Africa's Exodus: Capital Flight and the Brain Drain as Portfolio Decisions

Paul Collier,[*] Anke Hoeffler[**] and Catherine Pattillo[***]

This draft: 16th December 2003

[*] World Bank. The findings, interpretations, and conclusions expressed in this paper are entirely those of the author. They do not necessarily represent the views of the World Bank, its Executive Directors, or the countries they represent.

[**] Centre for the Study of African Economies.

[***] International Monetary Fund.

1. Introduction

Over the past three decades Africa has hemorrhaged private wealth, partly through the flight of financial capital and partly through the emigration of educated people. In this paper we analyze this exodus within an integrating framework of portfolio decisions taken by families. Families can decide both what proportion of their financial wealth, and what proportion of their educated members, to send abroad. We recognize that neither of these decisions is easy to implement. Moving wealth abroad is usually circumscribed by controls imposed by the country of origin. Further, most private wealth is in physical assets that cannot be shifted abroad. Moving people abroad is usually circumscribed by controls imposed by the country of destination. In the short run such impediments curtail the scope for choosing how portfolios of financial and human capital are held. However, the incentives to move assets out of environments with relatively low and risky returns is so strong that we might expect asset-holding families to find ways of responding to them. The impediments may impose long and variable delays on portfolio adjustment rather than prevent it altogether. In turn, such long delays may obscure the full consequences of policies that affect portfolio choices.

In previous work (Collier, Hoeffler and Pattillo, 2001) we introduced the idea of analyzing capital flight as a portfolio choice. We estimated the stock of capital flight as of 1990 for 42 countries and related this to an estimate of domestically held private net wealth for those countries in 1990. Thus, for example, we found that on average for the African countries in our sample, around 38 percent of private wealth was held abroad, this being a higher percentage than for any other region. We then used a cross-section econometric approach to explain the choice of the proportion of private wealth that was held abroad. In this paper we extend that analysis in two ways. First, we update and expand the data: we have annual data for the period 1970-98 for 48 countries. This permits us to analyze dynamics instead of relying upon cross-section relationships. This is potentially important: because portfolio adjustment can be expected to be very gradual, cross-section observations cannot be assumed to be snapshots of equilibria. On the contrary, many countries will be far from their long run equilibrium. An explicitly dynamic analysis has the potential to illuminate the adjustment process and so provide a better guide as to how policy changes play out over time. Secondly, we build corresponding data for human capital, looking at the proportion of a country's educated population that is living outside the country. This enables us to compare family decisions on the allocation of the human capital portfolio in an analogous way to those concerning other private capital. For simplicity, we will refer to these two choices as the human capital portfolio and the financial capital portfolio. However, the latter term can easily be misleading. It should be understood as the choice modeled in our previous paper, that is between holding foreign assets and net claims on domestic assets. At the level of the individual family such choices will often indeed be between financial assets: whether to hold a financial claim on a domestic real asset or on a foreign real asset. However, at the macro-level financial claims obviously net out. Hence, at the macro-level the underlying phenomenon is whether the real capital that underpins these financial claims is located domestically or abroad: financial choices determine real phenomena.

Section 2 selectively discusses related literature, focusing on Africa-specific studies. In Section 3 we describe how these data sets on financial and human capital portfolios were built, and present descriptive statistics for broad patterns – differences between regions and changes over time. In Section 4 we set out theories of portfolio decisions for financial and human capital and discuss empirical proxies for the theoretical concepts. In Section 5 we present econometric analyses of the two portfolio decisions. We investigate the determinants and the dynamics of portfolio choices, and compare financial and human capital. In Section 6 we apply the results to Africa, giving an account of why African capital flight has evolved as it has, and how it is likely to continue to evolve. Section 7 concludes.

2. Selected Related Literature

This paper's approach is unique in that we examine financial and human capital stocks, in a portfolio context, as opposed to capital flight and educated migration flows. Cline (1995) is the only other study we are aware of that looks at the share of capital flight in private portfolios, estimating repatriation for selected Latin American countries following the 1980s debt crisis. Of course, our theoretical and empirical approach is also informed by the large literature on the determinants of capital flight and migration flows. A further contribution is that with the exception of Lensink et. al (2000), which analyzes the relationship between political risk and capital flight, this paper is unique in studying capital flight using a large panel data set of developing countries.

A few recent studies of capital flight and migration flows from Africa provide an important context for our study. On capital flight, Ajayi and Khan (2000) provide a rich source of country-specific studies focusing on the measurement, magnitudes, conduits for, causes and consequences of capital flight from Nigeria, Tanzania, Kenya and Uganda. In addition to highlighting how poor macroeconomic policies have spurred large-scale flight, the studies stress the episodic nature of flows in response to changes in political regimes, policies, and perceived risks. For 30 SSA countries, Ndikumana and Boyce (2003) find that external borrowing is the most important determinant of capital flight, which they describe as debt-fueled. They also find that capital flight exhibits a high degree of persistence, and that the growth rate differential between the African country and its trading partners influences capital flight.

Our strategy is to investigate whether human capital flight can be explained within a similar portfolio choice framework as financial capital flight. This approach leads to inclusion of several explanatory variables also stressed in the (overall) migration literature: income differentials, lagged values of resident immigrant stocks to proxy for chain migration effects, and regional dummies, proxying for how distance affects the cost of migration (See Clark et. al 2002; Hatton and Williamson, 2002b, for example).

Migration from African countries to the OECD has been low, but appears to be considerably increasing. Hatton and Williamson (2001, 2002a) find that real wage gaps between Africa and the US, and demographic booms in African countries (the same forces driving European emigration in the late nineteenth century) are the main forces

driving African migration, and they predict that emigration pressures will strongly intensify over the next few decades. Ndulu (2002) focuses, as we do, on human capital flight, the high and rising share of highly educated emigrants. The paper discusses causes, in terms of lower returns on education investments, lack of complementary facilities needed for practicing in specialized professions, and political risks affecting abilities to utilize human capital. Although slowing human capital flight is extremely difficult, Ndulu discusses needed improvements in tertiary education and programs that allow educated Africans in the diaspora to return for limited periods, connect using information technology and invest.

3. Data and Descriptive Statistics

The most complex step in our analysis is the construction of the data series for financial and human capital flight. We describe these in turn.

Our capital flight variable is the ratio of the stock of flight capital to the stock of private wealth. We discuss these two stock measures and then present some descriptive statistics for their ratio. We use a slightly modified version of the World Bank residual method to calculate capital flight flows. The work by Claessens (1997), Chang, Claessens, and Cumby (1997), Claessens and Naude (1993) discusses this and other methods in great detail and concludes that the different concepts broadly yield the same results. According to the World Bank residual method capital flight is defined as the difference between the sources of funds and the uses of funds. Sources of funds is the sum of all net official inflows and the net flow of foreign direct investment. The uses of funds include the current-account deficit and addition to reserves[1]. We modify the World Bank concept by adding misinvoicing of trade and by not deducting private nonguaranteed debt.[2]

We accumulate these flows into stocks assuming the U.S. Treasury bills interest rate as the rate of return. One complication in the accumulation process is that sometimes the flows can be negative. This can be due to two different reasons: first, previous flight capital might be repatriated and second, agents might borrow internationally. Empirically we want to distinguish between these two reasons. Following the World Bank methodology, we treat all stocks of flight capital as zero at the start of our period of observation, 1970. However, following Cline (1995) we count the stock of flight capital as becoming positive in the first year that the flow of capital flight becomes positive. In effect, we treat early years of negative flows as the accumulation of debts that are not reduced by subsequent capital flight. Our flight capital stocks are thus gross of indebtedness.

If flows subsequently turn negative, we treat them as the repatriation of capital. However, we do not allow the stock of flight capital to turn negative, consistent with our distinction between capital repatriation and foreign borrowing. Hence a country that had annual net flows during the first five years of -2, -3, +2,-1 and –4 would, by our measure, have a

[1] We used balance of payments data with the exception of net official external borrowing, these data were obtained from World Bank sources, since they are likely to be more accurate.
[2] For a more detailed discussion please refer to Collier, Hoeffler and Pattillo (2001).

stock of flight capital of these years (before allowing for interest) of 0, 0, 2, 1 and 0. The flight capital stocks are converted to real 1985 US dollars to make the figures comparable to our private capital stock measures.

We now turn to the measure of private wealth which is the sum of flight capital plus the private real capital stock. We use the data on the share of private investment from Easterly and Rebelo (1993) and data on gross domestic investment from the Penn World Tables as well as World Bank data to calculate private investment flows. Following the method by King and Levine (1994) we calculate an initial private capital, denominated in 1985 U.S. Dollars. We then apply the perpetual inventory method to generate annual figures for the private capital stock from the flows of past private investment.

We present some descriptive statistics of the capital flight ratio by region in Figure 1A and Table 1A. Please refer to the appendix for the list of countries. We have potentially 1344 observations (28 years (1971-98) for 48 countries), however, data is not available for all years for all countries. This is either due to missing data towards the end of the period for some countries or due to the fact that for some countries we could only start the aggregation process in a year after 1971. In column (1) and (2) of Table 1A we present the decadal means (1980s, 19990s) for each region for all available observations. The next two columns present the decadal means for the 30 countries for which data for every year from 1980-1998 was available. We also depict these data in Figure 1 on a year by year basis. The average country had a capital flight ratio of about 13 percent. Capital flight rose throughout the 1980s and declined during the 1990s. Sub-Saharan Africa is the region with the highest capital flight ratio throughout the period, it increased steadily during the 1980s and fell only slightly during the 1990s. None of the other regions experienced such high capital flight ratios. East Asia is the region with the lowest capital flight ratio. The average capital flight ratios in Latin America and South Asia were similar, although South Asia's ratio increased steadily, while Latin America's ratio peaked in the 1980s.

Next, we turn from the financial capital flight to the human capital flight data. We construct a measure of the stock of educated adult immigrants to the United States from individual developing countries relative to the stock of the educated adult population of those countries, that is including both those remaining in their country of origin and those who have emigrated to the USA. The most convenient definitions in terms of data availability set 'educated' as possessing some secondary or tertiary education, and 'adult' as being over 25 years old. We call this measure 'educated emigration'. Since we wish to compare and contrast the migration of human capital with other migration we also construct an equivalent measure for overall migration and refer to this simply as 'emigration'. We focus on migrants to the U.S. for a number of reasons. By far, the destination for the largest share of international migrants is the United States. For the other OECD countries, while data on migration flows by country of origin are assembled, they are not as comprehensive as the U.S. census data, and there are no data on educational attainment of migrants. Finally, by analyzing migration to the U.S. we can abstract from the former colonial relationships that heavily influence migration to a number of OECD countries.

Although our key series is that for 'educated emigration', we first explain that for 'emigration' since it is a stepping stone to the more important series. In constructing the 'emigration' series we use U.S. Census data for 1970, 1980 and 1990 on foreign-born individuals by country of origin. As this disaggregration is not available yet for the 2000 census, we also use Census Bureau's annual Current Population Survey (CPS) data for 2000, where available or for 1997. We interpolate the intra-decade years by using gross annual flow data for the number of immigrants to the U.S. by country from the U.S. Immigration and Naturalization Service (INS). The total gross flow over the decade is made proportional to the size of the change over the decade from the census data, and a stock adjustment formula is applied. In this way, precedence is given to the census data, since it attempts to include illegal immigrants (although of course, coverage is limited) while the INS data cover only legal migrants. This procedure produces an annual series of the stock of foreign-born, which is divided by annual source country population figures from the *World Development Indicators* to get the annual measure of 'emigration'.

Next, consider the construction of the annual 'educated emigration' series. Our starting place is Carrington and Detragiache (1998) which for 61 developing countries, constructs for 1990 the variable we are after, the stock of educated migrants in the U.S. relative to the educated population in the source country.[3] Creation of the measure is quite involved, including a number of steps, which we only briefly summarize. First, estimates of the migrant stock over age 25 for three educational categories: primary or less, secondary and tertiary, are derived from U.S. census data. Another source is used to subtract off foreign graduate students by country of origin, as these individuals counted in the census may not be true migrants, but rather foreign students here only to complete their education. From the Barro-Lee educational attainment data set (Barro and Lee, 1993) and United Nations Demographic Yearbook data on age structure of population, estimates of the population over 25 in each source country by educational attainment are formed. Two estimates of the migration rate by educational category are formed. The first takes the ratios of the stock of migrants for a given educational category relative to the number of people in the home country in the same educational category, which implicitly assumes that that the migrants to the U.S. are still counted in the home country censuses, and thus forms an upper bound on the migration rate. The second method adds the number of migrants in the U.S. in a particular category back into the denominator, which then assumes that none of the migrants are counted in the home country census—this forms a lower bound to the migration rate.

Carrington and Detragiache's 1990 figures showed that the migration rates for individuals with little or no education were extremely low. For almost all countries, the highest migration rates are for individuals with tertiary education. The authors found that the brain drain is particularly high in the Caribbean, Central America and some African countries.

[3] U.S. Census data is not yet available to construct such measures for 2000. In future refinements of our measures, we plan to use historical data for 1970 and 1980 to construct comparable measures.

Our second step is to form an annual series on the proportion of the over 25 home country population with some secondary or higher education, by interpolating the quin-annual data from the updated Barro-Lee data set (Barrro and Lee, 2000). In the third step we use the assumption that the ratio we are interested in, the stock of educated people in the U.S. from a particular country relative to the number of educated people residing in the home country, moves with the share of educated people in the home country population. Using the upper and lower bounds for the 1990 estimates of the stock of educated migrants relative to the educated population in the home country as a base, we apply the growth rates from the share of educated people in the home country series to this base to form upper and lower bounds of an annual series. Our final 'educated emigration' series is the mid-point of the upper and lower bound series.

Our estimates of both 'emigration' and 'educated emigration', are clearly rough approximations, subject to the limitations of the data and the compromises that had to be made. While in some respects the estimates can be improved on, other limitations, importantly the undercounting of illegal immigrants in the U.S. Census, cannot be avoided.

We present some descriptive statistics of human capital flight in Figure 1B and Table 1B. As with financial capital flight there are large regional differences. Latin America has remarkably high human capital flight relative to other regions: by 1998 nearly a quarter of its educated adult laborforce was in the USA, whereas less than ten percent of its financial wealth was abroad. Africa had only modest human capital flight: by 1998 around two percent of its educated adults were in the USA. Whereas financial capital flight peaked during the 1980s, human capital flight has continued on a rapidly rising trend.

4. An Integrated Theory of Portfolio Choice

Families hold portfolios of wealth, financial and human. The proportions of these portfolios held abroad, g_f, g_h, will depend upon the returns on these assets held domestically relative to the return on the same asset held abroad, r_f, r_h, and upon their riskiness relative to foreign assets, v_f, v_h.

$$g_f = g_f(r_f, v_f),$$

$$g_h = g_h(r_h, v_h).$$

Empirically, we will benchmark the return on financial assets deployed domestically against those held in the USA. The return on financial assets held in the USA will be proxied by the US real interest rate, and this return will be treated as riskless. Similarly, we will benchmark the return on human capital deployed domestically against human capital sent to the USA. The return on human capital in the USA will be proxied by per capita US GDP and this income will also be treated as riskless. The challenge is therefore to proxy the return and the risks on domestically deployed financial and human capital.

Three factors determine the returns on domestic capital, financial or human: the policy environment that affects the productivity of capital, p; the rate of taxation of capital, t; and the capital-labor ratios, k_f, k_h:

$$r_f = r_f(p, t, k_f)$$

$$r_h = r_h(p, t, k_h).$$

The economic policy environment evidently affects the returns on capital. We proxy the policy environment by the Country Policy and Institutional Assessment (CPIA) which is an ordinal rating of economic policies made by World Bank staff. While this rating is subjective, reasonable efforts are made to ensure that it is comparable across countries and over time. While particular aspects of economic policy will differentially affect the return on financial and human wealth, the CPIA provides a broad assessment of a range of policies, aggregated into a single index. As such, it is reasonable to expect that 'good' policies will raise the return on both types of capital.

It is well recognized that because domestic investment is often highly irreversible, owners of assets will be wary of making investments in countries where the government has high future tax liabilities. Indebtedness represents a future tax liability. We therefore proxy the future tax liability by the net present value of international debt relative to GDP. Potentially, this liability deters both financial capital and human capital from locating in the country. Our other proxy for the impact of taxation is the parallel market premium for foreign exchange. This reflects the extent to which the government is implicitly taxing sales of foreign exchange and subsidizing purchases. Where the premium is large it is unlikely to be sustainable and so asset holders may reasonably see the policy as temporary. Whereas the other influences on the rate of return can reasonably be presumed to affect financial and human capital in qualitatively the same way, the effect of taxation and subsidy in the foreign exchange market produces opposing effects on the two types of wealth. A temporary subsidy on purchases of foreign exchange is an evident incentive to transfer financial capital out of the country.[4] However, human capital flight obviously does not benefit from this subsidy. On the contrary, those remittances made from earnings abroad that are sent through the banking system or other official channels will now be taxed.[5] A premium in the parallel market for foreign exchange thus represents a *subsidy* on the flight of financial capital but a *tax* on the repatriated income from the flight of human capital. We would therefore expect it to have opposite effects on the two portfolio choices.

[4] Admittedly, this depends upon the extent to which capital flight is able to take place at the official exchange rate. However, standard methods of capital flight, such as over-invoicing of imports and under-invoicing of exports, indeed enable capital to be withdrawn at the official exchange rate (Bevan, Collier and Gunning, 1990).

[5] While it is always possible to evade this tax for small amounts of remittances sent as cash and converted on the parallel market, such strategies become cumbersome and risky for larger amounts and so the taxation of remittances is a reality.

In our previous work we proxied the capital-labor ratio by the ratio of our estimate of the stock of private capital to the laborforce. However, in our present study we wish where possible to use proxies that are common to both types of capital, as with the policy environment and the parallel market premium. Hence, we proxy the endowment of both types of capital by per capita GDP. The level of per capita GDP will to an extent reflect the endowment of both physical and human capital. The presumption is that controlling for other influences, the return on both types of capital would tend to be higher in countries with lower stocks of capital, due to diminishing returns, although recognizing the insights of endogenous growth theory, such a tendency might be quite weak. Per capita income will also be influenced by policy. As a result, the predicted effect of per capita income is ambiguous: to the extent that it proxies a good policy environment, high per capita income will reduce capital flight rather than increase it.

Finally, we proxy the riskiness of the domestic environment.[6] For a given rate of return, the greater the degree of risk then the higher the proportion of the wealth portfolios, financial and human, that would be held abroad. We proxy riskiness by a measure of the durability of the political regime and by whether the country is at civil war. A highly durable regime may or may not have desirable policies, but it is at least more predictable. We proxy the length of the regime by the variable "Durable" which measures the number of years since the last regime change.[7] We would therefore expect that controlling for policies, more durable regimes would have less capital flight. A civil war is evidently a period of exceptionally high risks, and so we would expect this relatively rare event to induce further flight of financial and human capital. We measure civil war by the number of months per year the country experienced an internal major armed conflict.[8]

5. Results

Throughout the analysis we use two dependent variables, the proportion of private financial wealth held abroad, and the proportion of human capital held abroad. To distinguish human capital flight from other migration we also compare our results with those for the migration of less educated labor. Table 2 reports our core results.

Although our portfolio series extend for a period of 28 years, that for our key measure of policy, the Country Policy and Institutional Assessment, exists only for 22 of these years (1977-98). Even for relatively fast-adjusting processes this is known to be too few observations to permit reliable use of cointegration models to disentangle short-run and long-run relationships. In fact, our results suggest that portfolio choices for both financial and human capital are very slow to adjust. Very slow adjustment is indeed likely: both the shifting of financial capital out of a country and emigration face substantial impediments. Financial wealth cannot in aggregate be withdrawn from a country more

[6] Lensink, Niels and Murinde (2000) investigate the effects of risky policy environments on capital flight and find that countries with higher political risk experience more capital flight.
[7] Source: Polity IV dataset, for further details please refer to the appendix.
[8] Source: Collier and Hoeffler (2002).

rapidly that the capital stock on which it is a claim depreciates, and migration faces entry barriers and sometimes exit barriers. Our approach is therefore to use simple OLS regressions in which the dependent variable is introduced with varying lengths of lag. At the most this gives us a better understanding of the true adjustment processes than the cross-section analysis that has previously been the only approach that was feasible given the data then available. Given the limitations of the technique, it is more than usually important to retain a good sense of economic judgment. If results coincide with the predictions of theory, we have two independent pieces of corroborating evidence, if they collide either the theory could be missing something or the result could be spurious.

5. 1 Results for Financial Capital

Table 2A reports our results for financial capital flight. Column 1 shows that when the dependent variable is introduced into the regression with a lag of only a single year few other variables are significant. Portfolios adjust only very gradually, and the adjustment process cannot be detected when the only variation to be explained is year-on-year. As the lag on the dependent variable is extended, other variables start to become significant, with significance levels stabilizing once the lag reaches ten years. The fourth column of Table 2A reports results with a ten-year lag on the dependent variable in which the other explanatory variables are unlagged. This characterization is a simplification of a complex dynamic process in which presumably the current configuration of the portfolio is a function of a very long lag structure of the explanatory variables. With the other explanatory variables only included without lags, their coefficients should be interpreted as proxying the history of these variables over the preceding decade. For example, the apparent effect of current policy on the portfolio may reflect in part a rational anticipation of current policy on portfolio choices in earlier years, and may also reflect that policy in earlier years was similar to current policy since it is a slow-changing variable.

A useful way of interpreting the results is to consider what would be the effect of changing one explanatory variable and maintaining it at its new level thereafter. For most of the explanatory variables, for the first few years after the change there is no significant effect. The effect builds up over the first decade, as measured by the coefficients on the variables. If the change is maintained beyond a decade, further effects come through as captured by the ten-year lag on the dependent variable.

Since much of the delayed effects worked through changing the lagged dependent variable, it is potentially informative to decompose that variable into its predicted and residual components. Changes in the explanatory variables that are maintained for a long period change the *predicted* value of the lagged dependent variable a decade later. The coefficient on the predicted value of the lagged dependent variable may differ from that on the residual. The last column of Table 2A presents the results once the lagged dependent variable is decomposed into its predicted and residual components. The lagged dependent variable is predicted, using the coefficients from the first column, leaving a residual. For the years prior to 1981 there is no observation for the lagged dependent variable and so the portfolio cannot be predicted. Thus the 10 year lag of the prediction starts only in 1991. Rather than lose the 1981-90 observations, for the years prior to 1991

we use actual rather than predicted portfolio choices, as in the regressions of the previous columns. Actual capital flight is multiplied by a dummy which takes the value of unity only for years prior to 1991 and conversely for the predicted and residual portfolio choices. Thus, for the observations prior to 1991 the regression uses only the actual value of the lagged dependent variable, whereas for the later observations the regression suppresses the actual value and uses instead both the predicted value and the residual. All three terms representing the lagged dependent variable are significant. Of most interest for the interpretation of the full effects of the other explanatory variables is the coefficient on the predicted portfolio, which is 0.81. This is the coefficient that should be applied to the other explanatory variables to get an approximate indication of their delayed effects.

To see this consider the three domestic policy variables: debt, the CPIA and the parallel market premium. All are significant with the expected signs. An increase of debt/GDP of one percentage point raises the proportion of the financial capital portfolio held abroad by 0.032 percentage points during the first decade.[9] If the higher indebtedness is maintained into a second decade this effect is supplemented by a further shift in the portfolio of 0.81*0.032 percentage points. We should be very wary of extrapolating the model beyond this horizon. The underlying data describes change over only a 23 year period, and the model makes no attempt to establish a long-run equilibrium process. At the most, it indicates disequilibrium dynamics over one or two decades. With this caveat, there appears to be a high degree of inadvertent stealth to the effects of indebtedness and of the other policies. In the first two or three years after a change there are no discernable effects, yet after a decade each point change in indebtedness is shifting around 0.058 percentage points of the portfolio abroad.

Now consider the CPIA. The same stealth effects apply: consider a deterioration in the CPIA of one point that is maintained over a long period. During the first two or three years there will be no discernable effects. Yet, over the course of the first decade around 1.7 percentage points of the portfolio will shift abroad. Finally, consider the parallel market premium. Again, in the short term there is no effect, but after a decade an increased parallel premium of ten percentage points would induce a shift in the financial portfolio of 2 percentage points.

Risk, as proxied by the durability of the regime and by civil war, is highly significant: more durable regimes have less capital flight, countries with civil war have more capital flight. Our proxy for the capital stock, per capita income, is also significant with the sign that would be expected if it is predominantly picking up the effect of diminishing returns – higher income increases the proportion of the portfolio held abroad. The US real interest rate is also significant with the expected sign – high interest rates attract finance capital from developing countries.

[9] Note that the dependent variable is the *proportion* of the portfolio held abroad, so that it ranges from 0 to 1. A coefficient of 0.032 thus implies that if the explanatory variable increases by one (i.e. a doubling of debt) there is an increase of .032 percentage points in the overseas portfolio.

5. 2 Results for Human Capital

We now consider human capital flight, our core results being reported in Table 2B. The four columns correspond precisely to those reporting the financial capital flight regressions. We retain the same explanatory variables except where there are compelling reasons for alteration.

As with financial capital, the human capital portfolio adjusts only very slowly. As shown in the first column, when the dependent variable is introduced with only a one-year lag the three policy variables are either insignificant or have very small coefficients. However, as with financial capital flight, once the lag is extended to ten years they become significant both in the statistical and the economic sense (column 4). The last column again decomposes the lagged dependent variable into its predicted and residual components, maintaining observations by permitting the regression to use the actual lagged value where no value can be predicted. In the event, the coefficient on the predicted lagged dependent variable is not significantly different from that on the actual lagged dependent variable in the regression of column (4).

The coefficient on the lagged value of human capital flight is significantly larger than that on financial capital flight: 1.38 as compared with 0.81. This is not surprising. The literature on migration has long noted the chain nature of the migration decision, with early migrants providing information and assistance for subsequent migrants.[10] There is no such analogous process for movements of financial capital. Evidently, taking a sufficiently long-run period, the apparently explosive nature of migration cannot be true. For example, the vast nineteenth century migrations to the USA from Europe eventually tapered off before Europe depopulated. It further cautions against extrapolating our estimates of the effects of policies much beyond a decade. One implication of the much larger coefficient on migration than on financial capital flight is that the 'stealth' effects of policy change are even more serious.

We next consider the three policy variables: debt, the CPIA and the parallel market premium. Indebtedness significantly increases the emigration of the educated. While qualitatively this is the same effect as that of debt on financial capital flight, the size of the coefficient is less than one-tenth of the size of the debt coefficient for financial capital flight. Poor policy, as measured by the CPIA, also significantly increases human capital flight. Again, this is qualitatively and quantitatively similar to financial capital flight. There is, however, a striking difference between the financial and the human capital flight results once we turn to the effect of the parallel market premium. In both regressions the premium is highly significant, but it has opposite signs: a high premium actually reduces human capital flight. Recall that this is predicted from the theory discussed in Section 4: the parallel market premium constitutes an implicit subsidy on financial capital flight and an implicit tax on the remittances from human capital.

[10] In empirical studies of general migration *flows*, these important "chain migration" effects are proxied by the existing resident immigrant stock. (See Clark et al, 2002, and Hatton and Williamson, 2002b). For the US, the importance of these effects has been greatly reinforced by immigration policies favoring family reunification.

Turning to the other explanatory variables, as with financial capital flight, the higher is per capita GDP the higher is human capital flight. We have suggested that per capita GDP is here proxying the capital stock – financial and human – and so picking up the effect of diminishing returns. However, GDP is correlated with many other characteristics of a society and so this result is open to many different interpretations.

The proxies for risk are both significant. Regime durability has qualitatively the same effect as for financial capital although the magnitude of the effect is substantially greater. Puzzlingly, civil war appears to reduce human capital flight while increasing financial capital flight. We have no satisfactory explanation for this result, but, as we will see below, in any case it does not apply to Africa. As noted in the previous section, the US real interest rate is replaced by per capita US GDP. Since this is the only variable that is strongly time trended, we first detrend it. This avoids the variable spuriously picking up any unrelated but trended effects such as the likely gradual increase in the difficulty of an educated person in a developing country being able to gain entry into the USA. However, the resulting variable is insignificant.

Finally, because the USA shares a land border with Latin America, it is probably easier for migrants to gain entry from this region. Hence, we add a dummy variable for Latin America. The variable is significant, with a large coefficient.

In order to interpret the 'educated emigration' results it is useful to compare them to those for more general emigration. Human capital can only be relocated if people migrate, and people may move for many reasons unconnected with the return on their human capital. If the regression results for 'educated emigration' are the same as those for general 'emigration', we should be highly wary of interpreting the previously discussed results as reflecting portfolio decisions. In Table 2C we repeat the regressions of the previous table, but this time the dependent variable is not the proportion of the *educated* people born in country *x* who are in the USA, but rather the proportion of the entire population. The results are, in fact, remarkably different. First, the coefficients on all three variants of the lagged dependent variable are much larger for general emigration than for educated emigration. It is indeed likely that information and support by previous migrants is more important for unskilled labor and dependents than for skilled labor. Secondly, none of the three key explanatory variables proxying the return on human capital, - debt, policy, and the parallel market premium – is significant. Thirdly, per capita GDP remains significant but with the opposite sign – higher per capita income now reduces emigration. This is the 'normal' sign of per capita income on emigration – we would expect that the more that unskilled labor can earn, and the more that dependents can receive, in their home countries, the less is the incentive to migrate. This somewhat strengthens our previous interpretation of per capita GDP in the human capital regression as proxying a diminishing returns effect. Turning to the risk proxies, regime instability is both less significant, and has radically smaller effects, whereas civil war now has the expected effect of increasing emigration.

To summarize, while caution is in order due to the limitations of the econometric approach, three results are quite striking. First, there appear to be radical differences between human capital flight and general migration. Secondly, there appear to be close similarities between human capital flight and financial capital flight. Thirdly, these influences on both human and financial capital flight are consistent with what would be predicted from a simple model of portfolio choice, with its emphasis upon relative returns and risks.

6. Explaining African Capital Flight

We now apply the models of financial and human capital flight to the task of explaining African experience. In our previous paper we considered why Africa had so much more financial capital flight than other regions. We now pose the dynamic question as to why Africa has been able to reverse the flight of financial capital during the 1990s: recall that African financial capital flight peaked in 1988.[11] We also discuss the question as to why, despite this reversal of financial capital flight, there has been a continuing exodus of human capital.

We first test for African distinctiveness. In our core models of capital flight we have already included a dummy variable for Africa. This is significant for financial capital flight but not for human capital flight. For financial capital flight the coefficient is large – around nine percentage points of African portfolios are held abroad in excess of what would be predicted by the model.[12] By definition, the regression does not tell us why this is so. Since for human capital flight the Africa dummy is insignificant, whatever is driving the excess capital flight from Africa appears to apply specifically to financial assets rather than human assets. We offer one possible explanation that would indeed have this differential effect, but propose it purely as a speculation. Corruption has only recently been measured in a quantitative fashion, and so cannot be used as an explanatory variable in our analysis. However, if the indicators are to be believed, Africa has an above-average level of corruption.[13] Corruption may well fuel the flight of financial capital: wealth that has been acquired dishonestly, may be safer held abroad, clear of potential scrutiny and recall. By contrast, corruption would not be expected to have significant effects on human capital flight.[14] We should stress that this is merely an illustrative explanation of why Africa might have excess financial capital flight relative to the predictions of the model, but not excess human capital flight. Several other explanations may well be more plausible and the matter warrants more systematic investigation.

We now investigate whether Africa is different in terms of the effects of the key explanatory variables. We do this by adding the Africa dummy as an interaction term to

[11] This statement refers to the average for the eight Sub-Saharan African countries included in Figure 1A: Ethiopia, Kenya, Mauritania, Mauritius, Mozambique, Nigeria, Rwanda and Tanzania. (Recall that Figure 1A is based on only the 30 countries for which data for every year from 1980-98 was available).
[12] For an analysis of Sub-Saharan African capital flight see Boyce and Ndikumana (2001).
[13] See Kaufmann et al. (1999) for a recent dataset and analysis of goveranance and corruption indicators.
[14] While a handful of high-profile rogues may decide to emigrate, their numbers would be too small to affect our measure.

each of the other variables in turn. The results are reported in Table 3. We first test the interaction terms individually and then include those that are individually significant together in a single model, reducing this down by eliminating those interaction terms that are no longer significant. The resulting model is shown in the final column of the Table. The same two interaction terms are significant in both the financial capital flight and the human capital flight regressions: debt and civil war. This gives us some confidence that these results reflect genuine African differences rather than simply being statistical artifacts. For both financial capital flight (Table 3A) and human capital flight (Table 3B) debt is significantly less damaging for Africa than for other regions. This result may reflect an expectation of debt forgiveness, which, given the recent HIPC initiative, would have been rational. An implication would be that some of the benefits of the HIPC initiative accrued in advance of its implementation. Civil war also appears to have systematically differential effects in Africa both on financial and on human capital flight: war has more damaging effects on capital flight in Africa than in other regions.

We now decompose the changes in Africa's capital flight, and its differences with other regions, into those that are explained within the model, and those that are unexplained. The analysis is slightly complicated by the fact that changes in explanatory variables appear to have such long lagged effects, which in the case of human capital are actually explosive.

In Table 4A we compare the actual and predicted changes in African flight capital over the period 1988-98. Over this period, as depicted in Figure 1, financial capital flight was reversed, declining from 31.2% to 23.6% of the portfolio, but human capital flight continued. Our predicted values apply the actual values of the explanatory variables for the average of the Africa sample, to the coefficients on these variables, taking into account any significantly different coefficients for Africa as found in the final column of Table 3A. Since our thesis has been that to a large extent financial and human capital flight are driven by the same portfolio fundamentals, it is a challenge for the model to explain a period during which the two series had sharply diverging trends.

The African series for financial capital flight in Figure 1A is based on the simple average of eight countries for which there are data over the entire period. Of these eight countries, one lacks some data on pertinent explanatory variables, and so our analysis is based on seven countries: Ethiopia, Kenya, Mauritania, Mauritius, Nigeria, Rwanda, and Tanzania. Over the decade 1988-98 there was a marked improvement in several of the explanatory variables for these countries. The parallel market premium was substantially reduced, as was indebtedness. Offsetting such improvements in the independent variables, the lagged dependent variable continued to deteriorate, since both financial and human capital flight from Africa was larger in 1988 than it had been in 1978.

The results depicted in Table 4A fail to predict the observed decrease in financial capital flight. Instead, the predict a modest continued increase of 4.89 percentage points. However, this is the net effect of two opposing components. The main factor increasing capital flight was indeed the effect of the lagged dependent variable. This is predicted to have increased capital flight by an enormous 13.59 percentage points. Since this

prediction is based on applying an estimated coefficient to an extrapolation well outside the observed range of the sample, it is quite possible that the coefficient considerably exaggerates this effect. From Figure 1A, the 1988 value of capital flight for Africa, which becomes the lagged dependent variable in our prediction for 1998, is the highest observed value of capital flight for any region in the entire period. Offsetting the effect of the lagged dependent variable, the net effect of the independent variables is strongly to have reduced capital flight, the four drivers being the decline in the parallel market premium, the reduction in indebtedness, the reduction in the incidence of civil war in the seven countries, and the decline in US interest rates. Hence, although the model fails to predict the reversal of capital flight, it does point to some likely explanations, namely, the improvements in these four explanatory variables.

In comparing financial and human capital flight we should be aware of two differences predicted by our models. First, the lagged dependent variable has considerably more powerful effects on human capital flight than on financial capital flight both absolutely and more especially relative to the independent variables. Recall that there are obvious reasons for this due to the chain nature of migration, with past emigrants assisting prospective ones. As a result, a continued increase in the lagged dependent variable combined with an improvement in the independent variables could well produce a net reversal of financial capital flight but a continued exodus of human capital. Secondly, recall that the parallel market premium has qualitatively different effects, taxing educated emigration (through its effects on remittances) while subsidizing financial capital flight.

Turning to the prediction of human capital flight, depicted in Table 4B the model does rather better.[15] Here the observed increase in human capital flight is 0.83 percentage points, while the model's prediction is relatively close, at 0.78 percentage points. Again the main factor driving the predicted increase in human capital flight was the effect of the lagged dependent variable, accounting for over 90 percent of the predicted change between 1988 and 1998. In contrast to the financial capital flight case however, this prediction appears reasonable as the coefficient derives from a sample where the African observations are well within the sample range. While reductions in debt and the incidence of civil war in the ten countries in this sample work to reduce human capital flight, these effects are offset by changes in the other policy variables that increase human capital flight: deteriorations in the CPIA and reductions in the parallel market premium.

Finally, we wish to note three implications of the analysis. First, the large effects of the lagged dependent variables imply radically different paths for financial and human capital flight over the next decade. We would expect that the trend commenced during the 1990s, whereby the severe financial capital flight that Africa experienced has started to be reversed, would continue. Over the next decade the value of the lagged dependent variable will be steadily declining, and in the absence of large offsetting effects from changes in the other variables, this should strongly reduce capital flight. In contrast, the

[15] Table 4B is based on the averages for the 10 Sub-Saharan African countries in the sample for which continous data on educated emigration exists for the period; it is thus a different set of countries than considered in Table 4A. The countries are: Benin, The Gambia, Ghana, Kenya, Malawi, Mauritius, Mozambique, Uganda, Zambia and Zimbabwe.

lagged effects of human capital flight will continue to drive the emigration of the educated upwards. During the 1990s although the increase in educated migration was only 0.83 percentage points, this was a very large percentage increase since the prior base was only 1.33 percentage points. Hence, the proportion of African human capital located outside Africa is rising very rapidly and we would expect this to continue.

The second implication of our analysis follows from these two predictions, namely, that the problem of African capital flight will gradually shift from being overwhelmingly a matter of financial capital, to being more equally balanced between both financial and human capital.

The third implication of the analysis is that although policy matters for portfolio choices, its effects are so heavily lagged that they are difficult to discern within the normal horizon of political decision taking. Recall that the coefficients on the policy variables in the one-year lag models are all either insignificant or very small. Because there is little pay-off to policy change within an electoral cycle, this is an area of policy in which it is important for the effects of poor policy to be understood by the entire society rather than just an inner core of decision takers. Electorates need to endorse policies which only have long term effects, and they can only be expected to endorse such policies if they understand their true effects.

7. Conclusion

In this paper we have investigated capital flight as a portfolio choice. As in our previous work (Collier, Hoeffler and Pattillo, 2001), assets can be held either domestically or abroad, according to relative returns and relative risk. We have extended that earlier work in two directions with a particular focus upon its implications for Africa. First, we investigate human capital in the same portfolio choice framework as financial capital. Secondly, whereas our previous results dependent only on a cross-section, in this paper we investigate changes over a 23 year period, and so begin to make the analysis dynamic. We acknowledge that due to limitations of the length of the time series, our dynamic analysis is only rudimentary, and the results must be interpreted with caution.

Our results suggest that both financial and human capital flight can be analyzed within the same framework of portfolio choice. In particular, the allocation of human capital as between domestic and foreign locations appears to be determined by a process much more akin to that for financial capital than that which governs general migration. The same economic factors influence human and financial portfolio decisions, namely the relative returns and the relative risks in the competing locations.

We find that the severe financial capital flight that Africa experienced until the late 1980s, has started to be reversed. Our previous snapshot of capital flight as of 1990 happened to observe African portfolios at around the peak of capital flight. The factors that have accounted for this repatriation are probably the reduction in the parallel market premium, and African indebtedness, the reduction in the incidence of civil war (a

phenomenon true only of our seven sample countries, rather than a general African phenomenon), and the decline in real US interest rates.

We find that human capital flight, which for most of Africa's post-Independence history has not been a significant problem, is rapidly increasing. This apparently contradictory development relative to financial capital flight is because the emigration of the educated is subject to much more powerful momentum effects than financial capital flight. Migrants assist subsequent migrants, and this dynamic makes it very difficult to reduce human capital flight once it has got going.

Finally, we have found that for both types of capital flight policy changes only affect outcomes with long lags. This makes it difficult for policy makers to realize the implications of their actions, and difficult for politicians to claim credit for correct decisions within the pertinent political horizon. Due to the long lags involved, we predict that over the coming decade, financial portfolios will continue to be repatriated to Africa, but that human capital will continue its exodus. Africa's past problem has been financial capital flight, its future problem will be a more generalized high level of both financial and human capital deployed outside the continent.

Figures

Figure 1A: Capital Flight Ratio

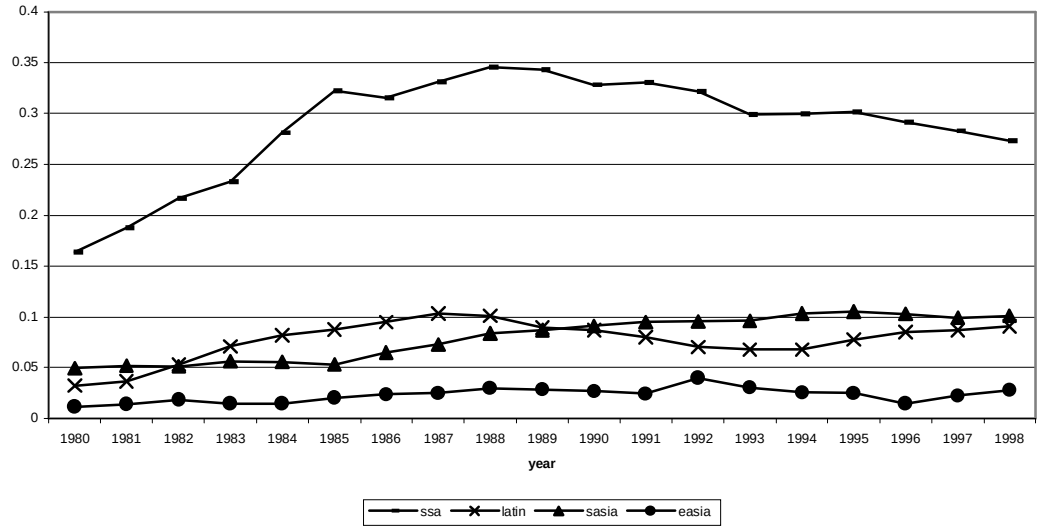
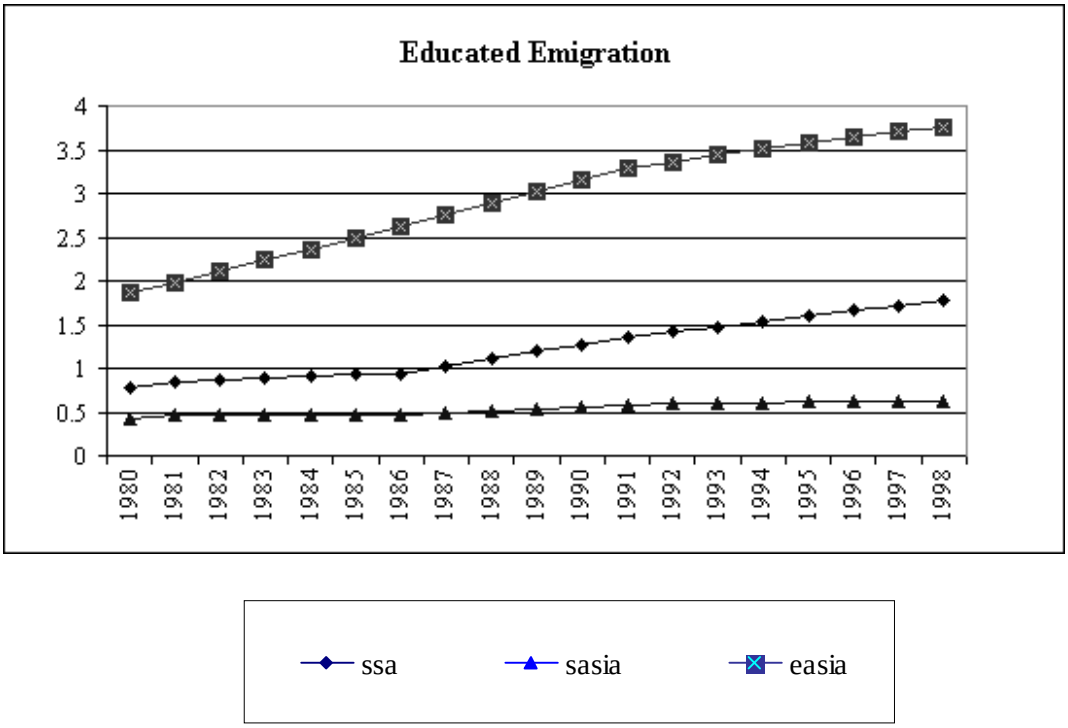
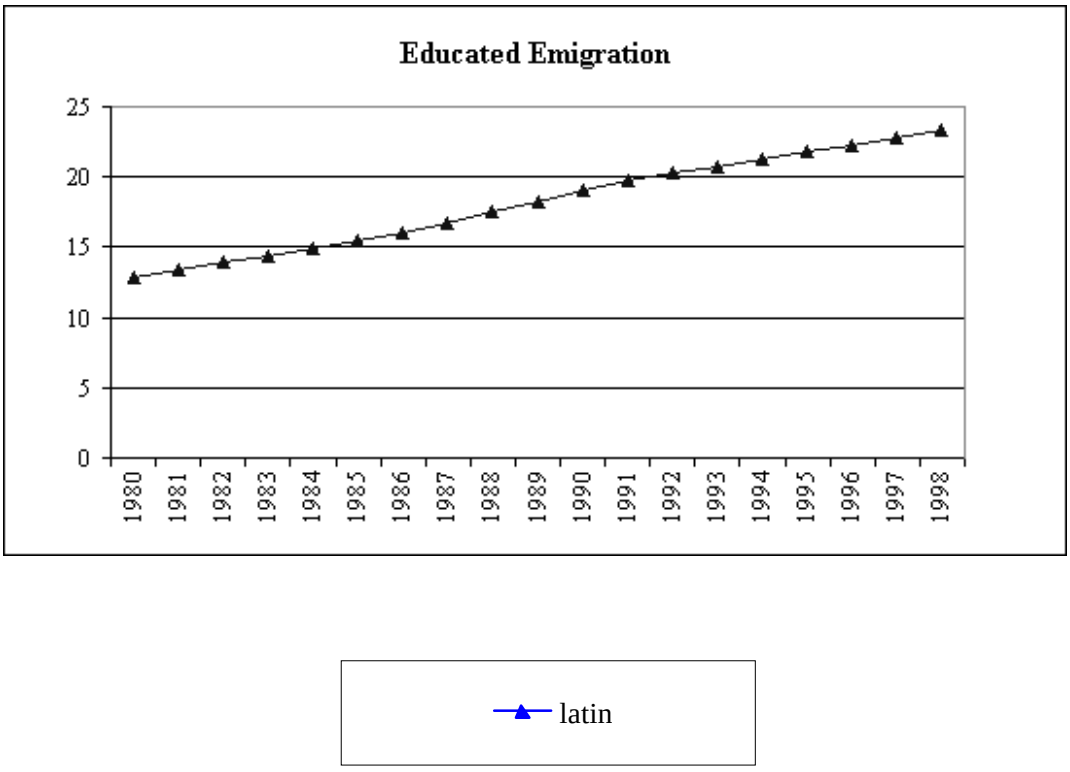


Figure 1B: Educated Emigration





Tables

Table 1A: Capital Flight as Share of Private Wealth by Region

	1980-1989	*1990-1998*	*1980-1989*	*1990-1998*
	(All Observations)		(Full Data Points Only)	
Sub-Saharan Africa	0.276	0.301	0.274	0.303
Latin America & Caribbean	0.085	0.090	0.075	0.079
South Asia	0.047	0.076	0.063	0.099
East Asia & Pacific	0.045	0.050	0.020	0.027

Table 1B: Regional Averages of Educated Emigration as Share of Educated Adult Population

	1980-1989	*1990-1998*	*1980-1989*	*1990-1998*
	(All Observations)		(Full Data Points Only)	
Sub-Saharan Africa	0.95	1.53	0.95	1.53
Latin America & Caribbean	15.33	21.25	15.33	21.25
South Asia	0.48	0.61	0.48	0.61
East Asia & Pacific	2.44	3.50	2.43	3.50

Table 1C: Regional Averages of Emigration as Share of Source Country Population

	1980-1989	*1990-1998*	*1980-1989*	*1990-1998*
	(All Observations)		(Full Data Points Only)	
Sub-Saharan Africa	0.05	0.08	0.05	0.08
Latin America & Caribbean	1.52	2.61	1.54	2.80
South Asia	0.04	0.08	0.04	0.08
East Asia & Pacific	0.45	0.86	0.42	0.58

Table 2A: Financial Capital Flight: Developing the 10-year Lag Model

	(1)	*(2)*	*(3)*	*(4)*	*(5)*
Lagged dependent variables					
wbcf_1	0.994				
	(0.000)***				
wbcf_3		0.951			
		(0.000)***			
wbcf_5			0.922		
			(0.000)***		
wbcf_10				0.869	
				(0.000)***	
wbcf_10 (pre-1991)					0.978
					(0.000)***
predicted wbcf_10					0.807
					(0.000)***
residual wbcf_10					0.938
					(0.000)***
Policies					
Debt	-0.000	-0.003	0.001	0.041	0.032
	(0.965)	(0.720)	(0.919)	(0.008)***	(0.053)*
black market premium	0.001	0.003	0.003	0.002	0.002
	(0.063)*	(0.031)**	(0.005)***	(0.000)***	(0.000)***
Cpia	0.000	-0.003	-0.000	-0.011	-0.017
	(0.979)	(0.467)	(0.975)	(0.134)	(0.024)**
Risk					
Durable	-0.000	-0.001	-0.001	-0.003	-0.003
	(0.088)*	(0.004)***	(0.000)***	(0.000)***	(0.000)***
civil war	0.001	0.003	0.006	0.011	0.009
	(0.029)**	(0.000)***	(0.000)***	(0.000)***	(0.000)***
Diminishing returns					
per capita gdp	0.000	0.000	0.000	0.000	0.000
	(0.146)	(0.049)**	(0.115)	(0.001)***	(0.002)***
Host country returns					
us real interest rate	-0.000	0.001	0.001	0.010	0.008
	(0.880)	(0.321)	(0.499)	(0.006)***	(0.038)**
Dummy variables					
Ssa	0.007	0.030	0.050	0.093	0.086
	(0.051)*	(0.000)***	(0.000)***	(0.000)***	(0.000)***
Observations	860	856	848	691	639
R-squared	0.977	0.894	0.817	0.636	0.641

Notes: Dependent variable: Financial Capital Flight. Robust p values in parentheses.
* significant at 10%; ** significant at 5%; *** significant at 1%.

Table 2B: Human Capital Flight - Developing the 10-year Lag Model

	(1)	(2)	(3)	(4)	(5)
Lagged dependent variables					
Educated emigration_1	1.0304				
	(0.000)***				
Educated emigration_3		1.0940			
		(0.000)***			
Educated emigration_5			1.1629		
			(0.000)***		
Educated emigration_10				1.3811	
				(0.000)***	
Educated emigration_10 (pre-1991)					1.4103
					(0.000)***
Predicted educated emigration_10					1.3755
					(0.000)***
residual education emigration_10					1.1442
					(0.000)***
Policies					
Debt	0.0827	0.2976	0.4665	0.6125	0.2117
	(0.003)***	(0.000)***	(0.000)***	(0.001)***	(0.222)
black market premium	0.0000	0.0000	-0.0000	-0.0004	-0.0004
	(0.045)**	(0.590)	(0.663)	(0.000)***	(0.000)***
Cpia	-0.0128	-0.0353	-0.0845	-0.2270	-0.2848
	(0.403)	(0.428)	(0.241)	(0.038)**	(0.006)***
Risk					
Durable	-0.0019	-0.0059	-0.0090	-0.0120	-0.0097
	(0.000)***	(0.000)***	(0.000)***	(0.000)***	(0.000)***
civil war	0.0051	0.0099	0.0008	-0.0252	-0.0414
	(0.087)*	(0.236)	(0.945)	(0.111)	(0.006)***
Diminishing returns					
per capita gdp	0.0000	0.0000	0.0001	0.0001	0.0001
	(0.021)**	(0.029)**	(0.050)**	(0.074)*	(0.063)*
Host country returns					
us per capita gdp	0.0000	0.0000	-0.0002	-0.0001	-0.0000
	(0.074)*	(0.924)	(0.062)*	(0.669)	(0.875)
Dummy variables					
Ssa	0.0171	0.0316	0.0081	0.0097	0.0553
	(0.333)	(0.562)	(0.928)	(0.943)	(0.720)
Latin	-0.0018	0.0238	0.0795	0.4308	0.3310
	(0.945)	(0.760)	(0.544)	(0.047)**	(0.096)*
Observations	733	733	733	648	621
R-squared	1.000	0.998	0.995	0.991	0.989

Notes: Dependent variable: Human Capital Flight. Robust p values in parentheses.* significant at 10%; ** significant at 5%; *** significant at 1%.

Table 2C: Migration - Developing the 10-year Lag Model

	(1)	(2)	(3)	(4)	(5)
Lagged dependent variables					
emigration_1	1.0387				
	(0.000)***				
emigration_3		1.1329			
		(0.000)***			
emigration_5			1.2713		
			(0.000)***		
emigration_10				1.9291	
				(0.000)***	
Emigration_10 (pre-1991)					2.0601
					(0.000)***
Predicted emigration_10					1.7379
					(0.000)***
residual immigration_10					2.0879
					(0.000)***
Policies					
Debt	0.0072	-0.0052	-0.0416	-0.0375	0.0298
	(0.732)	(0.907)	(0.399)	(0.721)	(0.764)
black market premium	-0.0000	0.0000	0.0000	0.0000	0.0000
	(0.368)	(0.900)	(0.099)*	(0.077)*	(0.596)
Cpia	0.0046	-0.0031	-0.0415	-0.0491	-0.0596
	(0.486)	(0.862)	(0.061)*	(0.225)	(0.154)
Risk					
Durable	-0.0006	-0.0015	-0.0022	-0.0027	-0.0030
	(0.002)***	(0.017)**	(0.047)**	(0.116)	(0.081)*
civil war	0.0035	0.0080	0.0099	0.0227	0.0218
	(0.014)**	(0.030)**	(0.048)**	(0.045)**	(0.015)**
Diminishing returns					
per capita gdp	-0.0000	-0.0000	-0.0000	-0.0001	-0.0001
	(0.415)	(0.336)	(0.191)	(0.000)***	(0.001)***
Host country returns					
us per capita gdp	-0.0000	-0.0001	-0.0002	-0.0001	-0.0000
	(0.353)	(0.001)***	(0.000)***	(0.190)	(0.997)
Dummy variables					
Ssa	-0.0044	-0.0120	-0.0174	-0.0068	0.0253
	(0.664)	(0.623)	(0.574)	(0.883)	(0.669)
Latin	0.0203	0.0680	0.1014	0.1542	0.1654
	(0.001)***	(0.000)***	(0.001)***	(0.005)***	(0.001)***
Observations	619	585	563	437	317
R-squared	0.996	0.979	0.959	0.919	0.932

Notes: Dependent variable: Migration. Robust p values in parentheses. * significant at 10%; ** significant at 5%; *** significant at 1%

Table 3A: Financial Capital Flight—Investigation of the Sub-Saharan Africa Effect

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
Lagged dependent variables											
wbcf_10	0.869	0.711	0.868	0.854	0.872	0.872	0.879	0.869	0.863	0.866	0.867
	(0.000)***	(0.000)***	(0.000)***	(0.000)***	(0.000)***	(0.000)***	(0.000)***	(0.000)***	(0.000)***	(0.000)***	(0.000)***
Policies											
debt	0.041	0.040	0.041	0.065	0.042	0.041	0.055	0.041	0.043	0.074	0.074
	(0.008)***	(0.009)***	(0.007)***	(0.000)***	(0.005)***	(0.006)***	(0.000)***	(0.008)***	(0.005)***	(0.000)***	(0.000)***
black market premium	0.002	0.002	0.002	0.002	0.002	0.002	0.003	0.002	0.002	0.003	0.003
	(0.000)***	(0.001)***	(0.000)***	(0.001)***	(0.000)***	(0.000)***	(0.000)***	(0.000)***	(0.000)***	(0.000)***	(0.000)***
cpia	-0.011	-0.013	-0.012	-0.013	-0.011	-0.012	-0.005	-0.011	-0.011	-0.006	-0.006
	(0.134)	(0.080)*	(0.103)	(0.094)*	(0.144)	(0.127)	(0.448)	(0.164)	(0.150)	(0.328)	(0.360)
Risk											
durable	-0.003	-0.003	-0.003	-0.003	-0.003	-0.003	-0.002	-0.003	-0.002	-0.002	-0.002
	(0.000)***	(0.000)***	(0.000)***	(0.000)***	(0.000)***	(0.000)***	(0.000)***	(0.000)***	(0.000)***	(0.000)***	(0.000)***
civil war	0.011	0.010	0.011	0.010	0.011	0.011	0.002	0.011	0.010	0.001	0.001
	(0.000)***	(0.000)***	(0.000)***	(0.000)***	(0.000)***	(0.000)***	(0.079)*	(0.000)***	(0.000)***	(0.121)	(0.131)
Diminishing returns											
per capita gdp	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	(0.001)***	(0.002)***	(0.000)***	(0.001)***	(0.001)***	(0.001)***	(0.008)***	(0.001)***	(0.001)***	(0.003)***	(0.005)***
Host country returns											
us real interest rate	0.010	0.009	0.010	0.008	0.009	0.008	0.007	0.010	0.010	0.006	0.006
	(0.006)***	(0.017)**	(0.007)***	(0.017)**	(0.009)***	(0.016)**	(0.038)**	(0.006)***	(0.005)***	(0.077)*	(0.075)*
Dummy variable											
ssa	0.093	0.081	0.114	0.142	0.089	0.082	0.046	0.098	0.112	0.093	0.085
	(0.000)***	(0.000)***	(0.000)***	(0.000)***	(0.000)***	(0.001)***	(0.001)***	(0.048)**	(0.000)***	(0.001)***	(0.001)***
SSA interaction terms											
debt*ssa				-0.084						-0.066	-0.064
				(0.024)**						(0.052)*	(0.056)*
per capita gdp*ssa			-0.000							-0.000	
			(0.014)**							(0.411)	
durable*ssa									-0.001		
									(0.210)		
cpia*ssa								-0.002			
								(0.910)			
us real interest rate*ssa						0.004					
						(0.629)					
black market premium*ssa					0.000						
					(0.484)						
civil war*ssa							0.026			0.026	0.026
							(0.000)***			(0.000)***	(0.000)***
wbcf_10*ssa		0.174									
		(0.152)									
Observations	691	691	691	691	691	691	691	691	691	691	691
R-squared	0.636	0.638	0.638	0.641	0.637	0.637	0.686	0.636	0.637	0.688	0.688

Notes: Dependent variable: Financial Capital Flight. Robust p values in parentheses. * significant at 10%; ** significant at 5%; *** significant at 1%.

Table 3B Human Capital Flight—Investigation of the Sub-Saharan Africa Effect

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Lagged dependent variables										
educated emigration_10	1.3811	1.3811	1.3816	1.3808	1.3813	1.3816	1.3810	1.3809	1.3814	1.3813
	(0.000)***	(0.000)***	(0.000)***	(0.000)***	(0.000)***	(0.000)***	(0.000)***	(0.000)***	(0.000)***	(0.000)***
Policies										
debt	0.6125	0.6125	0.6194	0.7798	0.6293	0.6183	0.6102	0.6101	0.7905	0.7874
	(0.001)***	(0.001)***	(0.001)***	(0.003)***	(0.001)***	(0.001)***	(0.001)***	(0.001)***	(0.003)***	(0.003)***
black market premium	-0.0004	-0.0004	-0.0004	-0.0004	-0.0004	-0.0004	-0.0004	-0.0004	-0.0004	-0.0004
	(0.000)***	(0.000)***	(0.000)***	(0.000)***	(0.001)***	(0.000)***	(0.000)***	(0.000)***	(0.002)***	(0.000)***
cpia	-0.2270	-0.2319	-0.2222	-0.2287	-0.2239	-0.2086	-0.2427	-0.2264	-0.2102	-0.2101
	(0.038)**	(0.036)**	(0.046)**	(0.036)**	(0.041)**	(0.057)*	(0.126)	(0.038)**	(0.055)*	(0.055)*
Risk										
durable	-0.0120	-0.0118	-0.0113	-0.0120	-0.0117	-0.0106	-0.0121	-0.0129	-0.0106	-0.0106
	(0.000)***	(0.000)***	(0.001)***	(0.000)***	(0.000)***	(0.000)***	(0.000)***	(0.003)***	(0.000)***	(0.000)***
civil war	-0.0252	-0.0253	-0.0244	-0.0248	-0.0266	-0.0385	-0.0253	-0.0247	-0.0378	-0.0381
	(0.111)	(0.111)	(0.136)	(0.118)	(0.097)*	(0.032)**	(0.112)	(0.115)	(0.036)**	(0.035)**
Diminishing returns										
per capita gdp	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
	(0.074)*	(0.071)*	(0.136)	(0.073)*	(0.077)*	(0.099)*	(0.075)*	(0.092)*	(0.097)*	(0.098)*
Host country returns										
us per capita gdp	-0.0001	-0.0001	-0.0001	-0.0001	-0.0001	-0.0000	-0.0001	-0.0001	-0.0000	-0.0000
	(0.669)	(0.640)	(0.667)	(0.684)	(0.706)	(0.722)	(0.662)	(0.681)	(0.745)	(0.738)
Dummy variables										
ssa	0.0097	-0.0361	0.1147	0.4562	-0.0178	-0.0747	-0.1315	-0.0337	0.3703	0.3756
	(0.943)	(0.782)	(0.694)	(0.011)**	(0.897)	(0.601)	(0.832)	(0.868)	(0.036)**	(0.034)**
latin	0.4308	0.4296	0.4225	0.4147	0.4399	0.4505	0.4239	0.4264	0.4359	0.4345
	(0.047)**	(0.048)**	(0.061)*	(0.054)*	(0.044)**	(0.039)**	(0.046)**	(0.045)**	(0.045)**	(0.045)**
SSA interaction terms										
debt*ssa				-0.7877					-0.7912	-0.7958
				(0.006)***					(0.004)***	(0.004)***
per capita gdp*ssa			-0.0001							
			(0.518)							
durable*ssa								0.0028		
								(0.655)		
cpia*ssa							0.0440			
							(0.792)			
black market premium*ssa					0.0003				0.0001	
					(0.038)**				(0.561)	
civil war*ssa						0.0907			0.0867	0.0915
						(0.000)***			(0.000)***	(0.000)***
educated emigration_10*ssa		0.0670								
		(0.126)								
Observations	648	648	648	648	648	648	648	648	648	648
R-squared	0.991	0.991	0.991	0.991	0.991	0.991	0.991	0.991	0.991	0.991

Notes: Dependent variable: Human Capital Flight. Robust p values in parentheses.* significant at 10%; ** significant at 5%; *** significant at 1%.

Table 4A: Explaining African Financial Capital Flight, 1988-98

Variables	1998	1998	1988-98	Coefficient (Net)	Predicted Change
Lagged dependent variable					
wbcf	31.22	23.57	-7.65		
wbcf_10	15.54	31.22	15.68	0.867	13.59
Policies					
Debt	67.5	54.3	-13.2	0.01	-0.13
Black market premium	86.45	62.85	-23.6	0.003	-7.00
cpia	3.15	2.9	-0.25	-0.006	1.50
Risk					
Durable	19.57	10.85	-8.72	-0.002	1.74
Civil war	1.71	0	-1.71	0.027	-4.61
Diminishing returns					
per capita gdp	1362	1719	357	0.000006	0.2
Host country returns					
US real interest rate	2.66	3.27	-0.61	0.006	-0.40
Total					+4.89

Table 4B: Explaining African Human Capital Flight

Variables	1988	1998	1998–1988	Coefficient (net)	Predicted change
Lagged dependent variables					
Educated emigration	1.329	2.161	0.831		
Educated emigration_10	0.805	1.329	0.524	1.381	0.7241
Policies					
Debt	0.598	0.640	0.043	-0.008	-0.0004
Black market premium	110.809	7.814	-102.995	0.000	0.0409
cpia	3.090	2.994	-0.096	-0.210	0.0202
Risk					
Durable	14	7	-7	-0.011	0.0701
Civil war	2	0	-2	0.053	-0.0854
Diminishing returns					
per capita gdp	1242	1564	322	0.000	0.0350
Host country returns					
US per capita gdp	13044	13525	481	0.000	-0.0226
Total					0.782
		+4.89			

Notes:

(1) Means are for the 10 SSA countries in the sample that are included in both the 1988 and the 1998 regression. These are: Benin, The Gambia, Ghana, Kenya, Malawi, Mauritius, Mozambique, Uganda, Zambia and Zimbabwe.

(2) Net coeffecients are from Table 3B, Col.10, summing the coeffecient on the variable and the relevant SSA interaction term for debt and civil war.

Data Appendix

Sample:

Sub-Saharan Africa
Benin, Burundi, Cameroon, Chad, Rep. of Congo, Ethiopia, Gabon, Gambia, Ghana, Kenya, Malawi, Mali, Mauritania, Mauritius, Niger, Nigeria, Rwanda, Senegal, Togo, Uganda, Zimbabwe

Latin America and Caribbean
Argentina, Bolivia, Brazil, Chile, Columbia, El Salvador, Guatemala, Haiti, Honduras, Mexico, Nicaragua, Paraguay, Peru, Venezuela

South Asia
Bangladesh, India, Pakistan, Sri Lanka

East Asia and Pacific
Fiji, Indonesia, Korea, Malaysia, Papua New Guinea, Philippines, Thailand

Middle East and North Africa
Egypt, Tunisia

Table A1: Samples

Country	*Figure 1A*	*Table 2A (n=691)*	*Figure 1B*	*Table 3B (n=648)*
Argentina	*	*		*
Bangladesh	*	*	*	
Benin		*	*	*
Bolivia	*	*		
Brazil	*	*		*
Burundi		*		
Cameroon		*	*	*
Chad		*		
Chile	*	*		*
Columbia	*	*		*
Congo, Republic		*		
Egypt	*	*		*
El Salvador	*	*		*
Ethiopia	*	*		
Fiji	*		*	
Gabon		*		
Gambia		*	*	*
Ghana		*	*	*
Guatemala	*	*		*
Haiti	*	*		
Honduras	*	*		*
India	*	*	*	*
Indonesia		*	*	*
Kenya	*	*	*	*
Korea	*	*	*	*
Malawi		*	*	*
Mali		*	*	*
Malaysia		*	*	*
Mauritania	*	*		
Mauritius	*	*	*	*
Mexico	*	*		*
Mozambique	*	*	*	*
Myanmar			*	
Nicaragua		*		*
Niger		*		
Nigeria	*	*		
Pakistan		*	*	*
Papua New Guinea	*		*	
Paraguay	*	*		
Peru		*		*
Philippines	*	*	*	*

Table A2 continued

Country	*Figure 1A*	*Table 2A (n=691)*	*Figure 1B*	*Table 3A (n=648)*
Rwanda	*	*	*	
Senegal		*	*	*
Singapore			*	
Sri Lanka	*	*	*	*
Tanzania	*	*		
Thailand	*	*	*	*
Togo		*	*	*
Tunisia	*	*		*
Turkey		*		*
Uganda		*	*	*
Venezuela	*			
Zambia			*	
Zimbabwe		*	*	*
Total	30	48	28	35

Table A2: Descriptive Statistics for the Core Models

	Financial Capital Flight (n=691)		*Human Capital Flight (n=648)*	
	All countries	*Sub-Saharan Africa*	*All countries*	*Sub-Saharan Africa*
Flight Capital Ratio	0.169 (0.222)	0.275 (0.279)		
Flight Capital Ratio (t-10)	0.109 (0.176)	0.182 (0.231)		
Educated emigration			6.253 (17.496)	1.252 (1.104)
Educated emigration(t-10)			4.244 (12.526)	0.732 (0.724)
GDP per capita (US $)	2151 (1765)	1226 (1312)	2330 (1786)	1141 (1254)
US GDP per capita (US $)			12629.85 (421.776)	12625.08 (421.144)
Debt/GDP	0.545 (0.393)	0.609 (0.322)	0.538 (0.400)	0.596 (0.290)
Black Market Premium	0.804 (5.350)	0.574 (1.859)	0.895 (602.292)	0.094 (441.220)
US real interest rate	2.77 (1.47)	2.74 (1.49)		
Civil War (months)	1.85 (4.25)	1.3 (3.645)	1.991 (4.403)	0.64 (2.648)
CPIA (index 1-5)	3.07 (0.73)	2.88 (0.65)	3.166 (0.727)	3.043 (0.657)
Durable (years since last regime change)	13.54 (12.68)	13.71 (11.05)	13.378 (12.875)	12.448 (10.951)

Note: Standard Deviation in parentheses. Differences in the US interest rates and US GDP per capita across sub-samples are due to the unbalanced structure of the panel.

Table 3A: Descriptive Statistics for all available observations

Variable	*All countries*	*Sub-Saharan Africa*
Flight Capital Ratio	0.134	0.238
	(0.206)	(0.266)
Flight Capital Ratio	0.115	0.206
(t-10)	(0.190)	(0.248)
Educated emigration	5.695	0.990
	(15.917)	(0.995)
Educated	4.381	0.722
emigration(t-10)	(12.333)	(0.707)
Emigration	0.897	0.063
	(1.680)	(0.052)
Emigration(t-10)	0.649	0.045
	(1.006)	(0.028)
GDP per capita	2099	1187
(US $)	(1787)	(1154)
US GDP per capita	12712.84	12712.84
(US $)	(420.283)	(420.283)
Debt/GDP	0.431	0.466
	(0.351)	(0.315)
Black Market	0.964	0.853
Premium	(4.784)	(3.378)
US real interest rate	1.457	1.46
	(2.34)	(2.34)
Civil War (months)	1.78	1.33
	(4.18)	(3.69)
CPIA (index 1-5)	2.96	2.83
	(0.71)	(0.64)
Durable (years since	12.64	12.40
last regime change)	(11.92)	(10.81)

Note: Standard Deviation in parentheses. Differences in the US interest rates and US GDP per capita across samples are due to the unbalanced structure of the panel.

Data

WBCF (Capital Flight Measure)

We measure capital flight as the ratio of foreign held capital stocks to total capital stocks, which are the sum of domestic and foreign capital stocks. The capital flight flows were calculated by using the World Bank method. See Claessens (1993) and Claessens and Naude (1997) for a detailed discussion of the various methods. They show that the commonly used methods to determine capital flight produce remarkably similar data series. Private capital stocks held domestically were compiled by aggregating private investment flows. We would like to thank Luc Moers for compiling these data series for us.

Emigration

Measures the overall stock of foreign-born individuals in the U.S. as a ratio of the home country population. Data on the stocks comes from the U.S. Census:
http://www.census.gov/population/www/documentation/twps0029/tab03.html
and the Census's Current Population Survey:
http://www.census.gov/population/www/socdemo/foreign/datatbls.html. Intra-decade interpolation utilizes data from the U.S. Immigration and Naturalization Service's (INS) *Statistical Yearbooks*. Annual population figures are from the World Bank *World Development Indicators.*

Educated Emigration

Measures the stock of educated (some secondary or tertiary education) foreign-born individuals in the U.S. over age 25 relative to the over 25 population in the home country with secondary or tertiary education. Data draws on Carrington and Detragiache (1998) and Barro and Lee (2000) http://www.cid.harvard.edu/ciddata/ciddata.html.

Civil War

Indicates the number of months the country experienced an internal major armed conflict in a given year. Major armed conflicts are defined as wars causing a minimum of 1,000 battle related deaths *per annum*. For further discussion and data see Collier and Hoeffler (2002).

CPIA

The Country Policy and Institutional Assessment measure of policy has 20 equally weighted components divided into four categories as follows: (1) Macroeconomic Management and Sustainability of Reforms (General Macroeconomic Performance, Fiscal Policy, Management of External Debt, Macroeconomic Management Capacity, Sustainability of Structural Reforms); (2) Structural Policies for Sustainable and Equitable Growth (Trade Policy, Foreign Exchange Regime, Financial Stability and Depth, Banking Sector Efficiency and Resource Mobilization, Property Rights and Rule-based Governance, Competitive Environment for the Private Sector, Factor and Product Markets, Environmental Policies and Regulations); (3) Policies for Social Inclusion (Poverty Monitoring and Analysis, Pro-poor Targeting and Programs, Safety Nets); and (4) Public Sector Management (Quality of Budget and Public Investment Process, Efficiency and Equity of Revenue Mobilization, Efficiency and Equity of Public Expenditures, Accountability of the Public Service). Index ranges from 1 to 5, lower scores indicate worse policies. Data source: World Bank.

Debt

Is the ratio of the net present value of the total debt service to GDP. Both variables are measured in current US dollars. Data sources: Easterly (2000) (net present value of the total debt service) and World Bank *World Development Indicators*, CD-Rom 2001 (Total GDP at Market Prices).

Durable
Number of years since the most recent regime change which is defined as a three point change in the polity score over a period of three years or less. The polity score ranges from –10 to 10 and in the year of regime change, new polity is coded as year zero (value=0). A discussion of the data can be found in Jaggers and Gurr (1995). Data source: Polity IV at http://www.cidcm.umd.edu/inscr/polity/

Real GDP per Capita
Income per capita was obtained from the Global Development Network (GDN) database. GDP per capita is measured in 1985 constant US dollars, the data until 1992 was taken from PWT 5.6 and updated for later years.

BMP (Black Market Exchange Rate Premium)
Source: Reinhart and Rogoff (2002) and World Bank *African Development Indicators*.

US Real interest rate
US real interest rates, source: IMF *International Financial Statistics*.

SSA (Sub-Saharan Africa dummy)
This dummy takes the value of one for countries in Sub-Saharan Africa and zero for all other countries.

References

Ajayi, S. Ibi, and Mohsin S. Khan, 2000. *External Debt and Capital Flight in Sub-Saharan Africa* (Washington: International Monetary Fund, IMF Institute).

Barro, R. and J. Lee. 1993. International Comparisons of Educational Attainment. *Journal of Monetary Economics* **32**: 363-94.

Barro, R. and J. Lee. 2000. International Data on Educational Attainment: Updates and Implications. Harvard Center for International Development Working Paper 42.

Bevan, D.L., P. Collier and J.W. Gunning. 1990. *Controlled Open Economies*, Clarendon Press, Oxford.

Boyce, J. K. and L. Ndikumana. 2001. Is Africa a Net Creditor? New Estimates of Capital Flight from Severely Indebted Sub-Saharan African Countries, 1970-96. *The Journal of Development Studies* **38**: 27-56.

Carrington, W. and E. Detragiache. 1998. How Big is the Brain Drain? IMF Working Paper 98/102.

Chang, K. P. H., S. Claessens, and R. E. Cumby. 1997. Conceptual and Methodological Issues in the Measurement of Capital Flight. *International Journal of Financial Economics* **2**:101-109.

Claessens, S. 1997. Estimates of Capital Flight and its Behaviour. *Revista de Analisis Economico* **12**:3-34.

Claessens, S.and D. Naude. 1993. Recent Estimates of Capital Flight. World Bank WPS 1186.

Clark, X., T. J. Hatton and J. G. Williamson. 2002. Where do U.S. Immigrants Come From and Why? NBER Working Paper 8998.

Cline, W. R., ed. 1995. *International Debt Reexamined*. Washington D.C.: Institute for International Economics.

Collier, P. and A. Hoeffler. 2002. Greed and Grievance in Civil Wars, Centre for the Study of African Economies Working Paper 2002-01.
http://www.economics.ox.ac.uk/CSAEadmin/workingpapers/pdfs/2002-01text.pdf

Collier, P., A. Hoeffler and C. Pattillo. 2001. Flight Capital as a Portfolio Choice. *The World Bank Economic Review* **15**: 55-80.

Easterly, W. and S. Rebelo. 1993. Fiscal Policy and Economic Growth. *Journal of Monetary Economics* **32**:417-58.

Hatton, T. J. and J. G. Williamson 2001. "Demographic and Economic Pressure on Emigration Out of Africa," NBER Working Paper No. 8124 (Cambridge, Massachussets).

Hatton, T. J. and J. G. Williamson. 2002a. Out of Africa? Using the Past to Project Future African Demand for Emigration. *Review of International Economics* **10**: 556-73.

Hatton, T. and J. Williamson. 2002b. What Fundamentals Drive World Migration? NBER Working Paper 9159 (Cambridge, Massachussets) .

Jaggers, K. and T. R. Gurr. 1995. Tracking Democracy's Third Wave with the Polity III Data. *Journal of Peace Research* **32**:469-82.

Jasso, G., Rosenzweig M. and J. Smith. 1998. The Changing Skill of New Immigrants to the United States: Recent Trends and Their Determinants. NBER Working Paper No. 6764.

Kaufmann, D., Kraay, A. and P. Zoido-Lobaton. 1999. Governance Matters. World Bank Working Paper No. 2196.

King, R. G., and R. Levine. 1994. Capital Fundamentalism, Economic Development, and Economic Growth. *Carnegie-Rochester Conference Series on Public Policy* **40**:259-92.

Lensink, R, H. Niels and V. Murinde. 2000. Capital Flight and Political Risk. *Journal of International Money and Finance* **19**:73-92.

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

Ndulu, B.J. 2002. "Human Capital Flight: Stratification, Globalization and the Challenges to Tertiary Education in Africa," (mimeo).

Reinhart, C. and K. Rogoff. 2002. The Modern History of Exchange Rate Arrangements: A Reinterpretation. NBER Working Paper 8963.