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## Immigration and Employment: Substitute Versus Complementary Labor in Selected African Countries

Arina Viseth

***IMF Working Papers* describe research in progress by the author(s) and are published to elicit comments and to encourage debate.** The views expressed in IMF Working Papers are those of the author(s) and do not necessarily represent the views of the IMF, its Executive Board, or IMF management.

I N T E R N A T I O N A L M O N E T A R Y F U N D

**IMF Working Paper**

African Department

**Immigration and Employment: Substitute Versus Complementary Labor in Selected African Countries****Prepared by Arina Viseth<sup>1</sup>**

Authorized for distribution by Corinne Delechat

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**Abstract**

This paper uses census and household survey data on Cameroon, Ghana, and South Africa to examine immigration's impact in the context of a segmented labor market in Sub-Saharan Africa. We find that immigration affects (i) employment (ii) employment allocation between informal and formal sectors, and (iii) the type of employment within each sector. The direction of the impact depends on the degree of complementarity between immigrants and native workers' skills. Immigration is found to be productivity-enhancing in the short to near term in countries where, the degree of complementarity between immigrants and native workers' skill sets is the highest.

JEL Classification Numbers: F22, F63, J08, J21, J24, J61.

Keywords: Immigration; Formal and Informal Sector; Employment; Occupational Choice; Complementary Versus Substitute Skills; Cameroon; Ghana; South Africa.

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Contents	Page
Abstract.....	2
I. Introduction .....	4
II. Literature Review .....	6
III.Theoretical Framework.....	7
IV. Empirical Framework .....	11
A. Stylized Facts.....	11
B. Model Specifications.....	14
C. Data .....	16
V. Results.....	18
A. Basic Results.....	18
B. Specific Skill Groups Results .....	24
VI. Conclusion and Policy Recommendations .....	25
References .....	26
Annex. Main Stylized Facts.....	30

## I. INTRODUCTION

Academic and policy circles have focused on the labor market impact of immigration in advanced economies, yet this issue is particularly relevant in developing and emerging countries because of the informal sector.<sup>2</sup> The informal sector is large and holds most of the jobs in developing and emerging economies. For example, the informal economy contributes between 25 and 65 percent of GDP (IMF 2017) and accounts for 85.8 percent of total employment in Sub-Saharan Africa (International Labor Organization, 2018).

Against this background, we ask the following questions:

- How does immigration in developing and emerging economies impact native employment, including sectoral composition (formal versus informal employment) and type of employment (self-employment versus wage employment) within each sector?
- How does this impact differ when foreign workers have complementary versus substitute skills compared with those of native workers?

The answers to these questions have important implications for developing and emerging economies' productivity, especially as African economies continue to strive to counter the economic impact of the COVID-19 pandemic while beginning to reopen borders and open spaces at the time of writing.<sup>3</sup> On the one hand, by importing skills in economies where the need for human capital is high, immigration could increase labor demand, stimulate job creation and be productivity enhancing across the economy, in both formal and informal sectors. On the other hand, by changing the sectoral composition of the labor force towards more informality, immigration could reduce productivity. As the current consensus indicates, the informal sector tends to perpetuate low productivity jobs (Ardagna and Lusardi 2008, La Porta and Shleifer, 2008, Banerjee and Duflo 2011, Paula and Scheinkman 2011) though early studies have found the opposite (Hernando De Soto, 1989, 2000).

According to the basic textbook theory of demand and supply, the labor market impact of immigration on the receiving economy will depend on whether immigrants and native workers are substitute or complement to each other. If immigrant and native workers have substitute skills, immigration increases labor supply, resulting in lower wages and employment of native workers. If immigrant and native workers have skills that complement each other, immigration increases labor demand, resulting in higher wages and employment of native workers.

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<sup>2</sup> In the formal sector, firms are licensed, regulated, pay taxes and must follow specific rules and regulations governing their employees. In the informal sector, workers are not guaranteed the same protections and benefits.

<sup>3</sup>The current context highlights the importance of looking at how immigration would affect informal employment. As opposed to previous crises, where the informal sector helped cushion the economic fallout on the formal sector through continuous supply to the domestic economy that sustained incomes and consumption for the majority of households, in the current crisis, informal workers are the most vulnerable to employment and income losses.

To understand immigration's impact in the context of a segmented labor market, we start with a modified version of the Rivera-Batiz (1981) model. Our modified model's main assumptions are: (i) both formal and informal sectors hire foreign workers, (ii) foreign and native workers could either have substitute or complementary skills sets, (iii) wages are flexible and (iv) labor markets are closed markets. Assuming foreign and native workers have substitute skills, immigration increases labor supply in the formal sector, reducing native employment in that sector and triggering native workers to search for jobs in the informal sector. As a result, some native workers become self-employed in the informal sector out of necessity. When foreign and domestic workers have complementary skills, immigration leads to an increase of labor demand in the formal sector, resulting in higher employment and economic expansion, which in turn would stimulate further activities and job creation in the informal sector.

To empirically estimate the employment of immigration in Africa, we use census and household survey data from three Sub-Saharan Africa (SSA) countries, Cameroon, Ghana, and South Africa, over 2005-2011. Country selection was based on the data available on the informal sector. A foreign worker is defined as a person born outside the country.<sup>4</sup> Interestingly, stylized facts reveal that immigration from outside the African continent (inter-regional immigration) brings workers with skills complementary to those of natives, while immigration within the African continent (intra-regional) brings workers with skills that substitute for those of natives. We rely on those stylized facts and test the channels assumed at work in the theoretical framework, distinguishing between the two cases of immigration or skill sets.

Results validate the theoretical framework. While inter-regional immigration increases total native employment, intra-regional immigration reduces it. Results also suggest inter-regional immigration tends to promote wage employment (both formal and informal), while intra-regional immigration generates more necessity-driven informal self-employment.

We make the following contributions to the existing literature. First, we estimate immigration's impact in the context of a segmented labor market in SSA, assessing the impact on total employment, sectoral allocation (employment in formal versus informal sector), and type of employment within each sector (self-employment versus wage employment). Second, we distinguish between two skill sets associated with foreign workers, complementary or substitute to skills of native workers, using data on immigration outside of and within SSA. Third, we apply the national framework adopted by Borjas (2003) at the continental level, using cross-country data on Cameroon, Ghana and South Africa, defining skill groups as the level of education and years of experience in a particular SSA country.<sup>5</sup> Using cross-country data allows us to consider the SSA region as one single segmented labor market, hence accounting for the possible native move within the SSA region that follows immigration, since frontiers in the region are often porous. In particular, this approach implies workers of the same

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<sup>4</sup> This definition is standard in the literature, see Borjas (2003), Mishra (2007).

<sup>5</sup> Sparreboom, Merter and Berger (2019) is the first cross-country study on the labor market impact of immigration in SSA and also apply Borjas (2003) using cross-country data. Their study, however, does not consider the informal sector.

education and years of experience are not perfectly substitutable across countries, reflecting the diverse quality of education in the region. Because this approach asks how immigration of workers from a certain skill group impacts native workers from that same skill group, it also implies that immigrants' skills are substitutable to those of native workers. We assume this holds through migrant social networks, which reduce possible disparities in the skills required, by providing information to immigrants on employment opportunities and on the labor market in the destination countries.<sup>6</sup>

The rest of the paper is organized as follows. Section 2 provides an overview of the literature on the labor market impact of immigration. Section 3 lays the theoretical framework. Section 4 describes stylized facts and the empirical framework. Section 5 presents the results and conducts a sensitivity analysis. Section 6 concludes with policy recommendations.

## II. LITERATURE REVIEW

A common approach adopted in the literature is the Area or local labor market approach. The popularity of the Area approach stems from its simplicity as it relies on immigrants clustering in particular geographical locations. The typical study defines a city, state or region as a closed labor market and correlates a measure of native economic outcome (wage, employment) on the relative quantity of immigrants in that location. Studies often focus on the U.S. and Europe and include Altonji and Card (1989, 1991), Schoeni (1997), Card (2001, 2007) Card and Lewis (2007) for the US labor market, Pischke and Velling (1997) and Glitz (2012) for Germany, and Winter-Ebner, Zweimuller (1996) for Austria. Although intuitively appealing, a well-known drawback of this approach arises from endogeneity issues, including native workers and firms' responses to immigration by moving out of the specific location and/or immigrants self-selecting themselves into the specific location. As a result, the Area approach could not confirm the expected results from the standard labor supply and demand model. To answer this drawback, other studies use natural experiments or cases of unexpected migration prompted by exogenous factors (such as political or weather-related events). For example, Card (1990) examines the influx of Cuban immigrants to Miami during the 1980 Mariel Boatlift. His findings show that wage and employment effects of this influx on natives were small.

An alternative approach is the national labor market approach, as pioneered by Borjas (2003). Borjas (2003) exploits variations across skill groups, where skills are defined by education and experience. This approach asks how immigrants of a particular skill groups affect native workers' labor market outcomes in that skill groups. While native workers within the same skill group are perfectly substitutable, they cannot easily move to other skill groups at a certain point of time. In this approach, the assumption of closed labor markets in the basic textbook theory is therefore more plausible. Borjas' (2003) findings are in line with the standard labor supply and demand model, i.e. when immigrants and natives are substitute workers, immigration is likely to harm the natives' labor market outcomes. Since its publication, many papers have followed the national labor market approach, including Bond and Gason (2011) for Australia, Borjas and Monras (2017) for the U.S., EU and the formally Soviet Union, and Maani and Tse (2017) for New Zealand. Some authors have also tried to account for adjustment

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<sup>6</sup> See Banerjee (1984).

mechanisms to immigration. Recent studies include Lewis (2011, 2013), who looks at changes in technology, as well as Peri and Sparber (2009) and Ottaviano et al. (2013), who investigate changes in native task specialization.

Only a few papers analyze the labor market impact of immigration in developing and emerging economies and how natives adjust to immigration. Those include Del Carpio et al. (2015) for Malaysia, Bryant and Rukumnuaykit (2013) for Thailand, Tumen (2016) for Turkey. Del Carpio et al. (2015) use survey data for Malaysia and look at native responses to immigration on multiple extensive margin choices, using variation across states and over time. The authors find that natives do adapt to immigration shocks. Following the Area approach, Bryant and Rukumnuaykit (2013) use survey data on Thailand and find that immigration negatively affects native wages and with a magnitude that is stronger than in developed countries. However, their study did not find evidence of any impact of immigration on native employment or native migration.<sup>7</sup> Using survey data on the forced immigration from Syria to Turkey, Tumen (2016) analyzes the impact of the Syrian refugees in Turkey and examines labor market outcomes including formal and informal employment, unemployment, wages, and price indices. The paper exploits the quasi-experimental regional variation in refugee concentration before and after the starting date of the inflows (and, as such, belongs to the Area approach literature) and finds that the Syrian refugees reduce informal employment but also prices. The author interprets those results as reflecting the labor cost advantages in the informal labor-intensive sectors which reduce consumer prices of the items produced in the informal sector relative to the ones produced in the formal sector. Applying Borjas' (2003) national approach, Sparreboom, Mertens and Berger (2019) use census and household survey data on three countries, Ghana, Rwanda, and South Africa to estimate the employment, unemployment, and wage impact of immigration. The authors find that the impact is likely negative for workers with lower levels of education, and that the complementarity of workers helps explain the results in some countries but not in all. Their study, however, does not consider the informal sector.

### III. THEORETICAL FRAMEWORK

The labor market in developing and receiving countries is often characterized by a large informal sector, which calls for a theoretical framework with a segmented labor market. To this end, our theoretical model is based on Rivera-Batiz (1981) model, which describes the labor market impact of immigration in the context of a two-sector segmented labor market. As in Rivera-Batiz (1981) model, our focus is in the short to near term, with fixed non-labor input (i.e. capital does not respond to immigration) and labor markets are assumed closed. However, to apply the model to the case of developing and emerging countries, we made some adjustments. First, while the Rivera-Batiz (1981) model assumes only the informal sector hires foreign labor, we assume both formal and informal sectors use domestic and foreign labor. There is no reason to assume the informal sector would hire foreign workers when the need for

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<sup>7</sup> Internal migration is the migration of native-born workers to other geographical locations as a response to immigration in a particular location.

skills is high in those countries. Second, while the Rivera-Batiz (1981) model assumes binding wages and unemployment in the formal sector, we assume both informal and formal have flexible wages and full-employment. Labor unions are often weak in developing and emerging countries, resulting in low bargaining power<sup>8</sup>. Third, while the Rivera-Batiz (1981) model only assumes domestic and foreign labor have substitute skills sets, we also consider the case where domestic and foreign labor have complementary skills sets.

The formal sector produces an importable good  $X_f$  through a short-run production function  $F_f$  using both domestic and foreign workers,  $N_f$  and  $S$  respectively.

$$X_f = F_f(N_f + S) \quad F_f' > 0, F_f'' < 0$$

The offer curve of foreign labor is defined as:

$$W_s = G(S, Z) \quad G_s > 0 \quad G_z > 0$$

Where  $W_s$  is the wage paid to the foreign labor  $S$  and  $Z$  is the average income of the foreign worker's origin country, assumed to be set exogenously.

Total consumption  $C_f$  is the difference between what is produced  $X_f$  and exported  $E_f$ :

$$C_f = X_f - E_f$$

Consumption is a function of real income  $Y$ , and the international price ratio  $P^R = P_f/P_i$  where  $P_f$  is the price of export goods and  $P_i$  is the price of imports.

$$C_f = C_f(P^R, Y) \quad C_{fP^R} > 0, C_{fY} > 0$$

$C_{fP^R}$  is the partial derivative of  $C_f$  with respect to  $P^R$   
 $C_{fY}$  is the partial derivative of  $C_f$  with respect to  $Y$

Real income  $Y$  is equal to the budget constraint:

$$Y = P_f C_f + P_i C_i$$

Profits in the formal sector,  $\Pi$ , is defined by:

$$\Pi = P^R \cdot F_f(N_f + S) - W_f N_f - W_s S = P^R \cdot F_f(N_f + S) - W_f N_f - S \cdot G(S, Z)$$

The first order conditions for profit maximization with respect to  $N_f$  and  $S$  are respectively:

$$P^R \cdot F_f' = W_f \quad (1)$$

$$P^R \cdot F_f' = W_s \quad (2)$$

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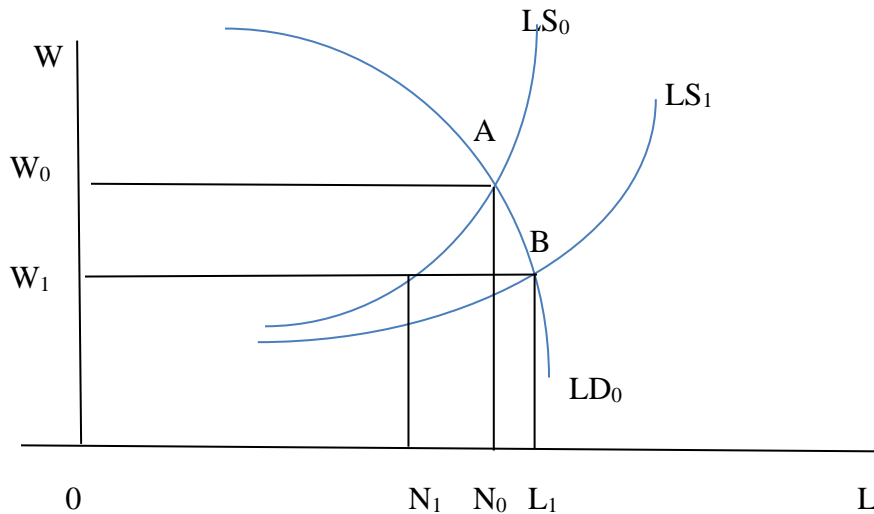
<sup>8</sup> While this is not strictly true for South Africa, the South African authorities have recently discussed with the IMF ways to promote a more flexible labor market (see IMF Country Report No. 20/33).



The equilibrium conditions (1) and (2) are shown in Figure 1.

**Figure 1. Immigration's Impact on the Formal Sector—Substitute Skills Sets**

The marginal product curve  $P^R.F_f'$  is the labor demand curve. The domestic labor supply curve is  $LS_0$ . The total labor supply curve to the sector which includes foreign workers in addition to native workers is  $LS_1$ .



The equilibrium wage is  $W_1$ , employment of domestic labor is  $ON_1$  and employment of foreign labor is  $L_1 - N_1$ .

The intersectoral allocation of total labor  $L^*$  is determined by workers who compare the expected wage in the formal sector with the current wage in the informal sector.

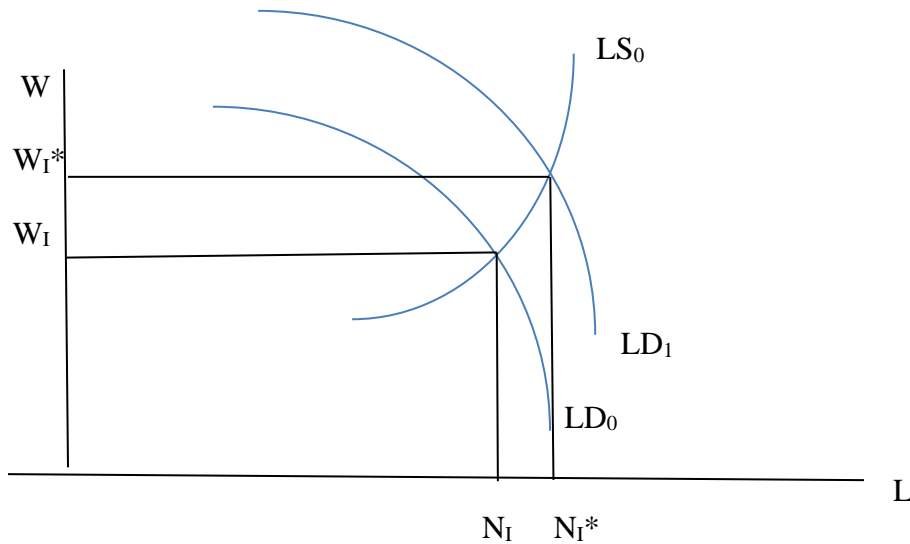
Figure 1 shows that immigration results in lower wages, from  $W_0$  to  $W_1$ , reducing native employment, from  $N_0$  to  $N_1$ , and forcing some native workers to become unemployed or move to the informal sector in search of a job, including choosing informal self-employment for necessity reasons.

The Rivera-Batiz (1981) model as presented above, assumes that all labor—foreign and domestic—is of one type, either low-skilled or high-skilled. Yet, foreign and domestic workers' skills sets could complement each other. In this case, there would be two labor markets to consider, the low-skilled labor market and the high-skilled labor market.

Assuming, for simplicity, that all foreign workers fall into the high-skilled category, then in the high-skilled formal labor market, the arrival of high-skilled immigrant workers would have a similar effect on employment as described above. An increase in labor supply would reduce wages and native employment, triggering native workers to either become unemployed or search for jobs in the informal sector.

In the low-skilled formal labor market, the arrival of high-skilled immigrant workers would complement the low-skilled labor, inducing higher productivity. As a result, labor demand for low-skilled native workers increases, raising wages and employment (Figure 2). The higher employment of low-skilled workers in the formal sector will likely support an expansion of economic activity, which, in turn, could create positive spillovers and stimulate economic activity in the informal sector, creating more jobs in that sector.<sup>9</sup>

**Figure 2. Immigration’s Impact on the Formal Sector—Complementary Skills Sets**



The expected short-term employment impacts of immigration can be summed up in Table 1.

**Table 1. Expected Short-term Employment Impacts of Immigration**

Total employment	Complementary labor			Substitute labor		
	+			-		
Formal employment	+	Self-employment rate	+	-	Self-employment rate	-
		Wage employment rate	+		Wage employment rate	-
Informal employment	+	Self-employment rate	+	+	Self-employment rate	+
		Wage employment rate	+		Wage employment rate	+

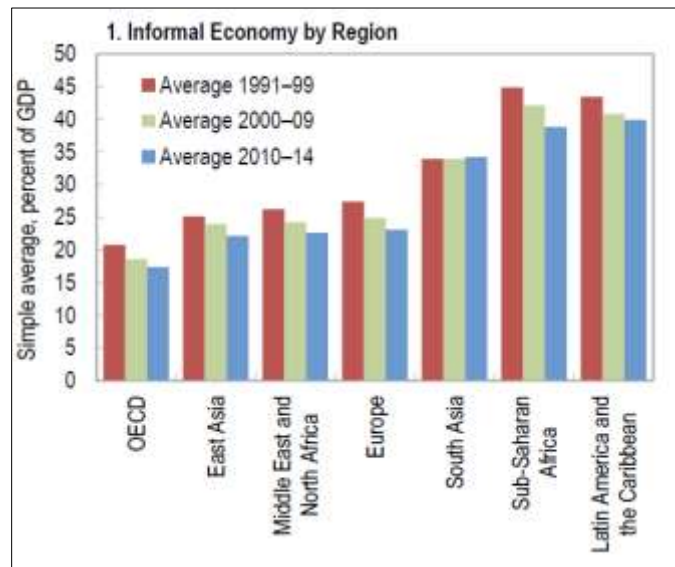
<sup>9</sup> The labor market outcomes derived in this section would remain similar should immigration be low-skilled. If immigrant workers were low-skilled, the low-skilled formal labor market would see less employment and lower wages among native workers, triggering native workers to either become unemployed or search for jobs in the informal sector. The high-skilled formal labor market would benefit from low-skilled immigration, supporting economic activities and creating positive spillovers in the informal sector.

## IV. EMPIRICAL FRAMEWORK

### A. Stylized Facts

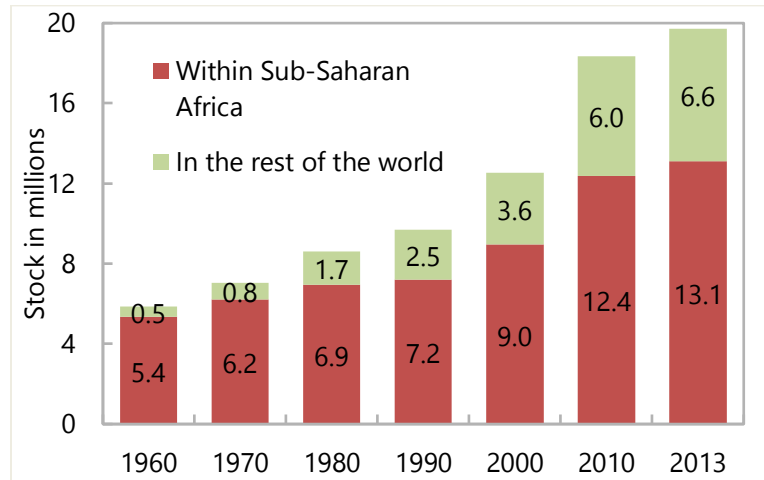
The SSA region is an interesting case study for several reasons: (i) the region has one of the largest informal economy in the world<sup>10</sup> (Figure 3); (ii) the region needs skills and could benefit from immigration; (iii) while immigration still accounts for a small proportion of the population (1 to 4 percent), immigration is both inter-regional and intra-regional, each type likely to bring different sets of skills (Figure 4) and; (iv) SSA workers are among the most entrepreneurial in the world (Figure 5).

**Figure 3. Informal Economy by Region, Income Level, and Type of Economy**



Source: IMF Sub-Saharan Africa Regional Economic Outlook (2017).

<sup>10</sup>Although South Africa's informal sector is not as large as the rest of SSA, the informal sector has been a rational response to formal labor market's rigidity.

**Figure 4. Stock of SSA Migrants (millions of people, 1960-2013)**

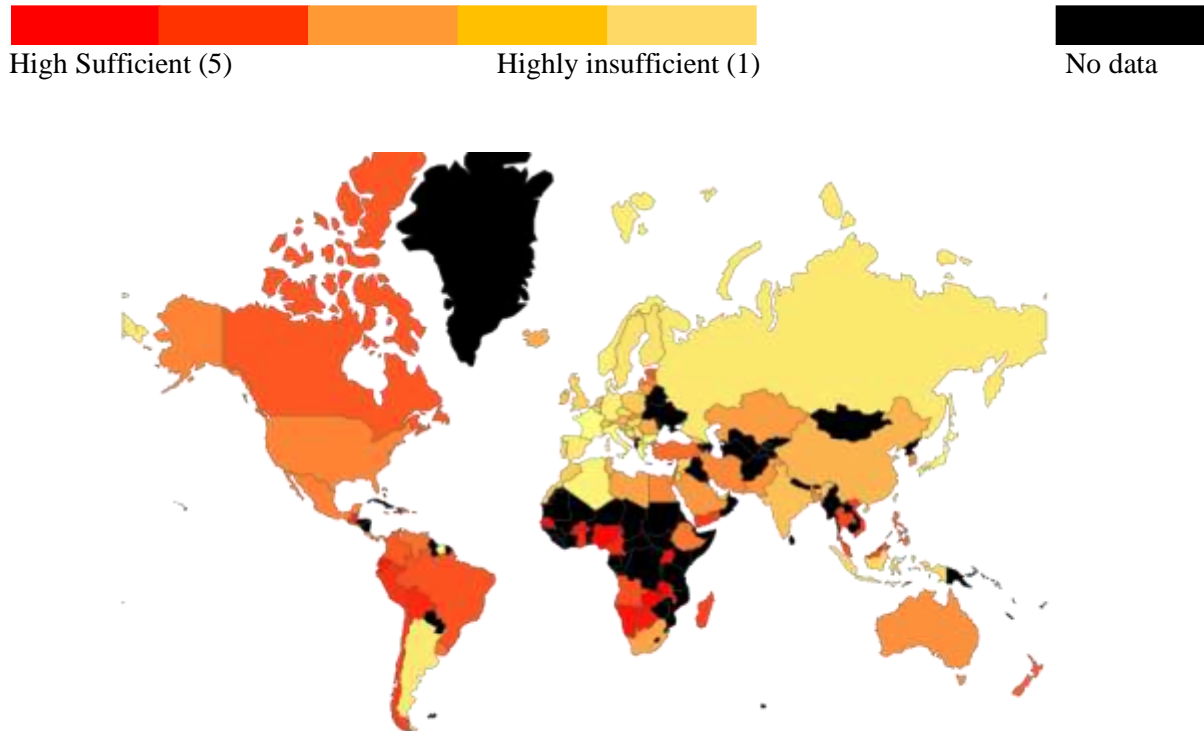
Source : Gonzalez-Garcia, Jesus, et al. 2016. Sub-Saharan African Migration: Patterns and Spillovers. Washington, D.C.: International Monetary Fund

**Table 2. Top 10 Immigration Countries in SSA, 2013**

Top Immigration Countries in SSA
South Africa
Cote d'Ivoire
Nigeria
Kenya
Ethiopia
Burkina Faso
Tanzania
South Sudan
Cameroon
Uganda

Source: World Bank Migration and Remittances Factbook 2016.

**Figure 5. Percentage of 18–64 Population who are Nascent Entrepreneurs**



Source: Global Entrepreneurship Monitor (2018).

Our study uses census and household survey data from the Public Use Microdata Samples (PUMS) of the Decennial Censuses and Surveys, obtained from the IPUMS<sup>11</sup>-International project started by University of Minnesota Population Center. Due to data availability on the informal sector and employment, we focus our analysis on Cameroon, Ghana and South Africa.

In all three countries, stylized facts show that immigrants represent a small proportion of the population, between 1 to 4 percent, and there are more intra-regional immigrants than inter-regional immigrants. The largest source of inter-regional immigrants for those countries is Europe, including France and the U.K.. In Cameroon, the main source countries for intra-regional immigrants are Chad, Nigeria, Central African Republic. In Ghana, they are Togo, Nigeria, Burkina Faso and Cote d'Ivoire and in South Africa, they are Zimbabwe, Mozambique and Lesotho. In all three countries, inter-regional immigrants are relatively more educated than intra-regional immigrants and intra-regional immigrants tend to match native workers' education profiles. These features allow us to test the hypothesis of complementarity versus substitutability between immigrant and native workers' skills sets, as described in the theoretical framework.

<sup>11</sup> IPUMS is the world's largest collection of publicly available individual-level census data and provides census and survey data integrated across time and space.

Native employment rates are relatively high, 48, 75 and 41 percent respectively for Cameroon, Ghana and South Africa. In all three countries, the informal sector is also large. Except for South Africa, the informal sector dominates the economy, accounting for more than 80 percent of employment in Cameroon and Ghana. In South Africa the informal sector is smaller than the formal sector but still significant, accounting for about 12 percent of employment (excluding private household activities, e.g. hiring of maids). In Cameroon and South Africa, native workers are more present in the formal sector while foreign workers are more present in the informal sector. In Ghana, native workers are more present in the informal sector (87 percent of native workers are in the formal sector against 85.3 percent of foreign workers), while foreign workers are more present in the formal sector (14.7 percent of foreign workers against 13 percent of native workers).

In all three countries, the informal / formal sector gathers more self-employed / wage employed than in the formal sector / informal sector (either in absolute terms or relative terms). The self-employed tend to predominantly be own-account workers, with own-account workers being relatively more present in the informal sector. Those trends are similar for foreign workers.

In all three countries, informal workers tend to be less educated than formal workers. In Cameroon and Ghana, the self-employed are less educated than the wage-employed in the informal sector, while the self-employed tend to be more educated than the wage-employed in the formal sector. Women self-employed however, tend to be less educated than women wage-employed in the formal sector. In South Africa, the self-employed tend to be more educated in both informal and formal sectors, and this pattern holds for both men and women workers.

## **B. Model Specifications**

Borjas (2003) exploits variations across skill groups and time, defined by education and experience, and identifies the effect of immigration on native workers' labor market outcomes. By conducting an analysis at the national level and not focusing on one geographical area, Borjas (2003) approach answers some of the drawbacks raised by the Area approach, such as natives moving out of the areas where immigration is taking place. While this approach does not consider adjustments to the capital stock, the theoretical framework's assumption of a closed labor market, as represented by the various skill groups,<sup>12</sup> becomes more plausible than previous methods. Borjas (2003) finds a significant and negative impact of immigration on the native wages.

The stylized facts highlighted above show that there are variations across skills which we use to follow Borjas' (2003) methodology. Our empirical strategy applies Borjas (2003) but at the SSA region level, using cross-sectional data and defining skill groups by education and experience levels in a particular country. Choosing the SSA region as a unit of analysis, this definition implies that workers with the same education and experience levels differ across countries. We assume this is the case because within the SSA region the quality of education is likely to differ from country to country. We also assume that a foreign worker is perfectly

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<sup>12</sup> Workers are said to be perfectly substitutable within the same skill group but not across different skill groups.

substitutable to a native worker of the same education and experience level in the considered country, because of migrants' networks. Migrants' networks have been shown to reduce asymmetries of information—regarding labor market rules, institutions, and employment opportunities—making job search more efficient for immigrants (Waldinger, 1997; Elliott, 2001) and providing formal education and training required for immigrants to obtain a job in the host country (Drever and Hoffmeister, 2008).

We will examine immigration's impact on (i) native total employment rate, which will be further decomposed into (ii) native formal employment rate and (iii) native informal employment rate. We will then look at immigration's impact on the type of employment -self-employment versus wage employment- within each sector (formal and informal).

An immigrant is defined as an individual who is foreign-born. To account for the two types of immigration, inter-regional and intraregional, we use two definitions of immigrant: (1) foreign born outside the considered country and outside the SSA region (inter-regional immigrant) and (2) foreign born outside the considered country but within the SSA region (intra-regional immigrant).

Formally we have the following.

- *Immigration's impact on the total employment rate of native-born workers*

$$Y_{cij} = \eta \cdot Z_{cij} + C_c + I_i + J_j + \varepsilon_{ijt}$$

$Y_{cij}$  is the employment rate of a native born in country  $c$ , education  $i$ , experience  $j$

$Z_{cij} = M_{cij}/N_{cij}$  is the immigrant supply shock or the immigration share of working-age population and measures the percentage increase in the labor supply of skill group  $(c,i,j)$  due to immigration.

The  $\eta$  coefficient is the parameter we care about, and if statistically significant, provides information on the direction and magnitude of change in the total native employment rate due to an immigration-induced labor supply shock.

We allow for linear fixed effects to control for the systematic differences in the total native employment outcome due to differences in country characteristics, education and experience levels.

$C$  is a vector of fixed effects reflecting the characteristics of the country in consideration, which controls for total native employment differences across countries. The country fixed effects vector captures among other factors, quality of education, and the structure of the labor market (gender, labor market flexibility, labor market segmentation and/or economic activity).

$I$  and  $J$  are vectors of fixed effects indicating the group's educational attainment and work experience respectively, which controls for differences in total native employment across education and experience groups.

- *Immigration's impact on the sector composition of native-born workers*

$$Y_{cij} = \eta \cdot Z_{cij} + C_c + I_i + J_j + \varepsilon_{ijt}$$

$Y_{cij}$  {Share of population working in formal sector ; Share of population working in informal sector}

$Z_{cij} = M_{cij}/N_{cij}$  is the immigrant supply shock or the immigration share of working-age population and measures the percentage increase in the labor supply of skill group (c,i,j) due to immigration.

As above, we allow for linear fixed effects.

- *Immigration's impact on the employment type of native-born workers*

Compared to previous specifications, this specification adds one more variable as a determinant of employment type.

Because self-employment depends on access to capital as much as skills, we add the access to capital variable as a determinant of employment type. Interestingly, IPUMS categorizes individuals as owners of a dwelling if the individual has acquired his/her housing unit with a mortgage or other lending arrangement. We use this information as a proxy for access to capital or  $A_{cij}$ , calculated as the share of individuals who are owners of dwelling as those with access to capital among the working-age population.

$$Y_{cij} = \eta \cdot Z_{cij} + A_{cij} + C_c + I_i + J_j + \varepsilon_{ijt}$$

$Y_{cij}$  {Share of population working as self-employed/wage employed in informal sector; Share of population working as self-employed/wage employed in formal sector}

$Z_{cij} = M_{cij}/N_{cij}$  is the immigrant supply shock or the immigration share of working-age population and measures the percentage increase in the labor supply of skill group (c,i,j) due to immigration.

$A_{cij}$  Proxy for access to capital or share of working-age population who have acquired their unit with a mortgage or other lending arrangement.

As above, we allow for linear fixed effects.

### C. Data

Our period of analysis is 2010. Following the literature (Borjas, 2003, Mishra, 2007), when 2010 was not available we proxy it with the closest census and survey data. In particular, the 2010 South Africa census and survey data is proxied by the 2011 census and survey data. The 2010 Cameroon data is proxied by the 2005 census and survey data.



To define a foreign-born worker, we use data indicating the country of birth for South Africa and Ghana. Because country of birth is not available for Cameroon, we use data on citizenship for Cameroon as a proxy for country of birth. We pick the countries of birth so as to differentiate between foreign-born within the SSA region and foreign-born outside the SSA region.

Individuals are divided into seven groups of education and eight groups of experience. Education attainment is categorized by: (i) no schooling (ii) some primary completed (iii) primary completed (iv) lower secondary general completed or lower secondary technical completed (v) secondary general completed (vi) some college or post-secondary technical education and (vii) college graduates.

Following Borjas (2003), work experience is defined as the number of years that have elapsed since the person left school. We measure it by current age minus the entry age (AT) into the labor market for the typical worker (Age minus AT). Entry age is assumed to be 17 years for the first four categories, 19 years for those with secondary general completed, 21 years for people with post-secondary technical education and 23 years for college graduates. We restrict the sample to individuals with experience ranging from 1-40 years so that we can focus on the individuals in the working age group, 18-63 years old. This gives us eight experience groups of five-year intervals.

As specified in Borjas (2003), because women typically enter and leave employment more often than men, for differing spells particularly around the issue of child rearing, defining experience based on age and entry age may not be relevant. This resulted in Borjas (2003) restricting the analysis to men, including women only as a specification test to determine the sensitivity of the results. We follow Borjas (2003) accordingly, focusing on men and including women as a specification test.

By using the SSA region as our unit of analysis, our empirical strategy controls for native possible move across countries following immigration. Because migrants' networks may result in immigrants "self-selecting" themselves into the considered country, we use past distribution of immigration<sup>13</sup> as defined by the previous decade, or the 1990s' immigrant distribution (or closest to the 1990s when data is not available). We use the 1987 Cameroon census and survey data, the 1984 Ghana census and survey data and the 1996 South African census and survey data in the construction of our immigration variable.

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<sup>13</sup> The use of a past instrument is common in the literature and assumes that past immigration inflows are good predictors of contemporary immigrant inflows and uncorrelated with current unobserved labor demand shocks. See for example Card (2001), Mishra (2007), and Amuedo-Dorantes and Rica (2011).

## V. RESULTS

### A. Basic Results

Overall, the empirical results validate the theoretical framework. Table 3 shows that in the case of complementary skill sets or inter-regional immigration, immigration stimulates production and increases labor demand for native workers, resulting in higher native employment. In the case of substitute skill sets or intra-regional immigration, immigrants and native workers compete for the same jobs, resulting in a decline of the native labor supply. Even though some women are likely to be misclassified, results are similar across genders.<sup>14</sup>

Tables 4 and 5 show how labor is allocated across formal and informal sectors following immigration. Regarding inter-regional immigration, immigration has a positive although not statistically significant impact on native formal employment (table 4). As immigrants enter the formal sector, this stimulates production and labor demand, resulting in higher native employment in that sector. The expansion of the formal sector induced by inter-regional immigration has then positive productivity spillovers in the informal sector, resulting in higher informal employment (table 5). Regarding intra-regional immigration, immigration decreases formal employment (table 4). As immigrants enter the formal sector, they compete with native workers for the same jobs, resulting in some natives being unemployed in the formal sector or find employment in the informal sector (table 5). Results are broadly similar across gender, although the impact on female employment tends to be stronger. Calculating elasticities, we estimate that (i) a 10 percent increase in inter-regional immigration leads to 0.4 percent increase in informal employment (ii) a 10 percent increase in intra-regional immigration would lead to 0.2 percent increase in informal employment.

Although both types of immigration lead to a positive impact on native employment in the informal sector, looking at how the types of informal employment are affected reveals two different processes (tables 6 to 9). The positive impact that inter-regional immigration has on informal employment is driven by wage employment. This indicates that the positive productivity spillovers from the formal sector lead to more hiring of employees in the informal sector. We note that the impact of inter-regional immigration on self-employment is the only result that does not have the expected sign. This result may indicate that expansion in the formal sector has likely brought more competition in that sector, driving smaller businesses out and resulting in a negative impact on self-employment. Regarding intra-regional immigration, the positive impact immigration had on informal employment is driven by self-employment. As native workers are driven out of the formal sector into the informal sector, they become self-employed for necessity reasons. Results related to access to capital confirm the importance of access to capital to become self-employed, as higher access to capital increases native self-employment in both formal and informal sectors.

Calculating elasticities, we find that (i) a 10 percent increase in inter-regional immigration raises informal wage employment by 0.5 percentage points and (ii) a 10 percent increase in

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<sup>14</sup> On informality and gender gaps in Sub-Saharan Africa, see Malta, Kolovich, Martinez and Tavares (2019).

intra-regional immigration leads to an increase in informal self-employment by 1.9 percentage points.

**Table 3. Effect of Immigration on Native Total Employment-to-Population Ratios**

	Inter-regional immigration	Intra-regional Immigration
	I	II
Male Employment	2.626** (1.274)	-1.488*** (0.352)
	Inter-regional immigration	Intra-regional Immigration
	I	II
Female Employment	5.40*** (1.392)	-1.575*** (0.298)

Standard errors are in parentheses and have been corrected for heteroskedasticity using White's correction. There are 168 observations. The total number of country-education-experience cells is  $3*7*8 = 168$ . Regressions are weighted by the sample size of the education-experience-country cell. Specification I define an immigrant as a foreign-born outside SSA. Specification II defines an immigrant as a foreign-born outside country c AND within SSA. All specifications include fixed effects. \*\*indicates statistical significance at 5 percent level. \*\*\*indicates statistical significance at 1 percent level.

**Table 4. Effect of Immigration on the Share of Population Working in the Formal Sector**

	Inter-regional immigration	Intra-regional Immigration
	I	II
Male Employment	0.256 (1.217)	-2.638*** (0.306)
	Inter-regional immigration	Intra-regional Immigration
	I	II
Female Employment	2.745 (2.301)	-0.505 (0.452)

Standard errors are in parentheses and have been corrected for heteroskedasticity using White's correction. There are 168 observations. The total number of country-education-experience cells is  $3*7*8 = 168$ . Regressions are weighted by the sample size of the education-experience-country cell. Specification I define an immigrant as a foreign-born outside SSA. Specification II defines an immigrant as a foreign-born outside country c AND within SSA. All specifications include fixed effects. \*\*indicates statistical significance at 5 percent level. \*\*\*indicates statistical significance at 1 percent level.

**Table 5. Effect of Immigration on the Share of Population Working in the Informal Sector**

	Inter-regional immigration	Intra-regional Immigration
	I	II
Male Employment	2.160* (1.219)	1.122*** (0.433)
	Inter-regional immigration	Intra-regional Immigration
	I	II
Female Employment	16.743 (19.875)	21.277*** (7.039)

Standard errors are in parentheses and have been corrected for heteroskedasticity using White's correction.

There are 168 observations. The total number of country-education-experience cells is  $3*7*8 = 168$

Regressions are weighted by the sample size of the education-experience-country cell.

Specification I define an immigrant as a foreign-born outside SSA.

Specification II defines an immigrant as a foreign-born outside country c AND within SSA.

All specifications include fixed effects.

\*\*\*indicates statistical significance at 1 percent level.

\*\*indicates statistical significance at 5 percent level. \*Indicates statistical significance at 10 percent level.

**Table 6. Effect of Immigration on the Share of Population Working as Self-Employed in the Formal Sector**

	Inter-regional immigration	Intra-regional Immigration
	I	II
Male Self-Employment	-4.003*** (0.931)	-0.251 (0.457)
Access to Capital	0.245*** (0.0245)	0.209*** (0.028)
	Inter-regional immigration	Intra-regional Immigration
	I	II
Female Self-Employment	-3.160*** (0.853)	-0.097 (0.451)
Access to Capital	0.242*** (0.025)	0.216*** (0.028)

Standard errors are in parentheses and have been corrected for heteroskedasticity using White's correction.

There are 168 observations. The total number of country-education-experience cells is  $3*7*8 = 168$

Regressions are weighted by the sample size of the education-experience-country cell.

Specification I define an immigrant as a foreign-born outside SSA.

Specification II defines an immigrant as a foreign-born outside country c AND within SSA.

All specifications include fixed effects.

\*\*\*indicates statistical significance at 1 percent level.

\*\*indicates statistical significance at 5 percent level. \*Indicates statistical significance at 10 percent level.

**Table 7. Effect of Immigration on the Share of Population Working as Wage-Employed in the Formal Sector**

	Inter-regional immigration	Intra-regional Immigration
	I	II
Male Wage Employment	1.933*** (0.764)	-0.353 (0.283)
Access to Capital	0.088*** (0.020)	0.094*** (0.023)
	Inter-regional immigration	Intra-regional Immigration
	I	II
Female Wage Employment	4.003*** (0.871)	0.151 (0.253)
Access to Capital	0.190*** (0.026)	0.223*** (0.223)

Standard errors are in parentheses and have been corrected for heteroskedasticity using White's correction.

There are 168 observations. The total number of country-education-experience cells is  $3 \times 7 \times 8 = 168$

Regressions are weighted by the sample size of the education-experience-country cell.

Specification I define an immigrant as a foreign-born outside SSA.

Specification II defines an immigrant as a foreign-born outside country c AND within SSA.

All specifications include fixed effects.

\*\*\*indicates statistical significance at 1 percent level.

\*\*indicates statistical significance at 5 percent level. \*Indicates statistical significance at 10 percent level.

**Table 8. Effect of Immigration on the Share of Population Working as Self-Employed in the Informal Sector**

	Inter-regional immigration	Intra-regional Immigration
	I	II
Male Self-Employment	0.206 (0.734)	<b>0.847*</b> (0.468)
Access to Capital	0.118*** (0.028)	0.140*** (0.031)
	Inter-regional immigration	Intra-regional Immigration
	I	II
Female Self-Employment	1.593 (1.146)	0.721 (0.751)
Access to Capital	0.197*** (0.042)	0.227*** (0.047)

Standard errors are in parentheses and have been corrected for heteroskedasticity using White's correction.

There are 168 observations. The total number of country-education-experience cells is  $3 \times 7 \times 8 = 168$

Regressions are weighted by the sample size of the education-experience-country cell.

Specification I define an immigrant as a foreign-born outside SSA.

Specification II defines an immigrant as a foreign-born outside country c AND within SSA.

All specifications include fixed effects.

\*\*\*indicates statistical significance at 1 percent level.

\*\*indicates statistical significance at 5 percent level. \*Indicates statistical significance at 10 percent level.

**Table 9. Effect of Immigration on the Share of Population Working as Wage-Employed in the Informal Sector**

	Inter-regional immigration		Intra-regional Immigration	
	I		II	
Male Wage Employment	<b>0.305***</b>		-0.105**	
	(0.118)		(0.054)	
Access to Capital	-.003		-0.105*	
	(0.003)		(0.054)	

	Inter-regional immigration		Intra-regional Immigration	
	I		II	
Female Wage Employment	0.346***		-0.077*	
	(0.094)		(0.046)	
Access to Capital	0.010***		0.011***	
	(.003)		(0.003)	

Standard errors are in parentheses and have been corrected for heteroskedasticity using White's correction.

There are 168 observations. The total number of country-education-experience cells is  $3*7*8 = 168$

Regressions are weighted by the sample size of the education-experience-country cell.

Specification I define an immigrant as a foreign-born outside SSA.

Specification II defines an immigrant as a foreign-born outside country c AND within SSA.

All specifications include fixed effects.

\*\*\*indicates statistical significance at 1 percent level.

\*\*indicates statistical significance at 5 percent level. \*Indicates statistical significance at 10 percent level.

**Table 10. Summary of Results**

	Inter-regional migration			Intra-regional migration		
Employment rate of Native Men	+			-		
Formal Employment rate of Native Men	+	Self-employment rate	-	-	Self-employment rate	-
		Wage employment rate	+		Wage employment rate	-
Informal Employment rate of Native Men	+	Self-employment rate	+	+	Self-employment rate	+
		Wage employment rate	+		Wage employment rate	-

statistically not significant

statistically significant

The above results also provide empirical evidence that necessity driven self-employment needs to be distinguished from transformational self-employment. This was pointed out in Schoar (2010), which argues that necessity-driven self-employment cannot automatically lead to

transformational self-employment, for example on the basis of greater access to capital only. The author shows that in order to support more transformational self-employment, other factors and policy measures would be needed, including product and labor markets deregulation.

### B. Specific Skill Groups Results

Because of the large inflows of immigrants who are high school dropouts,<sup>15</sup> we check whether the above results were driven by the specific group of high school dropouts and estimate regression specifically for native workers with at least a high school degree.

**Table 11. Effect of Immigration on Employment, Sector Allocation and Type of Employment—At Least High School Graduates**

	Inter-regional immigration	Intra-regional Immigration
Total Employment	-0.089 (0.981)	0.721 (2.928)
Formal Employment	2.172 (1.535)	-1.44 (3.585)
Informal Employment	-2.338** (0.911)	2.431 (1.969)
Formal Self-employment	-0.974*** (0.314)	-2.296*** (0.893)
Formal Wage Employment	1.042 (1.209)	-2.233 (2.872)
Informal Self-employment	-1.952*** (0.483)	0.503 (0.984)
Informal Wage Employment	-.227* (0.135)	-.036 (0.229)

Standard errors are in parentheses and have been corrected for heteroskedasticity using White's correction.

There are 168 observations. The total number of country-education-experience cells is  $3 \times 8 \times 3 = 72$ .

Regressions are weighted by the sample size of the education-experience-country cell.

The regressions include education, experience, and country fixed effects, as well as interactions between education and experience fixed effects, education and country fixed effects.

\*\*indicates statistical significance at 5 percent level.

\*\*\*indicates statistical significance at 1 percent level.

<sup>15</sup> The high school dropout categories are defined by those with (i) no schooling (ii) some primary completed (iii) primary completed and (iv) lower secondary general completed or lower secondary technical completed.



Results indicate that the basic results above may have been driven by the particular group of high school dropouts. While results regarding intra-regional immigration and sector allocation tend to go in the same direction as the basic results, inter-regional immigration is shown to have a negative impact on informal employment, on both self-employment and wage employment. Interpretation of the basic results above should therefore be considered within the context of SSA countries, where immigration is largely composed of high school dropouts.

## **VI. CONCLUSION AND POLICY RECOMMENDATIONS**

We assess immigration's impact on native employment in receiving developing and emerging countries, using data on SSA countries. First, results confirm what standard textbooks predict, i.e. the direction of the impact depends on the degree of substitutability or complementarity between immigrants and native workers. Should native workers be lower-skilled, immigration that brings relatively higher-skilled workers will increase native employment, while immigration that brings lower-skilled workers will reduce native employment. Our results corroborate immigration studies in developed countries such as Borjas (2003), which finds that low skilled immigration hurts unskilled native workers. Second, we find evidence that immigration shifts native employment between the formal and informal sector in receiving developing and emerging countries. While both types of immigration positively affect informal employment, the shift to informal employment is likely to happen for different reasons. In the case of inter-regional immigration, the informal sector is found to be the setting where job creation is taking place, as the boost in native employment generated by immigration translates into more informal wage employment. In the case of intra-regional immigration, the informal sector is found to be where low-productivity jobs could perpetuate.

Given our findings, receiving developing and emerging countries should enhance efforts to increase complementarity between immigrant and native workers. Policy recommendations include: (i) investing more in education and training—and ensuring quality of the education system (ii) better targeted Active Labor Market Policies (ALMPs), especially in regions that receive large inflows of immigrants whose skill profiles match those of native workers (iii) reducing gender gaps to increase women's education and labor force participation (iv) strengthening the overall business environment and greater access to capital to help firms expand. While access to finance is important, our findings also show that it may not be enough to promote self-employment and job creation. Any policy promoting employment in Africa should aim at triggering a sustained inclusive growth which implies increasing the demand for formal labor. The degree of regulation of labor and product markets as well as political environment could equally be important factors for self-employment to be able to generate innovation and jobs for others.

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### Annex. Main Stylized Facts

Cameroon	Ghana	South Africa
<p>Sectors of Employment - Native workers (Percent)</p> 	<p>Sectors of Employment - Native Workers (Percent)</p> 	<p>Sectors of Employment - Native Workers (Percent)</p> 
<p>Male Natives by Education</p> 	<p>Male Natives by Education</p> 	<p>Male Natives by Education</p> 
<p>Formally Employed Male Natives by Education</p> 	<p>Formally Employed Male Natives by Education</p> 	<p>Formally Employed Male Natives by Education</p> 
<p>Informally Employed Male Natives by Education</p> 	<p>Informally Employed Male Natives by Education</p> 	<p>Informally Employed Male Natives by Education</p> 
<p>Inter-regional Male Immigrants By Education</p> 	<p>Inter-regional Male Immigrants By Education</p> 	<p>Inter-regional Male Immigrants By Education</p> 
<p>Intra-regional Male Immigrants By Education</p> 	<p>Intra-regional Male Immigrants By Education</p> 	<p>Intra-regional Male Immigrants By Education</p> 
<p>Source: Cameroon Census and Survey data 2005.</p>	<p>Source: Ghana Census and Survey data 2010.</p>	<p>Source: South Africa Census and Survey data 2011.</p>