Brain Drain and External Imbalances in Sub-Saharan Africa

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Bringing Rigour and Evidence to Economic Policy Making in Africa

Brain Drain and External Imbalances in Sub-Saharan Africa

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List of abbreviations and acronyms

GDP	Gross Domestic Product
GFDD	Global Financial Development Database
IAB	Institut für Arbeitsmarkt und Berufsforschung (Institute for Employment Research)
IMF	International Monetary Fund
NFA	Net Foreign Asset
OECD	Organization for Economic Co-operation and Development
PPML	Poisson Pseudo Maximum Likelihood
PPP	Purchasing Power Parity
PWT	Penn World Table
SSA	Sub-Saharan Africa
WDI	World Development Indicators
WEO	World Economic Outlook

Abstract

The persistent nature of external deficits in sub-Saharan Africa (SSA) is a major concern. This paper examines the extent to which migration from SSA to OECD countries affects the dynamics of external balances in SSA countries. Based on panel regressions and gravity-based 2SLS estimation strategies on data from 46 SSA countries over the period 1990-2014, we establish that emigration — particularly of highly-skilled people — contributes to the persistence of external deficits in SSA countries. While emigration globally has a negative impact on the current account, only high-skilled emigration has a significant and robust impact. These findings are corroborated by the fact that highly-skilled individuals emigrate with their saving potential as suggested by the life-cycle theory. In addition, while remittances to home countries can help to compensate this negative effect of brain drain, our results show that highly-skilled emigrant's contribution to remittances is less important compared to that of low-skilled emigrants. Therefore, policy makers in SSA countries should implement policies to attract more remittances, particularly from highly-skilled emigrants, in order to reduce their external imbalances or external financing needs.

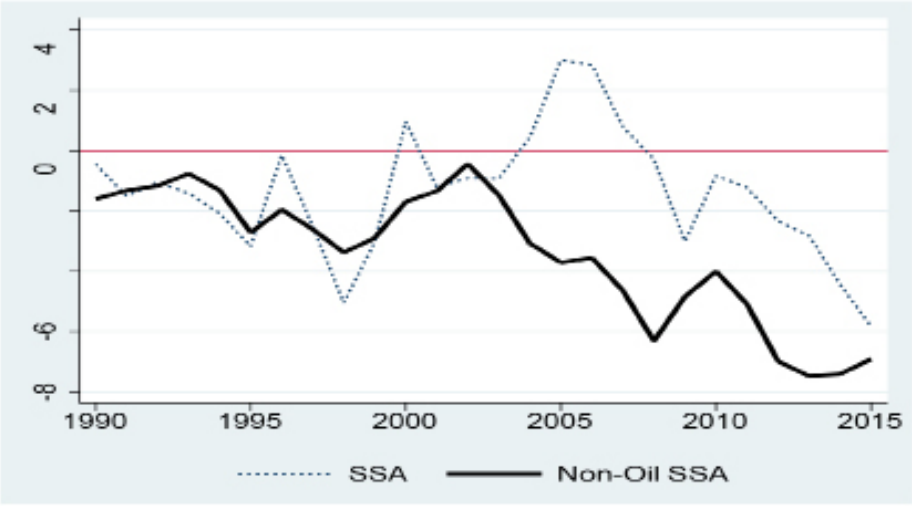
Key words: International migration; Saving; Remittances; External imbalances; SSA.

JEL classification: F22; F4; O4; O55.

1. Introduction

Sub-Saharan Africa's (SSA) strong economic growth since the early 2000s has not been enough to alleviate the structural funding needs on the continent. Indeed, the average growth rate of SSA countries over the period 2000-2015 was 5.5% against a world average of 3.9%. However, the average saving rate in SSA was only 18.8% over the same period, while the world average saving rate was 24.3%. This low level of mobilization of national saving may have the corollary of limiting ambitions in terms of the investment needed to sustain long-term growth while also contributing to fuelling the current account structural deficit. Therefore, contrary to mainstream thinking in the literature, global imbalances are not just a problem for developed, emerging or oil-producing countries. Indeed, Figure 1 clearly indicates that there is a persistence of external deficits in SSA countries. This persistence is more marked for non-oil SSA countries due to the oil price increase in recent years. The aim of this paper is to investigate how emigration influences these external imbalances.

Figure 1: External imbalances in SSA countries



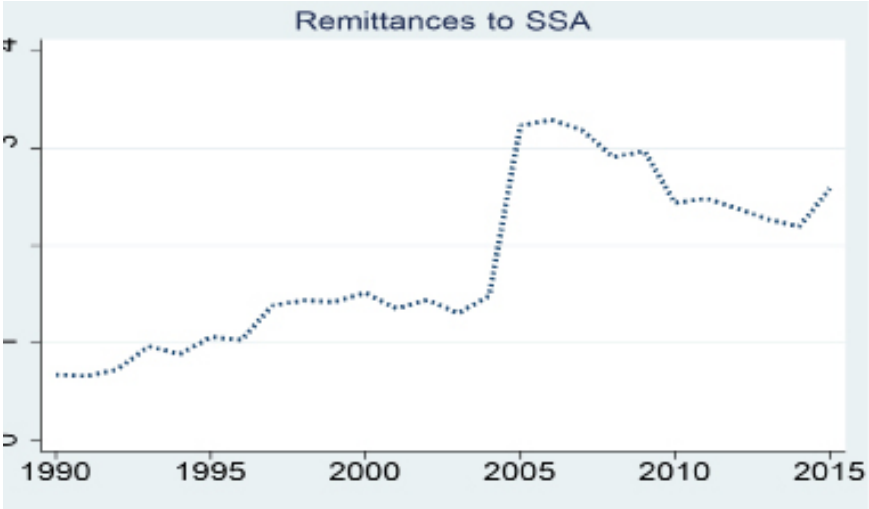
Note: Data on the current account are from the IMF.

There are two different channels through which brain drain influences current account, leading to contradictory effects. On the one hand, in connection with the life-cycle theory, emigration deprives SSA countries of a labour force with a higher potential for saving in the demographic structure. Indeed, according to the life-cycle hypothesis

(Leff, 1969), a rise in the share of the economically dependent population would lead to an increase in national consumption, a fall in national saving, and a deterioration in the current account. The architecture of international migration clearly shows that migrants are mainly of working age: 82% of international migrants in 2015 are between 15 and 64 years old (UN, 2017). In this regard, SSA countries are distinguished by emigration to developed OECD countries, particularly brain drain defined as emigration of highly-skilled people (with tertiary level of education). As a proportion of the potential educated labour force, the brain drain rate in Africa is among the highest in the world (Docquier and Marfouk, 2004). Consequently, the saving rate in SSA countries may be adversely affected by emigration, which should result in an external deficit or deterioration in the current account (given by the difference between national saving and national investment).[1] More importantly, since highly-skilled workers generally have a high propensity to save, the adverse impact of emigration on current account should be more pronounced for brain drain (high-skilled emigration).

On the other hand, emigration may lead to an improvement in SSA current account balance through emigrants' remittances. Indeed, there is a direct impact of remittances on current account, since remittances (of permanent migrants) are, by definition, recorded as credit in the current account balance.[2] Remittances being a source of income, they can also have an indirect impact on current account that depends on their use, i.e., how they influence consumption (saving), investment and in end trade balance.[3] It is now well known that emigrants make a significant contribution to the transfer of capital from OECD countries to their countries of origin. These remittances (as a percentage of GDP) increase significantly over time, especially with the development of new technologies and the reduction of transfer costs (see Figure 2).[4] In some countries, such as Cabo Verde, Democratic Republic of Congo, Gambia, Lesotho, Liberia, Senegal and Zimbabwe, migrant remittances per year exceed 10% of annual GDP. As much as the adverse impact through saving, the improving impact through remittances should depend on the skill levels of emigrants, since they matter for remittances received in the country of origin. Indeed, highly-skilled emigrants can remit more because they are more likely to get high skilled jobs and thus higher wages. However, it is reasonable to think that, for a given level of earnings, highly-skilled emigrants will have a low propensity to send money to their home country because they have strong incentives to integrate into the host community, to bring family to the host country, and to undertake long-term life projects (long-term borrowing for home or vehicle purchases) in the destination country. Empirical evidence from Faini (2007) and Niimi et al (2010) shows that high-skilled emigration is associated with a low level of per capita remittances.

Figure 2: Remittances to SSA countries



Notes: Remittances are taken from the World Bank WDI and are defined as the sum of personal transfers and compensation of employees. The series is estimated by the World Bank staff based on IMF balance of payments data.

In the end, the overall impact of brain drain on current account depends on how the skill composition of emigrants matters for both the adverse impact through saving and the improving effect through remittances. Thus, an empirical study on the impact of brain drain on the current account (net effect) can help to respond appropriately.

Therefore, this paper aims at exploring empirically the impact of emigration on the external balances of SSA countries depending on the skill composition of emigrants, in order to shed more light on the persistent deficit nature of the latter. Since the current account is the difference between saving and investment, and remittances may influence consumption (saving) and investment in the home country, we push even further by analysing the impact of emigration on saving and investment.

The study considers a sample of 46 SSA countries selected based on data availability, over the period 1990-2014. Given the structural context of this study, the empirical strategy follows the standard empirical model of medium-term current account determination. Therefore, our empirical strategy emphasizes the role of the medium-term determinants of current account, rather than factors behind the short-run dynamics of the current account. In this regard, we focus on current account variations that are not caused by cyclical factors or that do not result from the influence of nominal rigidities (Chinn and Prasad, 2003; Lane and Milesi-Ferretti, 2012). The study employs different econometric approaches. First, we employ panel (pooled) ordinary least squares (OLS) using five-year non-overlapping averages. Secondly, to account for potential simultaneity bias (for example, institutional quality matters for both current account balance and emigration), we rely on panel (pooled) two-stage least squares (2SLS). Following recent developments in international migration literature, this 2SLS estimation approach uses gravity-based predictors as instruments.

The rest of the paper is organized as follows. Section 2 provides the literature on the consequences of emigration (brain drain) and the role of demographic structure in global imbalances. In Section 3, we present the empirical model and describe the data used in the empirical estimation. Section 4 presents and discusses our main results. In Section 5, we provide some robustness checks. Section 6 analyses the channel through remittances. Finally, Section 7 concludes the paper.

2. Literature review

The strong dynamics of globalization since the 1990s has been accompanied by worsening global imbalances and a dramatic increase in international migration. These two phenomena are probably the most complex subjects of contemporary international economics faced by economists and decision makers. Several recent contributions have been devoted to analysing the effects of international migration (Beine et al, 2008; Spilimbergo, 2009; Docquier and Rapoport, 2012; Ortega and Peri, 2014; Docquier et al, 2016) and global imbalances (Cooper, 2008; Chinn et al, 2014; Backus et al, 2014).

The general belief on the consequences of brain drain is that it may be detrimental to the country of origin (Docquier and Rapoport, 2012). The main argument relies on endogenous growth theory that emphasizes the key role of education in growth (Lucas, 1988). Thus, the emigration of skilled workers (brain drain) represents a considerable shortfall for growth in the country of origin. For example, the seminal model by Bhagwati and Hamada (1974) shows that brain drain causes a loss for developing countries. This loss occurs through the fact that increasing international mobility induces highly-skilled workers from poor countries to bargain for higher wages, and low-skilled workers to respond by adjusting their wage requirements. Miyagiwa (1991) builds a theoretical model of brain drain and shows that brain drain increases education and income levels in the host country. Its impact is more important as, contrary to the presumption that brain drain hurts the unskilled people staying in the home country, it is rather medium-skilled people who are more adversely affected. Haque and Kim (1995) also find that brain drain jeopardizes the economic growth of the country of origin by reducing the rate of growth of effective human capital that remains in the economy. In sum, the early models on the consequences of brain drain (in the endogenous growth framework) find that it increases inequality at the global level, with developing countries becoming poorer for the benefit of the rich ones.

Other studies highlight some benefits of brain drain—the so-called 'brain gain'—that may counterbalance its negative effects (Stark et al, 1997; Stark et al, 1998; Vidal, 1998; Beine et al, 2008; Mayr and Peri, 2008; Giuliano and Ruiz-Arranz, 2009; Spilimbergo, 2009; Dustmann et al, 2011; Docquier et al, 2016). The main channels are the incentive to invest in education that the prospect of future emigration entails (Stark et al, 1997; Stark et al, 1998; Vidal, 1998; Beine et al, 2008), the resulting remittances that provide an alternative way to finance investment (Giuliano and Ruiz-Arranz, 2009), the benefits that the home country can acquire from the human capital of returning migrants (Mayr and Peri, 2008; Dustmann et al, 2011), and the transfer of knowledge

and institutional norms through the diaspora (Spilimbergo, 2009; Docquier et al, 2016).

Empirical literature is growing thanks to data availability in recent years. Based on US data, Beine et al (2003) examine the impact of brain drain on 50 developing countries and find an overall positive effect. However, they obtain that there are winners and losers among sending countries according to their levels of human capital: brain drain appears to hurt home countries with a large proportion of highly educated emigrants. In the same vein, Beine et al (2008) use emigration data on 127 origin countries by education level to examine the impact of brain drain on human capital formation. They find evidence of a promoting impact of skilled emigration on human capital. This finding was corroborated by Beine et al (2011) using panel data covering 147 countries over the period 1975-2000. Giuliano and Ruiz-Arranz (2009) explore the growth-enhancing impact of emigrants' remittances on 100 developing countries. They find that remittances promote growth in less financially developed countries by providing an alternative way to finance investment and by overcoming credit constraints. Using data for 20 SSA countries, Ahamada and Coulibaly (2013) find no growth-enhancing impact of remittances because they do not increase investment in physical capital.

Since origin and destination countries are characterized by substantial differences in political rights and cultures (Collier and Hoeffer, 2018), the empirical studies by Spilimbergo (2009) and Docquier et al (2016) highlight the role of emigration in improving political institutions. Based on international dataset, Spilimbergo (2009) finds that foreign students play an important role in promoting democracy in the home country, but only if education is acquired in democratic countries. Using cross-sectional and panel data, Docquier et al (2016) also find that general emigration from developing countries to OECD countries helps to improve institutional quality in the countries of origin.

Despite the growing literature on the consequences of emigration, the link between emigration and current account has received no attention. Emigration mainly concerns the working-age population and then changes the demographic structure in SSA countries by reducing the labour participation rate. As result, according to the life-cycle hypothesis (Leff, 1969), this will lead to a deterioration in the current account. More precisely, the life-cycle hypothesis predicts that a higher share of the economically dependent population should result in a deterioration in the current account by increasing national consumption and reducing national saving. This life-cycle hypothesis prediction has been corroborated by several empirical studies using cross-sectional and panel regression techniques (e.g., Kelley and Schmidt, 1996; Higgins and Williamson, 1997; Higgins, 1998; Chinn and Prasad, 2003; Chinn and Ito, 2007; Gruber and Kamin, 2007; Lane and Milesi-Ferretti, 2012). Looking beyond the national income accounting relationships, Cooper (2008) argues that the large US current account deficit of the early 1990s to the 2008 financial crisis was the natural result of two major forces in the global economy, namely the globalization of financial markets and the demographic evolution — two forces that could maintain these imbalances over a long period. Using panel data on 23 industrial and 86 developing

countries, Chinn et al (2014) examine whether the determinants of current account balances changed after the global crisis of 2008-2009; they find that the contribution of demographic structure tends to be stable. Based on a quantitative multi-country overlapping generation model, Backus et al (2014) show that demographic differences between countries can generate large international capital flows. More recently, using a database covering 165 countries over 1981-2012, Grigoli et al (2018) confirm the role of demographics in driving saving.

The paper by Gollin and Lange (2013) is a rare study that explicitly considers the role of international migration in current account balances or international capital flows. Building an overlapping generation model of a small open economy, the authors show that, because migrants must be equipped with capital, migration flows result in substantial capital flows. Using data from a panel of OECD countries, they confirm this finding.

Our paper is, to some extent, related to the study of Bugamelli and Paternò (2009) who investigate the impact of remittances on current account reversals in recipient countries. Using a panel data on emerging and developing countries, they find that remittances reduce the probability of current account reversals when remittances received get above 3% of GDP. Using annual data for 47 countries over the period 1990-2011, Hassan and Holmes (2016) show that remittances increase the speed of current account adjustment towards long-run equilibrium.

Our study aims at empirically investigating the impact of emigration on external balances of SSA countries that experience brain drain. Since current account balance indicates the nation's financing capacity or need, our study thus explores the contribution of brain drain on net capital flow into SSA countries (for more causes and consequences of capital flight from Africa, see Ajayi and Ndikumana [2014]).

3. Empirical methodology

Empirical model

This paper is designed to empirically investigate the effect of emigration on the current account balance of SSA countries, depending on the skill levels of emigrants. Given the structural aspect of the study, we follow the standard empirical model of medium-term current account determination (Chinn and Prasad, 2003; Chinn and Ito, 2007; Gruber and Kamin, 2007; Lane and Milesi-Ferretti, 2012). Therefore, our empirical strategy emphasizes the roles of the medium-term determinants of current account, rather than factors behind the short-run dynamics of the current account. In this regard, we focus on current account variations that are not influenced by cyclical factors or nominal rigidities. We then consider panel data to allow medium-term variations in current account across time. More specifically, we construct a panel that contains five-year non-overlapping averages of the data for each country (Chinn and Prasad, 2003; Chinn and Ito, 2007; Lane and Milesi-Ferretti, 2012). Averages are constructed over 1990-1994, 1995-1999, 2000-2004, 2005-2009, and 2010-2014, giving us five period observations for each cross-sectional unit. We consider the following model:

$$y_{it} = \alpha + \gamma Emig^{s}_{it} + \sum_{k} \beta^{k} X^{k}_{it} + \varepsilon_{it} \qquad (1)$$

where, ii and tt stand for country and period indices, respectively; $y\ y$ is either current account balance, saving or investment (expressed as a ratio to GDP); $Emig^{s}$ $Emig^{s}$ is the emigration rate of skill level ss (low, medium, high) that is the sum of emigrants with skill *s* as a share of native population of home country with the same skill *s* (computing the rates in this way allows better to measure the loss of labour market potential experienced by home country (Brücker et al, 2013; see subsection that follows); $X^{k} X^{k}$ are control variables; and ε stands for the error term. The selection of control variables follows the literature on the medium-term determinants of current account (Chinn and Prasad, 2003; Chinn and Ito, 2007; Gruber and Kamin, 2007; Lane and Milesi-Ferretti, 2012). Following this literature, where appropriate, variables are measured relative to a weighted-average of the corresponding variables of trading partners, since the current account should be influenced only by idiosyncratic shifts in fundamentals. The set of control variables includes:

- Dependency ratios (in relative terms): According to the life-cycle hypothesis, the economically dependent population will increase national consumption and reduce national saving, leading to a deterioration in the current account. Two dependency ratios are used: the young ratio (defined as the ratio of the population under 15 to the working-age population) and the old ratio (defined as the ratio of the population aged 65 and older to the working-age population). Both ratios are expected to have a negative impact.
- Fiscal balance (as share of GDP and in relative terms): This is used to account for the Ricardian equivalence hypothesis, and its impact is thus expected to be positive.
- Net foreign asset position (as share of GDP): This is used since a country with a net foreign asset position receives income issued from foreign direct investment, leading to an improvement in its current account. We use lagged value that allows us to avoid endogeneity, since the NFA position is the accumulation of past current account balances.
- GDP per capita (adjusted by PPP exchange rates, in relative terms and in logs): This aims to capture the stages of the development hypothesis, which predicts that a country must run current account deficits at the beginning of its development process due to important capital imports, and the current account starts to improve at the end of the development process.
- GDP growth rate (in relative terms): This allows us to account for the impact of income shock on the current account balance that depends on the perception of high growth rates by households. Transitory positive shock leads to an improvement in current account, while permanent positive shock causes the opposite.
- Trade openness (exports plus imports as a ratio of GDP): This is used to proxy for trade liberalization that increases trade flows. It is expected to have a negative impact.
- Volatility of terms of trade (standard deviation of terms of trade growth): It is used to capture the fact that, in environment with more volatile terms of trade, agent might save more for precautionary reasons in order to smoothen their consumption.
- Oil balance (as share of GDP): This allows us to take into account the influence of oil price fluctuations on the current account: higher oil prices promote the current account balance for oil-exporters by worsening the balance of oil-importing countries.
- Financial development: This is measured by domestic credit to the private sector as a share of GDP and is used to account for the influence of financial market development. It has an ambiguous impact on current account (Chinn and Prasad, 2003; Chinn and Ito, 2007). Since it measures the depth and sophistication of the financial system, it may improve current account by promoting saving. However, reflecting the borrowing constraints, it could deteriorate the current account by reducing the need for precautionary saving.
- Financial openness: Measured by the Chinn and Ito (2006) index of capital account

openness, this is used to account for the impact of financial liberalization policies. As for financial development, this variable has an ambiguous impact (Chinn and Prasad, 2003; Chinn and Ito, 2007). On the one hand, higher capital controls, by limiting access to international capital, could lead to smaller current account deficits. On the other hand, capital controls could be implemented in order to hamper capital flight resulting from past current account deficits.

We first estimate the model by pooled OLS. In cross-country panel analysis, country fixed effects are generally included in regressions in order to deal with unobserved heterogeneity. Following the literature on medium-term variations in current account balance (Chinn and Prasad, 2003; Lane and Milesi-Ferretti, 2012), Equation 1 does not include country-specific fixed effects. Indeed, the empirical specification in Equation 1 aims at explicitly accounting for the contribution of emigration to both the cross-sectional and time-series variation in current account balances. As highlighted by Chinn and Prasad (2003), to understand the variation in current accounts in panel data context, cross-country differences are important. Therefore, the inclusion of fixed effects would interfere with the relevance of dependent variables (even time varying) that are the source of the cross-country variations in current account. We then use the pooled OLS estimator rather than the fixed effects estimator.

In the pooled OLS regressions, we assume that emigration is exogenous with respect to the current account balance of the country of origin. However, there may be a simultaneity bias between emigration and current account balance. One can think that institutional quality matters for current account balance and emigration. Indeed, countries with poor governance tend to attract less capital flow and are more prone to brain drain. To take into account this potential simultaneity bias issue, we use the two-stage least squares (2SLS) estimation strategy. This 2SLS estimation approach follows recent developments in international migration literature (Ortega and Peri, 2014; Alesina et al, 2016; Docquier et al, 2016) inspired by trade literature (Frankel and Romer, 1999). Specifically, we rely on a pseudo-gravity regression to construct a geography-based prediction of bilateral migration stocks. We consider the following pseudo-gravity model that allows for time-varying bilateral relationships in a panel setting:

$$lnEmig^{s}_{ijt} = \gamma_1 lnPop_{i,1960} + \gamma_2 lnDist_{ij} + \gamma_3 OffLang_{ij} + \gamma_4 EthLang_{ij} + \gamma_5 \left(Landlocked_i + Landlocked_j\right) + \gamma_6 Colony_{ij} + \tau_t + \varphi_{jt} + \epsilon_{it} \quad (2)$$

where, $Emig^{s}_{ij}$ is the bilateral emigration rate of skill s, i.e., the stock of migrants with skill s born in country i and living in country j as share of country ii's native population with skill s; $Pop_{i,1960}$ denotes the population size of origin country ii in 1960; $Dist_{ij}$ is the weighted distance that is equal to the distance between home country ii and destination country j based on bilateral distances between the biggest cities of the two countries; $Landlocked$ is a dummy variable for landlocked countries;

$Colony_{ij}$ is a dummy for colonial relationship; $OffLang_{ij}$ and $EthLang_{ij}$ are dummies for sharing common official and ethnic minority languages (if the language is spoken by at least 9% of the population in both countries). In this gravity model, $Pop_{i,1960}$ is used to capture the initial capacity of the home country to send migrants. The migration costs are captured by geographic variables ($Dist, Landlocked$), linguistic variables ($OffLang, EthLang$) and colonial ties ($Colony$). Finally, Equation 2 includes common time fixed effects (τ_t) and destination-time fixed effects (φ_{jt}) to account for multilateral resistance in destination countries, reflecting the reaction of the bilateral migration of a given origin-destination pair to any time varying shock occurring to another pair. In the context of international migration, multilateral resistance in destination countries is the most important side of multilateral resistance, given the prominence of the migration policies in host countries (Beine and Parsons, 2015).

After estimating the gravity model in Equation 2, we compute the predicted emigration for each origin country ii by summing up over destination countries j j: $\widehat{Emig}_i^s = \sum_j \widehat{Emig}_{ij}^s$. The gravity model is estimated by the Poisson pseudo maximum likelihood (PPML) non-linear method. PPML estimation has the advantage to address issues related to observations of the dependent variable with zero value and to heteroscedasticity 9 (Silva and Tenreyro, 2006). We follow the procedure of Silva and Tenreyro (2010) to deal with the identification issue of PPML estimation with non-negative values of the dependent variable (bilateral migration) and large number of zeros on some regressors.

Data

In this section, we describe the variables used in our empirical analysis while providing their sources.

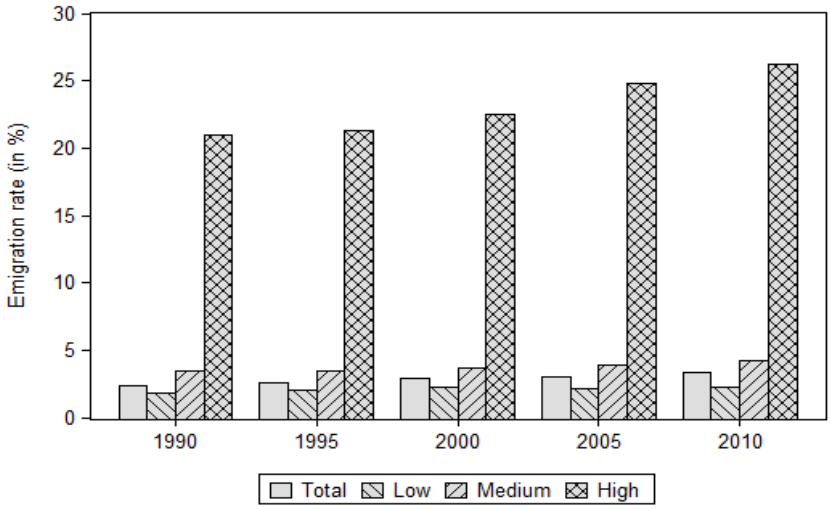
Following the literature (see, for example, Beine et al, 2008), we measure brain drain (emigration of people with high skills) by emigrants with a tertiary level of education (with a diploma higher than a high-school leaving certificate or equivalent). We rely on the Institute for Employment Research (*Institut für Arbeitsmarkt und Berufsforschung*—IAB) database (Brücker et al, 2013), which gives the total number of foreign-born individuals aged 25 years and older living in each of the 20 considered OECD destination countries, by year, country of origin and educational level, from 1980 to 2010 (five-year intervals). Educational levels are distinguished as low (lower secondary, primary and no schooling), medium (high-school leaving certificate or equivalent) and high (higher than high-school leaving certificate or equivalent). For each education level s, the value is expressed as a rate that is computed as the stock of emigrants[5] with education level s divided by the total number of individuals for a given source country (residents and emigrants) with the same education level ss. Computing the emigration rates in this way enables us better to measure the loss of labour market potential experienced by a given source country (Brücker et al, 2013).

These emigration rates are thus used in our regressions. Based on data availability (on all variables under consideration), we consider 46 SSA countries over the period 1990-2010.

Figure 3 reports the emigration rate for SSA and for each skill level. It shows that, on averages, the number of SSA migrants in OECD countries as a share of total origin population increases from 2.30% in 1990 to 3.35% in 2010. By decomposing by education level, the rate is high for brain drain (high skilled emigration). Indeed, the number of SSA highly-skilled migrants in OECD countries as a share of origin population with the same skill increases from 20.92% in 1990 to 26.22% in 2010. For low-skill emigration the rate rises from 1.76% in 1990 to 2.26% in 2010; and for medium-skill emigration it rises from 3.48% in 1990 to 4.21% in 2010. For each SSA country and for year 2010, Table A1 (in the appendix) gives the emigration rates for each education level. There is some heterogeneity in emigration rates across SSA countries, the highest rates being recorded by island countries (Cape Verde, Mauritius, São Tomé and Príncipe, the Seychelles).

Data on current account, saving, investment and fiscal balance are taken from the IMF World Economic Outlook (WEO) database. Data on GDP growth, population, dependency ratios, trade openness and remittances are collected from the World Bank World Development Indicators (WDI) database. Per capita GDP at chained purchasing power parity (PPP) is obtained from the Penn World Table (PWT version 9.0). As an indicator of financial development, we use the domestic credit to private sector taken from the World Bank Global Financial Development Database (GFDD) that refers to the financial resources provided to the private sector, such as loans, non-equity securities, trade credits and other account receivables that establish a claim for repayment. To proxy for financial openness, we rely on Chinn and Ito's (2006) index measuring a country's degree of capital account openness. Data on net foreign asset are collected from the updated and extended version of the dataset constructed by Lane and Milesi-Ferretti (2007). To compute the gravity-based predictor, we take data on geographic, ethnic, linguistic and colonial variables from the CEPII's Gravity database described in Head et al (2010).

Figure 3: Emigration rates



Note: Authors' computations based on IAB database (Brücker et al, 2013).

Table A2 (in the Appendix) summarizes descriptive statistics. At a quick glance, it also confirms that emigration from SSA countries to developed OECD countries is dominated by migration of people with high education. Table A2 also shows that, on average, SSA countries experience current account deficits at more than 6% of GDP, reflecting the region's need for external financing.

4. Empirical results

We begin by presenting the results based on the pooled OLS approach. Once these results are discussed, we will then present and dissect the results of the pooled 2SLS approach. Figure 4 gives a first look at the relationship between emigration rate and current account. This relationship appears to be negative whatever the skill level. Estimation results should give us a better view on this link and allows us to know if we can derive a causal relationship.

Pooled OLS results

Table 1 shows the results of the regressions carried out separately by successively considering as dependent variables the current account, the national saving, and the national investment. For each dependent variable, four regressions are made to take into account emigrants' skill level — respectively, all skills combined, low skills, medium skills, and high skills. Notice that, in estimating the impact depending on skill level, the three categories of emigrants (low, medium, high) are included separately and not together in the same regression. Indeed, given the strong correlation between the three categories of emigrants, it is not recommended to include all together in the same regression (sDocquier et al, 2016). However, for robustness check in Section 5, we include all categories together in the same regression (by classifying skills in two categories).

Regarding the current account regressions, the results show that emigration from SSA countries has a negative impact on their current account, which is significant only for highly-skilled emigrants. Emigration of 1% of highly educated people leads to a deterioration in the current account of 0.10% of GDP. This interesting result—whose robustness will be checked below—is statistically significant at 1%. Figure 4, which represents the scatter plot between highly-skilled emigration rates of SSA and average current account balances, supports this negative relationship between the two variables. The results of the regressions on national saving and investment provide some explanations for the impact of emigration on the current account. Indeed, like current account, national saving is negatively and significantly affected by brain drain, while national investment is not significantly impacted. In other words, if the brain drain degrades the current account, it is because it is accompanied by an exodus of the saving potential of highly-skilled emigrants. This result would then be consistent with the life-cycle theory that suggests a deficit-aggravating effect of brain drain in the countries of origin. Emigration of people with medium skills seems to be associated with a weakly significant increase in domestic investment but has no impact on the current account.

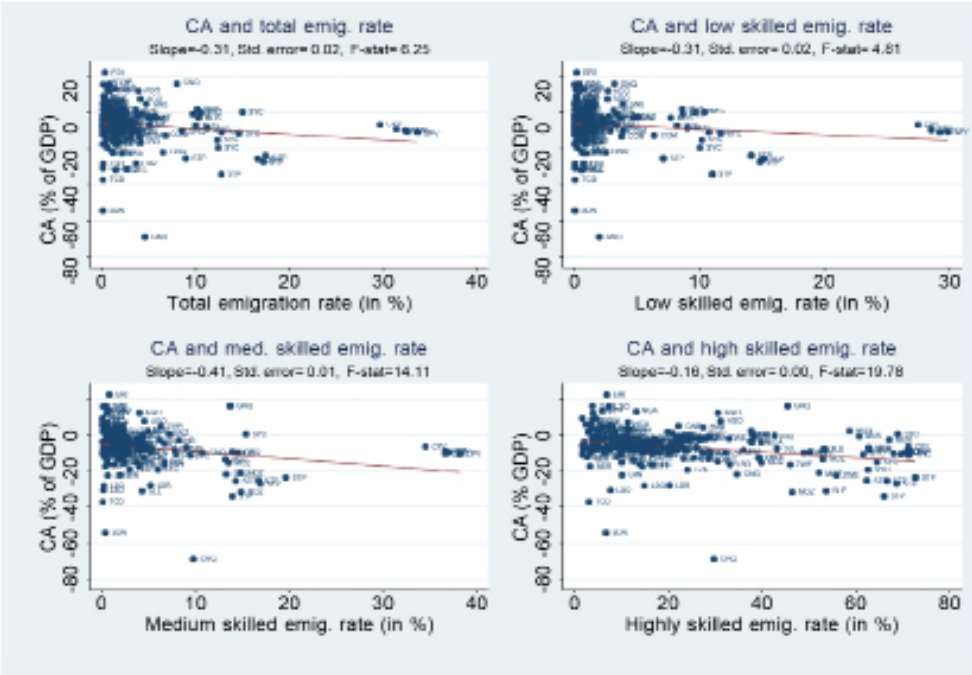
Table 1: Pooled OLS results

	Current account				Saving				Investment			
Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
All skills	-0.101				-0.030				0.040			
	(0.109)				(0.148)				(0.117)			
Low skill		-0.058				0.020				0.010		
		(0.114)				(0.151)				(0.137)		
Medium skill			-0.095				0.075				0.186*	
			(0.097)				(0.111)				(0.099)	
High skill				-0.104***				-0.133**				-0.016
				(0.035)				(0.053)				(0.041)
Young dep. ratio	-0.014	-0.015	-0.007	-0.038	0.220**	0.218**	0.210**	0.194**	0.259***	0.260***	0.240***	0.258***
	(0.078)	(0.078)	(0.079)	(0.081)	(0.089)	(0.089)	(0.090)	(0.089)	(0.076)	(0.077)	(0.080)	(0.074)
Old dep. ratio	0.091	0.134	0.093	0.116	-0.067	-0.030	0.021	-0.113	-0.213	-0.238	-0.086	-0.254
	(0.335)	(0.336)	(0.333)	(0.304)	(0.388)	(0.387)	(0.390)	(0.390)	(0.393)	(0.398)	(0.373)	(0.381)
Lagged NFA	0.001	0.001	0.000	-0.000	-0.000	-0.000	0.000	0.000	-0.002	-0.002	-0.001	-0.002
	(0.002)	(0.002)	(0.002)	(0.002)	(0.007)	(0.007)	(0.008)	(0.006)	(0.005)	(0.005)	(0.005)	(0.005)
Rel. Fiscal balance	0.683***	0.697***	0.692***	0.600***	0.708**	0.720**	0.729**	0.573**	-0.146	-0.155	-0.123	-0.174
	(0.244)	(0.247)	(0.240)	(0.218)	(0.298)	(0.298)	(0.299)	(0.273)	(0.211)	(0.212)	(0.202)	(0.210)
Rel. income	4.498***	4.322***	4.498***	4.681***	7.582***	7.420***	7.204***	8.147***	3.037**	3.144**	2.490*	3.254**
	(1.349)	(1.369)	(1.338)	(1.192)	(2.020)	(2.002)	(2.036)	(1.863)	(1.398)	(1.424)	(1.353)	(1.297)
Rel. GDP growth	-0.433**	-0.437**	-0.414**	-0.414**	0.541**	0.538**	0.518*	0.577**	0.623***	0.625***	0.574***	0.631***
	(0.169)	(0.169)	(0.174)	(0.161)	(0.265)	(0.265)	(0.269)	(0.244)	(0.187)	(0.186)	(0.189)	(0.186)
Trade openness	-0.078***	-0.078***	-0.078***	-0.077***	0.002	0.001	0.001	0.004	0.111***	0.111***	0.110***	0.112***
	(0.024)	(0.024)	(0.024)	(0.023)	(0.031)	(0.032)	(0.032)	(0.029)	(0.024)	(0.024)	(0.024)	(0.024)
TOT volatility	0.048	0.051	0.045	0.025	0.036	0.039	0.045	0.003	0.004	0.002	0.019	-0.003
	(0.075)	(0.076)	(0.074)	(0.076)	(0.093)	(0.093)	(0.093)	(0.088)	(0.076)	(0.076)	(0.076)	(0.077)
Oil balance	0.133*	0.137*	0.131*	0.143**	-0.065	-0.060	-0.053	-0.063	-0.134*	-0.137*	-0.115	-0.138*
	(0.073)	(0.074)	(0.075)	(0.070)	(0.104)	(0.105)	(0.105)	(0.095)	(0.078)	(0.078)	(0.081)	(0.074)
Financial dev.	-0.020	-0.021	-0.020	-0.026	-0.006	-0.007	-0.008	-0.014	0.021	0.022	0.019	0.021
	(0.027)	(0.027)	(0.027)	(0.026)	(0.032)	(0.032)	(0.031)	(0.034)	(0.031)	(0.031)	(0.031)	(0.031)
Financial openness	3.310	3.316	3.003	3.668*	8.924***	8.945***	9.182***	9.233***	6.517***	6.507***	7.115***	6.537***
	(2.131)	(2.159)	(2.181)	(1.962)	(2.943)	(2.964)	(2.994)	(2.709)	(1.888)	(1.883)	(1.902)	(1.861)

Constant	10.478**	10.337**	10.367**	13.428***	19.233***	19.137***	19.094***	23.289***	5.850	5.925	5.763	6.432
	(4.475)	(4.515)	(4.522)	(4.406)	(5.419)	(5.413)	(5.415)	(5.446)	(5.080)	(5.111)	(5.077)	(5.098)
Observations	144	144	144	144	141	141	141	141	141	141	141	141
R-squared	0.637	0.635	0.637	0.660	0.484	0.484	0.485	0.522	0.610	0.610	0.619	0.610
Period FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Notes: Heteroscedasticity-robust standard errors are in parentheses. *, **, and *** denote significance at the 10%, 5% and 1% confidence level, respectively.

Figure 4: Link between emigration and current account in SSA



Note: Each scatter plot shows observations by country and by 5-year period (1990 to 2014).
Source: Authors' calculations based on data from IAB (Brücker et al, 2013) and IMF World Economic Outlook (WEO).

With respect to control variables, we find that, contrary to expectations, the youth dependency ratio is positively associated with saving and investment, although its impact on the current account is insignificant. This unexpected result can be explained by the categorization of the demographic structure. In fact, we use data from the World Bank, which considers that children under 15 are not of working age. However, the work of children under 15 in Africa is an open secret, which would explain their positive impact on investment and national saving.

The results show that an improvement in the government's fiscal balance results in a significant improvement in national saving but has no significant impact on investment. Consequently, there is a positive impact of fiscal balance on the current account. This finding is theoretically expected and finds resonance in Blanchard's (1985) finite-horizon model as well as the overlapping generation models. These models underlie the fact that by redistributing income from future to present generations, government budget deficits tend to induce current account deficits. Known in the literature as twin deficits, this positive link is irrelevant in the particular case of Ricardian equivalence in which private saving completely offset changes in public saving. However, several empirical evidences support such a relationship (Chinn and Prasad, 2003; Lane and Milesi-Ferretti, 2012; Gnimassoun, 2015).

Oil balance has a positive significant impact on the current account with a significant negative impact on investment and no significant impact on saving. This

confirms the importance of oil price increase in promoting the current account balance for oil-exporters or in worsening the balance of oil-importing countries.

Our results also show that an increase in economic growth results in an increase in saving and investment, but with a more significant impact on investment, leading to a deterioration in the external balance. As predicted by the stage of development assumption, an increase in relative income leads to a significant improvement in the current account. This effect operates through an improvement in saving greater than that of investment induced by the increase in relative income.

In addition, by significantly improving investment without influencing national saving, the increase in openness to trade leads to a deterioration in the current account.

Finally, financial openness is associated with a significant increase in investment and domestic saving in comparable proportions, so that its impact on the current account is negligible.

To summarize the main results from pooled OLS analyses, the impact of emigration on the current account depends on the level of education of emigrants. The exodus of highly competent individuals is accompanied by the flight of their saving potential, and thus their ability to finance the economy, which results in a deterioration of the external balance of the countries of origin. We also find that the 'twice deficits' hypothesis holds for SSA countries. National saving and investment are positively correlated to economic activity. Finally, countries with higher levels of trade openness and financial openness tend to improve their investment more significantly. Overall, about 60%-70% of the variation in current accounts and national investments is explained by our models, while about 50% of the variation in national saving is explained. The following developments are intended to test the robustness of these results.

Gravity-based pooled 2SLS results

Given that countries with poor institutions may attract less capital flows and generally experience higher rates of brain drain, pooled OLS regressions above may suffer from endogeneity bias. Therefore, we use a gravity-based pooled 2SLS strategy (see Section 3) to account for the potential simultaneity bias. Table A3 (in the Appendix) show the results of our "zero-stage" gravity model. Though preliminary, these results give rise to some comments. Emigration rate from sub-Saharan Africa to OECD countries is greater when the countries of origin share the same language or have colonial ties with the country of destination. We also obtain the expected result that distance, isolation and the size of the population in 1960 are negatively correlated with emigration. The most interesting result concerns the difference in the impact of distance according to the level of education of the emigrants. Indeed, while emigrants with a high level of education are weakly impacted by distance, emigrants with a low level of education bear a very high cost of distance, at least three times greater. This result reflects an important fact regarding immigration policies in host countries that are primarily aimed at

attracting talent from developing countries. Figure A1 (in the Appendix) shows the scatter plot between the observed values of emigration rates and those predicted by gravity models. It appears that gravity models based on exogenous variables provide a very good prediction of emigration rates regardless of the level of education of emigrants. In fact, the slope coefficient is not significantly different from 1 regardless of the skill level of emigrants. These results give a first indication of the good quality of the instruments we use in our identification strategy.

Table 2 displays the pooled 2SLS estimates. The endogeneity bias correction strategy is conducted for all explanatory variables (current account, saving and investment). First of all, the strength of the first stage is confirmed by the Kleibergen-Paap Wald rk (KP) F-statistic for weak identification, which is very large in all specifications. Indeed, the KP F-statistic value is higher than the critical values reported by Stock and Yogo (2005), including the most demanding (16.38). This is especially true in all regressions involving brain drain. For brain drain, the results are almost identical to those of the pooled OLS approach, both quantitatively and qualitatively. An increase in the rate of brain drain from SSA countries causes a decline in national saving and increases the need for financing (current account deficit) in these countries. More specifically, an increase in the brain drain rate of 10% causes a reduction in national saving of 1.4 percentage points of GDP and a current account deterioration of 1.24 percentage points of GDP. Contrary to the previous results, emigration seems to have a negative impact on the current account regardless of the emigrants' level of education. However, the result is weak for low-skilled emigrants since a margin of error of 10% must be tolerated to accept this result. As for the emigration of medium skills, the result is valid at 5%, while the negative impact of the emigration of high skills is established at 1%.

For control variables, the results are almost the same as those for the pooled OLS.

In summary, this section shows that, taking into account the potential endogeneity of emigration, the result that brain drain causes deterioration in the current account is confirmed and even reinforced. The pooled 2SLS regressions also confirm that this effect is induced by the shortfall in saving generated by the exodus of people with a high level of education, given their greater saving potential in the structure of the population.

Table 2: Pooled 2SLS results

	Current Account				Saving				Investment			
Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
All skills	-0.367**				-0.143				0.122			
	(0.163)				(0.179)				(0.126)			
Low skill		-0.350*				-0.108				0.091		
		(0.179)				(0.188)				(0.146)		
Medium skill			-0.269**				-0.060				0.208	
			(0.125)				(0.142)				(0.131)	
High skill				-0.124***				-0.141**				-0.045
				(0.042)				(0.056)				(0.050)
Young dep. ratio	-0.003	-0.000	0.012	-0.042	0.225***	0.224***	0.225***	0.193**	0.255***	0.256***	0.238***	0.252***
	(0.081)	(0.079)	(0.079)	(0.079)	(0.086)	(0.086)	(0.087)	(0.086)	(0.073)	(0.072)	(0.077)	(0.069)
Old dep. ratio	-0.123	-0.061	-0.053	0.105	-0.158	-0.116	-0.094	-0.117	-0.146	-0.183	-0.068	-0.269
	(0.309)	(0.318)	(0.303)	(0.289)	(0.345)	(0.347)	(0.355)	(0.365)	(0.366)	(0.377)	(0.336)	(0.365)
Lagged NFA	0.000	0.001	-0.000	-0.000	-0.000	-0.000	-0.001	0.000	-0.002	-0.002	-0.001	-0.002
	(0.002)	(0.002)	(0.002)	(0.002)	(0.007)	(0.007)	(0.007)	(0.006)	(0.005)	(0.005)	(0.005)	(0.005)
Rel. Fiscal balance	0.613***	0.632***	0.660***	0.579***	0.678**	0.692**	0.705**	0.564**	-0.125	-0.137	-0.119	-0.205
	(0.224)	(0.231)	(0.219)	(0.211)	(0.280)	(0.281)	(0.280)	(0.269)	(0.200)	(0.204)	(0.189)	(0.202)
Rel. income	5.428***	5.221***	5.146***	4.785***	7.970***	7.799***	7.698***	8.186***	2.755**	2.903**	2.410*	3.401***
	(1.212)	(1.263)	(1.200)	(1.126)	(1.858)	(1.854)	(1.897)	(1.707)	(1.376)	(1.405)	(1.289)	(1.281)
Rel. GDP growth	-0.409**	-0.414***	-0.363**	-0.409***	0.551**	0.546**	0.556**	0.579**	0.616***	0.620***	0.568***	0.639***
	(0.159)	(0.160)	(0.163)	(0.151)	(0.246)	(0.248)	(0.249)	(0.225)	(0.177)	(0.176)	(0.184)	(0.175)
Trade openness	-0.075***	-0.077***	-0.077***	-0.076***	0.003	0.002	0.002	0.004	0.110***	0.110***	0.110***	0.112***
	(0.023)	(0.023)	(0.023)	(0.022)	(0.030)	(0.030)	(0.030)	(0.027)	(0.023)	(0.023)	(0.022)	(0.022)
TOT volatility	0.033	0.038	0.030	0.019	0.030	0.033	0.032	0.001	0.009	0.006	0.021	-0.010
	(0.071)	(0.072)	(0.071)	(0.072)	(0.088)	(0.088)	(0.087)	(0.086)	(0.072)	(0.072)	(0.071)	(0.071)
Oil balance	0.108	0.106	0.110	0.143**	-0.076	-0.073	-0.069	-0.063	-0.126*	-0.129*	-0.113	-0.138**
	(0.069)	(0.069)	(0.071)	(0.066)	(0.096)	(0.097)	(0.098)	(0.089)	(0.075)	(0.074)	(0.078)	(0.069)
Financial dev.	-0.019	-0.018	-0.018	-0.027	-0.005	-0.005	-0.005	-0.015	0.021	0.021	0.018	0.019
	(0.027)	(0.027)	(0.026)	(0.025)	(0.031)	(0.031)	(0.031)	(0.032)	(0.029)	(0.029)	(0.029)	(0.030)
Financial openness	3.186	3.111	2.354	3.728**	8.882***	8.885***	8.739***	9.251***	6.548***	6.544***	7.187***	6.603***
	(1.952)	(1.978)	(2.026)	(1.843)	(2.745)	(2.772)	(2.843)	(2.518)	(1.807)	(1.801)	(1.848)	(1.696)
Constant	11.179***	10.970***	10.652**	14.053***	19.486***	19.321***	19.222***	23.533***	5.666	5.808	5.742	7.337

	(4.107)	(4.132)	(4.226)	(4.243)	(5.107)	(5.099)	(5.081)	(5.199)	(4.791)	(4.812)	(4.783)	(4.939)
Observations	144	144	144	144	141	141	141	141	141	141	141	141
R-squared	0.621	0.620	0.628	0.660	0.481	0.481	0.480	0.522	0.609	0.609	0.619	0.608
Period FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
K-P F-stat	51.11	45.48	108.1	118.6	61.20	52.51	114.2	132.3	61.20	52.51	114.2	132.3
SY 10% max IV size	16.38	16.38	16.38	16.38	16.38	16.38	16.38	16.38	16.38	16.38	16.38	16.38
SY 25% max IV size	5.530	5.530	5.530	5.530	5.530	5.530	5.530	5.530	5.530	5.530	5.530	5.530

Notes: Heteroscedasticity-robust standard errors are in parentheses. *, **, and *** denote significance at the 10%, 5% and 1% confidence level, respectively. K-P F-stat is the Kleibergen and Paap (2006) rk Wald F-stat test of jointly weak identification. SY 10% max IV size and SY 25% max IV size are the Stock and Yogo (2005) critical values under the i.i.d. assumption.

5. Robustness checks

In this section, we provide various robustness analyses.

Regional specificities, oil endowment

Though we consider SSA countries, there may be heterogeneity issues. The first aspect of heterogeneity concerns regional specificities. Indeed, SSA is composed of several regions that may have their particularities. Particularly, some countries in West and Central Africa form currency unions. The role of exchange rate regimes in the dynamics of current accounts is well documented.[6] Given the relatively small size of our sample, it is not possible to make estimates by region. One way of controlling heterogeneity is to introduce dummy variables for regions. The dummy variables that we include are therefore the regions of East Africa, West Africa and Central Africa. Using these regional dummies also control for the effect of the exchange rate regime, since only countries in West and Central Africa have fixed exchange rate regime. Table A4 (in the Appendix) shows pooled 2SLS results for panel regressions. These results are perfectly in line with previous results. The brain drain causes a significant funding need for SSA countries.

The second aspect of heterogeneity is the oil endowment. Indeed, oil-producing countries such as Nigeria, Angola, Sudan, Equatorial Guinea, Gabon or Chad often experience sharp fluctuations in their current account, alternating exceptional deficits and surpluses depending on the evolution of the price of oil. These exceptional dynamics for the oil-exporting countries may obscure the overall dynamic. Even if oil balance is a control variable, it therefore seems important to control our results for this type of bias. We then implement regressions excluding oil-exporting countries. The corresponding results are reported in Table A5 (in the Appendix}. Once again, our main conclusions are not altered.

Outliers in emigration and threshold effects

Another source of the heterogeneity concerns outliers in emigration or a possible non-linearity in the effects of brain drain. For example, as mentioned above, emigration or brain drain is more important in island countries. To account for the potential effects of outliers or non-linearity, we perform two regressions depending on the level of brain drain: one on the sample with brain drain lower than the 90th percentile; the other on the sample with brain drain higher than the 10th percentile. The results are

reported in Table A6 (in the Appendix). The impact of brain drain is significant in the two regressions with around the same magnitude. Therefore, excluding outliers does change our finding.

Persistence in current accounts

In its methodological notes on external balance assessments, the IMF often emphasizes the strong autocorrelation that can characterize the dynamics of the current account and the need to take this into account in empirical estimates (see, for example, IMF, 2013). One way to take into account this persistence in the current account dynamics is to include the lagged current account among the explanatory variables in the regression. Another approach is to use the pooled OLS estimator with autocorrelation correction. The IMF prefers the second approach and uses in particular the pooled GLS with a panel-wide AR(1) correction, emphasizing that the first approach amounts to adding a quasi-fixed effect to the estimates and gives rise to a key interpretative/normative issue related to the current account in a given year being explained by the previous year's current account. We use both approaches to control autocorrelation in the dynamics of current accounts.[7] The results are shown in Table A7 (in the Appendix). They show that, regardless of the approach used to control the autocorrelation of current accounts, only the emigration of high skills significantly deteriorates the current account. The previous results thus remain robust to persistence in current accounts.

On the skill-specific effects

Previous results have shown that the effect of emigration on the current account depends on the level of education of emigrants. We test the sensitivity of these results by performing two additional tests. Firstly, instead of considering three skill levels as before, we distinguish two categories: emigrants with tertiary education (high skill) and emigrants with non-tertiary education that includes emigrants with low and medium skills as previously defined. Secondly, we include these two categories of emigrant together in the same regression to analyse the relative effect of emigration by skill. Note, however, that given the strong correlation between the two categories of emigrant (0.70 in our case), this procedure is not highly recommended (see Docquier et al, 2016). Table A8 (in the appendix) presents the results of these additional tests. These results confirm that the effect of emigration differs according to the level of education of emigrants. Looking separately at the effects of emigrants with tertiary education and those with a lower education, in columns 1 and 2, we find that only the emigration of Africans with tertiary education negatively and significantly affects the current account. The negative impact of emigrants with a lower level of education is weakly significant (at 10%). Even when both types of emigration are considered in the same regression, only the emigration of Africans with tertiary education has

a negative and significant impact on the current account of African countries. By examining how this new decomposition of emigration by skill affects saving and investment, we obtain some enlightening results, especially when the two types of skill are considered together in the same regression. Indeed, it appears that the negative effect of highly-skilled emigrants goes through a depressive effect on saving that is much more significant than the effect on investment. Compared with high skills, the emigration of low educated Africans significantly improves saving and investment in a relatively comparable proportion, thus justifying insignificant impact on the current account. This relatively positive effect of low-skilled emigration on saving and investment could pass through migrant remittances.

6. The role of remittances

One of the main characteristics of emigration is that it involves remittances to the countries of origin. Since remittances are credited to the balance of payments of the recipient countries, they have a positive influence on the current account balance. Thus, the negative effect of emigration on the current account could be even greater without these remittances. In this section, we examine the effect of emigrants' level of education or skill on their propensity to send money to their country of origin. This investigation may lead to a better understanding of previous results as some studies show that emigrants with high skills have a lower propensity to remit (Faini, 2007; Niimi et al, 2010). We then regress remittances on their potential determinants, i.e., relative income, capital opening, financial openness and population dependency ratios. Table 3 reports the estimation results. These results are edifying for several reasons. First, they confirm the macroeconomic results of Faini (2007) and Niimi et al (2010). Indeed, while it is clear that migrants send money to their country of origin, these remittances depend on the skills level of migrants. Low-skilled and medium-skilled emigrants from SSA countries remit more significantly to home, while highly-skilled emigrants contribute marginally to remittances. Though surprising because of the greater likelihood that highly-skilled emigrants will find decent and better paid work in the host country, these results may be explained by two arguments provided by previous studies. On the one hand, migrants with a low level of qualification are most often from families of poor origin and will thus need to send funds to support their families, while migrants with a high level of qualification are in a contrary configuration. On the other hand, skilled migrants are able to bring their families and may easily benefit from a safer legal and financial status in the host country, which reduces the incentive to remit. Their full integration into the host country leads them to make long-term investments (buy a house, buy a car, projects for their children, etc.), which reduces their propensity to remit. On the contrary, low-skilled emigrants have weak incentives to integrate into host country and most often plan to return to their country of origin; this encourages them to send more money, not only to help their families, but also to prepare for their return.

To summarize, the results on remittances provide an explanation for the net negative impact of brain drain on the current account. Indeed, while the negative effect of the exodus of highly-skilled emigrants on national saving supported by the life-cycle theory is clearly operative, the positive effect of the remittances from these emigrants on the current account is less clear. Emigrants with low skills remit more than emigrants with high skills.

Table 3: Emigration and remittances

	Pooled OLS				Pooled 2SLS			
Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
All skills	0.381***				0.324***			
	(0.064)				(0.083)			
Low skill		0.430***				0.344***		
		(0.069)				(0.093)		
Medium skill			0.286***				0.334***	
			(0.066)				(0.065)	
High skill				0.034				0.090***
				(0.031)				(0.034)
Young dep. ratio	-0.002	-0.007	-0.018	0.007	-0.002	-0.007	-0.021	0.027
	(0.037)	(0.037)	(0.038)	(0.054)	(0.037)	(0.037)	(0.037)	(0.046)
Old dep. ratio	0.954**	0.939**	0.883**	0.704*	0.911**	0.885**	0.919**	0.762*
	(0.410)	(0.410)	(0.408)	(0.400)	(0.399)	(0.399)	(0.402)	(0.408)
Rel. income	-2.234***	-2.288***	-1.785**	-1.465*	-2.115***	-2.118***	-1.843**	-1.511**
	(0.755)	(0.752)	(0.761)	(0.769)	(0.758)	(0.748)	(0.765)	(0.739)
Financial dev.	0.015	0.015	0.013	0.021	0.016	0.015	0.012	0.023
	(0.020)	(0.020)	(0.020)	(0.022)	(0.019)	(0.019)	(0.019)	(0.021)
Financial openness	-0.353	-0.102	0.471	0.220	-0.202	0.050	0.439	-0.515
	(2.021)	(2.066)	(1.985)	(1.982)	(1.936)	(1.980)	(1.922)	(1.966)
Constant	4.395	4.429	5.459	4.138	4.486	4.544	5.536	2.681
	(3.985)	(3.988)	(4.011)	(4.430)	(3.862)	(3.861)	(3.900)	(4.050)
Observations	183	183	183	183	183	183	183	183
R-squared	0.135	0.137	0.118	0.063	0.133	0.134	0.116	0.043
Period FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
K-P F-stat					66.29	52.73	86.13	197.3
SY 10% max IV size					16.38	16.38	16.38	16.38
SY 25% max IV size					5.530	5.530	5.530	5.530

Notes: Heteroscedasticity-robust standard errors are in parentheses. *, **, and *** denote significance at the 10%, 5% and 1% confidence level, respectively. K-P F-stat is the Kleibergen and Paap (2006) rk Wald F-stat test of jointly weak identification. SY 10% max IV size and SY 25% max IV size are the Stock and Yogo (2005) critical values under the i.i.d. assumption.

7. Conclusion and policy recommendations

In this paper, we examine how emigration — the extent of which, particularly with regard to skilled emigration, has increased since the early 1990s — influence current account deficits in SSA countries. To this end, we rely on the literature on the medium-term determinants of current accounts which we extend by adding emigration rate among the determinants. Inclusion of the emigration rate is particularly based on the life-cycle theory that emigration of working people increases the dependency ratio of the population and reduces the national saving rate. Then, in addition to traditional pooled OLS regression approaches, we use a gravity-based pooled 2SLS strategy to identify a causal effect of emigration according to emigrants' skill level.

Our results clearly establish a negative brain drain effect. Indeed, although emigration globally has a negative impact on the current account in SSA countries, only high-skilled emigration has a significant negative impact. This result is robust regardless of the estimation strategy— pooled OLS or pooled 2SLS. We provide an explanation for this result by examining the two components of the current account, saving and investment. Indeed, the results show that brain drain significantly deteriorates the current account because it induces a significant reduction in national saving without affecting investment.

This study thus contributes to the literature on the two phenomena that are probably among the most complex topics of contemporary international economics faced by economists and decision makers: global imbalances and international migration. Global imbalances are generally considered as a phenomenon of developed, emerging or oil-exporting countries. Our study highlights that they may involve developing countries, particularly SSA countries, through international migration. In other words, our paper makes a connection between these two characteristics of contemporary globalization which have been investigated separately in the literature. Given that the current account surplus (deficit) reflects a nation's financing capacity (need), our study points out the role of emigration on the external imbalance or external financing need of African countries. Our findings give rise to policy recommendations to reverse, in the short and medium term, the negative effect of brain drain on the external balance and thereby reduce the magnitude of the brain drain itself in the long run. Given that the negative effect of brain drain is due to insufficient remittances to offset the loss of savings, policy makers should implement policies to attract more remittances, particularly from highly-skilled emigrants. A relevant way is via issuance of "diaspora bonds," which can effectively drain diaspora savings ("bring saving

back") for financing economic development. Since the remuneration of savings in advanced countries is low as the marginal productivity of capital is lower compared to developing countries, diaspora savings potentially constitute an abundant, stable and inexpensive source of financing for African countries compared to alternative financing (local, regional and international financial markets). Diaspora bonds have already been operationalized by several countries in the world including China, Japan, Israel and India. For example, through diaspora bonds, Israel has established a strong economic and social link with its diaspora since 1951. African countries could learn from this model of success. So far, Ethiopia is one of the few African countries to have operationalized this type of financing (with little success) even though several experiments are under way in other countries such as Rwanda, Ghana and Nigeria. In fact, for diaspora bonds to be successful, countries must create the conditions for a healthy business environment (political stability, solid financial institutions). This particularly concerns highly-skilled emigrants who, having access to financial services in host country, have great sensitivity to the quality of the business environment in origin country. In addition, diaspora bonds should be used to finance infrastructure projects without falling into "white elephant projects" that undermine economic prosperity in several African countries.

African countries could also attract more remittances through traditional channels by implementing appropriate policies. This includes reducing the cost of transfers, improving the quality of internet connection and access to financial services, and recognition of dual nationality. Indeed, empirical studies clearly show that origin countries that do not allow dual nationality are less attractive for remittances.

With effective mobilization of diaspora savings or remittances and rational use of these resources, Africa could achieve economic prosperity which is the only condition for a long-term reduction of brain drain.

Notes

1 Since both public spending (social security, schools) and income tax are age-dependent, international migration may also influence fiscal balance through its impact on the age structure of the population. This consideration was recently investigated by d'Albis et al (2018) on 15 Western European countries and by d'Albis et al (2019) on 19 OECD countries over the period 1985-2015.

2 In the IMF's categorization (see the sixth edition of the IMF's Balance of Payments Manual [BPM6]), remittances of permanent migrants correspond to personal transfers that consist of all current transfers in cash or in kind made or received by resident households to or from non-resident households. There is another item called compensation of employees that refers to the income of border, seasonal, and other short-term workers who are employed in an economy where they are not resident and of residents employed by non-resident entities. Personal transfers and compensation of employees are the two components of personal remittances; and both are recorded in the current account.

3 For more details see, for example, the recent paper of Lartey (2018).

4 In Figure 2, the jump in 2005 is due to the change in the way remittances are recorded in the balance of payments. Indeed, data starting from 2005 are based on the sixth edition of the IMF's Balance of Payments Manual (BPM6), while data before 2005 are based on the previous version.

5 Since former migrants continue to remit to their home country, relying on migration stocks rather than inflows is more relevant to reflect the influence of remittances on the current account. Indeed, the stock data assume that migrants are settled in host countries over a relatively long period and are therefore more appropriate for better accounting for remittances.

6 For a recent literature, see, for example, Gnimassoun (2015) and Martin (2016).

7 Given that our estimates do not include country-fixed effects, our estimates do not suffer from the bias of Nickell (1981).

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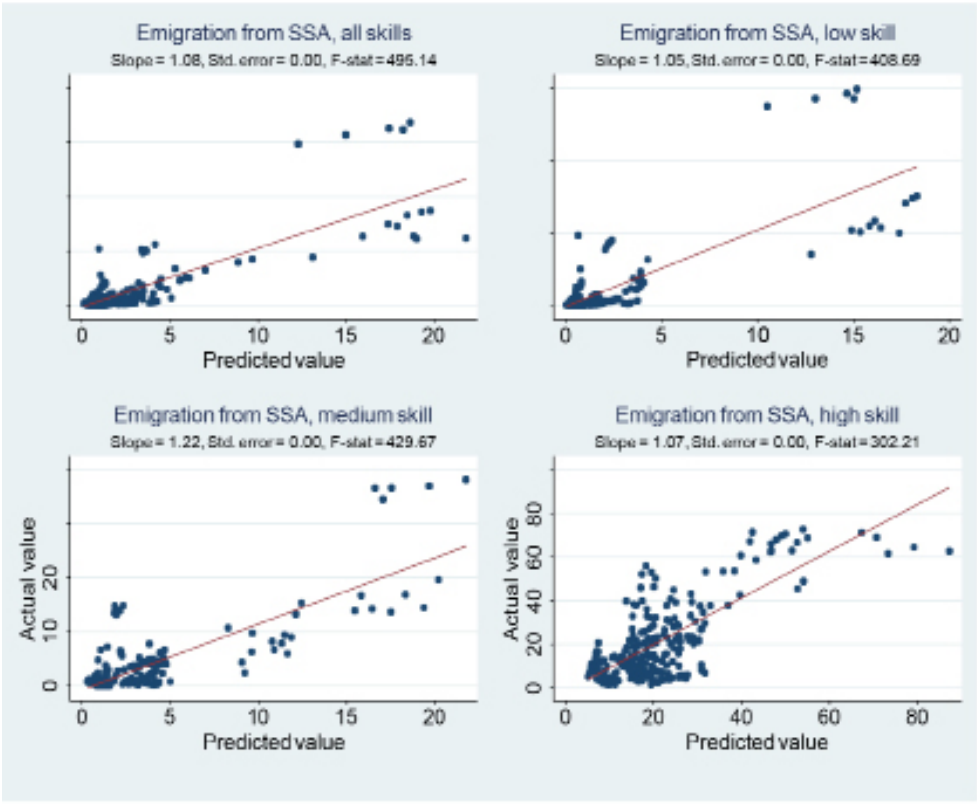
Appendix

Figure A1: Observed emigration and predicted emigration, depending on skills



Note: This figure reports the scatter plots of the relationship between actual and predicted values of emigration from SSA countries to OECD countries.

Table A1: Emigration rates by country of origin and by education level, 2010

Emigration rates in %

Country	Total	Low	Medium	High
Angola	4.08	2.63	4.52	31.15
Benin	0.46	0.19	0.54	7.34
Botswana	0.34	0.24	0.06	5.52
Burkina Faso	0.13	0.07	0.16	1.69
Burundi	0.35	0.10	1.28	16.51
Cameroon	1.35	0.52	1.16	22.21
Cape Verde	33.63	29.19	38.15	69.61
Central African Republic	0.55	0.26	0.76	10.12
Chad	0.12	0.04	0.12	4.59
Comoros	6.80	6.35	4.48	39.46
Congo, Dem. Rep. of the	0.40	0.17	0.51	11.42
Congo, Rep. of the	3.41	2.32	2.10	36.33
Cote d'Ivoire	0.84	0.54	0.86	5.08
Equatorial Guinea	8.54	2.85	14.48	48.83
Eritrea	2.63	0.98	4.19	42.64
Ethiopia	0.62	0.13	1.14	16.92
Gabon	1.39	0.71	0.79	5.86
Gambia, The	5.04	2.31	8.60	42.88
Ghana	2.27	1.16	1.14	27.26
Guinea	1.19	0.62	1.96	10.11
Guinea-Bissau	5.07	3.35	9.00	21.33
Kenya	1.76	0.80	0.84	23.72
Lesotho	0.12	0.02	0.08	6.43
Liberia	3.65	0.71	5.19	20.24
Madagascar	0.62	0.30	0.76	13.73
Malawi	0.34	0.17	0.20	35.97
Mali	1.40	0.94	6.63	12.57
Mauritania	1.64	0.91	4.00	14.50
Mauritius	11.22	9.03	4.15	62.89
Mozambique	1.47	0.53	14.83	46.37
Namibia	0.39	0.09	0.26	10.59
Niger	0.08	0.03	0.33	3.32
Nigeria	0.61	0.11	0.56	12.04
Rwanda	0.30	0.08	1.08	10.07
Sao Tome and Principe	17.44	14.12	19.59	72.62

Senegal	3.08	1.49	7.76	20.67
Seychelles	12.39	10.02	5.96	62.58
Sierra Leone	2.67	0.74	4.28	53.63
South Africa	1.60	0.62	0.52	12.10
Sudan	0.40	0.10	0.72	7.97
Swaziland	4.27	3.35	2.57	28.67
Tanzania	0.56	0.16	1.20	32.21
Togo	1.17	0.67	0.95	15.10
Uganda	1.01	0.39	1.08	12.57
Zambia	0.90	0.29	0.34	27.41
Zimbabwe	2.10	0.93	0.61	55.83

Note: The emigration rate for each education level *s* is given by the number of emigrants with education level *s* as a percentage of the total number of individuals from a given source country (residents an emigrants) with the same education level *s*.

Source: Authors' computations based on emigration data from IAB (Brücker et al, 2013) and population data from WDI.

Table A2: Descriptive statistics

Variable	Mean	Std. Dev.	Min.	Max.	N
Current account (as % of GDP)	-6.74	10.43	-68.98	22.12	213
Saving (as % of GDP)	15	11.83	-31.98	49.57	205
Investment (as % of GDP)	22.49	11.17	4.15	90.07	205
Remittance (as % of GDP)	3.73	7.3	0	54.59	184
Migration rate (in %)					
All skill	2.83	5.63	0.05	33.63	215
Low skill	2.09	4.99	0.02	29.81	215
Medium skill	3.48	6.4	0.05	38.15	215
High skill	21.73	19.09	1.67	72.62	215
Lagged NFA (as % of GDP)	-105.24	230.33	-2009.1	872.91	213
Relative Fiscal balance (as % of GDP)	-1.92	22.69	-298.35	28.93	183
Relative GDP growth	0.86	6.28	-36.07	52.58	213
Terms of trade volatility	8.81	7.57	0	35.37	211
Trade openness	77.46	49.59	14.38	440.74	205
Relative income	-2.33	0.92	-4.56	0.26	210
Financial openness	0.27	0.25	0	1	214
Financial openness	19.23	21.76	1.87	148.31	206
Relative dependency ratio (old)	-8.60	2.86	-17.21	-1.51	215
Relative dependency ratio (young)	39.85	13.37	-3.47	68.66	215

Note: The emigration rate for each education level *s* is given by the number of emigrants with education level *s* as a percentage of the total number of individuals from a given source country (residents and emigrants) with the same education levels.

Source: Authors' computations based on data from the following databases: IAB (Brücker et al,

2013), WDI, WEO, PWT, GFDD, Chinn and Ito (2006) and Lane and Milesi-Ferretti (2007).

Table A3: Gravity PPML results, emigration from SSA to OECD

Panel gravity regressions

Variables	Total	Low	Medium	High
Ln pop60 origin	-0.542***	-0.644***	-0.333***	-0.179***
	(0.040)	(0.053)	(0.073)	(0.029)
Ln distance	-1.429***	-1.388***	-1.151**	-0.275
	(0.280)	(0.324)	(0.525)	(0.213)
Colonial ties	1.289***	1.551***	1.774***	1.464***
	(0.267)	(0.273)	(0.332)	(0.184)
Sum landlocked	-0.774***	-0.581*	-1.021***	-0.524***
	(0.252)	(0.350)	(0.185)	(0.093)
Common off. lang.	0.727***	0.101	0.837**	1.499***
	(0.216)	(0.200)	(0.334)	(0.189)
Common ethno. lang.	0.640***	0.762***	0.249	0.363***
	(0.124)	(0.138)	(0.175)	(0.101)
Constant	11.130***	9.917***	9.022*	2.322
	(2.711)	(3.065)	(5.033)	(2.135)
Observations	4,400	4,400	4,400	4,400
R-squared	0.717	0.713	0.445	0.544
Time FE	Yes	Yes	Yes	Yes
Time-varying Dest. FE	Yes	Yes	Yes	Yes

Notes: Heteroscedasticity-robust standard errors are in parentheses. *, **, and *** denote significance at the 10%, 5% and 1% confidence level, respectively.

Table A4: Controlling for regional specificities (pooled 2SLS)

	Current Account				Saving				Investment			
Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
All skills	-0.212				-0.056				0.068			
	(0.133)				(0.156)				(0.140)			
Low skill		-0.178				-0.016				0.024		
		(0.142)				(0.160)				(0.166)		
Medium skill			-0.188*				0.021				0.223*	
			(0.111)				(0.133)				(0.125)	
High skill				-0.110**				-0.171**				-0.093
				(0.054)				(0.073)				(0.066)
Young dep. ratio	-0.062	-0.064	-0.048	-0.073	0.215***	0.212***	0.208**	0.217***	0.302***	0.305***	0.274***	0.310***
	(0.072)	(0.071)	(0.071)	(0.071)	(0.083)	(0.082)	(0.086)	(0.084)	(0.068)	(0.069)	(0.072)	(0.064)
Old dep. ratio	0.218	0.292	0.230	0.177	0.119	0.170	0.214	-0.268	-0.150	-0.207	0.056	-0.478
	(0.407)	(0.404)	(0.395)	(0.392)	(0.418)	(0.419)	(0.432)	(0.436)	(0.507)	(0.514)	(0.466)	(0.516)
Lagged NFA	0.005**	0.006**	0.004*	0.003	-0.000	0.000	0.000	-0.001	-0.005	-0.005	-0.004	-0.006
	(0.002)	(0.002)	(0.003)	(0.003)	(0.006)	(0.006)	(0.006)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)
Rel. Fiscal balance	0.597***	0.607***	0.617***	0.590***	0.680**	0.685***	0.687***	0.631**	-0.117	-0.123	-0.117	-0.156
	(0.206)	(0.208)	(0.205)	(0.199)	(0.265)	(0.264)	(0.262)	(0.256)	(0.192)	(0.193)	(0.185)	(0.193)
Rel. income	3.044*	2.753*	3.051**	3.566**	6.759***	6.552***	6.366***	9.009***	3.971**	4.205**	3.054*	5.671***
	(1.590)	(1.596)	(1.552)	(1.600)	(2.034)	(2.001)	(2.121)	(2.026)	(1.960)	(1.992)	(1.765)	(2.005)
Rel. GDP growth	-0.461***	-0.468***	-0.424***	-0.432***	0.519**	0.513**	0.504**	0.621***	0.655***	0.662***	0.587***	0.724***

	(0.150)	(0.150)	(0.155)	(0.144)	(0.241)	(0.242)	(0.245)	(0.220)	(0.164)	(0.161)	(0.175)	(0.163)
Trade openness	-0.087***	-0.089***	-0.089***	-0.085***	-0.002	-0.003	-0.003	0.004	0.112***	0.113***	0.111***	0.117***
	(0.021)	(0.021)	(0.021)	(0.020)	(0.028)	(0.028)	(0.028)	(0.026)	(0.022)	(0.023)	(0.022)	(0.023)
TOT volatility	0.049	0.052	0.045	0.043	0.049	0.051	0.053	0.032	0.014	0.012	0.025	0.001
	(0.067)	(0.068)	(0.067)	(0.066)	(0.088)	(0.088)	(0.088)	(0.081)	(0.079)	(0.079)	(0.080)	(0.075)
Oil balance	0.315***	0.320***	0.316***	0.309***	-0.031	-0.025	-0.018	-0.089	-0.280**	-0.287***	-0.251**	-0.327***
	(0.112)	(0.114)	(0.112)	(0.108)	(0.126)	(0.126)	(0.128)	(0.121)	(0.110)	(0.111)	(0.108)	(0.111)
Financial dev.	-0.037	-0.036	-0.036	-0.045**	-0.004	-0.004	-0.004	-0.024	0.036	0.036	0.035	0.025
	(0.024)	(0.023)	(0.024)	(0.023)	(0.033)	(0.032)	(0.032)	(0.034)	(0.028)	(0.028)	(0.027)	(0.030)
Financial openness	6.903***	7.115***	6.238***	5.569**	10.787***	10.982***	11.225***	6.926**	4.379	4.158	5.943**	1.831
	(2.246)	(2.279)	(2.330)	(2.378)	(3.273)	(3.280)	(3.430)	(3.513)	(2.703)	(2.726)	(2.594)	(3.052)
Constant	14.746***	14.680***	14.540***	16.998***	20.992***	20.935***	20.924***	25.450***	4.791	4.858	4.843	7.319
	(4.169)	(4.200)	(4.245)	(4.160)	(5.423)	(5.418)	(5.415)	(5.549)	(4.912)	(4.923)	(4.922)	(5.085)
Observations	144	144	144	144	141	141	141	141	141	141	141	141
R-squared	0.673	0.673	0.674	0.695	0.500	0.501	0.502	0.545	0.638	0.638	0.648	0.637
Period FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Region/MU FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
K-P F-stat	63.18	53.82	137.6	78.35	71.34	59.55	143.7	90.77	71.34	59.55	143.7	90.77
SY 10% max IV size	16.38	16.38	16.38	16.38	16.38	16.38	16.38	16.38	16.38	16.38	16.38	16.38
SY 25% max IV size	5.530	5.530	5.530	5.530	5.530	5.530	5.530	5.530	5.530	5.530	5.530	5.530

Notes: Heteroscedasticity-robust standard errors are in parentheses. *, **, and *** denote significance at the 10%, 5% and 1% confidence level, respectively. K-P F-stat is the Kleibergen and Paap (2006) rk Wald F-stat test of jointly weak identification. SY 10% max IV size and SY 25% max IV size are the Stock and Yogo (2005) critical values under the i.i.d. assumption.

Table A5: Excluding oil-exporting countries (pooled 2SLS)

	Current Account				Saving				Investment			
Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
All skills	-0.219				-0.093				0.092			
	(0.144)				(0.160)				(0.168)			
Low skill		-0.235				-0.079				0.124		
		(0.164)				(0.173)				(0.188)		
Medium skill			-0.033				0.087				0.086	
			(0.092)				(0.125)				(0.125)	
High skill				-0.164***				-0.195***				-0.092
				(0.063)				(0.074)				(0.080)
Young dep. ratio	-0.061	-0.059	-0.071	-0.090	0.199**	0.199**	0.180**	0.187**	0.308***	0.305***	0.302***	0.312***
	(0.065)	(0.066)	(0.063)	(0.063)	(0.087)	(0.087)	(0.089)	(0.084)	(0.071)	(0.072)	(0.073)	(0.064)
Old dep. ratio	0.212	0.225	0.458	0.082	-0.187	-0.157	0.058	-0.596	-0.164	-0.138	-0.169	-0.541
	(0.447)	(0.453)	(0.418)	(0.428)	(0.461)	(0.466)	(0.449)	(0.501)	(0.537)	(0.534)	(0.493)	(0.565)
Lagged NFA	0.004**	0.005**	0.005**	0.001	-0.004	-0.004	-0.004	-0.003	-0.004	-0.004	-0.003	-0.003
	(0.002)	(0.002)	(0.002)	(0.003)	(0.005)	(0.005)	(0.005)	(0.006)	(0.004)	(0.004)	(0.004)	(0.004)
Rel. Fiscal balance	0.237	0.243	0.264	0.231	0.243	0.247	0.266	0.228	-0.276	-0.274	-0.280	-0.302
	(0.235)	(0.236)	(0.236)	(0.225)	(0.243)	(0.242)	(0.239)	(0.245)	(0.239)	(0.241)	(0.243)	(0.250)
Rel. income	2.724	2.706	1.823	3.745**	1.845	1.732	1.061	4.381*	-0.177	-0.253	-0.098	1.655
	(1.716)	(1.734)	(1.677)	(1.770)	(2.485)	(2.482)	(2.423)	(2.569)	(2.241)	(2.208)	(2.199)	(2.491)
Rel. GDP growth	-0.028	-0.031	-0.069	0.088	1.296***	1.290***	1.210***	1.486***	0.993***	0.987***	0.964***	1.124***
	(0.182)	(0.183)	(0.184)	(0.157)	(0.331)	(0.332)	(0.330)	(0.310)	(0.180)	(0.179)	(0.188)	(0.205)
Trade openness	-0.049**	-0.049**	-0.055***	-0.043**	0.107***	0.106***	0.100***	0.111***	0.150***	0.149***	0.150***	0.157***

	(0.021)	(0.021)	(0.020)	(0.021)	(0.034)	(0.034)	(0.034)	(0.033)	(0.035)	(0.036)	(0.035)	(0.033)
TOT volatility	0.022	0.024	0.034	-0.002	-0.046	-0.044	-0.032	-0.070	-0.006	-0.005	-0.003	-0.026
	(0.065)	(0.065)	(0.065)	(0.062)	(0.095)	(0.096)	(0.098)	(0.087)	(0.080)	(0.081)	(0.079)	(0.073)
Oil balance	0.499**	0.501**	0.552**	0.412**	0.455	0.463*	0.507*	0.250	-0.182	-0.179	-0.180	-0.316
	(0.222)	(0.225)	(0.217)	(0.198)	(0.277)	(0.277)	(0.271)	(0.264)	(0.209)	(0.209)	(0.200)	(0.227)
Financial openness	5.198**	5.141**	5.935**	2.886	14.561***	14.664***	15.661***	9.819**	8.500***	8.602***	8.699***	5.597
	(2.266)	(2.302)	(2.320)	(2.480)	(4.106)	(4.124)	(4.218)	(4.345)	(2.955)	(2.947)	(2.966)	(3.745)
Financial openness	-0.033	-0.034	-0.034*	-0.043**	0.058	0.058	0.054	0.035	0.083**	0.083**	0.081**	0.073**
	(0.021)	(0.021)	(0.021)	(0.021)	(0.038)	(0.038)	(0.036)	(0.037)	(0.032)	(0.033)	(0.032)	(0.033)
Constant	11.067***	11.104***	11.653***	14.043***	1.544	1.583	2.749	6.005	-6.003	-5.812	-5.659	-4.521
	(3.661)	(3.700)	(3.819)	(3.394)	(6.036)	(6.058)	(6.134)	(6.242)	(7.281)	(7.378)	(7.323)	(6.630)
Observations	121	121	121	121	118	118	118	118	118	118	118	118
R-squared	0.488	0.485	0.506	0.525	0.545	0.545	0.549	0.583	0.569	0.568	0.573	0.565
Period FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
K-P F-stat	45.26	39.40	197.2	50.70	53.32	45.41	247.5	59.63	53.32	45.41	247.5	59.63
SY 10% max IV size	16.38	16.38	16.38	16.38	16.38	16.38	16.38	16.38	16.38	16.38	16.38	16.38
SY 25% max IV size	5.530	5.530	5.530	5.530	5.530	5.530	5.530	5.530	5.530	5.530	5.530	5.530

Notes: Heteroscedasticity-robust standard errors are in parentheses. *, **, and *** denote significance at the 10%, 5% and 1% confidence level, respectively. K-P F-stat is the Kleibergen and Paap (2006) rk Wald F-stat test of jointly weak identification. SY 10% max IV size and SY 25% max IV size are the Stock and Yogo (2005) critical values under the i.i.d. assumption.

Table A6: Outliers in emigration and threshold effects (pooled 2SLS)

	Lower than 90th percentile	Higher than 10th percentile
Variables	(1)	(2)
High skill	-0.143**	-0.183***
	(0.066)	(0.047)
Young dep. ratio	-0.233***	-0.072
	(0.058)	(0.065)
Old dep. ratio	0.502	0.095
	(0.324)	(0.321)
Lagged NFA	0.002	0.002
	(0.002)	(0.002)
Rel. Fiscal balance	0.343	0.352
	(0.222)	(0.231)
Rel. Income	2.797**	3.727***
	(1.217)	(1.139)
Rel. GDP growth	-0.142	0.145
	(0.171)	(0.162)
Trade openness	-0.040*	-0.042*
	(0.023)	(0.023)
TOT volatility	0.013	-0.013
	(0.065)	(0.071)
Oil balance	0.532**	0.390*
	(0.208)	(0.202)
Financial dev.	-0.068***	-0.033
	(0.017)	(0.022)
Financial openness	5.662***	3.072*
	(1.745)	(1.814)
Constant	18.201***	12.129***
	(4.035)	(3.579)
Observations	111	107
R-squared	0.593	0.501
Period FE	Yes	Yes
K-P F-stat	37.30	89.64
SY 10% max IV size	16.38	16.38
SY 25% max IV size	5.530	5.530

Notes: Heteroscedasticity-robust standard errors are in parentheses. *, **, and *** denote significance at the 10%, 5% and 1% confidence level, respectively. K-P F-stat is the Kleibergen and Paap (2006) rk Wald F-stat test of jointly weak identification. SY 10% max IV size and SY 25% max IV size are the Stock and Yogo (2005) critical values under the i.i.d. assumption.

Table A7: The persistence issue

	Pooled (2SLS) with lagged CA				Pooled (2SLS) with within-panel autocorrelation			
Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Lagged CA	0.199***	0.208***	0.204***	0.184***				
	(0.070)	(0.070)	(0.070)	(0.070)				
All skills	-0.259*				-0.367			
	(0.155)				(0.237)			
Low skill		-0.234				-0.350		
		(0.168)				(0.255)		
Medium skill			-0.181				-0.269	
			(0.127)				(0.169)	
High skill				-0.103**				-0.124**
				(0.041)				(0.053)
Young dep. ratio	-0.016	-0.015	-0.007	-0.045	-0.003	-0.000	0.012	-0.042
	(0.075)	(0.074)	(0.074)	(0.075)	(0.091)	(0.088)	(0.085)	(0.088)
Old dep. ratio	0.063	0.120	0.123	0.207	-0.123	-0.061	-0.053	0.105
	(0.300)	(0.307)	(0.292)	(0.279)	(0.361)	(0.370)	(0.354)	(0.329)
Lagged NFA	-0.002	-0.002	-0.003	-0.002	0.000	0.001	-0.000	-0.000
	(0.004)	(0.004)	(0.004)	(0.004)	(0.002)	(0.002)	(0.002)	(0.002)
Rel.Fiscal balance	0.767***	0.789***	0.806***	0.717***	0.613**	0.632**	0.660***	0.579**
	(0.217)	(0.221)	(0.209)	(0.210)	(0.252)	(0.260)	(0.249)	(0.233)
Rel. income	4.120***	3.888***	3.875***	3.792***	5.428***	5.221***	5.146***	4.785***
	(1.203)	(1.243)	(1.172)	(1.114)	(1.350)	(1.404)	(1.353)	(1.269)
Rel. GDP growth	-0.358**	-0.360**	-0.326**	-0.360**	-0.409**	-0.414**	-0.363**	-0.409***

	(0.154)	(0.154)	(0.157)	(0.148)	(0.167)	(0.168)	(0.170)	(0.157)
Trade openness	-0.068***	-0.069***	-0.070***	-0.069***	-0.075***	-0.077***	-0.077***	-0.076***
	(0.021)	(0.021)	(0.020)	(0.020)	(0.025)	(0.025)	(0.025)	(0.023)
TOT volatility	0.011	0.014	0.008	-0.000	0.033	0.038	0.030	0.019
	(0.066)	(0.067)	(0.066)	(0.066)	(0.069)	(0.070)	(0.068)	(0.074)
Oil balance	0.123*	0.124*	0.126*	0.147**	0.108	0.106	0.110	0.143*
	(0.065)	(0.065)	(0.067)	(0.063)	(0.077)	(0.077)	(0.077)	(0.074)
Financial dev.	-0.008	-0.007	-0.007	-0.016	-0.019	-0.018	-0.018	-0.027
	(0.027)	(0.027)	(0.026)	(0.025)	(0.033)	(0.033)	(0.032)	(0.029)
Financial openness	2.802	2.739	2.243	3.249*	3.186	3.111	2.354	3.728**
	(1.876)	(1.890)	(1.911)	(1.811)	(2.130)	(2.166)	(2.201)	(1.858)
Constant	10.831***	10.642***	10.497***	13.240***	11.179***	10.970***	10.652**	14.053***
	(3.671)	(3.710)	(3.721)	(3.688)	(4.058)	(4.063)	(4.227)	(4.310)
Observations	143	143	143	143	144	144	144	144
R-squared	0.660	0.661	0.666	0.685	0.621	0.620	0.628	0.660
Period FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
K-P F-stat	51.81	46.57	106.1	117.1	51.11	45.48	108.1	118.6
SY 10% max IV size	16.38	16.38	16.38	16.38	16.38	16.38	16.38	16.38
SY 25% max IV size	5.530	5.530	5.530	5.530	5.530	5.530	5.530	5.530

Notes: Standard errors robust to arbitrary heteroscedasticity and within-panel autocorrelation are in parentheses. *, **, and *** denote significance at the 10%, 5% and 1% confidence level, respectively. K-P F-stat is the Kleibergen and Paap (2006) rk Wald F-stat test of jointly weak identification. SY 10% max IV size and SY 25% max IV size are the Stock and Yogo (2005) critical values under the i.i.d. assumption.

Table A8: Effects of tertiary and non-tertiary education (pooled 2SLS)

	Current Account			Saving			Investment		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Variables	Low	Tert	Low vs Tert	Low	Tert	Low vs Tert	Low	Tert	Low vs Tert
L-skill	-0.325*		-0.017	-0.062		0.673***	0.161		0.616***
	(0.167)		(0.203)	(0.174)		(0.208)	(0.129)		(0.204)
T-skill		-0.124***	-0.121**		-0.141**	-0.283***		-0.045	-0.175**
		(0.042)	(0.059)		(0.056)	(0.075)		(0.050)	(0.081)
Lagged NFA	0.000	-0.000	-0.000	-0.000	0.000	0.002	-0.002	-0.002	-0.001
	(0.002)	(0.002)	(0.002)	(0.007)	(0.006)	(0.006)	(0.005)	(0.005)	(0.005)
Relative Fiscal balance	0.637***	0.579***	0.579***	0.702**	0.564**	0.560**	-0.121	-0.205	-0.209
	(0.227)	(0.211)	(0.211)	(0.282)	(0.269)	(0.260)	(0.201)	(0.202)	(0.216)
Relative GDP growth	-0.407**	-0.409***	-0.408***	0.545**	0.579**	0.558***	0.611***	0.639***	0.619***
	(0.159)	(0.151)	(0.150)	(0.248)	(0.225)	(0.211)	(0.177)	(0.175)	(0.181)
TOT volatility	0.036	0.019	0.019	0.034	0.001	-0.000	0.010	-0.010	-0.011
	(0.071)	(0.072)	(0.072)	(0.088)	(0.086)	(0.085)	(0.072)	(0.071)	(0.071)

Trade openness	-0.077***	-0.076***	-0.076***	0.002	0.004	0.001	0.110***	0.112***	0.109***
	(0.023)	(0.022)	(0.022)	(0.030)	(0.027)	(0.025)	(0.023)	(0.022)	(0.022)
Relative Prod.	5.215***	4.785***	4.822***	7.677***	8.186***	6.738***	2.657*	3.401***	2.077
	(1.242)	(1.126)	(1.183)	(1.887)	(1.707)	(1.640)	(1.378)	(1.281)	(1.436)
Capital openness	2.909	3.728**	3.694**	8.869***	9.251***	10.294***	6.676***	6.603***	7.557***
	(2.000)	(1.843)	(1.872)	(2.807)	(2.518)	(2.472)	(1.821)	(1.696)	(1.715)
Financial openness	-0.019	-0.027	-0.026	-0.006	-0.015	-0.028	0.020	0.019	0.007
	(0.027)	(0.025)	(0.024)	(0.031)	(0.032)	(0.027)	(0.029)	(0.030)	(0.031)
Young dep. ratio	0.002	-0.042	-0.040	0.223***	0.193**	0.125	0.251***	0.252***	0.190**
	(0.079)	(0.079)	(0.080)	(0.086)	(0.086)	(0.079)	(0.074)	(0.069)	(0.076)
Old dep. ratio	-0.069	0.105	0.094	-0.090	-0.117	0.316	-0.123	-0.269	0.127
	(0.315)	(0.289)	(0.316)	(0.350)	(0.365)	(0.329)	(0.366)	(0.365)	(0.381)
Oil balance	0.111	0.143**	0.141**	-0.068	-0.063	0.004	-0.122	-0.138**	-0.078
	(0.069)	(0.066)	(0.067)	(0.098)	(0.089)	(0.086)	(0.075)	(0.069)	(0.065)
Constant	10.832***	14.053***	13.975***	19.238***	23.533***	27.133***	5.751	7.337	10.628**
	(4.156)	(4.243)	(4.368)	(5.093)	(5.199)	(5.180)	(4.792)	(4.939)	(5.126)
Observations	144	144	144	141	141	141	141	141	141
R-squared	0.622	0.660	0.658	0.482	0.522	0.566	0.609	0.608	0.596
Period FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
K-P F-stat	66.01	118.6	45.74	76.16	132.3	45.75	76.16	132.3	45.75
SY 10% max IV size	16.38	16.38	16.38	16.38	16.38	16.38	16.38	16.38	16.38
SY 25% max IV size	5.530	5.530	5.530	5.530	5.530	5.530	5.530	5.530	5.530

Notes: Heteroscedasticity-robust standard errors are in parentheses. *, **, and *** denote significance at the 10%, 5% and 1% confidence level, respectively. K-P F-stat is the Kleibergen and Paap (2006) rk Wald F-stat test of jointly weak identification. SY 10% max IV size and SY 25% max IV size are the Stock and Yogo (2005) critical values under the i.i.d. assumption.

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