cities. Second is a dummy variable for linguistic proximity which takes a value of one if the official language of the aid donor and recipient is the same, and zero otherwise. Third is a dummy variable for religious proximity which takes a value of one if aid donor and recipient share the same dominant religion, and zero otherwise. I then interact the three

variables with the donor country's aid to GNI ratio. I drop the interaction terms for the same language as Japan and Germany because no aid recipient satisfies those criteria.

The estimation results, reported in Table 9 for the Cline measure, and Appendices 7a-7c for the others, support the research hypothesis: The interaction terms between inflation and the dummy for the post-war period as a whole, and the dummy for first half-decadal post-war period, are positively significant at 1% across all the regressions. The size of either coefficient, 0.007 to 0.009, is also similar to those from the preceding estimations. Aid, considered as the endogenous regressor, is statistically insignificant across all the regressions. The Cline estimates tend to be more significant than those from the preceding estimation methods. However, the post-war dummy is significant only at 6 to 8%, compared with 5% in the GLS. In addition, inflation is positively significant at 10% or less, although its coefficient is close to zero. The controls in the World Bank, Morgan and Dooley regressions are mostly insignificant.
The last row in the tables gives the F statistic of the Davidson-Mackinnon (1993) test for the endogeneity of aid. The test involves first regressing the endogenous variable (aid) on all the exogenous variables in the model to obtain predicted aid. The original capital flight model is then estimated with predicted aid as an additional regressor. An F test is then used to test the null that predicted aid is not statistically different from zero. Rejection of the null implies that aid is endogenous and OLS estimation is inconsistent. For the Cline, World Bank and Morgan regressions, the null cannot be rejected. Thus, aid is not endogenous in these regressions and OLS estimation is consistent. The null is rejected in all but the last Dooley regressions. Appendix 8 presents the first-stage regression results. In every case the F statistic is approximately zero, indicating the joint significance of the regressors.

Arellano-Bond First-Differenced GMM

While consistent in small sample, the OLS and Within-Group estimates of the coefficient of the lagged dependent variable in Equation 1 are biased upwards and downwards respectively (see Nicke1 1981). I therefore implement the Arellano-Bond First-Differenced GMM estimator (the A-B GMM estimator for short) as an additional robustness check. This estimator seeks to address the problems posed by using lagged dependent variables as regressors as well as other sources of endogeneity. To implement the A-B GMM I re-write Equation 1 as:

$$cf_{it} = \sum_{j=1}^{p} \alpha_j , cf_{i,t-j} + x_{it}\lambda + w_{it}\theta + v_i + e_{it} \qquad (2)$$

where x represents the strictly exogenous variables, w the endogenous regressors and v the unobserved country-specific effects. α, λ and θ are parameters. The A-B GMM approach involves first-differencing Equation 2:

$$\Delta cf_{it} = \sum_{j=1}^{p} \alpha_j \Delta cf_{i,t-j} + \Delta x_{it}\lambda + \Delta w_{it}\theta \qquad (3)$$

I estimate Equation 3 using lagged levels of the dependent variable and the endogenous regresssors as instruments for $\sum_{j=1}^{p} \Delta cf_{i,t-j}$ and $\Delta w_{it}$ respectively. $\Delta x_{it}$, being strictly exogenous, serves as its own instruments.

I estimate a parsimonious version of Equation 3 using only the first lag of the dependent variable, and taking the inflation post-war interaction term, and the war and post-war dummies as strictly exogenous. All other regressors are assumed endogenous. I use the one-step variant of the A-B GMM estimator as recommended by the authors, Arellano and Bond (1991), for inference on the parameter estimates.

Table 10 presents the estimation results. The inflation post-war interaction term estimates are similar to those from the other estimation methods. The coefficient of the interaction term ranges from 0.008 to 0.011 and is statistically significant at 1%. Investment is also statistically significant at less than 5% with a coefficient of -0.23 to -0.38. Inflation is significant at less than 5% in the World Bank and Dooley model, and insignificant in the other models. In all four estimations the Sargan test statistic indicates support for the validity of the over-identifying restrictions.

The A-B GMM estimator has its own drawbacks. Notably, the differencing of slow-moving regressors may lead to low statistical significance. Furthermore, lagged levels of variables are often poor instruments for first differences.

A synthesis

The interaction terms between inflation and the dummy for the post-war period as a whole, and for the first five post-war years, are positively significant at 1 to 5% across virtually all regressions, consistent with the hypothesis that inflation has an additional positive impact on capital flight after war. With a coefficient of 0.005 to 0.01, a one percentage point reduction in the post-conflict inflation rate leads to a reduction in annual capital flight flows by 0.005 to 0.01 percentage points of GDP. Given mean annual wartime inflation rate of 117%, and 67% post-war (Table 5), and mean capital flight flows ranging from -1.3% of GDP (Cline) to 1.5% (World Bank), the total effect could be substantial. Consequently, reducing inflation offers some scope for reducing post-conflict capital flight, especially in high-inflation countries like Argentina with post-war inflation rates of over 600% in 1984 and 1985.

Except for the Within-Group and Arellano-Bond GMM estimates, the Cline war dummy is generally positively significant at less than 10% with coefficients ranging from 0.95 to 2.1. Thus, relative to peacetime, the average country shifts abroad every year an additional 0.95 to 2.1 percentage points of GDP as Cline capital flight during wartime. This is hardly surprising, given the increase in risks during war. However, the size of the increase is large, given mean Cline capital flight flows of -0.95% of GDP during peacetime. The insignificance of the Within-Group and Arellano-Bond estimates may be due to the differencing of the variables in these estimation techniques. This reduces statistical significance, especially for slowing-changing regessors like the war and post-war dummies. The evidence on post-war capital flight flows is conflict with some of the results indicating an increase relative to peacetime while others indicate a decrease.

Except for the Arellano-Bond estimates, a consistent positive relationship between Cline capital flight and its first lag emerges from the estimation results, with a coefficient estimate of 0.16 to 0.41. This indicates some degree of persistence in Cline capital flight flows. A similar positive relationship holds for the Dooley measure except for some of the Within-Group regressions. The second and higher lags are all statistically insignificant across all four capital flight measures, implying the absence of long-term persistence in all capital flight measures. Another consistent effect is a negative effect of investment or/and its lag on Cline capital flight flows with a coefficient estimate of -0.05 to -0.19 for investment. Inflation and its lag on are often positively significant with a coefficient of 0.001, suggesting that inflation increases capital flight flows in all circumstances.

The log of per capita income, aid and GDP growth show no consistent relationship with capital flight, being statistically insignificant in some regressions and insignificant in others. The Dollar real exchange rate overvaluation index is never significant. This could imply that distortion of the real exchange rate from its free trade level, which the index purports to capture, has no net effect on capital flight flows; or the index fails to capture the distortion.

The Two-Stage Least Squares results suggest that aid is not endogenous in the Cline, World Bank and Morgan specifications, implying that OLS estimation is consistent and preferable to Two-Stage Least Squares. On the other hand, the results suggest that aid is endogenous in the Dooley regressions, implying that OLS estimation is inconsistent and Two-Stage Least Squares estimation is preferable.

Table 6: Cline OLS Results

| | (1) | (2) | (3) | (4) | (5) | (6) | (7) |
|---|---|---|---|---|---|---|---|
| Inflation & post-war dummy interaction term | 0.010 | 0.009 | 0.008 | 0.008 | 0.008 | | |
| | (0.00)*** | (0.00)*** | (0.00)*** | (0.00)*** | (0.00)*** | | |
| War dummy | | 2.116 | 0.947 | 1.207 | 1.202 | 1.022 | 1.203 |
| | | (0.00)*** | (0.08)* | (0.01)** | (0.01)** | (0.04)** | (0.01)** |
| post-war dummy | | 1.762 | 1.494 | 0.784 | 0.882 | 0.860 | 0.809 |
| | | (0.05)** | (0.02)** | (0.38) | (0.28) | (0.35) | (0.37) |
| dependent variable: 1st lag | | | 0.408 | 0.326 | 0.336 | 0.327 | 0.326 |
| | | | (0.00)*** | (0.00)*** | (0.00)*** | (0.00)*** | (0.00)*** |
| lagged Dollar overvaluation index | | | | -0.001 | -0.001 | -0.001 | -0.001 |
| | | | | (0.36) | (0.50) | (0.35) | (0.35) |
| log of per capita income | | | -0.246 | | | -0.346 | -0.299 |
| | | | (0.43) | | | (0.27) | (0.10) |
| interaction term: 1st 5 post-war years & inflation | | | | | | 0.008 | 0.008 |
| | | | | | | (0.00)*** | (0.00)*** |
| interaction term: 2nd 5 post-war years & inflation | | | | | | 0.006 | 0.006 |
| | | | | | | (0.06)* | (0.04)** |
| lagged GDP growth | | | | -0.038 | -0.036 | | -0.038 |
| | | | | (0.35) | (0.40) | | (0.35) |
| lagged inflation % | | | | 0.000 | 0.000 | | 0.000 |
| | | | | (0.25) | (0.26) | | (0.25) |
| lagged investment % | | | | -0.046 | -0.071 | | -0.045 |
| | | | | (0.17) | (0.09)* | | (0.18) |
| GDP growth % | | | -0.030 | | | -0.032 | |
| | | | (0.40) | | | (0.36) | |
| Inflation % | | | 0.000 | | | 0.000 | |
| | | | (0.13) | | | (0.02)** | |
| investment % GDP | | | -0.052 | | | -0.077 | |
| | | | (0.06)* | | | (0.03)** | |
| aid % GNI | | | 0.000 | | | -0.034 | |
| | | | (1.00) | | | (0.64) | |
| lagged aid % GNI | | | | | -0.059 | | |
| | | | | | (0.54) | | |
| lagged log of per capita income | | | | -0.288 | | | |
| | | | | (0.12) | | | |
| Dollar overvaluation index | | | 0.001 | | | | |
| | | | (0.35) | | | | |
| Observations | 1821 | 1821 | 1484 | 1556 | 1527 | 1542 | 1556 |
| R-squared | 0.12 | 0.13 | 0.32 | 0.23 | 0.23 | 0.23 | 0.23 |
| Wooldridge test statistic for serial correlation: F | 1.4 (0.25) | 1.5 (0.22) | 21 (0.00)*** | 33 (0.00)*** | 32 (0.00)*** | 33 (0.00)*** | 33 (0.00)*** |

Robust p values in parentheses

* significant at 10%; ** significant at 5%; *** significant at 1%

Table 7: Cline GLS Results

| | (1) | (2) | (3) | (4) | (5) |
|---|---|---|---|---|---|
| Inflation & post-war dummy interaction term | 0.008 | 0.008 | 0.008 | | |
| | (0.00)*** | (0.00)*** | (0.00)*** | | |
| war dummy | 0.551 | 1.112 | 1.050 | 0.965 | 1.110 |
| | (0.21) | (0.05)** | (0.06)* | (0.09)* | (0.05)** |
| post-war dummy | 1.779 | 1.236 | 1.417 | 1.548 | 1.297 |
| | (0.00)*** | (0.04)** | (0.02)** | (0.02)** | (0.04)** |
| GDP growth % | -0.009 | | | -0.009 | |
| | (0.78) | | | (0.82) | |
| Inflation % | 0.000 | | | 0.000 | |
| | (0.62) | | | (0.44) | |
| Dollar overvaluation index | -0.000 | | | | |
| | (0.93) | | | | |
| investment %GDP | -0.089 | | | -0.152 | |
| | (0.00)*** | | | (0.00)*** | |
| aid %GNI | -0.045 | | | -0.066 | |
| | (0.03)** | | | (0.01)*** | |
| Lagged dependent variable | 0.399 | 0.211 | 0.219 | 0.210 | 0.211 |
| | (0.00)*** | (0.00)*** | (0.00)*** | (0.00)*** | (0.00)*** |
| log of per capita income | -0.363 | | | -0.346 | -0.101 |
| | (0.09)* | | | (0.21) | (0.65) |
| lagged GDP growth % | | 0.004 | -0.001 | | 0.004 |
| | | (0.91) | (0.99) | | (0.91) |
| lagged inflation % | | 0.000 | 0.000 | | 0.000 |
| | | (0.18) | (0.17) | | (0.18) |
| lagged Dollar overvaluation index | | -0.001 | -0.001 | -0.001 | -0.001 |
| | | (0.46) | (0.49) | (0.53) | (0.45) |
| lagged investment % | | -0.102 | -0.113 | | -0.102 |
| | | (0.00)*** | (0.00)*** | | (0.00)*** |
| lagged log of per capita income | | -0.101 | | | |
| | | (0.65) | | | |
| interaction term: 1st 5 post-war years & inflation | | | | 0.008 | 0.008 |
| | | | | (0.00)*** | (0.00)*** |
| interaction term: 2nd 5 post-war years & inflation | | | | 0.003 | 0.004 |
| | | | | (0.66) | (0.60) |
| lagged aid %GNI | | | -0.074 | | |
| | | | (0.00)*** | | |
| Observations | 1484 | 1556 | 1527 | 1542 | 1556 |
| Number of id | 62 | 63 | 62 | 62 | 63 |

p values in parentheses

* significant at 10%; ** significant at 5%; *** significant at 1%

Table 8: Cline Within-Group Results

| | (1) | (2) | (3) | (4) | (5) | (6) | (7) |
|---|---|---|---|---|---|---|---|
| Inflation & post-war dummy interaction term | 0.009 | 0.009 | 0.007 | 0.009 | 0.009 | | |
| | (0.00)*** | (0.00)*** | (0.00)*** | (0.00)*** | (0.00)*** | | |
| war dummy | | 1.730 | 0.852 | 1.200 | 0.994 | 1.183 | 1.231 |
| | | (0.04)** | (0.30) | (0.18) | (0.24) | (0.18) | (0.18) |
| post-war dummy | | 0.797 | 1.071 | 0.415 | 0.544 | 0.600 | 0.472 |
| | | (0.51) | (0.28) | (0.72) | (0.59) | (0.60) | (0.68) |
| dependent variable: 1st lag | | | 0.236 | 0.163 | 0.173 | 0.160 | 0.163 |
| | | | (0.00)*** | (0.08)* | (0.05)** | (0.08)* | (0.08)* |
| lagged Dollar overvaluation index | | | | -0.002 | -0.002 | -0.002 | -0.001 |
| | | | | (0.28) | (0.10) | (0.20) | (0.31) |
| log of per capita income | | | 1.308 | | | 3.445 | 2.358 |
| | | | (0.27) | | | (0.13) | (0.30) |
| interaction term: 1st 5 post-war years & inflation | | | | | | 0.009 | 0.009 |
| | | | | | | (0.00)*** | (0.00)*** |
| interaction term: 2nd 5 post-war years & inflation | | | | | | 0.004 | 0.004 |
| | | | | | | (0.28) | (0.25) |
| lagged GDP growth | | | | -0.020 | -0.025 | | -0.023 |
| | | | | (0.63) | (0.56) | | (0.58) |
| lagged inflation % | | | | 0.000 | 0.000 | | 0.000 |
| | | | | (0.24) | (0.27) | | (0.25) |
| lagged investment % | | | | -0.133 | -0.083 | | -0.129 |
| | | | | (0.05)* | (0.04)** | | (0.05)* |
| GDP growth % | | | 0.001 | | | -0.004 | |
| | | | (0.98) | | | (0.92) | |
| Inflation % | | | 0.000 | | | 0.000 | |
| | | | (0.81) | | | (0.12) | |
| investment % GDP | | | -0.126 | | | -0.192 | |
| | | | (0.00)*** | | | (0.01)** | |
| aid % GNI | | | 0.039 | | | 0.046 | |
| | | | (0.67) | | | (0.56) | |
| lagged aid % GNI | | | | | -0.139 | | |
| | | | | | (0.47) | | |
| Lagged log of per capita income | | | | 2.609 | | | |
| | | | | (0.27) | | | |
| Dollar overvaluation index | | | -0.001 | | | | |
| | | | (0.24) | | | | |
| Observations | 1821 | 1821 | 1484 | 1556 | 1527 | 1542 | 1556 |
| Number of id | 72 | 72 | 62 | 63 | 62 | 62 | 63 |
| R-squared | 0.13 | 0.13 | 0.23 | 0.17 | 0.17 | 0.17 | 0.17 |

Robust p values in parentheses

* significant at 10%; ** significant at 5%; *** significant at 1%

Table 9: Cline 2SLS Results

| | | (1) | (2) | (3) | (4) | (5) |
|---|---|---|---|---|---|---|
| Inflation & post-war dummy interaction term | | 0.009 | 0.008 | 0.009 | | |
| | | (0.00)*** | (0.00)*** | (0.00)*** | | |
| war dummy | | 1.701 | 1.126 | 1.833 | 1.708 | 1.840 |
| | | (0.00)*** | (0.02)** | (0.00)*** | (0.00)*** | (0.00)*** |
| post-war dummy | | 1.957 | 0.963 | 1.879 | 1.985 | 1.892 |
| | | (0.06)* | (0.28) | (0.08)* | (0.07)* | (0.08)* |
| GDP growth % | | -0.026 | -0.032 | | -0.025 | |
| | | (0.52) | (0.38) | | (0.53) | |
| Inflation % | | 0.000 | 0.000 | | 0.000 | |
| | | (0.01)** | (0.10)* | | (0.01)** | |
| lagged Dollar overvaluation index | | 0.000 | -0.001 | 0.000 | 0.000 | 0.000 |
| | | (0.85) | (0.59) | (0.75) | (0.87) | (0.77) |
| investment %GDP | | -0.129 | -0.109 | | -0.127 | |
| | | (0.00)*** | (0.00)*** | | (0.00)*** | |
| aid %GNI | | -0.023 | -0.069 | 0.014 | -0.011 | 0.026 |
| | | (0.83) | (0.48) | (0.90) | (0.92) | (0.82) |
| lagged dependent variable | | | 0.331 | | | |
| | | | (0.00)*** | | | |
| interaction term: 1st 5 post-war years & inflation | | | | | 0.009 | 0.009 |
| | | | | | (0.00)*** | (0.00)*** |
| interaction term: 2nd 5 post-war years & inflation | | | | | 0.007 | 0.007 |
| | | | | | (0.04)** | (0.03)** |
| lagged GDP growth % | | | | -0.046 | | -0.047 |
| | | | | (0.31) | | (0.31) |
| lagged inflation % | | | | 0.001 | | 0.001 |
| | | | | (0.01)** | | (0.01)** |
| lagged investment % | | | | -0.094 | | -0.092 |
| | | | | (0.01)** | | (0.01)** |
| Observations | | 1519 | 1513 | 1503 | 1519 | 1503 |
| R-squared | | 0.15 | 0.22 | 0.15 | 0.15 | 0.15 |
| Davidson-Mackinnon | F-statistic | 1.81 (0.179) | 0.48 (0.491) | 2.23 (0.14) | 1.82 (0.177) | 0.29 (0.593) |

Robust p values in parentheses
* significant at 10%; ** significant at 5%; *** significant at 1%

Table 10: Arellano-Bond GMM Results

| | | Cline | World Bank | Morgan | Dooley |
|---|---|---|---|---|---|
| Inflation & post-war dummy interaction term | | 0.008 | 0.007 | 0.011 | 0.006 |
| | | (0.00)*** | (0.00)*** | (0.00)*** | (0.00)*** |
| war dummy | | 1.88 | -0.155 | 1.00 | 0.092 |
| | | (0.44) | (0.89) | (0.67) | (0.95) |
| post-war dummy | | 1.73 | -0.42 | 1.69 | -0.26 |
| | | (0.58) | (0.71) | (0.559) | (0.847) |
| GDP growth % | | 0.038 | 0.077 | 0.042 | 0.09 |
| | | (0.67) | (0.414) | (0.66) | (0.41) |
| Investment % GDP | | -0.256 | -0.237 | -0.227 | -0.38 |
| | | (0.00)*** | (0.01)*** | (0.01)** | (0.004)** |
| aid %GNI | | 0.065 | 0.118 | 0.13 | 0.21 |
| | | (0.75) | (0.59) | (0.58) | (0.32) |
| lagged dependent variable | | 0.117 | 0.048 | 0.045 | 0.049 |
| | | (0.14) | (0.36) | (0.50) | (0.17) |
| Inflation | | 0.00 | 0.00 | 0.00 | 0.003 |
| | | (0.89) | (0.17) | (0.67) | (0.10) |
| Test statistic for 2nd order autocorrelation | Z value | -0.41 | -0.44 | -0.50 | -0.72 |
| | p-value | 0.678 | 0.659 | 0.619 | 0.473 |

Robust p values in parentheses

* significant at 10%; ** significant at 5%; *** significant at 1%

## 6. CONCLUSION

I have studied the relationship between inflation and capital flight after war, an hitherto unresearched issue in the literature. I have generated consistent evidence in support of the hypothesis that inflation has an additional positive impact on capital flight flows after war. The evidence has proved robust to four measures of capital flight and several econometric estimation techniques. The evidence suggests that for a typical post-conflict economy, a one percentage point increase in inflation is associated with a 0.005 to 0.01 percentage point of GDP increase in capital flight flows. Relative to the average level of capital flight flows, and the high and sustained inflation rates that some post-conflict economies experience, the total effect could be substantial. The key implication is that low inflation helps to stem and reverse capital flight flows in post-conflict economies. This finding potentially raises a dilemma for post-conflict economies: Low inflation implies the loss of seigniorage revenues. With large financing needs the sacrifice could be poignant, if not unacceptable. The appropriate decision to adopt in such circumstances would depend on the circumstances of the economy such as macroeconomic conditions upon war termination. For high-inflation economies the benefits of reducing inflation could be substantial: Large reductions in capital flight would be realized. For all economies low inflation is generally propitious for economic activity. Thus the reduction in capital flight can be seen as an additional benefit of low inflation after war. The reduction might in turn induce domestic investment, generating tax revenues for the government and offsetting over time the loss of seigniorage revenues that low inflation entails.

## References

Arellano, M., and S. Bond , (1991) "Some Tests of Specification for Panel Data: Monte Carlo Evidence and an Application to Employment Equations" *Review of Economic Studies*, 58, April, 277-297.

Alvarez, J. and Arellano, M, (2003) "The Time Series and Cross-Section Asymptotics of Dynamic Panel Data Estimators", *Econometrica*, 71, 1121-1159.

Bekker, P.A. (1994) "Alternative Approximations to the Distributions of Instrumental Variable Estimators" *Econometrica*, 62, 657-681.

Blundell, R., and S. Bond (1998) "Initial Conditions and Moment Restrictions in Dynamic Panel Data Models", *Journal of Econometrics*, 87, August, 115-143.

Boyce J.K. (1992) "The Revolving Door? External Debt and Capital Flight: A Philippine Case Study" *World Development*, 20,3, 335-349.

Boyce J.K., (1993) "The Philippines: The Political Economy of Growth and Impoverishment in the Marcos Era", London: Macmillan.

Cardoso, E.A., and R. Dornbusch, (1989) "Foreign Capital Flows" in H. Chenery and Srinivasan T.N. *Handbook of Development Economics*, volume 2, 1416-1439, Amsterdam: Elsevier Science Publishers.

Chang, P.H.K., S. Claessens and E.C. Robert (1997) "Conceptual and Methodological Issues in the Measurement of Capital Flight", *International Journal of Financial Economics, 2*, 101-119.

Chenery, H. and M. Bruno, (1962) "Development Alternatives in an Open Economy: The Case of Israel" Economic Journal, 72, 79-103.

Chenery, H. and A. Strout, (1966) "Foreign Assistance and Economic Development", *American Economic Review*, 56, 4, 679-733.

Cline, W. R. (1995) *International Debt Re-examined*, Washington, D.C.: Institute for International Economics.

Collier, P., A. Hoeffler and C. Pattillo (2004) "Africa's Exodus: Capital Flight and the Brain Drain as Portfolio Decisions" *Journal of African Economies, 13,2, 15-54.*

----------(2001) "Flight Capital as a Portfolio Choice", *World Bank Economic Review*, 15, 1, 55-80.

Collier P., and J. W. Gunning, (1995) "War, Peace and Private Portfolios" *World Development*, 23,2, 233-241.

Cuddington, J., (1986) "Capital Flight: Estimates, Issues and Explanations", *Princeton Studies in International Finance*, no. 58.

Dollar, D. (1992) "Outward-oriented Developing Economies Really Do Grow More Rapidly: Evidence from 95 LDCs, 1976-1985", *Economic Development and Cultural Change*, 40,3, 523-544.

Dooley, M. (1986) "Country-Specific Risk Premiums, Capital Flight and Net Investment Income Payments in Selected Developing Countries" International Monetary Fund, unpublished.

Erbe, S. (1985) "The flight of Capital from Developing Countries" *Intereconomics*, 20: 268-275.

Gleditsch, N. P., P. Wallensteen, M. Eriksson, M. Sollenberg and H. Strand (2002) "Armed Conflict 1946-2001: A New Dataset" *Journal of Peace Research* 39,5, 615-637.
Hermes, N., and Lensink, R., (2000) "Capital Flight and the Uncertainty of Government Policies". Mimeo.

Khan, M. and Haque, N.U. (1985) "Foreign Borrowing and Capital Flight: A Formal Analysis" Staff Papers, International Monetary Fund, 32.

Lensink, R., N. Hermes and V. Murinde (2000) "Capital Flight and Political Risk" *Journal of International Money and Finance*, 19, 73-92.

Mikkelsen, J.G., (1991) "An Econometric Investigation of Capital Flight" Applied Economics 23.

Morgan Guaranty Trust Company (1986) "World Financial Markets", March and September.

Morimune, K. (1983) "Approximate Distributions of k-Class Estimators when the Degree of Overidentifiability is Large Compared with the Sample Size", *Econometrica*, 51, 821-841.

Ndikumana, L., and J.K. Boyce (2003) "Public Debts and Private Assets: Explaining Capital Flight from Sub-Saharan African Countries", *World Development*, 31,1, 107-130.

---------- (1998) Congo's Odius Debt: External Borrowing and Capital Flight in Zaire, *Development and Change* 29,2, 195-217.

Summers, R., and A. Heston (1988) "A New Set of International Comparisons of Real Product and Price Levels: Estimates for 130 Countries, 1950-1985" Review of Income and Wealth 34, 1-25.

Tavares, J., (2003) "Does Foreign Aid Corrupt?" *Economic Letters* 79, 99-106.

Vos (1992) "Private Foreign Asset Accumulation, not just Capital Flight: Evidence from the Philippines" *Journal of Development Studies*, 28,3, 500-537.

Woolridge, J.M., (2002) *Econometric Analysis of Cross Section and Panel Data*, Cambridge and London: The MIT Press.

World Bank (1985) *World Development Report* Washington DC: World Bank.

## Appendix 1a: Conflict Episodes

| Country | Type of war experienced: | | |
|---|---|---|---|
| | Interstate war | Civil war | Internationalised civil war |
| Algeria | | 1993- | |
| Argentina | | 1975-77 | |
| Bangladesh | 1991 | 1987-92 | |
| Burundi | | 1997- | |
| Chad | 1987 | 1989-90 | 1965-88, 1998-99 |
| Colombia | | 1980- | |
| Congo, Brazzaville | | | 1997-99 |
| Congo, DRC | | 1964-65, 1978 | 1997- |
| Egypt | 1967, 1969-70, 1973 | | 1967, 1969-70 |
| El Salvador | 1969 | 1981-91 | |
| Guatemala | | 1968-95 | |
| Honduras | 1969 | | |
| Indonesia | 1962-66, | -1961, 1975-89, 1992<br>1997-98 | |
| Iran | 1980-88 | 1966-68, 1979-88, 1990-93, 1996-97, 1999- | |
| Lao (PDR) | | 1989-90 | -1961, 1963-73 |
| Lebanon | | | 1976-90 |
| Libya | 1987 | | 1987 |
| Morocco | | 1980-89 | 1975-79 |
| Mozambique | | 1981-88, 1991-92 | 1989-90 |
| Nicaragua | | 1978-79, 1983-89 | |
| Nigeria | | 1967-70 | |
| Peru | | 1981-99 | |
| Philippines | 1969-75 | 1972- | |
| Rwanda | | 1991-94, 1998- | 1997- |
| Senegal | | 1999- | 1998-99 |
| Sierra Leone | | 1994-99 | 2000 |
| Somalia | | 1987-96 | |
| South Africa | | 1979-88 | 1975-76, 1987-88 |
| Sri Lanka | | 1971, 1985- | |
| Sudan | | 1963-72, 1983- | |
| Syria | 1967, 1973 | 1982 | 1979-82 |
| Thailand | 1966, 1974-75 | 1974-82 | |
| Tunisia | 1961 | | |
| Uganda | | 1981-91, 1994- | 1997- |
| Zimbabwe | | 1976-79 | |

## Appendix 1b: Non-conflict countries

Barbados, Benin, Bolivia, Botswana, Brazil, Burkina Faso, Cameroon, Central African Republic, Chile, Costa Rica, Côte d'Ivoire, Djibouti, Dominican Republic, Ecuador, Fiji, Gabon, Gambia, Ghana, Grenada, Guinea, Guyana, Haiti, Jamaica, Kenya, Lesotho, Republic of Korea, Madagascar, Malawi, Mali, Mauritius, Mexico, Nepal, Niger, Oman, Papua New Guinea, Paraguay, Swaziland, Tanzania, Uruguay, Venezuela, Zambia.

## Appendix 2: Definitions of variables and data sources

| Name of variable | Definition | Source |
|---|---|---|
| Aid | official development assistance (ODA) and official aid % of gross national income. | WDI 2006 |
| Cline capital flight measure | see text | IMF |
| Dollar real exchange rate overvaluation index | An index of real exchange rate distortion constructed by Dollar (1992) | GDN |
| Dooley capital flight measure | see text | IMF |
| GDP growth | % growth rate of real GDP | WDI 2006 |
| Inflation | inflation rate % | WDI 2006 |
| inflpwar | interaction term between inflation and the post-war variable | |
| investment | gross fixed capital formation % GDP | WDI 2006 |
| Morgan-Guarantee capita flight measure | see text | IMF |
| Per capita income | Per capita GDP | WDI 2006 |
| postwar | post-war dummy | Constructed using data from Gleditsch *et al* (2002) |
| War | War dummy | Constructed using data from Gleditsch *et al* (2002) |
| World Bank capital flight measure | see text | IMF |

## Appendix 3: Unit roots test

| Variable | ADF Fischer Chi-Squared Test statistic | PP Fischer Chi-Squared Test statistic |
|---|---|---|
| Aid %GNI | 311 (0.00)*** | 392 (0.00)*** |
| Cline capital flight % GDP | 617 (0.00)*** | 668 (0.00)*** |
| Dollar overvaluation index | 204 (0.00)*** | 323 (0.00)*** |
| Dooley capital flight %GDP | 881 (0.00)*** | 919 (0.00)*** |
| GDP growth | 884 (0.00)*** | 921 (0.00)*** |
| GDP per capita constant 2000 US$ | 176 (0.07)* | 156 (0.36) |
| Inflation % | 469 (0.00)*** | 479 (0.00)*** |
| Investment | 325 (0.00)*** | 270 (0.00)*** |
| Log of per capita GDP | 204 (0.00)*** | 191 (0.01)*** |
| Morgan capital flight %GDP | 718 (0.00)*** | 829 (0.00)*** |
| Per capita income | | |
| World Bank capital flight %GDP | 730 (0.00)*** | 800 (0.00)*** |

Notes: the null of both tests is unit roots.
p-values in parentheses.
* significant at 10%, ** significant at 5%, *** significant at 1%

## Appendix 4a: World Bank OLS Results

| | (1) | (2) | (3) | (4) | (5) | (6) | (7) |
|---|---|---|---|---|---|---|---|
| Inflation & post-war dummy interaction term | 0.009 | 0.009 | 0.006 | 0.007 | 0.007 | | |
| | (0.00)*** | (0.00)*** | (0.00)*** | (0.00)*** | (0.00)*** | | |
| war dummy | | 0.514 | 0.327 | 0.233 | 0.184 | 0.165 | 0.232 |
| | | (0.33) | (0.56) | (0.61) | (0.71) | (0.75) | (0.62) |
| post-war dummy | | 0.712 | 1.227 | 0.484 | 0.521 | 0.526 | 0.531 |
| | | (0.41) | (0.05)** | (0.58) | (0.52) | (0.56) | (0.55) |
| dependent variable: 1st lag | | | 0.261 | 0.158 | 0.166 | 0.158 | 0.158 |
| | | | (0.00)*** | (0.19) | (0.15) | (0.18) | (0.19) |
| lagged Dollar overvaluation index | | | | -0.001 | -0.000 | -0.001 | -0.001 |
| | | | | (0.45) | (0.55) | (0.26) | (0.44) |
| log of per capita income | | | 0.258 | | | 0.125 | -0.049 |
| | | | (0.38) | | | (0.67) | (0.77) |
| interaction term: 1st 5 post-war years & inflation | | | | | | 0.007 | 0.007 |
| | | | | | | (0.00)*** | (0.00)*** |
| interaction term: 2nd 5 post-war years & inflation | | | | | | 0.003 | 0.004 |
| | | | | | | (0.21) | (0.17) |
| lagged GDP growth | | | | -0.042 | -0.042 | | -0.042 |
| | | | | (0.26) | (0.28) | | (0.26) |
| lagged inflation % | | | | 0.001 | 0.001 | | 0.001 |
| | | | | (0.08)* | (0.09)* | | (0.08)* |
| lagged investment % | | | | 0.010 | -0.001 | | 0.010 |
| | | | | (0.74) | (0.97) | | (0.75) |
| GDP growth % | | | -0.026 | | | -0.015 | |
| | | | (0.42) | | | (0.65) | |
| Inflation | | | 0.000 | | | 0.001 | |
| | | | (0.19) | | | (0.18) | |
| Invest | | | -0.008 | | | -0.024 | |
| | | | (0.75) | | | (0.43) | |
| Aid | | | 0.068 | | | 0.027 | |
| | | | (0.34) | | | (0.70) | |
| lagged aid % GNI | | | | | -0.046 | | |
| | | | | | (0.60) | | |
| lagged log of per capita income | | | | -0.050 | | | |
| | | | | (0.76) | | | |
| Dollar overvaluation index | | | 0.001 | | | | |
| | | | (0.30) | | | | |
| observations | 1891 | 1891 | 1530 | 1603 | 1574 | 1590 | 1603 |
| R-squared | 0.10 | 0.10 | 0.21 | 0.15 | 0.15 | 0.14 | 0.15 |
| Wooldridge test for serial correlation F statistic: | 1.8 (0.18) | 2.0 (0.17) | 28 (0.00) | 17 (0.00) | 16 (0.00) | 19 (0.00) | 17 0.00 |

Robust p values in parentheses

* significant at 10%; ** significant at 5%; *** significant at 1%

## Appendix 4b: Morgan OLS Results

| | (1) | (2) | (3) | (4) | (5) | (6) | (7) |
|---|---|---|---|---|---|---|---|
| Inflation & post-war dummy interaction term | 0.009 | 0.009 | 0.005 | 0.007 | 0.007 | | |
| | (0.00)*** | (0.00)*** | (0.04)** | (0.01)** | (0.02)** | | |
| war dummy | | 0.422 | 0.152 | 0.100 | 0.093 | -0.001 | 0.095 |
| | | (0.31) | (0.77) | (0.82) | (0.84) | (1.00) | (0.83) |
| post-war dummy | | 0.656 | 1.212 | 0.403 | 0.461 | 0.440 | 0.447 |
| | | (0.45) | (0.07)* | (0.68) | (0.61) | (0.66) | (0.65) |
| dependent variable: 1st lag | | | 0.251 | 0.165 | 0.173 | 0.161 | 0.165 |
| | | | (0.00)*** | (0.12) | (0.09)* | (0.13) | (0.13) |
| lagged Dollar overvaluation index | | | | -0.003 | -0.001 | -0.002 | -0.003 |
| | | | | (0.64) | (0.78) | (0.79) | (0.63) |
| log of per capita income | | | 0.109 | | | -0.023 | -0.095 |
| | | | (0.73) | | | (0.94) | (0.58) |
| interaction term: 1st 5 post-war years & inflation | | | | | | 0.008 | 0.008 |
| | | | | | | (0.04)** | (0.01)** |
| interaction term: 2nd 5 post-war years & inflation | | | | | | 0.004 | 0.004 |
| | | | | | | (0.17) | (0.16) |
| lagged GDP growth | | | | -0.048 | -0.047 | | -0.048 |
| | | | | (0.21) | (0.24) | | (0.21) |
| lagged inflation % | | | | 0.000 | 0.000 | | 0.000 |
| | | | | (0.22) | (0.23) | | (0.24) |
| lagged investment % | | | | -0.003 | -0.015 | | -0.002 |
| | | | | (0.93) | (0.68) | | (0.94) |
| GDP growth % | | | -0.039 | | | -0.028 | |
| | | | (0.25) | | | (0.39) | |
| Inflation | | | 0.000 | | | 0.000 | |
| | | | (0.07)* | | | (0.05)** | |
| Invest | | | -0.012 | | | -0.032 | |
| | | | (0.66) | | | (0.34) | |
| aid % GNI | | | 0.044 | | | -0.000 | |
| | | | (0.54) | | | (1.00) | |
| lagged aid % GNI | | | | | -0.047 | | |
| | | | | | (0.60) | | |
| Lagged log of per capita income | | | | -0.093 | | | |
| | | | | (0.59) | | | |
| Dollar overvaluation index | | | 0.001 | | | | |
| | | | (0.37) | | | | |
| observations | 1862 | 1862 | 1498 | 1571 | 1542 | 1557 | 1571 |
| R-squared | 0.11 | 0.11 | 0.17 | 0.11 | 0.12 | 0.11 | 0.11 |
| Wooldridge test statistic for serial correlation (p-value) | 0.70 (0.41) | 0.80 (0.38) | 23 (0.00) | 30 (0.00) | 29 (0.00) | 31 (0.00) | 30 (0.00) |

Robust p values in parentheses

* significant at 10%; ** significant at 5%; *** significant at 1%

## Appendix 4c: Dooley OLS Results

| | (1) | (2) | (3) | (4) | (5) | (6) | (7) |
|---|---|---|---|---|---|---|---|
| Inflation & post-war dummy interaction term | 0.009 | 0.008 | 0.006 | 0.006 | 0.007 | | |
| | (0.00)*** | (0.00)*** | (0.00)*** | (0.00)*** | (0.00)*** | | |
| war dummy | | 0.697 | 0.447 | 0.433 | 0.367 | 0.340 | 0.428 |
| | | (0.25) | (0.48) | (0.44) | (0.53) | (0.57) | (0.45) |
| post-war dummy | | 0.379 | 1.347 | 0.484 | 0.551 | 0.576 | 0.489 |
| | | (0.70) | (0.07)* | (0.64) | (0.56) | (0.58) | (0.64) |
| Dependent variable: 1st lag | | | 0.209 | 0.145 | 0.153 | 0.149 | 0.145 |
| | | | (0.00)*** | (0.04)** | (0.03)** | (0.04)** | (0.04)** |
| lagged Dollar overvaluation index | | | | -0.001 | -0.000 | -0.001 | -0.001 |
| | | | | (0.52) | (0.64) | (0.28) | (0.51) |
| log of per capita income | | | 0.239 | | | 0.174 | -0.046 |
| | | | (0.51) | | | (0.63) | (0.86) |
| Interaction term: 1st 5 post-war years & inflation | | | | | | 0.006 | 0.006 |
| | | | | | | (0.00)*** | (0.00)*** |
| interaction term: 2nd 5 post-war years & inflation | | | | | | 0.005 | 0.006 |
| | | | | | | (0.09)* | (0.04)** |
| lagged GDP growth | | | | -0.082 | -0.086 | | -0.082 |
| | | | | (0.09)* | (0.08)* | | (0.09)* |
| lagged inflation % | | | | 0.001 | 0.001 | | 0.001 |
| | | | | (0.12) | (0.12) | | (0.12) |
| lagged investment % | | | | -0.025 | -0.035 | | -0.024 |
| | | | | (0.63) | (0.51) | | (0.65) |
| GDP growth % | | | -0.070 | | | -0.069 | |
| | | | (0.18) | | | (0.19) | |
| Inflation | | | 0.000 | | | 0.000 | |
| | | | (0.20) | | | (0.19) | |
| Invest | | | -0.051 | | | -0.075 | |
| | | | (0.32) | | | (0.17) | |
| Aid | | | 0.052 | | | 0.022 | |
| | | | (0.47) | | | (0.76) | |
| lagged aid % GNI | | | | | -0.063 | | |
| | | | | | (0.49) | | |
| lagged log of per capita income | | | | -0.028 | | | |
| | | | | (0.91) | | | |
| Dollar overvaluation index | | | 0.000 | | | | |
| | | | (0.60) | | | | |
| observations | 1852 | 1852 | 1502 | 1574 | 1545 | 1561 | 1574 |
| R-squared | 0.05 | 0.05 | 0.13 | 0.10 | 0.10 | 0.10 | 0.10 |
| Wooldridge test statistic for serial correlation (p-value) | 4.1 (0.05) | 4.2 (0.04) | 15 (0.00) | 12 (0.00) | 12 (0.00) | 13 (0.00) | 13 (0.00) |

Robust p values in parentheses
* significant at 10%; ** significant at 5%; *** significant at 1%

Appendix 5a: World Bank GLS Results

| | (1) | (2) | (3) | (4) | (5) |
|---|---|---|---|---|---|
| Inflation & post-war dummy interaction term | 0.005 | 0.009 | 0.009 | | |
| | (0.00)*** | (0.00)*** | (0.00)*** | | |
| war dummy | 0.137 | 0.565 | 0.564 | 0.326 | 0.568 |
| | (0.76) | (0.32) | (0.32) | (0.57) | (0.32) |
| post-war dummy | 1.115 | 0.286 | 0.524 | 0.267 | 0.384 |
| | (0.03)** | (0.63) | (0.38) | (0.67) | (0.53) |
| GDP growth % | 0.002 | | | 0.009 | |
| | (0.96) | | | (0.80) | |
| Inflation % | 0.000 | | | 0.001 | |
| | (0.05)** | | | (0.02)** | |
| Dollar overvaluation index | 0.000 | | | | |
| | (0.91) | | | | |
| investment % GDP | -0.030 | | | -0.074 | |
| | (0.23) | | | (0.02)** | |
| aid %GNI | 0.025 | | | -0.013 | |
| | (0.23) | | | (0.61) | |
| Lagged dependent variable | 0.293 | 0.050 | 0.054 | 0.044 | 0.050 |
| | (0.00)*** | (0.07)* | (0.05)* | (0.12) | (0.07)* |
| log of per capita income | 0.121 | | | 0.050 | 0.090 |
| | (0.53) | | | (0.83) | (0.64) |
| lagged GDP growth % | | -0.028 | -0.030 | | -0.028 |
| | | (0.43) | (0.40) | | (0.42) |
| lagged inflation % | | 0.001 | 0.001 | | 0.001 |
| | | (0.00)*** | (0.00)*** | | (0.00)*** |
| lagged Dollar overvaluation index | | 0.002 | 0.002 | 0.002 | 0.002 |
| | | (0.13) | (0.09)* | (0.16) | (0.13) |
| lagged investment % | | -0.019 | -0.023 | | -0.020 |
| | | (0.53) | (0.41) | | (0.51) |
| Lagged log of per capita income | | 0.075 | | | |
| | | (0.69) | | | |
| interaction term: 1st 5 post-war years & inflation | | | | 0.010 | 0.009 |
| | | | | (0.00)*** | (0.00)*** |
| interaction term: 2nd 5 post-war years & inflation | | | | 0.004 | 0.003 |
| | | | | (0.61) | (0.63) |
| lagged aid % GNI | | | -0.058 | | |
| | | | (0.00)*** | | |
| observations | 1530 | 1603 | 1574 | 1590 | 1603 |
| Number of id | 63 | 64 | 63 | 63 | 64 |

p values in parentheses

* significant at 10%; ** significant at 5%; *** significant at 1%

## Appendix 5b: Morgan GLS Results

| | (1) | (2) | (3) | (4) | (5) | (6) | (7) |
|---|---|---|---|---|---|---|---|
| Inflation & post-war dummy interaction term | 0.009 | 0.009 | 0.008 | 0.006 | 0.006 | | |
| | (0.00)*** | (0.00)*** | (0.00)*** | (0.02)** | (0.01)** | | |
| war dummy | | 0.894 | -0.116 | 0.325 | 0.388 | 0.199 | 0.316 |
| | | (0.16) | (0.80) | (0.58) | (0.50) | (0.74) | (0.59) |
| post-war dummy | | -0.049 | 1.154 | 0.568 | 0.812 | 0.624 | 0.612 |
| | | (0.94) | (0.03)** | (0.36) | (0.19) | (0.34) | (0.33) |
| lagged dependent variable | | | 0.270 | 0.078 | 0.080 | 0.064 | 0.076 |
| | | | (0.00)*** | (0.01)*** | (0.00)*** | (0.02)** | (0.01)*** |
| lagged Dollar overvaluation index | | | | -0.003 | -0.001 | -0.001 | -0.003 |
| | | | | (0.45) | (0.84) | (0.72) | (0.42) |
| log of per capita income | | | -0.151 | | | -0.120 | -0.019 |
| | | | (0.44) | | | (0.62) | (0.92) |
| interaction term: 1st 5 post-war years & inflation | | | | | | 0.008 | 0.006 |
| | | | | | | (0.00)*** | (0.02)** |
| interaction term: 2nd 5 post-war years & inflation | | | | | | 0.003 | 0.003 |
| | | | | | | (0.69) | (0.71) |
| lagged GDP growth | | | | -0.023 | -0.022 | | -0.023 |
| | | | | (0.53) | (0.55) | | (0.53) |
| lagged inflation % | | | | 0.000 | 0.000 | | 0.000 |
| | | | | (0.13) | (0.12) | | (0.13) |
| lagged investment % | | | | -0.033 | -0.043 | | -0.034 |
| | | | | (0.28) | (0.14) | | (0.28) |
| GDP growth % | | | -0.003 | | | 0.008 | |
| | | | (0.93) | | | (0.84) | |
| Inflation % | | | 0.000 | | | 0.000 | |
| | | | (0.56) | | | (0.69) | |
| investment % | | | -0.032 | | | -0.090 | |
| | | | (0.21) | | | (0.01)*** | |
| aid %GNI | | | -0.009 | | | -0.035 | |
| | | | (0.67) | | | (0.17) | |
| lagged aid %GNI | | | | | -0.059 | | |
| | | | | | (0.00)*** | | |
| lagged log of per capita income | | | | -0.025 | | | |
| | | | | (0.90) | | | |
| Dollar overvaluation index | | | 0.000 | | | | |
| | | | (0.91) | | | | |
| observations | 1862 | 1862 | 1498 | 1571 | 1542 | 1557 | 1571 |
| Number of id | 74 | 74 | 63 | 64 | 63 | 63 | 64 |

p values in parentheses

* significant at 10%; ** significant at 5%; *** significant at 1%

## Appendix 5c: Dooley GLS Results

| | (1) | (2) | (3) | (4) | (5) | (6) | (7) |
|---|---|---|---|---|---|---|---|
| Inflation & post-war dummy interaction term | 0.008 | 0.008 | 0.005 | 0.008 | 0.008 | | |
| | (0.00)*** | (0.00)*** | (0.00)*** | (0.00)*** | (0.00)*** | | |
| war dummy | | 1.130 | 0.140 | 0.627 | 0.633 | 0.408 | 0.625 |
| | | (0.16) | (0.82) | (0.36) | (0.35) | (0.55) | (0.36) |
| post-war dummy | | -0.248 | 1.242 | 0.426 | 0.745 | 0.421 | 0.456 |
| | | (0.77) | (0.06)* | (0.56) | (0.31) | (0.58) | (0.54) |
| lagged dependent variable | | | 0.224 | 0.101 | 0.109 | 0.096 | 0.101 |
| | | | (0.00)*** | (0.00)*** | (0.00)*** | (0.00)*** | (0.00)*** |
| lagged Dollar overvaluation index | | | | 0.001 | 0.002 | 0.001 | 0.001 |
| | | | | (0.38) | (0.32) | (0.37) | (0.38) |
| log of per capita income | | | 0.114 | | | 0.114 | 0.073 |
| | | | (0.65) | | | (0.69) | (0.75) |
| interaction term: 1st 5 post-war years & inflation | | | | | | 0.008 | 0.008 |
| | | | | | | (0.00)*** | (0.00)*** |
| interaction term: 2nd 5 post-war years & inflation | | | | | | 0.005 | 0.006 |
| | | | | | | (0.58) | (0.56) |
| lagged GDP growth | | | | -0.066 | -0.074 | | -0.067 |
| | | | | (0.15) | (0.11) | | (0.14) |
| lagged inflation % | | | | 0.001 | 0.001 | | 0.001 |
| | | | | (0.02)** | (0.02)** | | (0.02)** |
| lagged investment % | | | | -0.033 | -0.033 | | -0.032 |
| | | | | (0.37) | (0.34) | | (0.38) |
| GDP growth % | | | -0.017 | | | -0.028 | |
| | | | (0.69) | | | (0.56) | |
| Inflation % | | | 0.000 | | | 0.000 | |
| | | | (0.30) | | | (0.16) | |
| investment %GDP | | | -0.057 | | | -0.097 | |
| | | | (0.09)* | | | (0.01)*** | |
| aid %GNI | | | 0.008 | | | -0.011 | |
| | | | (0.76) | | | (0.73) | |
| lagged aid %GNI | | | | | -0.070 | | |
| | | | | | (0.00)*** | | |
| Lagged log of per capita income | | | | 0.082 | | | |
| | | | | (0.72) | | | |
| Dollar overvaluation index | | | 0.000 | | | | |
| | | | (0.97) | | | | |
| observations | 1852 | 1852 | 1502 | 1574 | 1545 | 1561 | 1574 |
| Number of id | 72 | 72 | 62 | 63 | 62 | 62 | 63 |

p values in parentheses

* significant at 10%; ** significant at 5%; *** significant at 1%

## Appendix 6a: World Bank Within-Group Results

| | (1) | (2) | (3) | (4) | (5) | (6) | (7) |
|---|---|---|---|---|---|---|---|
| Inflation & post-war dummy interaction term | 0.009 | 0.009 | 0.006 | 0.008 | 0.008 | | |
| | (0.00)*** | (0.00)*** | (0.00)*** | (0.00)*** | (0.00)*** | | |
| war dummy | | -0.224 | -0.445 | -0.446 | -0.680 | -0.583 | -0.408 |
| | | (0.76) | (0.51) | (0.52) | (0.32) | (0.40) | (0.56) |
| post-war dummy | | -1.288 | -0.224 | -0.930 | -0.872 | -1.073 | -0.923 |
| | | (0.21) | (0.76) | (0.36) | (0.29) | (0.29) | (0.37) |
| dependent variable: 1st lag | | | 0.131 | 0.034 | 0.048 | 0.034 | 0.033 |
| | | | (0.04)** | (0.78) | (0.67) | (0.77) | (0.79) |
| lagged Dollar overvaluation index | | | | -0.001 | -0.002 | -0.002 | -0.001 |
| | | | | (0.24) | (0.09)* | (0.21) | (0.28) |
| log of per capita income | | | 2.280 | | | 3.998 | 2.978 |
| | | | (0.03)** | | | (0.06)* | (0.19) |
| interaction term: 1st 5 post-war years & inflation | | | | | | 0.008 | 0.008 |
| | | | | | | (0.00)*** | (0.00)*** |
| interaction term: 2nd 5 post-war years & inflation | | | | | | 0.006 | 0.006 |
| | | | | | | (0.05)** | (0.04)** |
| lagged GDP growth | | | | -0.038 | -0.041 | | -0.043 |
| | | | | (0.32) | (0.32) | | (0.28) |
| lagged inflation % | | | | 0.001 | 0.001 | | 0.001 |
| | | | | (0.10) | (0.12) | | (0.11) |
| lagged investment % | | | | -0.102 | -0.050 | | -0.100 |
| | | | | (0.12) | (0.20) | | (0.12) |
| GDP growth % | | | -0.001 | | | 0.006 | |
| | | | (0.97) | | | (0.86) | |
| inflation % | | | 0.000 | | | 0.001 | |
| | | | (0.34) | | | (0.21) | |
| investment % GDP | | | -0.107 | | | -0.158 | |
| | | | (0.00)*** | | | (0.02)** | |
| aid % GNI | | | 0.129 | | | 0.114 | |
| | | | (0.15) | | | (0.16) | |
| lagged aid % GNI | | | | | -0.110 | | |
| | | | | | (0.55) | | |
| lagged log of per capita income | | | | 3.079 | | | |
| | | | | (0.18) | | | |
| Dollar overvaluation index | | | -0.001 | | | | |
| | | | (0.16) | | | | |
| observations | 1891 | 1891 | 1530 | 1603 | 1574 | 1590 | 1603 |
| Number of id | 74 | 74 | 63 | 64 | 63 | 63 | 64 |
| R-squared | 0.10 | 0.10 | 0.17 | 0.13 | 0.13 | 0.13 | 0.13 |

Robust p values in parentheses

* significant at 10%; ** significant at 5%; *** significant at 1%

## Appendix 6b: Morgan Within-Group Results

| | (1) | (2) | (3) | (4) | (5) | (6) | (7) |
|---|---|---|---|---|---|---|---|
| Inflation & post-war dummy interaction term | 0.009 | 0.009 | 0.004 | 0.005 | 0.005 | | |
| | (0.00)*** | (0.00)*** | (0.21) | (0.04)** | (0.07)* | | |
| war dummy | | 0.733 | 0.287 | 0.271 | 0.107 | 0.299 | 0.282 |
| | | (0.36) | (0.72) | (0.73) | (0.89) | (0.71) | (0.72) |
| post-war dummy | | 0.336 | 0.908 | 0.931 | 0.652 | 0.950 | 0.952 |
| | | (0.77) | (0.36) | (0.36) | (0.49) | (0.34) | (0.35) |
| Dollar overvaluation index | | | -0.001 | -0.001 | -0.001 | -0.001 | -0.001 |
| | | | (0.23) | (0.17) | (0.18) | (0.23) | (0.17) |
| dependent variable: 1st lag | | | 0.148 | 0.151 | 0.154 | 0.146 | 0.151 |
| | | | (0.02)** | (0.01)** | (0.01)** | (0.01)** | (0.01)** |
| log of per capita income | | | 2.541 | | | 2.577 | 1.190 |
| | | | (0.02)** | | | (0.02)** | (0.37) |
| interaction term: 1st 5 post-war years & inflation | | | | | | 0.005 | 0.006 |
| | | | | | | (0.21) | (0.04)** |
| interaction term: 2nd 5 post-war years & inflation | | | | | | 0.003 | 0.003 |
| | | | | | | (0.41) | (0.38) |
| lagged GDP growth | | | | -0.028 | -0.022 | | -0.029 |
| | | | | (0.42) | (0.56) | | (0.40) |
| lagged inflation % | | | | 0.000 | 0.000 | | 0.000 |
| | | | | (0.40) | (0.50) | | (0.41) |
| lagged investment % | | | | -0.058 | -0.044 | | -0.056 |
| | | | | (0.17) | (0.21) | | (0.17) |
| GDP growth % | | | -0.008 | | | -0.008 | |
| | | | (0.82) | | | (0.81) | |
| Inflation % | | | 0.000 | | | 0.000 | |
| | | | (0.14) | | | (0.15) | |
| investment % | | | -0.114 | | | -0.114 | |
| | | | (0.00)*** | | | (0.00)*** | |
| aid %GNI | | | 0.105 | | | 0.104 | |
| | | | (0.30) | | | (0.29) | |
| lagged aid % GNI | | | | | 0.063 | | |
| | | | | | (0.49) | | |
| lagged log of per capita income | | | | 1.338 | | | |
| | | | | (0.33) | | | |
| observations | 1862 | 1862 | 1498 | 1511 | 1483 | 1498 | 1511 |
| Number of id | 74 | 74 | 63 | 64 | 63 | 63 | 64 |
| R-squared | 0.11 | 0.11 | 0.14 | 0.14 | 0.14 | 0.14 | 0.14 |

Robust p values in parentheses

* significant at 10%; ** significant at 5%; *** significant at 1%

## Appendix 6c: Dooley Within-Group Results

| | (1) | (2) | (3) | (4) | (5) | (6) | (7) |
|---|---|---|---|---|---|---|---|
| Inflation & post-war dummy interaction term | 0.008 | 0.008 | 0.005 | 0.007 | 0.007 | | |
| | (0.00)*** | (0.00)*** | (0.00)*** | (0.00)*** | (0.00)*** | | |
| war dummy | | -0.249 | -0.708 | -0.243 | -0.524 | -0.437 | -0.272 |
| | | (0.77) | (0.39) | (0.78) | (0.53) | (0.60) | (0.75) |
| post-war dummy | | -2.000 | -0.609 | -1.201 | -1.058 | -1.336 | -1.319 |
| | | (0.09)* | (0.49) | (0.29) | (0.27) | (0.24) | (0.25) |
| dependent variable: 1st lag | | | 0.123 | 0.068 | 0.080 | 0.068 | 0.068 |
| | | | (0.01)*** | (0.32) | (0.22) | (0.32) | (0.33) |
| lagged Dollar overvaluation index | | | | -0.002 | -0.002 | -0.002 | -0.002 |
| | | | | (0.19) | (0.05)* | (0.15) | (0.23) |
| log of per capita income | | | 2.783 | | | 4.989 | 3.280 |
| | | | (0.04)** | | | (0.03)** | (0.17) |
| interaction term: 1st 5 post-war years & inflation | | | | | | 0.007 | 0.007 |
| | | | | | | (0.00)*** | (0.00)*** |
| interaction term: 2nd 5 post-war years & inflation | | | | | | 0.009 | 0.010 |
| | | | | | | (0.00)*** | (0.00)*** |
| lagged GDP growth | | | | -0.076 | -0.084 | | -0.081 |
| | | | | (0.13) | (0.11) | | (0.11) |
| lagged inflation % | | | | 0.001 | 0.001 | | 0.001 |
| | | | | (0.13) | (0.16) | | (0.14) |
| lagged investment % | | | | -0.117 | -0.047 | | -0.110 |
| | | | | (0.19) | (0.51) | | (0.20) |
| GDP growth % | | | -0.037 | | | -0.043 | |
| | | | (0.49) | | | (0.42) | |
| inflation % | | | 0.000 | | | 0.001 | |
| | | | (0.36) | | | (0.19) | |
| investment % GDP | | | -0.153 | | | -0.215 | |
| | | | (0.02)** | | | (0.02)** | |
| aid %GNI | | | 0.109 | | | 0.120 | |
| | | | (0.25) | | | (0.15) | |
| lagged aid %GNI | | | | | -0.161 | | |
| | | | | | (0.41) | | |
| lagged log of per capita income | | | | 3.759 | | | |
| | | | | (0.12) | | | |
| Dollar overvaluation index | | | -0.002 | | | | |
| | | | (0.11) | | | | |
| Observations | 1852 | 1852 | 1502 | 1574 | 1545 | 1561 | 1574 |
| Number of id | 72 | 72 | 62 | 63 | 62 | 62 | 63 |
| R-squared | 0.05 | 0.06 | 0.10 | 0.08 | 0.09 | 0.09 | 0.08 |

Robust p values in parentheses

* significant at 10%; ** significant at 5%; *** significant at 1%

Appendix 7a: World Bank 2SLS Results

| | (1) | (2) | (3) | (4) | (5) |
|---|---|---|---|---|---|
| Inflation & post-war dummy interaction term | 0.009 | 0.007 | 0.008 | | |
| | (0.00)*** | (0.00)*** | (0.00)*** | | |
| war dummy | 0.078 | 0.080 | 0.184 | 0.076 | 0.183 |
| | (0.87) | (0.87) | (0.69) | (0.87) | (0.69) |
| post-war dummy | 0.809 | 0.516 | 0.790 | 0.889 | 0.855 |
| | (0.45) | (0.58) | (0.46) | (0.42) | (0.44) |
| GDP growth % | -0.016 | -0.023 | | -0.017 | |
| | (0.65) | (0.50) | | (0.64) | |
| Inflation % | 0.001 | 0.000 | | 0.001 | |
| | (0.20) | (0.23) | | (0.20) | |
| lagged Dollar overvaluation index | -0.000 | -0.001 | -0.000 | -0.000 | -0.000 |
| | (0.76) | (0.53) | (0.97) | (0.73) | (0.95) |
| investment %GDP | -0.029 | -0.033 | | -0.029 | |
| | (0.35) | (0.26) | | (0.35) | |
| aid %GNI | -0.064 | -0.073 | -0.023 | -0.061 | -0.021 |
| | (0.54) | (0.47) | (0.83) | (0.56) | (0.85) |
| lagged dependent variable | | 0.164 | | | |
| | | (0.19) | | | |
| Interaction term: 1st 5 post-war years & inflation | | | | 0.009 | 0.008 |
| | | | | (0.00)*** | (0.00)*** |
| Interaction term: 2nd 5 post-war years & inflation | | | | 0.003 | 0.004 |
| | | | | (0.27) | (0.23) |
| lagged GDP growth | | | -0.045 | | -0.045 |
| | | | (0.26) | | (0.26) |
| lagged inflation % | | | 0.001 | | 0.001 |
| | | | (0.06)* | | (0.07)* |
| lagged investment % | | | 0.002 | | 0.002 |
| | | | (0.96) | | (0.95) |
| observations | 1565 | 1561 | 1549 | 1565 | 1549 |
| R-squared | 0.11 | 0.13 | 0.13 | 0.11 | 0.13 |
| Davidson-Mackinnon test F statistic | 0.10 (0.76) | 0.04 (0.83) | 0.17 (0.68) | 0.10 (0.75) | 0.63 (0.43 |

Robust p values in parentheses

* significant at 10%; ** significant at 5%; *** significant at 1%

## Appendix 7b: Morgan 2SLS Results

| | (1) | (2) | (3) | (4) | (5) |
|---|---|---|---|---|---|
| Inflation & post-war dummy interaction term | 0.009 | 0.008 | 0.008 | | |
| | (0.00)*** | (0.00)*** | (0.00)*** | | |
| war dummy | 0.082 | 0.016 | 0.180 | 0.079 | 0.178 |
| | (0.85) | (0.97) | (0.68) | (0.86) | (0.69) |
| post-war dummy | 0.682 | 0.402 | 0.648 | 0.743 | 0.694 |
| | (0.53) | (0.69) | (0.56) | (0.51) | (0.54) |
| GDP growth % | -0.025 | -0.026 | | -0.025 | |
| | (0.47) | (0.43) | | (0.47) | |
| Inflation % | 0.000 | 0.000 | | 0.000 | |
| | (0.04)** | (0.11) | | (0.04)** | |
| lagged Dollar overvaluation index | 0.000 | -0.002 | -0.001 | 0.000 | -0.001 |
| | (0.96) | (0.84) | (0.88) | (0.98) | (0.86) |
| investment %GDP | -0.033 | -0.035 | | -0.032 | |
| | (0.30) | (0.25) | | (0.31) | |
| aid %GNI | 0.006 | 0.001 | 0.055 | 0.011 | 0.060 |
| | (0.96) | (1.00) | (0.68) | (0.93) | (0.65) |
| lagged dependent variable | | 0.162 | | | |
| | | (0.14) | | | |
| interaction term: 1st 5 post-war years & inflation | | | | 0.009 | 0.008 |
| | | | | (0.00)*** | (0.00)*** |
| interaction term: 2nd 5 post-war years & inflation | | | | 0.004 | 0.005 |
| | | | | (0.14) | (0.11) |
| lagged GDP growth % | | | -0.057 | | -0.058 |
| | | | (0.16) | | (0.16) |
| lagged inflation % | | | 0.000 | | 0.000 |
| | | | (0.11) | | (0.11) |
| lagged investment % | | | 0.003 | | 0.004 |
| | | | (0.92) | | (0.90) |
| observations | 1536 | 1528 | 1520 | 1536 | 1520 |
| R-squared | 0.12 | 0.11 | 0.12 | 0.12 | 0.12 |
| Davidson-Mackinnon test<br>F statistic | 0.41<br>0.521 | 0.00<br>0.97 | 0.56<br>0.454 | 0.42<br>0.518 | 0.002<br>0.880 |

Robust p values in parentheses
* significant at 10%; ** significant at 5%; *** significant at 1%

Appendix 7c: Dooley 2SLS Results

| | (1) | (2) | (3) | (4) | (5) |
|---|---|---|---|---|---|
| Inflation & post-war dummy interaction term | 0.009 | 0.008 | 0.008 | | |
| | (0.00)*** | (0.00)*** | (0.00)*** | | |
| war dummy | 0.243 | 0.173 | 0.432 | 0.237 | 0.429 |
| | (0.67) | (0.77) | (0.45) | (0.68) | (0.45) |
| post-war dummy | 0.869 | 0.656 | 0.760 | 0.957 | 0.816 |
| | (0.45) | (0.54) | (0.50) | (0.42) | (0.49) |
| GDP growth % | -0.089 | -0.090 | | -0.090 | |
| | (0.13) | (0.12) | | (0.13) | |
| Inflation | 0.000 | 0.000 | | 0.000 | |
| | (0.30) | (0.33) | | (0.30) | |
| lagged Dollar overvaluation index | -0.000 | -0.000 | 0.000 | -0.000 | 0.000 |
| | (0.98) | (0.74) | (0.83) | (0.97) | (0.83) |
| investment %GDP | -0.109 | -0.099 | | -0.109 | |
| | (0.05)** | (0.06)* | | (0.05)** | |
| aid %GNI | -0.195 | -0.184 | -0.138 | -0.197 | -0.139 |
| | (0.16) | (0.16) | (0.35) | (0.16) | (0.34) |
| lagged dependent variable | | 0.155 | | | |
| | | (0.04)** | | | |
| interaction term: 1st 5 post-war years & inflation | | | | 0.009 | 0.008 |
| | | | | (0.00)*** | (0.00)*** |
| interaction term: 2nd 5 post-war years & inflation | | | | 0.003 | 0.005 |
| | | | | (0.32) | (0.17) |
| lagged GDP growth % | | | -0.093 | | -0.093 |
| | | | (0.07)* | | (0.07)* |
| lagged inflation % | | | 0.001 | | 0.001 |
| | | | (0.10) | | (0.10) |
| lagged investment % | | | -0.060 | | -0.061 |
| | | | (0.31) | | (0.31) |
| observations | 1536 | 1532 | 1520 | 1536 | 1520 |
| R-squared | 0.05 | 0.07 | 0.07 | 0.05 | 0.07 |
| Davidson-Mackinnon test<br>F statistic | 6.88<br>(0.009)*** | 7.12<br>(0.008)*** | 6.65<br>(0.01)*** | 6.87<br>(0.009)*** | 0.04<br>0.84 |

Robust p values in parentheses

* significant at 10%; ** significant at 5%; *** significant at 1%

## Appendix 8: First-Stage Regression Results of Two-Stage Least Squares Estimation

| | (1) | (2) | (3) | (4) | (5) |
|---|---|---|---|---|---|
| inflation & post-war dummy interaction term | 0.006 | 0.006 | 0.006 | | |
| | (0.04)** | (0.03)** | (0.04)** | | |
| war dummy | 0.046 | -0.037 | 0.090 | 0.052 | 0.101 |
| | (0.95) | (0.96) | (0.90) | (0.94) | (0.89) |
| post-war dummy | 1.291 | 0.992 | 1.173 | 1.596 | 1.457 |
| | (0.15) | (0.27) | (0.19) | (0.09)* | (0.11) |
| GDP growth % | -0.099 | -0.105 | | -0.103 | |
| | (0.35) | (0.33) | | (0.34) | |
| inflation % | -0.000 | -0.000 | | -0.000 | |
| | (0.12) | (0.12) | | (0.12) | |
| lagged Dollar overvaluation index | 0.003 | 0.002 | 0.002 | 0.002 | 0.002 |
| | (0.07)* | (0.08)* | (0.14) | (0.07)* | (0.14) |
| investment %GDP | -0.101 | -0.093 | | -0.100 | |
| | (0.00)*** | (0.00)*** | | (0.00)*** | |
| Interaction terms with donor aid to GNI ratio % | | | | | |
| French language dummy | 2.118 | 2.093 | 2.018 | 2.087 | 1.990 |
| | (0.00)*** | (0.00)*** | (0.00)*** | (0.00)*** | (0.00)*** |
| French religion dummy | 2.2 | 1.8 | 2.1 | 2.3 | 2.2 |
| | (0.00)*** | (0.02)** | (0.00)*** | (0.00)*** | (0.00)*** |
| Inverse of distance from France | 8,302 | 7,146 | 8,616 | 7,899 | 8,222 |
| | (0.01)** | (0.05)** | (0.01)** | (0.02)** | (0.02)** |
| UK language dummy | -0.174 | -0.188 | -0.525 | -0.161 | -0.518 |
| | (0.78) | (0.77) | (0.44) | (0.79) | (0.44) |
| UK religion dummy | -0.249 | -0.040 | 0.130 | -0.246 | 0.139 |
| | (0.79) | (0.97) | (0.89) | (0.80) | (0.88) |
| Inverse of distance from UK | -137 | -804 | 227 | 134 | 485 |
| | (0.94) | (0.64) | (0.89) | (0.94) | (0.77) |
| US language dummy | 3.850 | 5.013 | 4.693 | 3.824 | 4.678 |
| | (0.04)** | (0.01)** | (0.03)** | (0.04)** | (0.03)** |
| US religion dummy | 5.154 | 3.825 | 3.951 | 5.175 | 3.959 |
| | (0.08)* | (0.20) | (0.18) | (0.07)* | (0.18) |
| Inverse of distance from US | -10,957 | -6,234 | -9,994 | -11,265 | -10,279 |
| | (0.00)*** | (0.12) | (0.00)*** | (0.00)*** | (0.00)*** |
| Inverse of distance from Japan | -8,583 | -11,766 | -7,742 | -9,345 | -8,493 |
| | (0.10)* | (0.03)** | (0.13) | (0.07)* | (0.09)* |
| German religion dummy | -3.183 | -3.505 | -2.916 | -3.221 | -2.949 |
| | (0.00)*** | (0.00)*** | (0.01)*** | (0.00)*** | (0.01)*** |
| inverse of distance from Germany | -11,249 | -10,756 | -10,941 | -11,295 | -10,972 |
| | (0.02)** | (0.04)** | (0.03)** | (0.02)** | (0.03)** |
| Lagged aid | | 0.077 | | | |
| | | (0.26) | | | |
| interaction term: 1st 5 post-war years & inflation | | | | 0.006 | 0.006 |
| | | | | (0.04)** | (0.04)** |
| interaction term: 2nd 5 post-war years & inflation | | | | -0.013 | -0.013 |
| | | | | (0.00)*** | (0.00)*** |
| lagged GDP growth % | | | 0.009 | | 0.008 |
| | | | (0.86) | | (0.87) |
| lagged inflation % | | | 0.000 | | 0.000 |
| | | | (0.51) | | (0.51) |
| lagged investment % | | | -0.155 | | -0.154 |
| | | | (0.00)*** | | (0.00)*** |
| observations | 1568 | 1514 | 1551 | 1568 | 1551 |
| R-squared | 0.13 | 0.14 | 0.14 | 0.14 | 0.14 |
| F statistic | 9.25<br>0.000 | 975<br>(0.00) | 9.88<br>(0.00) | 9.35<br>(0.00) | 9.93<br>(0.00) |

Robust p values in parentheses
* significant at 10%; ** significant at 5%; *** significant at 1%