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ABSTRACT

Demographic and Economic Pressure on Emigration out of Africa^{*}

Two of the main forces driving European emigration in the late nineteenth century were real wage gaps between sending and receiving regions and demographic booms in the low-wage sending regions (directly augmenting the supply of potential movers as well as indirectly making already-measured employment conditions less attractive). These two features are even more prominent in Africa today, but do or can Africans respond to them with the same elasticity as in the days of “free” migration? Our new estimates of net migration and labor market performance for the countries of sub-Saharan Africa suggest that exactly the same forces are at work driving African across-border migration today. Rapid growth in the cohort of young potential migrants, population pressure on the resource base, and poor economic performance are the main forces driving African migration. A century ago, more modest demographic forces in Europe were accompanied by strong catching-up economic growth in the low-wage emigrant regions, followed by a slowdown in already-modest demographic growth. Yet, migrations were still mass. In Africa today, economic growth has faltered, its economies have fallen further behind the high-wage OECD leaders, and there is a demographic speed up in the making. Our estimates suggest that the pressure on emigration out of Africa will intensify, manifested in part by a growing demand for entrance into high-wage OECD labor markets.

JEL Classification: F22, J11, J61, 015

Keywords: International migration, demographic pressure, African population

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Introduction

Concern has been rising about a potential flood of African migrants penetrating Europe's porous southern borders and washing under America's leaky door. The European response has been to tighten immigration requirements, stiffen border controls and toughen up on asylum seekers. Africa's rapid population growth and poor economic performance imply for many observers that the pressure for emigration will increase, and the United States' experience with immigration over its southern border serves to reinforce those concerns. Yet relatively little is known about what aggregate forces are at work in Africa and precisely what their effects on the demand for emigration might be in the near future.

History supports the view that African emigration pressure should be building up, has been building up, and will build up still further. In the age of mass trans-Atlantic migration in the half-century before World War I, 55 million emigrants moved from the Old World to the New. This mass migration began in the more developed countries of northwestern Europe and then spread to the less developed regions in the south and east. European emigrants were persuaded to move by the prospect of large earnings gains for themselves and their children, by the pace of development at home, by demographic pressure on the resource base, and by the cumulative effects of past migrations through the so-called "friends and relatives effect" (Hatton and Williamson 1998, Chp. 3). Once mass migration gained momentum, annual emigration rates as high as 15 per thousand per annum were recorded for relatively poor countries like Italy and Ireland (Hatton and Williamson 1998, p. 33). The migrations typically began with small streams of pioneers before they grew to a migrant flood as the friends and relatives effect unlocked the economic and demographic fundamentals pushing emigrants out of local labor markets.¹ This delay – poor countries recording at first only modest levels of emigration – seems to be somewhat of a paradox since simple economics would suggest that poor countries would record the highest rates of emigration. The paradox is resolved as soon as we remember that migration

¹ Our simulations of the typical European emigration cycle show that migrant stock effects continued to raise emigration rates even after the economic and demographic forces weakened and as

is constrained by the availability of the financial resources to invest in the move. Repatriation of funds back home by emigrant pioneers helped release that constraint, but only with a lag.

Our purpose in this paper is to examine more fully than has been done thus far the size, causes, characteristics and future of international migration within and out of Africa. The questions are guided by our understanding of the mass migrations of a century ago (Hatton and Williamson 1998). What drives Africans to migrate across international borders? Are those forces the same ones that drove poor peasants and impoverished urban workers in nineteenth century Europe to seek a better life in the New World? Legal restrictions on immigration into high-wage OECD countries have certainly choked off observed migrations, but despite these restrictions can the same pressures to emigrate be observed in modern Africa as were present a century ago in Europe? Do Africans move across borders mainly in response to political upheaval and civil war, or are the same economic and demographic forces at work in Africa today that drove “free” European mass migration in the past and that drives “free” rural-urban migration in all presently developing countries, Africa included? Are these forces likely to intensify or weaken in the future? Is migration pressure building up or easing off?

We argue that African emigration pressure is building up dramatically and that it is driven by some of the same forces observed in late nineteenth century Europe. The paper first examines the dimensions of migration within and out of sub-Saharan Africa. It then estimates the impact of wars and political upheavals on refugee flight. Next, it uses newly available data to estimate the forces driving net migration within Africa. These estimates are then used to construct a measure of what we call *migration pressure* for sub-Saharan Africa as a whole. Finally, the paper uses what we have learned about past African emigration to project its likely future.

western Europe converged on the New World (Hatton and Williamson 1998, pp. 49-51).

African International Migration

Students of African migration are confronted with an apparently conflicting mixture of facts. On the one hand, there is a vast literature on rural-urban migration that paints a picture of a highly mobile African labor force responding elastically to changing economic incentives between sectors and regions. On the other hand, given the incentives, African cross-border international migration seems low. This is especially so when it is viewed in the light of the mass migrations from Europe a century ago.

The same fundamentals that drove European emigration a century ago are even a more powerful engine in Africa today. Rates of natural increase in Africa are expected to remain above 2 percent for the next two decades, rates that are almost double those of late nineteenth century Europe. The contrast is even more striking when rates of increase of young adults are compared (Hatton and Williamson 2000, Table 4), and these are the ones most likely to move. Furthermore, the wage gaps favoring Europe over Africa today are double those that favored the New World over Europe in the nineteenth century. If Africans are as responsive to migration fundamentals as Europeans were a century ago (a point discussed further below), then large outflows should be taking place now and larger ones should be expected in the future. But restrictions on immigration in high-wage OECD countries have so far stemmed much, but certainly not all, of this potential flow. Thus, the stock of African-born living in the West is still fairly modest.

[Table 1 about here]

Table 1 shows the proportion of immigrants to the United States (excluding those from Canada) distributed by region of origin. African immigrants to the United States were only a tiny share of the total in 1955-64 but their share rose to more than 9 percent in 1995-7. By 1997 they had mounted to an annual inflow of 48,000 immigrants. These African “pioneers” are now a significant part of US immigration. Comparisons with immigration from Asia are revealing. Asian immigration surged up to 1975-84 and then declined – replicating the “life-cycle” which

the European mass migrations traced out a century ago – suggesting that the Asian miracle finally started doing its work in the late 1980s, after a lag choking off the urge to emigrate. African immigration now has the same foothold that Asian immigration had in the 1950s. Indeed, a third of the African immigrants arriving in the 1990s were classified as close relatives of US citizens and thus it seems likely that the friends and relatives effect is already serving to erode the poverty and/or legislated constraint on potential African emigrants.

Migration Within Africa

It is estimated that 2.8 percent of the 1990 resident population of sub-Saharan Africa were living outside their country of birth (Zlotnik 1998, Table 1, p. 431). This is much lower than Western Europe (6.1 percent) or the United States (8.6 percent), but, of course, these two are immigrant regions. Comparisons with other emigrant regions, like Asia or Latin America, would be more relevant, and by this comparison the African figure looks much higher: of the 1990 resident populations, 1.4 percent in Asia and 1.7 percent in Latin America were living outside their country of birth. The Caribbean (2.9 percent) was the only emigrating region that recorded a higher rate than sub-Saharan Africa, and it wasn't higher by much. Another relevant comparison might be with mobility *within* the United States. It turns out that the African 2.8 percent figure is much lower than the proportion of resident US-born population living outside their region of birth. These comparisons suggest that while African across-border migration is higher than it is in other low-wage regions, it is low compared to Europe's past as well as to present across-border migration within the United States and the European Union. The lower migration rate could be explained by any combination of the following four factors: there are serious political, legal, language, and/or geographic barriers to international across-border mobility within Africa as well as between Africa and the OECD; African migration is typically temporary, and this "churning" would be grossly understated in the data; African across-border migration is much less responsive to labor market incentives; or, the labor market incentives for

across-border in Africa are limited since most African labor markets are all low-wage regardless of location.

While across-border migration within Africa is not as free as it is between United States regions or between EU members, the barriers within the African continent are far lower than between it and the high-wage industrial world. In West Africa, the treaty which formed the Economic Community of West African States in 1975 (known as ECOWAS), contained a protocol providing for free movement of capital and labor.² Agreements for trade and economic cooperation in other regions, such as the Common Market for Eastern and Southern Africa (COMESA), the Southern African Development Community (SADC), and the Eastern and Southern African Preferential Trade Area (PTA) were set up with free factor mobility as an objective but contained no explicit protocols.³ Nevertheless, it has been argued that understandings between groups of countries has facilitated labor migration on an informal level – indeed the effective barriers may be lower in east Africa than under ECOWAS (Akande 1998, p. 346). But such agreements and understandings have followed rather than led growing across-border labor migration. With completely porous borders between most contiguous African countries, a large amount of undocumented migration takes place and attempts to control migration have been only partial at best (Adepoju 1995, p. 93).

Many of the inter-African migrations involve movement from the more populous and/or less developed countries such as Burkina Faso, Uganda, Lesotho, Mozambique, Mali, Rwanda and Burundi. The receiving countries have included Côte d'Ivoire, Gabon, Zaire, Equatorial Guinea, Nigeria (until recently) and above all the Republic of South Africa (Adepoju 1994, p. 211). These migrations, often in response to the development of minerals, primary commodities,

² The countries included in ECOWAS are: Benin, Burkina Faso, Cape Verde, Gambia, Ghana, Guinea Bissau, Cote d'Ivoire, Liberia, Mali, Mauritania, Niger, Nigeria, Senegal, Sierra Leone and Togo. Article 2(2) of the 1975 Treaty states that “[The Community shall by stages ensure the abolition as between the Member States of the obstacles to the free movement of persons, services and capital” (quoted in Akande 1998, p. 347).

³ These agreements cover almost the whole of eastern and southern Africa. Members of the PTA are: Angola, Burundi, Botswana, Comoros, Djibouti, Kenya, Lesotho, Malawi, Mauritius, Mozambique, Namibia, Rwanda, Somalia, Sudan, Swaziland, Tanzania, Uganda, Zambia and Zimbabwe.

or oil for export, have typically reversed when economic fortunes changed. A graphic example is offered by the flood of migrants into Nigeria from surrounding countries (especially Ghana) during the 1970s in response to the oil boom. Many of those migrants without papers were expelled in the early 1980s when boom turned to bust. Another example is offered by the migrants from Botswana, Lesotho, Malawi, Mozambique and Swaziland recruited for the South African gold and copper mines. These migrants formed a quasi-permanent labor force much like the guest workers in postwar Germany (Milazi 1998). But here too, changing economic fortunes slowed recruitment and led many of the migrants to return.⁴

These movements suggest no lack of mobility among Africans. Indeed the large literature on rural-urban migration testifies to high levels of mobility within countries, mobility that often spills across international borders. One example is Robert Lucas's (1985) study of migration among the Batswana, migration to cities within Botswana as well as to South Africa. His results from microdata indicated highly elastic responses of migration to wage rates and employment probabilities in the urban sector as a whole, and only slightly smaller negative elasticities with respect to local wage rates and employment probabilities. Lucas estimated that an increase in the urban employment probability would draw more than enough migrants to fill the new jobs – supporting the famous hypothesis of John Harris and Michael Todaro (1970).

Both the Lucas study and one by Richard Adams (1993) of rural urban migration in Egypt find that, given the incentive to migrate, those with more education were no more likely to migrate than those with less. The fact that those with education more often migrate simply reflects the greater economic return to education in the cities. As we pointed out above, these and many other studies have found that the migrants were young, single males typically in the

⁴ The number of foreign workers employed by the South African Chamber of Mines fell from an average of 216,679 in 1985-9 to 178,881 in 1990-3 (Zlotnik 1998, p. 458). In 1988 the South African mining industry stopped recruiting migrant workers from Malawi because a considerable number had tested positive for HIV/AIDS, but there were also deeper causes such as the collapse of apartheid and the increased competition between domestic and foreign workers (Chirwa 1997). Adekayne (1998) argues that, in general, where expulsion orders were promulgated against immigrants or where recruitment stops were imposed, these were typically a response to worsening employment conditions.

age range 15-29.⁵ Furthermore, there is very little evidence suggesting that the poorest laborers were constrained by poverty; Adams found that laborers without land were the most likely to migrate. He concluded that “despite considerable travel and opportunity costs associated with international migration, males who are both poor *and* landless are able to find or borrow the money they need” (1993, p. 162).

Most migrants within Africa view their migration as temporary. Surveys of these migrants indicate that most intend to return to their rural (or, increasingly, urban) origins within a few years or upon retirement from the labor force. Most migrants send remittances back to their families in their homelands. Indeed, these remittances have been estimated to account for 10-20 percent of all family incomes in the major cities (Oucho 1996, pp. 16-17). Findlay and Sow (1998) studied short and long term migration among rural households in the Senegal River valley in Mali. Here, remittances were a key element in closing the food deficit in rural households and migrants left for increasingly long periods with about 40 percent migrating to France. The authors found that the poorer the family, the more likely its migrants would remain in Africa—suggesting that the poverty constraint affected the choice of destination. They also found that households with previous emigration experience to France were more likely to send new migrants to France—suggesting that the friends and relatives effect was also important in determining the direction of those migrations.

Growing restrictions on French immigration in 1974, 1981 and the early 1990s did not stop migration from the Senegal River Valley. Findlay and Sow observe that “Every year thousands continue to find a way into France and thousands more who are discouraged have increasingly turned to other destinations: Zaire or other central African republics; Abidjan and the plantations of the Ivory Coast; and other countries of coastal West Africa. In the early 1990s, with increased tightening of immigration restrictions following the break up of the Soviet

⁵ See, for example, Oucho 1996, pp. 12, 44. Migration self-selected by age in the past too. Between 1868 and 1910, young adults aged 15-40 accounted for an enormous 76 percent of the immigrant totals, at a time when the figure for the United States population was only 42 percent (Hatton and Williamson 1998, p. 11).

Union and its massive east-west migrations, migrants from this region are increasingly making their way to the US, primarily to New York and the other east coast cities” (1998, p. 75).

Clearly, migration pressures have been building up, driven by poverty, opportunity and previous migration experience; and restrictions in one place have diverted flows elsewhere. Of course, there are big income gains from rural-urban migration. But African across-border migration generally involves moving from one poor country to another. Big gains by moving from a low-wage to a high-wage country are simply not typical of across-border migration within Africa. Thus, despite the pressure to migrate, the gains from international migration *within* Africa may not be very great. The biggest gains are to migration *out of* Africa.

African Refugees

Africa is famous for its refugees. While it has 12 percent of the world’s population, in most years Africa accounts for more than a third of the world’s stock of refugees living in foreign countries. Recent events in Liberia, Rwanda, Burundi and Sierra Leone are just the most recent in a long list of tragic population displacements in response to political upheaval and internecine warfare. Newspaper headlines tell us almost daily about the scale and horror of related atrocities. But headlines do not place the size and persistence of the displacements in perspective. Furthermore, little formal analysis has been done on the correlates of such displacements for Africa as a whole or on their permanence.

The bulk of the displaced refugees do not leave Africa. Despite press coverage about rising pressure from African asylum seekers beating on the doors of Europe and America, a tiny proportion of all African refugees end up outside Africa. Ballpark estimates of the total number of displaced persons in Africa indicates that these are typically about 2.5 percent of the total African population. About a quarter of these are displaced across international borders, mainly into neighboring states. Those living in other countries are better documented since, as asylum

seekers, they come under the scrutiny of the governments of the receiving countries and international organizations such as UNHCR, and, for the most part, they are accorded official refugee status. During the 1990s the number of refugees in Africa ranged between 5 and 6 million.

Figures documenting the total stock of refugees are collected (or estimated) each year by the US Committee for Refugees and published in its *World Refugee Survey*. Although the numbers are large they are not as large as might have been expected, and for one simple reason: most refugees return to their country of origin as soon as possible. UNHCR resettlement and repatriation policies are aimed specifically to this end. But of the millions of refugees repatriated between 1970 and 1990 only about one in ten were returned to their homelands under an organized scheme (Rogge 1994, pp. 17, 29). Indeed, the evidence suggests that refugees often return against the advice of the UNHCR. Thus at least 100,000 refugees from Burundi returned in early 1994 as soon as the fighting receded but despite continuing instability in the country (US Committee for Refugees 1994, p. 48). In other cases, they were pushed back by hostile populations or unwelcoming governments in the receiving countries, and in a few cases they became refugees from the receiving country. Thus, when civil war erupted in Zaire in 1996, finally overthrowing the Mobutu regime, an estimated 600,000 to 700,000 Rwandan refugees were pushed back across the border in “an unusual mixture of voluntary and involuntary repatriations” (US Committee for Refugees 1998, p. 84).

The high rates of return are much more common in Africa than elsewhere in the world (Rogge 1994, p. 21). Even among refugees who remained displaced for long periods, such as those from southern Sudan (1955-72) or those exiled from Burundi (1972-1993), mass returns took place as soon as conditions permitted. It has been suggested that political motives, tribal and kinship ties, and the loss of culture and identity all make refugees keen to return (Makanya 1994). But there may be a more important motive at work: African refugees, often displaced into rural parts of bordering states, experience even greater deprivation than they do at home. In

many cases the refugees are detained in camps and are unable to seek or obtain a living in the receiving country.

In order to get a clearer picture of the typical effects of war and upheaval on the creation of refugees we take advantage of the datasets assembled by Robert Bates from a range of sources (see Appendix). The dataset on violence contains a variety of variables documenting the incidence of coups, crises, civil wars, guerrilla campaigns, and invasions from hostile neighbors. We use these variables to “explain” the stock of refugees from a given country at the end of a given year as estimated by the US Committee for Refugees (available in the Bates data). The sample we select is annual data for 1987 to 1992 for 41 countries of sub-Saharan Africa. In these data, there are 142 cases where no refugees are observed and another 104 with positive numbers of refugees. We therefore use tobit estimation where the dependent variable is the number of refugees per thousand population, while violence dummies are on the right-hand side.

[Table 2 about here]

Table 2 documents strong effects arising from each of the violence variables. Since the right-hand side variables are in the form of dummies, the coefficients can be read as the number of refugees per thousand population created as a result of the violence event in question. The coefficients in column (1) indicate that coups d’etat typically create an efflux of 45 per thousand while government crises generate over 20 per thousand. Although government crises are not always associated with widespread violence, perhaps fear of violence accounts for the surprisingly large effect on refugee creation. Guerrilla warfare creates nearly 30 refugees per thousand. If that figure seems low, perhaps it can be explained by the fact that guerrilla campaigns are often protracted affairs that, once initiated, generate few additional refugees per year. Finally, and predictably, civil wars generate the largest displacement effects, about 64 refugees per thousand.

These violence events vary greatly in size and intensity, all the more so when scaled by the size of the country. Equation (2) adds an additional variable that measures the number of military deaths during the civil war (among the armed forces in the conflict) per thousand of

population. The coefficient indicates that, as a proxy for the intensity of war, one military death is associated with 35 refugees. But even including intensity proxies like this, the pseudo- R^2 is still less than 0.1, a low figure reflecting the enormous heterogeneity in the size and intensity of the upheavals, as well as their refugee-creating effects.

Although the data used here are crude, in principle they represent the *stock* of refugees at any one time rather than, say, the annual or monthly average flow. If refugees remain displaced for a number of years, even after the end of the conflict or crisis, then lagged values should also matter. Equations (1) and (2) were estimated with one and two lags of each explanatory variable. The coefficients on these lags were insignificant and in general they were small. The chi-squared test decisively rejects the joint significance of all the lags in every case (penultimate lines of Table 2). Thus, refugee migrations appear to be temporary and quickly reversed.

Explaining Net Emigration in Africa

Some Preliminaries

While refugee flows clearly dominate the news, other migrations from and within Africa receive less attention. One reason is the lack of aggregate data on the magnitude of these population movements. Across-border movements of migrants or long-term visitors is unsystematically recorded at best, and for the most part, completely absent.⁷ Thus we have no usable data on the magnitudes of gross annual flows from and to the countries of Africa. As a substitute, we use the net migration estimates produced by the United States Census Bureau and listed in its International Data Base.⁸ These estimates were generated as residuals from a demographic accounting exercise rather than from direct observation. Given that they were

⁷ The United Nations *Demographic Yearbooks* contain compilations of demographic data, including international migration, but they contain very few entries for Africa. The ILO's International Migration Database (www.ilo.org/public/english/protection/migrant/ilmdb/index/htm) also contains remarkably little on African migration.

constructed from census and survey data, themselves often of doubtful quality, the US census estimates should be regarded as approximations to the true underlying migration rates.

In order to take account of refugee flows that are part of the net migration estimates, we construct a variable for the average refugee movement using the estimates for the refugee stock examined above. To measure the refugee flow we take the *change* in the stock of refugees emanating from a country less the change in the stock of refugees from elsewhere living in that country. This is expressed per thousand of the country's population to give it the same dimension as the net migration estimate. Since, as we have seen, refugees are driven to move by wars and political upheavals, these must be taken into account if the economic and demographic forces driving migration are to be clearly revealed.

We also need to take into account certain other policy-induced migration flows -- particularly between Ghana and Nigeria. In the 1970s there was mass migration of Ghanaians into Nigeria. This followed the collapse of the cocoa economy in Ghana, and the oil export boom in Nigeria that was accompanied by expansion in both the manufacturing and service sectors.⁹ Under the ECOWAS treaty relatively free movement of documented migrants was permitted. But only about half the Ghanaian migrants in Nigeria had legal immigrant status and in 1983 the Nigerian government ordered the removal of those who had migrated across the porous international border without obtaining official papers.¹⁰ One estimate puts the number returning in 1983 at 900,000 while a further 90,000 returned following a subsequent order in 1985 (Arhin 1994).

Key explanatory variables in most migration studies are unemployment rates and/or employment growth – short run factors that influence the timing of migration, and real wages – more fundamental forces that determine whether a permanent move will take place. We use a

⁸ Available from the Census Bureau's website: www.census.gov/ipc/www/idbnew.html.

⁹ Economic developments in Ghana and Nigeria during this period are documented respectively by Frimpong-Ansah (1992) and Bevan, Collier and Gunning (1999).

¹⁰ A similar repatriation in the opposite direction occurred in 1969. Nigerians had migrated to Ghana during the 1950s and 1960s in response to the cocoa boom. In 1969 the Ghanaian government issued the Aliens Compliance Order which effectively deported Nigerians equivalent to about 5 percent of the labor force.

new dataset for purchasing parity adjusted unskilled real wage rates in Africa assembled by Davin Chor and kindly made available by Richard Freeman (see the Appendix below). These data are used to construct the foreign to domestic wage ratios relevant to the migration decision. The foreign wage facing potential migrants in a given country is taken to be the combination of a large weight times the average wage for the African region in which the country resides (reflecting the incentive to migrate within Africa) plus a small weight times the average wage in Europe and the United States (reflecting the incentive to migrate overseas). Employment growth at home is proxied by the rate of growth of real GDP and that for the region by an index of regional GDP growth.

We also want to include measures reflecting the effects of growing demographic supply-side pressure on the labor market. In particular, we want to assess the impact of a glut of young workers, those entering an already-crowded labor market who are also those most likely to migrate. For this we use the share of the population aged 15-29. This and other demographic variables such as population density are taken from the Census Bureau's annual data base. Other variables used in the analysis, such as the proportion of the population living in urban areas and the proportion of adults who are illiterate, are taken from the Bates data base mentioned earlier. The sources, definitions and construction of the variables are detailed in the Appendix.

Estimating Net Emigration Behavior in Africa

Our panel includes twenty-one countries covering the years 1977 to 1995, in theory yielding 399 observations. Since many country/periods have missing variables, the resulting dataset contains only 265 observations. We use pooled regression rather than fixed or random effects estimation, a choice supported by specification tests.¹¹ The results suggest that African migrations are driven by much the same forces documented for late nineteenth century trans-Atlantic migration, and the elasticities are similar as well.

¹¹ Test statistics derived from estimating random effects and fixed effects models are: Hausman specification test $\chi^2(9) = 11.36$; Breusch/Pagan test for random effects, $\chi^2(1) = 0.84$; test for fixed

Equation (1) in Table 3 presents an ordinary least squares specification which explains 53 percent of the variation in this unbalanced panel. Furthermore, the net movement of refugees explains a great deal of total net out-migration. If the net refugee movement had a one-for-one effect on net migration, then the coefficient would be one. In fact the coefficient is substantially less than one. This suggests that refugee inflows generate offsetting movements in the opposite direction. If those offsetting movements are labor market driven, then this result implies that refugees crowd out others, and that the crowding out is very significant – for every two refugees, one local is pushed out of the home labor market. The dummies for 1983 and 1985 are significant for Ghana but not for Nigeria. The coefficient for Ghana in 1983 implies an inward migration of about a million – broadly consistent with existing accounts. The coefficient for Nigeria, the much bigger country, suggests an outward movement of about two million.

[Table 3 about here]

The growth of home GDP enters with a negative sign as expected: good economic performance in local labor markets keeps potential emigrants at home. The estimated coefficient implies that a one percent increase in GDP is associated with a decline in net out-migration of 0.5 per thousand. Although positive, the coefficient on regional GDP growth – defined as growth in the region in which the country resides, and thus as growth in contiguous markets – is very small and insignificant. Perhaps the variable fails to capture the growth of specific sectors (and countries) in the region that attracts migrants, but we do not know. Lagging these activity variables proved to be insignificant as did the lagged dependent variable. Variables such as the rate of adult literacy, life expectancy and the percentage of the population living in urban areas were all highly insignificant and so they were excluded from the regression. Regional dummies (east, middle and south) could be jointly rejected and so these were also excluded.

The two most important influences on net out-migration in equation (1) are the foreign to domestic wage ratio and the share of the population aged 15-29. Both are positive and significant, and the two combined explain a very large share of the observed net out-migration,

effects $F(20, 235) = 1.04$.

as was true of European emigration before World War I. Furthermore, a comparison of these relative wage and demographic effects with those estimated for European emigration before World War I should help put magnitudes in perspective. Based on panel data for 12 European countries, a rise in the foreign to home wage ratio by ten percent raised gross European emigration in the late nineteenth century by 0.7 per thousand in the short-run and by 1.3 per thousand in the long run (Hatton and Williamson 1998, p. 47). County level panel data for Ireland indicated that an increase of ten percent in the foreign to home wage ratio increased late nineteenth century Irish emigration by about 0.7 per thousand. The Irish data also indicated that an increase in the share of the population aged 15-34 by 5 percentage points increased the emigration rate by between 0.7 and 1.0 per thousand (Hatton and Williamson 1998, p. 89). These relative wage and demographic effects estimated for the late nineteenth century European mass migrations are strikingly similar to those estimated for late twentieth century African migrations in Table 3.

Neither the wage ratio nor the young adult population share can, of course, be taken as completely exogenous. The rapid growth of labor supply implied by expanding cohorts of young workers would be expected to push down the unskilled wage at home as well as to expand the share of workers most likely to move across the border. As a result, the wage gap effect will be downward biased as a result of migration itself. Similarly, if emigration is selective of young workers, then, as a result of migration, their share in the population will be smaller (the reverse for in-migration). Consequently the coefficient on the demographic variable will also be biased towards zero. In short, there is reason to think that the OLS-estimated wage and demographic coefficients in equation (1) of Table 3 are understated.

To attack this problem, equation (2) in Table 3 presents instrumental-variable estimates for net out-migration. The instrument used for the demographic variable is the proportion of the population aged 10-14 five years earlier, and those used for the home wage are population density, the adult illiteracy rate and three regional dummies (see further below). As compared with the OLS results in equation (1) the coefficient on the wage ratio nearly doubles from 5.4 to

9.3 and that on the share of population aged 15-29 rises from 2 to 2.6. The coefficient on the relative wage implies that an increase of ten percent in the foreign to home wage ratio increases out-migration by nearly one per thousand of the population. The coefficient on the demographic variable indicates that a rise in the share of the population aged 15-29 from, say, 25 percent to 30 percent would increase net out-migration by $0.26 \times 5 = 1.3$ per thousand.

The relative wage effects seem to be sensitive to specification, so it might be worth exploring these a bit further. Table 4 presents estimates for the log of the real unskilled wage (not the wage ratio) for the home country using the same set of country/year observations. Since these are purchasing power parity-adjusted real wage rates, comparison across countries is appropriate. The results strongly support the view that demographic supply-side pressure pushes down the wage in a manner reflecting classic diminishing returns. Population density has a negative effect: a rise in density of 10 persons per km² depresses the real wage by 2 percent. The share of population aged 15-25 is also highly significant and it implies that a one percentage point increase in the share of this young (and less skilled) age group pushes down the wage by 7.6 percent. When the share of population aged 15-29 is instrumented using the share aged 10-14 lagged five years (equation 2) the effect increases to nearly 13 percent. These results imply that the age-earnings relationship is steep in Africa.

[Table 4 about here]

In addition to these effects, adult illiteracy also pushed down the wage with a well-determined coefficient. A fall in the rate of adult illiteracy by one percentage point increases the real wage by one percent. The only regional dummy that was significant is that for the south. But this has a large impact: other things equal real unskilled wages were nearly 40 percent higher in the south than elsewhere. Why are wages 40 percent higher in the south? Only two countries in the sample fall into our definition of south: these are Lesotho and Swaziland. Both are enclaves, completely surrounded by South Africa, and have labor markets which are fairly well integrated with those that surround them. The 40 percent premium is simply a South African premium. A variable measuring the percentage of the population living in urban areas

had no significant effect on the wage rate. Lest the reader be surprised by this last result, she should remember that our urban wages are not economy-wide averages that would include wage rates in formal agricultural employment, earnings in subsistence agriculture, or urban informal sector earnings.

Measuring Emigration Pressure

African international migration is mostly *within* low-wage Africa rather than *from* Africa to the high-wage developed world. Yet it seems likely that if demographic and economic pressures continue to mount, some part of it will spill over into African intercontinental migration. We have no way of measuring directly what such spillover effects might be in the future. However, we can use our estimate of the determinants of net migration movements from (and to) African countries to generate a measure of *migration pressure*. This will allow us to assess what the likely future trends in emigration out of Africa will be.

Our measure of *migration pressure* is based on the demographic effects that drive migration, leaving aside for the moment future economic effects. Estimates of demographic variables and their forecasts into the future are obtained from two sources. In addition to the information we have used in constructing our data base, the US Census Bureau's International Demographic Database contains demographic forecasts for future years on an annual basis. The other source is the United Nations' *World Population Prospects*, which provides five-yearly forecasts of a similar set of variables. Both provide estimates of total population, its structure, and vital rates based on data up to 1995. The estimates of net out-migration from sub-Saharan Africa that emerge from the demographic accounting exercises up to 1995 are modest. The Census Bureau's estimate of net emigration shows a rising trend to 1.2 per thousand in 1995 while the UN's estimate is even smaller and shows no trend. After 1995 the Census Bureau estimate shows declining emigration while that of the UN is almost constant. However, these

forecasts are based on essentially arbitrary assumptions: they do not rely on some estimated migration equation like those in Table 3.

Insofar as demographic pressure will increase for countries within sub-Saharan Africa, then (by aggregation) they should increase the pressure for out-migration from sub-Saharan Africa as a whole. Our measure of migration pressure is derived by applying the values of population density and the proportion of the population aged 15-29 to the coefficients from equation (2) in Table 3,¹² allowing for indirect effects on the wage ratio using equation (2) in Table 4. That is, we allow the demographic variables to have their impact on the home wage, and thus on the foreign to domestic wage ratio. Demography thus has two effects: first, by *directly* influencing emigration via its impact on the young-adult cohort share; and second, by *indirectly* influencing the home wage by labor supply-side effects.

It is unlikely that all the additional migration pressure calculated in this way would appear as emigration from sub-Saharan Africa as a whole. Intercontinental migration is costly, involves longer distances, and meets more political restrictions, and these factors would attenuate the degree to which migration pressure would spill over into migration out of Africa. Similarly, the stock of previous migrants in non-African countries is still relatively small and so the friends and relatives effect is likely to be limited. In the decade 1985 to 1995 out-migration from sub Saharan Africa as a whole was about 10 percent of the sum of out-migration for the individual countries. We therefore generate measures of *migration pressure* by assuming out-of-Africa spillover rates of 5, 10 and 15 percent of the increases in total across-border migration that would be generated by our reduced-form migration equation.¹³

We also need to take account of the effects of higher projected rates of emigration on the size and structure of the remaining population. We do this by means of a simulation using five year survival ratios calculated from the existing population forecasts for 1995 to 2025. Spillovers

¹² Using the instrumental variable estimates the generating equation is:
 $M = [2.59 + 9.33(0.128)] \text{ Share } 15-29 + 9.33(0.002) \text{ Popn Density}$, where the variables are each measured from a base year.

¹³ Thus we multiply the equation in the previous footnote by 0.05, 0.1 and 0.15 respectively.

to out-of-Africa emigration are calculated for each year and these are used to adjust the survivor rates of the (five year) age groups in the range 15-29 at time t to those in the range 20-34 at time $t+5$. Births are also affected since births at $t+5$ are assumed to depend on the population aged 15-29 at time t . Moving forward in time, these effects gradually seep through the age structure. At each step the updated age structure (and the overall size of the population) is used to generate the number for *migration pressure* in the next period.¹⁴

The figures in the first three columns of Table 5 are based on the Census Bureau's demographic forecast. Beginning at 0.7 per thousand (the average for 1993-7) and assuming 10 percent spillover, out-of-Africa *migration pressure* builds up to 1.8 per thousand by 2025. This projected out-of-Africa emigration rate, if actually achieved by 2025, would be modest by the standards of pre-World War I mass migrations: the figure for the 1870s was 2.2 per thousand and for the 1900s 5.4 per thousand. Under the assumption of 15 percent spillover, the rate reaches 2.4 per thousand by 2025, about the same as Europe in the 1870s, but still less than half of Europe's rate for the 1900s.¹⁵ While these projected out-of-Africa emigration rates are modest by the historical standards of the pre-World War I decades, they still imply sizeable numbers. Assuming 10 percent spillover, out-of-Africa emigrants increase by about 1.5 million between 1995 and 2025; and with 15 percent spillover they increase by about 2.1 million. These significant increases follow from the rise in the young adult population share from 27.2 in 1995 to 30.1 in 2025, and the rise in population density from 24.5 to 44.1 per km² over the same period.

[Table 5 about here]

Table 5 also reports the calculated out-of-Africa *migration pressure* using the UN's medium variant projection. The base of 0.34 per thousand is the UN's estimate of out-migration

¹⁴ The effects on the forecast populations are relatively modest since only a small amount of the migration pressure is allowed to spill out. For spillover rates of 10 percent the populations estimated by the Census Bureau and the UN underlying the calculations in Table 5 would be each be reduced by 2025 by about 20 million, or less than 2 percent of the total forecast population, as a result of the hypothesised emigration.

¹⁵ The European emigration rates are weighted averages, based on twelve emigrating countries and

in 1995. On these estimates, the growth of out-of-Africa *migration pressure* is slightly less than when the Census Bureau's forecasts are used as the base. This is due to the somewhat smaller increase in the share of population aged 15-29: from 26.8 percent in 1995 to 29.2 in 2025. As with the Census Bureau's projection, most of the increase in out-of-Africa *migration pressure* arrives before 2015 and it levels out thereafter. The absolute numbers in 2025 range from just under a million with 5 percent spillover to just under two million with 15 percent spillover. Alternative calculations were made using the UN's low variant projection and the results are very similar. In that case, out-of-Africa *migration pressure* in 2025 ranges from 0.84 million with 5 percent spillover to 1.86 million with 15 percent spillover. Thus, even using conservative demographic projections, there is still a substantial increase in the demographic pressure on future emigration out of Africa.

These out-of-Africa *migration pressures* would be greater still in the absence of the HIV/AIDS epidemic. The demographic forecasts, which were constructed in 1998, anticipate the effects of the epidemic, which will be to decimate a large proportion of the population increase that would otherwise occur and, to the extent that it is a young adult disease, to alter the age structure. The UN's downward revisions of life expectancy between 1995 and 2000 for 29 countries in sub-Saharan Africa yield a fall from 54 to 47 years (UN 1999, p. 4). More important to our *migration pressure* measure, the population share 15-29 rises by less due to the presence of HIV/AIDS and the same is true of population density. Predictions of the future demographic impact of the HIV/AIDS epidemic in Africa are, of course, prone to uncertainty. If, as is happening in Uganda, its spread is controlled early, then the UN population forecasts could be much too low. If, on the other hand, it spreads rapidly, as in Botswana and South Africa, and is not stabilized quickly, then the UN projections could be much too high.¹⁶

their population weights.

¹⁶ Caldwell (2000) argues that more active government intervention could bring HIV/AIDS under

Alternative Economic Scenarios

Between 1973 and 1992 GDP per capita stagnated in Africa, while it grew annually at 2 percent in southern Europe.¹⁷ Thus, the relative gap between southern Europe and Africa rose from 5.6 to 8.2 and the incentive for emigration must have increased accordingly. A 2 percent growth gap in real wages over 20 years increases the relative wage by nearly 50 percent. Surely, the growing pressure on Europe's southern borders must be one manifestation of Africa's falling behind economically. The wage gaps between Africa and the developed world are now more than twice as large as those that gave rise to mass migration from Europe to the New World in the late nineteenth century. Our estimates for the late nineteenth century suggest that increasing the wage gap by 50 percent would increase the (gross) emigration rate by 3.4 per thousand, other things constant. Applied to sub-Saharan Africa, that would generate something on the order of 1.8 million additional emigrants.

The stagnation in African living standards is confirmed by our purchasing power parity adjusted real wage rates. A weighted index of unskilled wage rates for sub-Saharan Africa indicates that the real wage was exactly the same in 1995 as it had been in 1976. Our wage equation suggests one reason for this stagnation: demographic pressure. Using the coefficients from equation (2) in Table 4, we calculate that growing demographic pressure reduced the real wage by 17 percent over this period. Capital accumulation (physical and human) together with technical progress was only sufficient (0.8 percent per year) just to offset the effects of downward demographic pressure on the wage.

If the real wage in the developed OECD countries grows at the same rate up to 2025 as it did from the mid-1970s to the mid-1990s (1.35 percent per year), then it will be 40 percent higher by 2025. Based on the UN's medium projection, demographic pressure alone will reduce

control more quickly.

¹⁷ Among the many recent papers on Africa's growth failure, see three: Bloom and Sachs (1998),

the wage in sub-Saharan Africa by about 40 percent. Thus, African labor productivity would need to grow at 2.7 percent per annum in order to keep the emigration incentive constant. If African labor productivity growth just kept pace with demographic pressure, then there would still be additional migration pressure coming from the OECD-growth-induced expanding wage gap. Giving OECD wages as little as a 10 percent weight in the foreign wage construction for African countries, this would generate additional migration pressure of 0.31 per thousand by 2025, or about 140 thousand migrants – other things equal. A higher weight would raise the figure accordingly – other things equal.

But other things are not equal now, nor will they be in the future. Immigration restrictions are tight, although they are clearly not as effective as governments in Europe and America would like. In addition, the so-called friends and relatives effect which operated so powerfully in the nineteenth century -- as previous immigrants drew new immigrants across the Atlantic -- is weaker now, given that the stock of African emigrants in high-wage OECD countries is still relatively small. But this just means that a trickle now could become a flood later as the migrant stock grows. It might also be true that many Africans are constrained from long-distance emigration by poverty. But poverty and low income were also features of late nineteenth century Europe. Insofar as the poverty trap did operate, it was released for many migrants by the friends and relatives effect, manifested by remittances homeward, help with job search abroad, and rising exploitation of family reunification loopholes in immigrant restrictions. If these forces are still important, as seems likely, they suggest that emigration out of Africa could cumulate further into the future more than our measures of *migration pressure* imply.

Rapid economic development in Africa would stem this *migration pressure*. Over the last 20 years structural adjustment programs (SAPs) launched in a number of countries by international organizations like the World Bank have aimed at doing just that. Assessments of the results vary. While some observers claim that they have seen some success, others are less sanguine. In any case the effects on labor demand seem to have been modest. In the case of

Collier and Gunning (1999), and Deaton (1999).

Ghana, an SAP pioneer since 1983, the economic performance since the mid-1980s has been described as “jobless growth.” A recent United Nations report suggests that while job cuts in government and in state owned enterprises have depressed the labor market in Ghana, the benefits of economic liberalization have done little to raise wages and incomes elsewhere, or to alleviate poverty (UN 1997, pp. 45, 61).

SAP programs typically include the realignment of overvalued exchange rates and the liberalization of restrictions on trade in the hope that the gains from trade will help lever up living standards. Indeed the basic 2 by 2 Heckscher-Ohlin trade model suggests that opening an economy to trade will raise the income of the relatively abundant factor in that country. Thus trade could be a substitute for migration. But generalizations of this model which include more factors, specific factors (such as land), or differences in technology, generate ambiguous results. Furthermore, history confirms theory: evidence from the Atlantic economy between 1870 and 1940 suggests that trade and migration were not substitutes (Collins, O’Rourke, and Williamson 1999)

Although the long-term deterioration in Africa’s terms of trade driven by declining primary goods prices identified by Angus Deaton (1999) might be reversed, trade liberalization seems unlikely to have significant effects in stemming migration pressure. A recent general equilibrium analysis of trade policies for low income countries like those in sub-Saharan Africa by Riccardo Faini, J-M. Grether and Jaime de Melo (1999) supports that view. The results from policy simulations of their multisectoral model are that trade liberalization by the low income country generates increased emigration because of the sharp fall in the real exchange rate. On the other hand, agricultural trade liberalization by developed countries, or worldwide liberalization, would tend to stem the flow of emigrants.

In a previous paper (Hatton and Williamson 2000), we have elaborated in more detail the possible economic scenarios for Africa, and traced out their emigration implications. Like others, we reach a pessimistic conclusion about the likelihood of rapid African growth in the near future. If the income gap between Africa and the OECD continues to increase then this will

add further fuel to out-of-Africa *migration pressure*, pressure which may continue long after those driven by demographic forces have eased.

Conclusion

The two underlying fundamentals that drove European emigration in the late nineteenth century were the size of real wage gaps between sending and receiving regions -- a gap that gave migrants the incentive to move, and demographic booms in the low-wage sending regions -- a force that served to augment the supply of potential movers. These two fundamentals are even more prominent in Africa today, and Africans seem to be just as responsive to them as were Europeans a century ago. Although this is no longer an age of “free” intercontinental migration, our new estimates of net migration for the countries of sub-Saharan Africa suggest that exactly the same forces are at work driving African across-border migration today. Rapid growth in the cohort of young potential migrants, population pressure on the resource base, and poor economic performance are the main forces driving African emigration. In Europe a century ago, more modest demographic increases were accompanied by strong catching-up economic growth in low-wage emigrant regions. Furthermore, the sending regions of Europe eventually underwent a slowdown in demographic growth serving to choke off some of the mass migration. Yet, migrations were still mass. Africa today offers a contrast: economic growth has faltered, its economies have fallen further behind the leaders (no catch up here), and there will be a demographic speed up in the near future (no slow down here). Our estimates suggest that the pressure on African emigration will intensify, including a growing demand for entrance into high-wage labor markets of the the developed world. Indeed, there is an excellent chance that by 2025 Africa will record far greater mass migrations than did nineteenth century Europe. The demographic unknown in this equation is, of course, African success in controlling the spread of the HIV/AIDS. If it is controlled early, then these emigration predictions are more

likely to prevail. If it spreads rapidly, then some, but not all, of the emigration pressure will subside.

Appendix: Data Sources

Refugees

Stock of refugee data by country of origin and destination were taken from the Robert Bates datafiles for 46 sub-Saharan countries, available at <http://www.gov.harvard.edu/rbates/data>. These series were supplemented from the original source, *World Refugee Survey*, published annually by the US Committee for refugees. The dataset on violence also contains dummy variables for coups, crises, civil and guerrilla wars which were used in the analysis of refugee movements. The dataset omits South Africa and we also excluded the islands around Africa.

Net Migration

Net migration series were taken from the US Census Bureau's on-line demographic aggregation at: www.census.gov/ipc/www/idbnew.html. We eliminated country-years where either no data or strings of zeros are given. The final dataset was further constrained by lack of wage data for some country years (see below). The final dataset of 265 observations comprises: Angola, 1982-95; Burkina Faso, 1986-95; Burundi, 1980-95; Cameroon, 1980-95; Central African Republic, 1989-95; Chad, 1980-95; Côte d'Ivoire, 1989-95; Gabon, 1977-90; Ghana, 1977-95; Lesotho, 1981-90; Malawi, 1987-95; Mali, 1987-95; Nigeria, 1977-95; Rwanda, 1979-95; Senegal, 1989-95; Sierra Leone 1991-5; Sudan, 1984-95; Swaziland, 1978-95; Togo, 1982-93; Zambia, 1981-95; and Zimbabwe, 1983-95.

Real Wages

Unskilled real wage rates at 1990 purchasing power parities come from a larger international dataset made available by Richard Freeman. The data are compiled from wage rates and earnings for a wide range of specific occupations reported annually by the International Labor Organization. These are adjusted for differences in measurement and coverage (see Freeman and Oostendorp 1999; Chor 2000). Wage indices for Sub-Saharan African were compiled from these

series by Davin Chor. We construct the foreign wage rate for a given African country as a combination of the average wage of other countries in the same region (weighted by population in 1990) for four regions, west, east middle and south, and an unweighted average of principal developed countries which receive migrants from Africa. These countries are: Belgium, France, Germany, Spain, Sweden, Italy, United Kingdom and United States. The wage indices for these were taken from Williamson (1995), updated to 1995 using the same sources, and converted to purchasing power parities of 1990. The unweighted average of these developed country wage rates is given a weight of 0.1 in the foreign wage index for each African country.

Other Data

Indices of real GDP growth were taken from the Bates file of economic data. Regional GDP growth was calculated as an a weighted average of rates of growth by country with 1990 population weights for the four regions, west, east, middle and south. Data on population and age structure used in the regression analysis was taken from the US Census Bureau's database which provides annual data. This source also contains annual demographic forecasts used to assess migration pressure. Other variables, such as the proportion of the adult population who were illiterate and the share of the population living in urban areas, were taken from the Bates data base.

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Table 1
US Immigrants (Excluding Canadians) by Source and Period, 1955-1997
(in percent)

Region	1955-64	1965-74	1975-84	1985-94	1995-97
Europe	78.3	49.3	20.2	21.2	25.4
Asia	12.0	37.1	65.2	61.9	54.1
Oceania	0.6	1.2	1.2	1.0	0.9
Africa	1.1	2.5	3.6	5.0	9.3
South America	8.0	9.9	9.9	11.0	10.3

Source: US Immigration and Naturalization Service, Statistical Yearbook of the Immigration and Naturalization Service 1997 (Washington, D.C.: USGPO, 1997), p. 20.

Notes: More than one-third of US immigration is Canadian, and the figures here exclude them. Columns may not add to 100 percent due to rounding.

Table 2
Tobit Estimates of Number of African Refugees per 1000 Population
(annual data, 1987-92, 41 countries)

	Eq. (1)	Eq. (2)
Constant	-46.65 (7.05)	-32.36 (4.75)
Coups d'Etat	44.96 (2.94)	35.74 (1.89)
Government Crises	21.36 (2.01)	18.32 (1.89)
Guerrilla Warfare	28.69 (3.39)	25.23 (3.29)
Civil War	63.73 (6.29)	35.35 (2.88)
Military Deaths in Civil War	-	35.36 (4.40)
Pseudo-R ²	0.08	0.07
Log Likelihood	-604.33	-595.64
Restrictions, 1 lag ($\chi^2_{(4,5)}$)	1.02	2.19
Restrictions, 2 lags ($\chi^2_{(8,10)}$)	1.08	2.01
Number of observations	246	246

Note: 't' statistics in parentheses.

Table 3
Determinants of African Net Out-Migration (per thousand population)
(unbalanced panel, 21 countries, 1977 to 1995)

	Eq. (1) OLS	Eq. (2) IV
Constant	-55.48 (3.38)	-73.18 (3.42)
Log Wage Ratio (foreign/home)	5.42 (2.88)	9.33 (2.37)
Share of Population aged 15-29	2.01 (3.22)	2.59 (3.07)
Growth of GDP per capita at home	-0.51 (3.46)	-0.55 (3.67)
Growth of GDP per capita in region	0.02 (0.11)	0.06 (0.25)
Net Refugee Outflow (per 1000 popn)	0.48 (11.95)	0.47 (11.55)
Dummy: Ghana, 1983	-88.18 (5.81)	-94.56 (5.95)
Dummy: Ghana, 1985	-32.36 (2.14)	-37.84 (1.87)
Dummy: Nigeria, 1983	26.50 (1.77)	28.33 (1.87)
Dummy: Nigeria, 1985	15.73 (1.05)	15.16 (1.14)
R ²	0.53	0.51
Number of Observations	265	265

Note: 't' statistics in parentheses.

Table 4
Determinants of the Log of Unskilled Real Wages
(unbalanced panel, annual data, 1977 to 1995)

	Eq. (1) OLS	Eq.(2) IV
Constant	2.631 (4.93)	4.061 (6.06)
Population per Square Kilometer	-0.002 (5.70)	-0.002 (5.07)
Percentage of Population Aged 15-29	-0.076 (4.00)	-0.128 (5.33)
Percentage of Adult Population Illiterate	-0.010 (4.87)	-0.011 (5.33)
Dummy: Southern Africa	0.392 (3.83)	0.387 (3.73)
R ²	0.33	0.31
Number of Observations	265	265

Note: 't' statistics in parentheses.

Table 5:
Calculation of Pressure on Emigration Out of Sub-Saharan Africa

Year	US Census Bureau Demographic Projection			UN Demographic Projection Medium Variant		
	Emigration spillover = 5%	Emigration spillover = 10%	Emigration spillover = 15%	Emigration spillover = 5%	Emigration spillover = 10%	Emigration spillover = 15%
	Per Thousand Population			Per Thousand Population		
1995	0.70	0.70	0.70	0.34	0.34	0.34
2000	0.82	0.94	1.07	0.48	0.61	0.75
2005	0.97	1.23	1.49	0.65	0.96	1.21
2010	1.13	1.54	1.94	0.77	1.19	1.58
2015	1.25	1.78	2.30	0.81	1.25	1.68
2020	1.29	1.87	2.45	0.81	1.27	1.74
2025	1.26	1.83	2.40	0.81	1.30	1.80
	Absolute Number (Millions)			Absolute Number (Millions)		
1995	0.41	0.41	0.41	0.20	0.20	0.20
2000	0.54	0.62	0.70	0.31	0.39	0.48
2005	0.72	0.91	1.10	0.47	0.69	0.90
2010	0.92	1.25	1.57	0.62	0.95	1.26
2015	1.11	1.58	2.03	0.72	1.11	1.49
2020	1.26	1.81	2.36	0.80	1.25	1.70
2025	1.34	1.91	2.50	0.88	1.40	1.92

Source: Calculations are based on demographic projections using the demographic coefficients from equation (2) in Table 1 and equation (2) in Table 2. The predictions are based on the reduced form migration equation, assuming that 5, 10 or 15 percent of additional migration pressure spills over into emigration from Sub-Saharan Africa as a whole. The survival rates, calculated from the existing demographic projections, are adjusted to take account of the higher levels of out-migration. Births are also scaled down so that the ratio of births to population aged 15-29 five years previously, is held constant.

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