The impact of the diaspora on African trade

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Abstract

The link between diaspora and trade has been the subject of numerous studies in the literature. However, none of these studies address the specific case of Africa, and very few have examined migrant's countries of origin. This paper aims to assess the trade effects generated by the African diaspora. The methodology adopted is that of a gravity model with a five-year jump panel from 1995 to 2020 for 40 African countries with 68 partner countries. The results show that the diaspora has a strong effect on imports and exports, particularly through the information channel and the reduction of transaction costs. This effect is then greater on African imports than on their exports Two other channels have been tested empirically; one for imports and one for exports, and they also have positive and robust effects. These are, respectively, the diffusion of knowledge brought by migrants and the preference for goods from the country of origin.

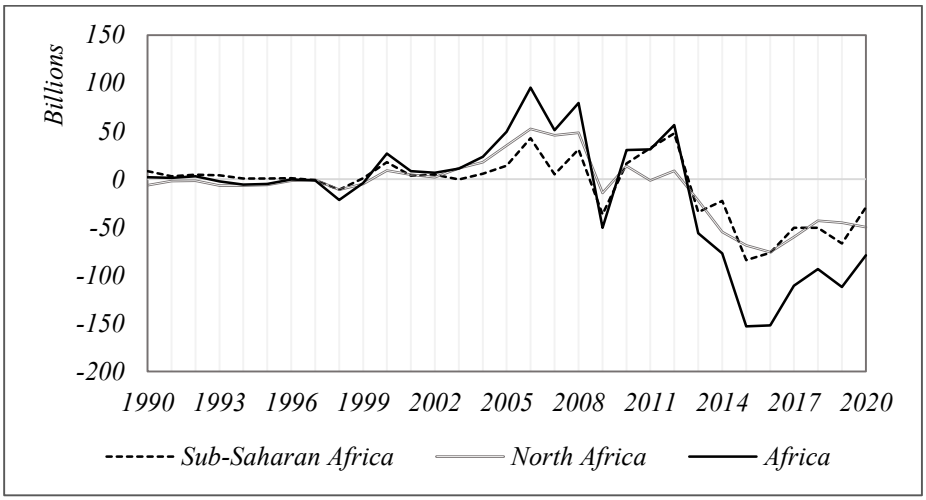
Keywords: diaspora, trade, Africa, gravity model.

JEL code: F14, F16, F22, O47.

1. Introduction

In an increasingly globalized world, China, the European Union (EU) and the United States (US) are the main players in international trade, accounting for almost 40% of total trade (Eurostat, 2021). In 2021, Africa will account for only 2.8%, compared to 11.5% for the United States, 14.5% for China and 14% for the European Union. Furthermore, as Figure 1 shows, the African trade balance is structurally deficient over the period 2012-2021, reaching 36.3 billion US dollars (USD) in 2021 (World Bank, 2023).

Figure 1: African trade balance in current US dollars (1990-2020)



***Source**: Authors, based on World Bank data (2023).*

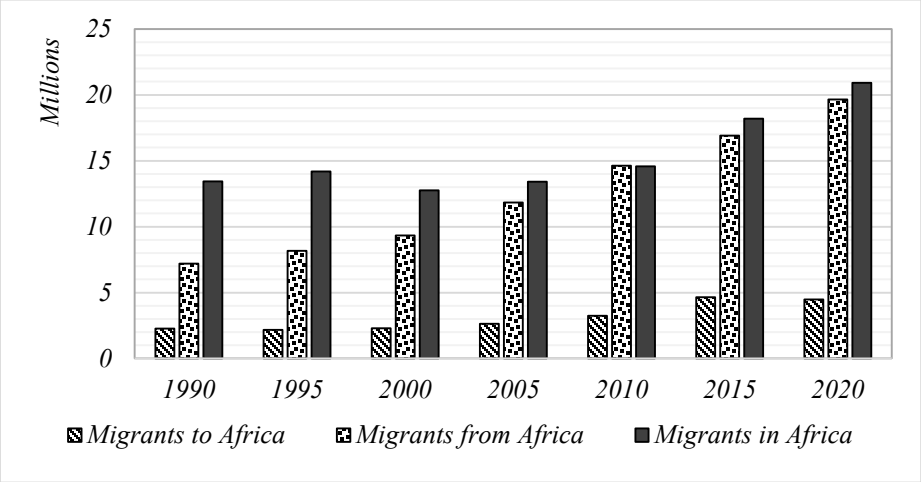
Moreover, intraregional trade in Africa remained very low, accounting for only 14.4% of the continent's trade in 2019[2]. This situation is often explained by the low diversification of exports. Indeed, on the one hand, there is a strong preponderance of commodities from the agricultural, oil and mining sectors, which account for more than 60% of total exports in 83% of African countries[3]. On the other hand, although the weight of manufactured goods in total imports has been declining since the mid-1990s, it remains substantial, estimated at more than 60% (World Bank, 2023).

In this context, African authorities are making efforts to reduce the external deficit. In the last decade, there has been renewed interest in import substitution policies in several African countries, including Egypt, Morocco, Senegal, Cameroon, Ghana and Angola. However, little or no attention has been given to the role of the diaspora[4] in these policies. For example, in the case of Cameroon, the country's National Development Strategy 2020-2030 limits the role of the diaspora in financing the economy.

[2] UNCTAD (2021): United Nations Conference on Trade and Development.
[3] UNCTAD (2022).
[4] Migrations over time have given rise to communities of migrants from one country to another. These communities are sometimes referred to as diaspora for their country of origin. The definition of this term has evolved over time without ever reaching consensus (International Organization for Migration, 2020). Moreover, it is not easy to identify the difference between the concepts of migrant and diaspora. For the purposes of this study, we equate diaspora with migrant stock, representing a group of people who have been forced or have chosen to leave their homeland to settle in other countries. This consideration is also adopted by Rapoport (2017) for a study on diaspora externalities in development.

A look at migration trends in Africa since 1990 (*Figure 2*) reveals a steady increase. In fact, the number of legal migrants, both within and from Africa, will almost double between 2000 and 2020.

Figure 2: Evolution of the number of incoming, outgoing and remaining migrants in Africa



***Source**: Authors, based on United Nations data (2023).*

Moreover, net emigration (the difference between the number of people leaving the continent and the number arriving) has been positive since 1990. Thus, of the more than 40 million African migrants in 2020, 51.56% will remain on the continent, a figure that is likely to be revised upwards, as many countries do not systematically count them[5]. The metropolises of Nigeria, South Africa and Egypt are the main destinations of these intra-African migratory flows, reflecting the relative economic dynamism of these conurbations.

However, the dynamics of emigration are not the same in the different regions of the African continent (*Appendix Figure 3, left*). In fact, despite their upward trends, Central and East Africa are the regions with the lowest number of emigrants over the period 1990–2020. Two of the main drivers of this African migration identified in the literature are armed conflict and lack of opportunities in the labor market (Cheptitski, 2014). In terms of intercontinental migration (*Appendix Figure 3, right*), Europe remains the preferred destination for African migrants. It accounts for 56.10% of total emigration outside Africa, followed by Asia with 24.02% in 2020. Europe and Asia will receive 27.18% and 11.64%, respectively, of all African migrants (United Nations, 2023). In terms of country, France and the US occupy the top two positions, accounting for 10.65% and 6.36%, respectively, of total African migration.

The economic literature is quite extensive on the determinants of foreign trade, especially on the role of international migration and diaspora. Indeed, beyond the traditional issue of the transfer of remittances (see Batista and Narciso 2018), the impact of external migration is felt in the generation of trade effects at the bilateral level. Seminal studies on this issue have been performed by Gould (1994), Head and Ries (1998), and Dunlevy and Hutchinson (1999). Some authors find that immigration has a positive and significant effect on exports (Head and Ries, 1998; Girma and Zu, 2002; Piperakis et al., 2003). Others contradict these results and show that immigration has a more positive effect on imports (Dunlevy and Hutchinson, 1999; Tai, 2009). Since then, the impact of migration on trade has generally been assessed for migrants' host countries through the mechanisms

[5] Africa Center for Strategic Studies (2021).

of migrants' information and preferences, first introduced by Gould (1994)[6]. Important developments have made it possible to identify, in addition to the networks that immigrants create in their destination country, the diversity of their place of birth. Among other things, this diversity and the diffusion of immigrants' knowledge can boost productivity and, ultimately, exports to the host country (Ortega and Peri, 2014; Alesina et al., 2016; Docquier et al., 2020). Finally, there is a unified framework for examining this impact on exports through networks, knowledge and diversity (Orefice et al., 2021). For most of these works, the study areas include the United States, Canada, Greece, Italy, Sweden, Spain, the United Kingdom and the European Union. Methodologically, these authors generally rely on augmented gravity models. Since these studies are limited to the trade effects of migration for host countries, they cannot account for these effects for countries of origin due to the bias introduced by mirror reading in gravity models (Yotov et al., 2016). Thus, while some authors (Felbermayr and Jung, 2009; Hatzigeorgiou, 2010) have had to specifically address the trade effects of south–north migration and include African countries in their sample, the issue of the trade effects of the African diaspora on the continent remains unexplored.

This issue is all the more relevant now that African policymakers are particularly interested in the contribution of the diaspora to development. The diaspora has been identified as playing a key role in the growth of the private sector and the expansion of value chains through the creation of businesses in a number of sectors, including import-export (AfDB[7], 2011). However, the actual impact of this diaspora on both imports and exports remains unclear. Our study therefore raises the question of the impact of the African diaspora on generating bilateral trade effects between African countries and their trading partners. The specific objective is to assess its impact on bilateral imports and exports to derive the net effect on Africa's foreign trade. This study not only contributes to enriching the empirical literature, which lacks a specific and comprehensive study on this issue in an African context but also aims to enlighten African development policies on the commercial dimension of the diaspora's role

To address this issue, the empirical method adopted is that of an augmented gravity model. The chosen estimator is the Poisson Pseudo Maximum Likelihood (PPML), inspired by the work of Santos Silva and Tenreyro (2006, 2010, 2011). Following the recommendations of Yotov et al. (2016), and due to the structure of the migration data, we use a five-year skip panel applied to data from 40 African countries and 68 trading partner countries over the period 1995–2020.

Following this introduction, the paper proceeds as follows: literature review, empirical strategy, analysis of results and conclusion.

2. Literature review

The link between migration and trade is not new in the literature. Its theoretical foundations go back to the introduction of labor movements between countries in HOS models[8]. Markusen (1988) showed that the immigration of highly skilled workers has negative effects on the economies of the countries of origin. These economies tend to specialize in low-skilled production. This ultimately leads to greater demand for and dependence on differentiated and labor-intensive products, which

[6] The information mechanism is the one by which immigrants, because of their knowledge and connection with the markets of their countries of origin, can facilitate bilateral interactions and reduce trade frictions; the preference mechanism is the one by which immigrants tend to demand products and services from their countries of origin.
[7] AfDB: African Development Bank.
[8] HOS: Heckscher-Ohlin-Samuelson.

weakens the trade structure of these economies. However, owing to the advantages associated with their language and ethnic origin, immigrants are able to establish firms that import from their host country and thus export to their country of origin. Min (1990) found similar evidence for Korean immigrants living in the US.

Early empirical work (Gould, 1994; Head and Ries, 1998; Girma and Yu, 2002) on the trade effects of international migration showed that migrant networks have strong effects on generating trade flows. These studies generally test two channels through which immigration is likely to affect the growth of trade flows. First, immigrants tend to maintain a preference for home country products in their host countries. This mechanism suggests that immigrants' consumption of products from their country of origin leads to a direct increase in the host country's imports of these goods and thus to an increase in exports for the countries of origin. Second, immigrants bring with them information about foreign markets and contacts that can reduce the transaction costs of trade. This second mechanism predicts a direct increase in both export and import flows between the host country and the country of origin, thanks to a reduction in the transaction costs associated with obtaining information about foreign markets and establishing trade relations. Recent work has empirically tested a third channel through which migrants can increase the productivity of firms in the host country. This has positive effects on both exports and imports from the country of origin. This channel is consolidated on the one hand by the diversity of migrants' birthplaces, which translates into more competitive firms due to the multiculturalism of their workers (Ortega and Peri, 2014; Alesina et al., 2016; Docquier et al., 2020). On the other hand, migrants are consolidated through better knowledge in specific sectors that migrants bring to the host country (Bahar and Rapoport, 2018; Bahar et al. 2019).

A number of studies have attempted to identify the diaspora's largest impact (on imports or exports) to quantify its real contribution to bilateral trade. First, a distinction is made between the group of studies that find a greater impact on the host country's exports and the group that finds a greater impact on imports.

In the first group, the work of Gould (1994) is seminal. The author uses an AGM[9] for bilateral trade data between the US and 47 trading partners over the period 1970-1986. He shows that the effects of information provided by immigrants appear to be stronger for exports and imports of manufactured goods than for those of producer goods. For example, an additional immigrant from Singapore has the greatest potential to generate new trade, with additional imports valued at 29,359 USD per year and exports valued at 47,708 USD. In contrast, an additional immigrant from the Philippines generates only approximately 6 USD in imports and 4 USD in exports per year. Moreover, the longer immigrants stay in the US, the smaller their impact on bilateral trade. Overall, immigrant ties appear to affect exports more than imports. Girma and Yu (2002) find similar results for UK bilateral trade data with 48 partner countries over the period 1981-1993. Using an AGM, they show that immigrants who do not originate from a Commonwealth country have a significant impact on US exports. This is not the case when they do. They argue that this result is related to the fact that immigrants from countries that were colonized by the United Kingdom (Commonwealth countries) do not bring any new information that could reduce transaction costs between their country of origin and the host country. They find similar results for imports, where immigration from Commonwealth countries actually tends to reduce imports. Similarly, Piperakis et al. (2003) examine the impact of immigration on Greek bilateral trade with EU partners for the

[9] AGM: Augmented Gravity Model.

period 1981-1991. The results show that immigration has a positive effect on the volume of Greece's bilateral exports but has no effect on its bilateral imports. They argue that this is consistent with the fact that immigration reduces the transaction costs of Greek exports.

In the second group, Head and Ries (1998) emphasize the knowledge that immigrants bring to their host country, as identified by Gould (1994). Using bilateral trade data between Canada and 136 partner countries over the period 1980-1992, they show that a 10% increase in the number of immigrants leads to a 3% increase in imports and a 1% increase in exports. These effects are to some extent confirmed by the study of Wagner et al. (2002), again for Canada, where the authors find a positive relationship between an increase in the number of immigrants and the development of foreign trade, regardless of the sample and the econometric method used. Second, the magnitude of the effect appears to vary across samples, immigrant groups, and product groups. Overall, they conclude that an average new immigrant increases exports to his or her country of origin by 312 USD and imports by 944 USD per year.

While these studies are groundbreaking, they suffer from several methodological difficulties. Indeed, the OLS approach used will show several difficulties in dealing with the estimation of gravity models, especially with respect to the persistence of heteroscedasticity. In addition, these studies do not incorporate evidence on trade barriers and their impact on international trade. In addition, based on previous studies, the use of total imports or imports classified by degree of substitutability seems too general to address the issue of migrant preferences. The inclusion of multilateral resistance and empirical developments in gravity models will mark a gap between this work and what we can describe as more modern, more empirically reliable work.

Thus, Tai (2009) integrates market structure, the transmission of culture and information, and educational networks to explain the mechanisms through which immigrant preferences affect trade. Using Swiss trade data for the period 1995-2000, coupled with French data, the author shows that Swiss imports are more affected by migration than exports are. This is because Swiss imports are much more substitutable. Thus, a multi-sectoral analysis that interacts migration with the elasticity of substitution suggests that market structure largely determines how migration affects trade. However, a single-country analysis somewhat limits the scope of the results. Moreover, the addition of data from France may pose an operational hurdle because the results obtained are not specific to Switzerland. In many aspects, France and Switzerland are different in terms of trade, especially in terms of size.

While previous studies have examined the impact of immigration only for developed countries, the study of Hatzigeorgiou (2010) is novel in that it examines the relationship between migration and trade for a panel that integrates developed and developing countries. An AGM is applied to a large country dataset that includes 15 African countries. In addition, the author includes three variables to account for multilateral resistance. These are (i) the average number of days for import and export clearance between partner transactions, which aims to control for the time and efficiency of customs and border procedures; (ii) the average level of irregular payments in exports, which aims to reflect institutional quality and the level of corruption; and (iii) the average level of e-readiness, which aims to control for the level of predictability faced by exporters and importers and, to some extent, the levels of corruption. The results of Hatzigeorgiou (2010) suggest that immigrants and emigrants are significantly associated with higher trade volumes. Immigrants seem to be particularly good at facilitating trade in differentiated goods, for which information costs are particularly high. Felbermayr and Jung (2009), who look at the trade effects of South–North

migration, come to similar conclusions. However, an estimate that includes both developed and developing countries, including African countries that are highly dependent on imports, does not seem relevant. This is because the obvious individual heterogeneities between these groups of countries are not considered. Moreover, Bettin and Lo Turco (2012) estimated an AGM that explores the link between South–North migration and trade in primary and final goods as well as in labor- and capital-intensive goods with the aim of assessing preferential and technological channels in a transnational framework over the period 1990-2005. The results show that migration improves the import of primary and final goods (preference channel) and the export of differentiated products with low elasticity of substitution (information channel). The estimates also show that the increased presence of migrants from the South favors the export of labor-intensive goods (technology channel). However, the study could not explicitly account for the foreign trade situation of southern countries due to the mirror-reading bias in gravity models (Yotov et al., 2016).

Beyond the similarity of the results, other contributions bring new insights into the specificity of the impact of migration and the mechanism involved. For example, Mundra (2014) finds that immigrant trade elasticity varies with the share of immigrants in different occupational groups using a sample of 63 US trading partners over the years 1991-2000. She finds that the share of professional immigrants significantly increases immigrant trade elasticity for all types of trade due to immigrants' ability to effectively use their networks for commercial purposes. To correct for endogeneity bias in her model, she instrumentalizes the migration variable with sociodemographic variables. Finally, Orefice et al. (2022) propose a unified empirical framework to identify and combine the main mechanisms proposed in the literature: the role of networks in reducing bilateral transaction costs and productivity changes resulting from migration-induced knowledge diffusion and labor force diversification. The authors also assess their relative importance. For diversity, they find stronger results in sectors characterized by more complex production processes and more intensive teamwork cooperation.

Although abundant, the literature on the trade effects of migration is rich, and it does not tell us anything about the specific impact of the diaspora on African trade. What is at stake is the potential impact of diaspora migration on Africa's trade balance.

3. Empirical strategy

3.1. Model specification

The empirical framework adopted is that of a gravity model[10]. The bilateral structure of the trade and migration data suggests such an approach. The advantage of this model is that it incorporates a large number of variables and observations, thus increasing the robustness of any correlations, given the abundance of factors that can determine foreign trade. As such, it has become the most popular method for assessing the determinants of trade flows (Boughanmi et al., 2021). Estimated for a long time in a form transposed from the law of gravity, the theoretical underpinnings of these models and the introduction of multilateral resistance factors[11] to trade were developed by Anderson and Van Wincoop (2003). The analytical framework is that of a monopolistic model

[10] This model is based on the Newtonian physics postulate that the force of attraction between two bodies is proportional to the product of their relative masses, and inversely proportional to the square of the distance between them.

[11] In addition to the absolute costs of bilateral trade, trade between countries i and j is explained by the resistance or friction that the exporter encounters on other markets, and the resistance that the importer puts up against the trade of its partners as a whole (Anderson and Van Wincoop, 2003).

applied to international trade, assuming increasing returns to scale and product differentiation. Three basic assumptions underpin this framework: profit maximization by firms in monopolistic competition, utility maximization by consumers and specialization of the supply of goods between countries (see Head and Mayer, 2014). The specification adopted is as follows:

$$M_{ij} = GY_i^a Y_j^b \phi_{ij}^c RM_{i(j)} \quad (1)$$

where G is the model constant. M_{ij} is the value of trade flows (imports or exports) from country j to country i. Y_i and Y_j represent the GDP of countries i and j, respectively. ϕ_{ij} represents characteristics common to countries i and j. $RM_{i(j)}$ represents multilateral trade resistance factors. a, b and c *are* parameters.

Olivero and Yotov (2012) advocate the inclusion of time-varying country fixed effects to account for multilateral resistance in a gravity model estimation framework with panel data. However, a five-year jump panel such as ours (limited to six years) does not allow for the inclusion of such a large number of variables[12]. In this study, we focused on two measures of resistance factors. First, we will include importing and exporting country fixed effects and time fixed effects to capture observable and unobservable cross-sectional multilateral resistance factors (Hummels, 2001; Feenstra, 2016). This approach is widely used in the literature for studies investigating the trade effects of migration (Jansen and Piermartini, 2009; Tai, 2009; Hatzigeorgiou, 2010). Second, we propose a proxy[13] that captures the effect of bilateral resistance based on "remoteness indices" (Helliwell, 1998). Its expression is given by:

$$RM_{ijt} = \left[\frac{PIB_{it}+PIB_{jt}}{Dist_{ij}}\right]^{-1}, \quad (2)$$

where PIB_{it} and PIB_{jt} represent the respective GDPs of countries i and j in year t, respectively. $Dist_{ij}$ represents the distance between countries i and j.

We empirically test three channels through which diasporas can influence foreign trade. The first channel is business networks with the country of origin created by migrants in the host country, which can reduce transaction costs. They are captured by the stock of migrants from country i to country j noted $MigStock_{ijt}$ (Gould, 1994; Head and Ries, 1998).

The second channel is the technical knowledge provided by migrants (KD_{i_0jt}) which can boost productivity in the host country and, ultimately, imports from the country of origin (Bahar and Rapoport, 2018; Orefice et al., 2021). These authors assess the diffusion effect of migrants' trade knowledge by the share of migrants from different origins (except country i) in the total number of migrants from country j. This share is then coupled with the diffusion effect of migrants' trade knowledge. This share is then coupled with the Balassa Index to capture the comparative advantage in a given sector. This approach has the advantage of eliminating the bias associated with multiple collinearities through the transaction cost reduction channel. In this study, we propose a similar approach. In the absence of this index to assess comparative advantage for African countries, we

[12] Furthermore, such an approach helps to absorb a large number of time-varying country characteristics, such as GDP or population, which we wish to highlight in line with the standard gravity model.

[13] This proxy is built using the index $Rem_{it} = \sum_j Dist_{ij} / PIB_t$ (Helliwell, 1998), where PIB_t represents world GDP in year t. However, it is inflexible and biased, as it is calculated from constant quantities over time for all countries (Avom and Mignamissi, 2017).

use the gross enrollment ratio (TBT_{i_0t}) to assess the level of knowledge of migrants. Thus, at the level of the starting ratio, we add to the denominator the product between the stock of migrants and this enrollment rate, i.e.,

$$KD_{i_0jt} = \left[\sum_{i\neq i_0} MigStock_{ijt} + TBT_{i_0t} \times MigStock_{i_0jt}\right] / \sum_i MigStock_{ijt}\,. \quad (3)$$

The multiple collinearity bias with the first channel does not arise here, owing in particular to the time-varying size effect of the denominator but also to the time-varying rate factor in the numerator.

The third channel is the preference of migrants for products from their country of origin[14]. Gould (1994) suggested that the export effect (for the host country) exceeds the import effect only above a certain threshold (equivalent to 5,000 people). However, his study was conducted only in the context of the U

S as a migrant-receiving country. In a multicountry context, migrants from the same country of origin marry several destination countries. They are thus exposed to a variety of products in different economic environments, which tends to diversify their preferences even for products from the country of origin. These preferences can also be shared with natives through a preference diffusion effect (Rapoport, 2017). Thus, preference diversification can create extensive margins for home country exports. Thus, ignoring Gould's (1994) migrant size effect, this channel can be assessed through the diversification of destinations of migrants from the same country. This channel is captured by the Herfindahl–Hirschman concentration index, according to the formula $PR_{it} = 1 - \sum_{j=1}^{J} t_{ijt}^2$ where t_{ijt} is the share of migrants from country i in the total number of migrants to country j.

The following assumptions are made: (i) the first channel affects both imports and exports of the country of origin, (ii) the second channel affects only imports, and (iii) the third channel affects only exports. All three channels have a positive impact on these foreign trade indicators.

The estimated model is an augmented, log-linearized form of equation (1). Once this modeling framework is established, exports and imports are modeled by the following equations:

$$\begin{aligned}\ln(M_{ij(k)t}) = {} & \alpha_0 + \alpha_1 \ln(MigStock_{ijt}) + \alpha_2\, KD_{ijt} + \alpha_3 \ln(PIB_{it}) + \alpha_4 \ln(PIB_{jt}) + \alpha_5 \ln(Dist_{ij}) \\ & + \alpha_6 \ln(pop_{it}) + \alpha_7 \ln(pop_{jt}) + \boldsymbol{\alpha} \times \boldsymbol{L} + \alpha_8 RM_{ijt} + \delta_i + \mu_j + \lambda_t + \varepsilon_{ij(k)t}, \end{aligned} \quad (4)$$

and

$$\begin{aligned}\ln(X_{ij(k)t}) = {} & \beta_0 + \beta_1 \ln(MigStock_{ijt}) + \beta_2\, PR_{it} + \beta_3 \ln(PIB_{it}) + \beta_4 \ln(PIB_{jt}) + \beta_5 \ln(Dist_{ij}) \\ & + \beta_6 \ln(pop_{it}) + \beta_7 \ln(pop_{jt}) + \boldsymbol{\beta} \times \boldsymbol{L} + \beta_8 RM_{ijt} + \delta_i + \mu_j + \lambda_t + \varepsilon_{ij(k)t}, \end{aligned} \quad (5)$$

where $pop_{i(j)t}$ represents the country's population $i(j)$. $\boldsymbol{L}$ is a vector of size 4×1 that includes bilateral sociodemographic variables ($FC_{ij}, COL_{ij}, CC_{ij}$ et LC_{ij} takes the value 1 respectively in the case of a common border, colonial dependence, common colonial past and common language and 0 otherwise). δ_i, μ_j and λ_t represent country fixed effects i and j and time fixed effects, respectively. Finally, $\varepsilon_{ij(k)t}$ represents the error term. (k) indicates that estimates will also be made at the level of disaggregated imports and exports according to a certain typology of goods. While most of those previous studies focused on differentiated or undifferentiated goods, we opted for a

[14] In earlier studies (Gould, 1994; Head and Ries, 1998), the preference effect is the difference between the effect of the diaspora on the home country's exports and the effect on its imports. This is due to Gould's (1994) unilaterally approved assumption that preference only influences the home country's exports.

typology of four (04) goods: raw materials ($k = 1$), intermediate goods ($k = 2$), consumer goods ($k = 3$), and capital goods ($k = 4$). This approach has the advantage of ensuring comparability with previous studies, given that the first two types of goods generally require less differentiation than the last two. It also offers the possibility of assessing the effect of the diaspora at a higher level of trade disaggregation. The sociodemographic variables introduced into the model also explain migration between countries (Bahar and Rapoport, 2018). Their presence therefore causes a multicollinearity bias that renders the elasticities carried by the variable $\ln(MigStock_{ijt})$ in both models. To address this problem, these variables were omitted from sensitivity tests to assess the extent of bias.

In equation (4), the diaspora effect is therefore captured by the variables $\ln(MigStock_{ijt})$ and KD_{ijt}, while in equation (5), it is captured by the variables $\ln(MigStock_{ijt})$ and PR_{it}.

3.2. Estimating technique

When log-linearizing equation (1) is used, the zero values of the trade variable are indeterminate, while the logarithms of low trade values tend to cancel out. This leads to biased results. In fact, omitting these zero values can lead to biased results, as well as selection bias in the case of truncation. Several studies have shown that ordinary least squares, traditionally used to estimate log-linearized equations, generally faces persistent heteroscedasticity (Head and Mayer, 2014; Yotov et al., 2016). Given these obstacles, Santos Silva and Tenreyro (2006, 2010, 2011) prescribe the use of a Poisson Pseudo Maximum Likelihood (PPML) estimator. Despite the reservations expressed by some authors (Martin and Pham, 2008; De Benedictis and Taglioni, 2011), a comparison between the PPML estimator and the gamma pseudo maximum likelihood (GPML) and a nonlinear least squares (NLS) estimator suggest that the PPML is the least affected by heteroscedasticity (Martinez-Zarzoso, 2013). Although the PPML estimator is not always unanimously accepted in the literature, it is widely used. For this reason, we chose PPML as our preferred estimation technique.

3.3. Sample and data sources

The study sample is a five-year jump panel from 1995 to 2020 covering 40 African countries with 68 partner countries (*Appendix Table 10*). This choice is justified, on the one hand, by the five-year structure of migration data obtained from the United Nations website (UN International Migrant Stock 2020). On the other hand, compared to continuous annual specifications, Olivero and Yotov (2012) showed that estimates obtained with lags of 3, 4, and 5 years yield similar results with respect to the estimation of standard gravity variables. Furthermore, when estimating gravity models, Yotov et al. (2016) suggest using year-skipping panels rather than continuous year panels to ensure the adjustment of bilateral trade flows in response to trade policies or other changes in trade costs.

The different partners of African countries were selected according to the structure of the CEPII database (*Gravity Dataset*), which includes these countries as trading partners and the availability of data. To ensure a certain representativeness of the data, complementarity of information, and mitigation of biases that could arise from a single source of information, the data attached to the different variables come from several sources (*Appendix Table 6*).

4. Results

4.1. Statistical results

Table 6 in the appendix presents the descriptive statistics of the variables introduced in the different models. The average value of imports from the African countries in the sample over the study period is 89 billion USD, while the average value of exports is 101 billion USD. The products most imported by these countries are consumer goods, with a value of 30 billion USD, while the products most exported are raw materials, with a value of 56 billion USD. Over the study period, the average stock of African migrants in the destination countries in our sample was 6,643 individuals. The variables related to migrant preferences and knowledge diffusion are between 0 and 1. The former seems to be uniformly distributed within this interval, with an average of 0.66 and extreme values close to the limits. The latter has values entirely contained between the last two deciles of the interval, i.e., 0.9 and 1, with an average of 0.99.

The correlation matrix (*Appendix Table 7*) shows a significant positive correlation at the 5% level between the migrant stock and both total imports and total exports. The preference and knowledge variables also show positive correlations with the trade variables. These positive correlations are confirmed by the increasing trends in the various scatterplots in Figures 4 and 5 (*in the Appendix*). On the one hand, the slope of the regression lines associated with the stock of migrants is steeper for imports (*Figure 4*) than for exports (*Figure 5*). On the other hand, the effect of migrants' knowledge on imports appears to be greater than the effect of their preference for exports from the continent.

4.2. Econometric results

4.2.1. Total exports and imports

Tables 1 and 2 present model sets for assessing the impact of the diaspora on imports and exports, respectively, using PPML as the estimator. The standard variables of the gravity model produce the expected results. Indeed, the different GDPs of partner countries increase both imports and exports, which is also the case for the population, except for that of foreign countries *j,* which has the effect of reducing imports from migrants' countries of origin (i.e., Africa). This is in line with the law of supply and demand since a large population in a foreign country tends to reduce the supply of exports to the African country. Distance tends to reduce trade intensity, in line with standard specifications for gravity models in the study of international trade (Lavallée, 2006). The sociodemographic variables act as catalysts for bilateral trade and contribute to trade intensification.

The variables of interest have the expected signs and significance. Despite the possible multicollinearity bias generated by sociodemographic variables that also explain migration, models 1 and 6 show that these variables do not disturb the sign or significance of the elasticity associated with the variable $\ln(MigStock_{ijt})$. This is the case for both imports and exports. However, the effect diminishes with the introduction of these control variables. Specifically, the African diaspora helps to increase imports from its country of origin to its country of destination. This is achieved by reducing the transaction costs associated with trade and by facilitating access to market

information in the countries of origin (Gould, 1994). Thus, a 1% increase in the number of African migrants increases the continent's imports by 2.1% (Model 1). Moreover, the knowledge and technical skills of these migrants induce productivity gains for foreign firms, which ultimately contribute to an increase in African imports from these foreign firms (+71.5%), in line with the results obtained by Orefice et al. (2021) and Zhou et al. (2023).

Table 1: Impact of the diaspora on total imports (PPML)

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)
$ln\_MigStock_{ijt}$	0.021***	0.021***	0.020***	0.019***	0.020***	0.018***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
KD_{ijt}	0.715***	1.041***	0.693***	0.633***	0.685***	0.918***
	(0.220)	(0.219)	(0.219)	(0.221)	(0.221)	(0.220)
ln_PIB_{it}	0.026***	0.026***	0.026***	0.026***	0.026***	0.026***
	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)
ln_PIB_{jt}	0.028***	0.030***	0.027***	0.028***	0.028***	0.029***
	(0.008)	(0.008)	(0.008)	(0.008)	(0.008)	(0.008)
ln_pop_{it}	0.049**	0.052**	0.049**	0.050**	0.050**	0.053**
	(0.024)	(0.024)	(0.024)	(0.024)	(0.024)	(0.024)
ln_pop_{jt}	-0.025	-0.021	-0.025	-0.025	-0.024	-0.020
	(0.018)	(0.018)	(0.018)	(0.018)	(0.018)	(0.018)
ln_dist_{ij}	-0.069***	-0.056***	-0.071***	-0.071***	-0.071***	-0.062***
	(0.004)	(0.005)	(0.004)	(0.004)	(0.004)	(0.005)
RM_{ijt}	-192.646***	-170.524***	-198.838***	-188.618***	-191.499***	-172.052***
	(35.484)	(35.574)	(35.547)	(35.385)	(35.369)	(35.500)
FC_{ij}		0.069***				0.067***
		(0.010)				(0.010)
CC_{ij}			0.035***			0.032***
			(0.008)			(0.008)
COL_{ij}				0.046***		0.049***
				(0.008)		(0.009)
LC_{ij}					0.015***	0.003
					(0.005)	(0.005)
Constant	0.779**	0.218	0.825**	0.889**	0.819**	0.400
	(0.363)	(0.361)	(0.363)	(0.364)	(0.365)	(0.362)
Observations	6,916	6,916	6,916	6,916	6,916	6,916
Effects i j and t	yes	yes	yes	yes	yes	yes
R-squared	0.092	0.092	0.092	0.092	0.091	0.092
Wald chi2	17453.22	17692.15	17515.59	17411.74	17438.05	17755.26
Prob > F	0.000	0.000	0.000	0.000	0.000	0.000

Robust standard errors in parentheses
*** $p<0.01$, ** $p<0.05$, * $p<0.1$*

For the results on exports, we can see that migrants also contribute to their increase through transaction costs and information. A 1% increase in the number of African emigrants increases the value of African exports by 1.7% (Model 1). Moreover, migrants' preferences for products from their country of origin actually lead to an increase in their demand and thus to an increase in African exports of these products (+14.4%). These trade effects of the African diaspora are in line with the results obtained by Felbermayr and Jung (2009) for south–north migration.

Table 2: Impact of the diaspora on total exports (PPML)

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)
$ln\_MigStock_{ijt}$	0.017***	0.015***	0.017***	0.014***	0.014***	0.010***
	(0.001)	(0.001)	(0.001)	(0.002)	(0.002)	(0.002)
PR_{it}	0.144***	0.145***	0.144***	0.145***	0.145***	0.147***
	(0.049)	(0.049)	(0.050)	(0.049)	(0.049)	(0.049)
ln_PIB_{it}	0.042***	0.042***	0.042***	0.042***	0.042***	0.042***
	(0.010)	(0.010)	(0.010)	(0.010)	(0.010)	(0.010)
ln_PIB_{jt}	0.005	0.007	0.005	0.005	0.004	0.006
	(0.011)	(0.011)	(0.011)	(0.011)	(0.011)	(0.011)
ln_pop_{it}	0.005	0.010	0.005	0.006	0.007	0.013
	(0.043)	(0.043)	(0.043)	(0.043)	(0.043)	(0.043)
ln_pop_{jt}	0.097***	0.101***	0.097***	0.097***	0.103***	0.106***
	(0.024)	(0.024)	(0.024)	(0.024)	(0.024)	(0.024)
ln_dist_{ij}	-0.078***	-0.064***	-0.079***	-0.083***	-0.084***	-0.074***
	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.006)
RM_{ijt}	-180.95***	-153.98***	-190.24***	-172.423***	-177.22***	-148.18***
	(48.901)	(48.892)	(49.334)	(48.730)	(48.763)	(49.204)
FC_{ij}		0.071***				0.074***
		(0.010)				(0.010)
CC_{ij}			0.032***			0.017
			(0.011)			(0.011)
COL_{ij}				0.079***		0.068***
				(0.013)		(0.014)
LC_{ij}					0.041***	0.030***
					(0.007)	(0.007)
Constant	0.947**	0.683	0.980**	0.998**	0.947**	0.736*
	(0.446)	(0.445)	(0.445)	(0.444)	(0.445)	(0.442)
Observations	5,957	5,957	5,957	5,957	5,957	5,957
Effects i, j and t	yes	yes	yes	yes	yes	yes
R-squared	0.105	0.106	0.105	0.106	0.106	0.107
Wald chi2	10156.68	10161.66	10129.54	10244.51	10195.02	10283.24
Prob > F	0.000	0.000	0.000	0.000	0.000	0.000

Robust standard errors in parentheses
**** p<0.01, ** p<0.05, * p<0.1*

A comparison of the two effects shows that the African diaspora contributes more to Africa's increased imports than to increased exports. This result is consistent with other findings in the literature, in parallel with analyses of migrants' host countries (Gould, 1994; Girma and Yu, 2002; Piperakis et al., 2003). Moreover, the effect of the preference channel on African exports is empirically weaker than the effect of migrants' knowledge on imports. This puts into perspective the importance of migrants' preferences for African products.

4.2.2. Exports and imports of specific goods

Table 3 shows the results of the estimations for the selected good types. For each type of good, the variables of interest produce the expected effects. In addition, migrants induce more import effects than export effects for trade in certain goods.

The transaction cost reduction channel has a greater effect on exports of capital goods (+2.5%), followed by consumer goods (+2.1%), while the effect is roughly the same for the other two types of goods (+2%). The same is true for the preference channel, where exports of consumer goods

have the largest effect (+28.1%). This result confirms that of Mundra (2014), who showed that imports of differentiated goods from the host country are the most affected by migration due to migrants' reduced information and demand from migrants for products from the country of origin. Erbahar and Gencosmanoglu (2021) and Bettin and Lo Turco (2012) find similar results for foreign exports to lower-income countries and for the study of south–north migration, respectively. Erbahar and Gencosmanoglu (2021) showed that the effect of migrants is less significant for trade in intermediate goods, while Bettin and Lo Turco (2012) concluded that the effect of migrants on exports from south to north is more intensive for final goods than for primary goods.

The magnitude of the diaspora effect varies for imports of different types of products. The information channel leads to a greater effect on imports of raw materials (+3.1%) and consumer goods (+3%). The effects are generally the same for imports of intermediate and capital goods (+2.5%). The trend is the same for the knowledge channel, where the effect is greater for consumer goods (+135%) and raw materials (107%). This result can be explained by the fact that migrants induce imitation effects in the consumption habits of the families remaining in their countries of origin, with greater elasticity in their final consumption. This conclusion also contradicts that of Bettin and Lo Turco (2012), who find non-significant effects for all types of products. The reason for this may be the endogeneity bias not considered by the authors, caused by the variable related to trade agreements, which has reciprocal causality with the trade variable (Yotov et al., 2016).

Table 3: Effects of the diaspora on trade by specific goods (PPML)

VARIABLES	Raw materials		Intermediate goods		Consumer goods		Capital goods	
	Export	Import	Export	Import	Export	Import	Export	Import
$ln\_MigStock_{ijt}$	0.020***	0.031***	0.020***	0.025***	0.021***	0.030***	0.025***	0.025***
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.001)	(0.002)	(0.001)
PR_{it}	0.171***		0.177**		0.281***		0.136*	
	(0.063)		(0.085)		(0.065)		(0.075)	
KD_{ijt}		1.070***		0.912***		1.351***		0.771***
		(0.405)		(0.316)		(0.265)		(0.250)
ln_PIB_{it}	0.035**	0.016	0.046***	0.026***	0.052***	0.034***	0.026*	0.024***
	(0.014)	(0.012)	(0.015)	(0.008)	(0.013)	(0.007)	(0.015)	(0.007)
ln_PIB_{jt}	0.013	0.004	0.024	0.009	0.024*	0.030***	0.026	0.049***
	(0.015)	(0.017)	(0.016)	(0.011)	(0.013)	(0.010)	(0.016)	(0.010)
ln_pop_{it}	-0.056	0.070	-0.098	0.059	0.059	-0.028	0.038	0.075**
	(0.061)	(0.051)	(0.064)	(0.036)	(0.053)	(0.029)	(0.066)	(0.029)
ln_pop_{jt}	0.126***	-0.026	0.045	0.040*	0.010	0.015	0.015	-0.008
	(0.032)	(0.041)	(0.034)	(0.024)	(0.028)	(0.023)	(0.036)	(0.026)
ln_dist_{ij}	-0.082***	-0.066***	-0.083***	-0.082***	-0.107***	-0.099***	-0.083***	-0.084***
	(0.007)	(0.007)	(0.007)	(0.006)	(0.006)	(0.005)	(0.007)	(0.006)
RM_{ijt}	46.565	35.560	-67.332	-85.861	-134.897**	-78.836*	-208.26**	-161.30***
	(75.419)	(78.964)	(95.643)	(53.308)	(56.653)	(46.009)	(85.036)	(48.511)
Constant	1.050*	0.786	1.606***	0.132	0.513	0.247	1.182**	-0.235
	(0.599)	(0.748)	(0.622)	(0.520)	(0.513)	(0.436)	(0.600)	(0.446)
Observations	4,831	4,991	4,488	6,128	5,019	6,632	4,223	6,359
Effects i,j and t	yes	yes	yes	yes	yes	Yes	yes	yes
R-squared	0.088	0.093	0.099	0.101	0.126	0.103	0.116	0.111
Wald chi2	5578	5991	211407	11011	10546	15880	32771	16720
Prob > F	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

Robust standard errors in parentheses
**** p<0.01, ** p<0.05, * p<0.1*

4.3. Robustness tests

The validity of the estimation of gravity models by PPML is generally assessed by the results proposed by competing estimators. Several estimators have been considered in the literature, each correcting for a bias specific to PPML. For our purposes, we use the zero-inflated negative binomial (ZINB) estimator, which corrects overdispersion bias, the inequality between the conditional variance of the dependent variable and its expectation, and the bias introduced by inefficient management of the number of zeros in the dependent variable in the case of high proportions (De Benedictis and Taglioni, 2011). Moreover, we retain the ordinary least squares (OLS) estimator for near similarity in first-order conditions with the PPML (Head and Mayer, 2014).

Table 4: Robustness of the diaspora effect on total trade (ZINB and OLS)

VARIABLES	ZINB		OLS	
	Export	Import	Export	Import
$ln\_MigStock_{ijt}$	0.017***	0.021***	0.250***	0.323***
	(0.002)	(0.003)	(0.021)	(0.017)
PR_{it}	0.145**		1.804***	
	(0.072)		(0.591)	
KD_{ijt}		0.715		9.57***
		(0.443)		(3.038)
ln_PIB_{it}	0.043***	0.026*	0.682***	0.488***
	(0.016)	(0.013)	(0.134)	(0.088)
ln_PIB_{jt}	0.004	0.028*	0.193	0.458***
	(0.018)	(0.016)	(0.154)	(0.104)
ln_pop_{it}	0.004	0.049	-0.176	0.456
	(0.066)	(0.055)	(0.560)	(0.362)
ln_pop_{jt}	0.098**	-0.025	1.531***	-0.292
	(0.041)	(0.037)	(0.348)	(0.236)
ln_dist_{ij}	-0.077***	-0.069***	-1.369***	-1.236***
	(0.009)	(0.008)	(0.079)	(0.056)
RM_{ijt}	-185.04***	-192.65***	-190.36	-382.61
	(59.162)	(48.870)	(437.785)	(276.329)
Log(α)_cons	-28.463	-75.632***		
	(33.425)	(29.100)		
Constant	0.958	0.779	-11.737*	-12.631**
	(0.699)	(0.769)	(6.061)	(5.132)
Observations	5,957	6,916	5,957	6,916
Effects i, j and t	yes	yes	yes	yes
R-squared			0.64	0.73
LR chi2	3454	3340		
Root MSE			2.25	1.67
Prob > F	0.000	0.000	0.000	0.000

Robust standard errors in parentheses
**** p<0.01, ** p<0.05, * p<0.1*

The test results for the overall estimates are reported in Table 4. Tables 8 and 9 show the tests for the different types of goods. To avoid any multicollinearity bias, we estimated Model (2) without the sociodemographic variables. The results show that the different transmission channels for diaspora effects on trade are robust to the ZINB and OLS estimators. The validity of the comparisons made between the different effects is also preserved. However, the channel of

knowledge provided by migrants loses its significance for ZINB while remaining positive. Nevertheless, the significance obtained by OLS allows us to confirm the previous analyses for this channel. We note that, in general, the effects of the different channels are overestimated by the OLS estimator, while the proportions observed for the PPML are maintained for the ZINB. This is simply because these two estimators are almost identical in the optimization program.

At the level of the different product types, the signs and significance are largely preserved. Nevertheless, using the ZINB estimator, we find that the effects of migrants' preference and knowledge channels are insignificant in the equations for exports and imports of capital goods. Furthermore, they are supported by ordinary least squares, which lends some credibility to their interpretation.

4.4. Sensitivity tests

The tests performed here allow us to assess the sensitivity of the estimates to certain groups of countries. For African countries, tests are performed according to whether they are North African or Sub-Saharan African. For partner countries, tests are performed according to whether they are African or non-African. The results are presented in Table 5.

With Africa as the set of partner countries *j* (columns 5 and 6), we see that the channels related to preference and knowledge are positive but not significant. With respect to preference, this may be due to the fact that most African countries generally produce similar goods, which leads to a constancy in migrants' utility with respect to the goods they find in their destination countries. With respect to knowledge, the equivalence of educational cultures and sociodemographic characteristics across African countries (which explain both migration and trade) means that the knowledge generated by migrants is insignificant for firms in the destination country, which are able to generate large export margins. The estimates outside Africa (columns 7 and 8) reflect the strong effects of the different channels. This nonsignificant result is due, among other things, to the heterogeneity between the origin and destination markets, the variety of goods that African migrants encounter in their destination countries, the numerous productivity gains of Western firms induced by migrants, and the significant frictions in trade transactions between African and Western countries.

In sub-Saharan Africa, we can see that the knowledge channel has a positive but insignificant effect on imports, which is not the case in North Africa, where the effect is significant. Indeed, sub-Saharan African countries are more in need of capital infrastructure than are North African countries, given the dynamics of their respective firms and capital. The massive import of capital goods by African countries has been shown to be weakly affected by the knowledge brought about by migrants and therefore strongly influenced by countries south of the Sahara. The differentiation thresholds for these goods are therefore high enough for the knowledge of sub-Saharan African migrants alone to generate significant productivity margins and exports. On the other hand, the knowledge contributed by migrants from North Africa can create significant margins, as the industrial or agricultural practices of these countries are quite sophisticated and productive for Western firms. Exports from North African countries are negatively affected by both the information and preference channels. This result is also obtained by Hatzigeorgiou and Lodefalk (2016) in their sensitivity test on the role of migration in exports from North Africa to Sweden. However, the authors do not explain this bias with the expected results. The information channel is insignificant, while the preference channel is negative and significant. The preference channel is captured by the diversity of migrants' destinations. Given that countries north of the Sahara share

a number of cultural characteristics with Western countries, it seems more likely that this diversity acts as a catalyst for the consumption of local goods in destination countries, in order to promote the full integration of North Africans.

Table 5: Sensitivity of the diaspora effect on total trade (PPML)

VARIABLES	Country *i* (African countries)				Country *j* (Foreign countries)			
	Sub-Saharan Africa		North Africa		Africa		Outside Africa	
	Export	Import	Export	Import	Export	Import	Export	Import
$ln\_MigStock_{ijt}$	0.017***	0.020***	-0.002	0.013***	0.016***	0.017***	0.015***	0.019***
	(0.002)	(0.001)	(0.003)	(0.004)	(0.003)	(0.003)	(0.002)	(0.001)
PR_{it}	0.131**		-0.374**		0.060		0.192***	
	(0.052)		(0.182)		(0.081)		(0.060)	
KD_{ijt}		0.091		0.870***		0.082		0.838***
		(0.319)		(0.299)		(0.358)		(0.232)
ln_PIB_{it}	0.043***	0.025***	-0.084**	0.043**	0.061***	0.015	0.034***	0.029***
	(0.011)	(0.006)	(0.035)	(0.017)	(0.019)	(0.014)	(0.012)	(0.006)
ln_PIB_{jt}	-0.001	0.034***	0.056***	0.047***	0.003	0.026	0.012	0.034***
	(0.013)	(0.009)	(0.019)	(0.010)	(0.016)	(0.016)	(0.017)	(0.010)
ln_pop_{it}	0.126**	0.049*	0.329***	-0.012	-0.153**	0.034	0.083	0.055**
	(0.058)	(0.029)	(0.126)	(0.075)	(0.077)	(0.058)	(0.051)	(0.025)
ln_pop_{jt}	0.137***	-0.056**	0.025	0.032**	0.140**	-0.079	0.097***	-0.018
	(0.035)	(0.024)	(0.026)	(0.015)	(0.065)	(0.070)	(0.028)	(0.018)
ln_dist_{ij}	-0.092***	-0.076***	-0.092***	-0.058***	-0.104***	-0.081***	-0.045***	-0.035***
	(0.007)	(0.006)	(0.012)	(0.009)	(0.008)	(0.008)	(0.008)	(0.005)
RM_{ijt}	-110.57**	-176.5***	-160.591	218.254	-95.938	-143.3***	-315.75***	-297.02***
	(50.910)	(37.245)	(340.576)	(182.507)	(58.851)	(53.402)	(87.671)	(53.020)
Constant	-0.358	1.638***	0.712	-0.073	1.846**	2.441***	0.089	0.211
	(0.589)	(0.458)	(1.320)	(0.606)	(0.816)	(0.870)	(0.652)	(0.411)
Observations	4,976	5,911	981	1,005	1,725	1,906	4,232	5,010
Effects i, j and t	yes	yes	yes	yes	yes	yes	yes	yes
Wald chi2	7967	14421	6192	8738	3042	3613	8511	15407
Prob > F	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

Robust standard errors in parentheses
**** p<0.01, ** p<0.05, * p<0.1*

5. Conclusion

This study aimed to assess the effect of the African diaspora on Africa's foreign trade. To this end, we use an augmented gravity model that includes control variables such as GDP and population, as well as sociodemographic variables. Multilateral impediments were captured using cross-sectional and time fixed effects, as well as a proxy derived from the work of Helliwell (1998). The Poisson Pseudo Maximum Likelihood (PPML) estimator was used.

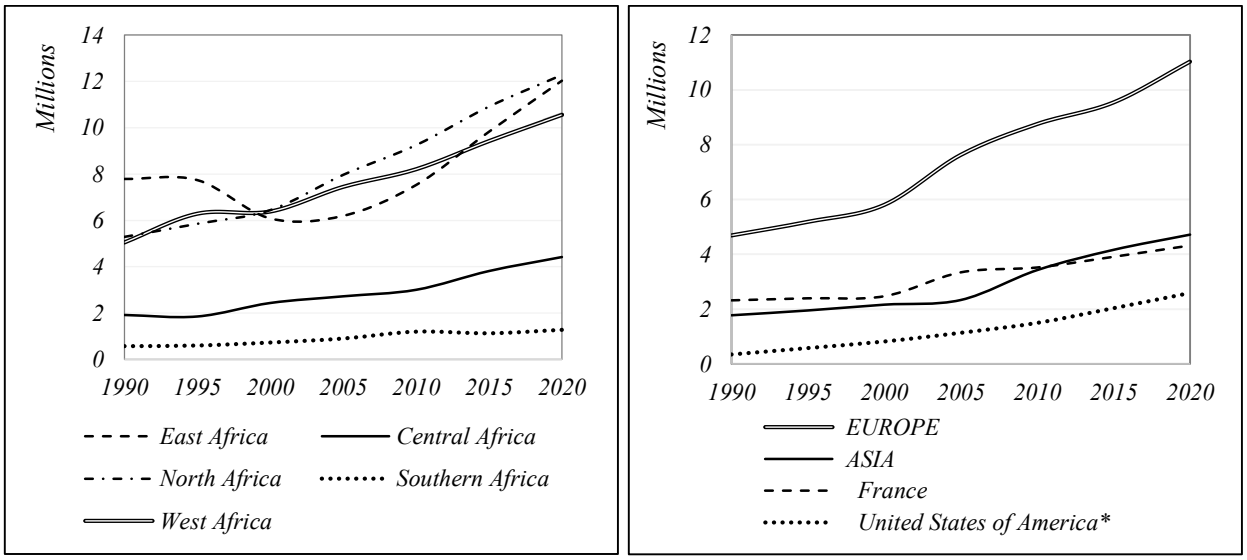
At the end of this study, several conclusions emerge. First, the African diaspora has strong effects on African imports and exports. The first channel, related to the reduction in transaction costs, is robust to all the retained estimators, as well as to sensitivities related to membership in different groups of countries, except for North Africa, where the effect is insignificant for exports. The other two channels are also robust to at least two of the selected estimators. Second, the African diaspora induces more trade effects on imports than on exports, both at the level of total trade and at the level of disaggregated products. Third, migrants' preferences for products from their countries of origin have a smaller overall effect on imports from African countries than the knowledge that

migrants bring to exports. The second conclusion is also supported by Gould's (1994) hypothesis that preference affects only exports from the country of origin. Fourth, the effect of the channel related to the knowledge brought about by migrants is more preponderant for the import of final goods than for primary goods, while the effect of the channel linked to preference is more important for the export of consumer goods.

The diaspora must therefore be an instrument of foreign policy for African countries. The role of the diaspora in implementing import substitution policies should not be limited to financing the economy. Governments can mobilize strategies to promote local products in export markets. In addition, public authorities can increase awareness of the need to reduce imports of substitutable products.

6. Appendix

Figure 3: Number of emigrants by African region (left) and number of international African immigrants by region and country of destination (right)



***Source**: Authors based on United Nations data (2023).*

Table 6: Descriptive statistics for variables and data sources

Variables	N	Mean	Mean[15]	Std. dev.	min	max	Sources
ln M_{ijt} (Total)	11 271	14.34	89 853.08	3.64	0	22.98	UN[16] Comtrade database (2023)
ln M_{ijt} (Raw materials)	6 830	12.57	20 561.42	3.76	0	21.83	UN Comtrade database (2023)
ln M_{ijt} (Intermediate goods)	8 943	13.38	28 521.76	3.65	0	21.51	UN Comtrade database (2023)
ln M_{ijt} (Consumer goods)	10 337	13.10	30 859.06	3.62	0	21.98	UN Comtrade database (2023)
ln M_{ijt} (Capital goods)	9 423	12.82	28 924.69	3.67	0	21.99	UN Comtrade database (2023)
ln X_{ijt} (Total)	9 097	13.99	10 1189.4	3.73	0	24.12	UN Comtrade database (2023)
ln X_{ijt} (Raw materials)	6 606	13.43	56 634.68	3.75	0	23.88	UN Comtrade database (2023)
ln X_{ijt} (Intermediate goods)	6 243	12.90	31 254.59	3.78	0	22.28	UN Comtrade database (2023)
ln X_{ijt} (Consumer goods)	7 392	12.49	36 791.04	3.73	0	22.84	UN Comtrade database (2023)
ln X_{ijt} (Capital goods)	5 831	11.52	12 131.18	3.48	0	21.06	UN Comtrade database (2023)
ln $MigStock_{ijt}$	9 057	6.01	6 643.78	2.74	0	14.31	UN Int. Migrant Stock (2020)
PR_{it}	16 176	0.66	0.66	0.22	0.09	0.94	Built by the authors
KD_{ijt}	16 176	0.99	0.99	0.007	0.91	1	Built by the authors
ln GDP_{jt}	16 176	22.86	32 759 489	1.62	19.12	26.89	CEPII[17] (2023)
ln GDP_{it}	16 056	24.82	5.26e+08	2.24	18.72	30.67	CEPII (2023)
ln pop_{it}	16 176	9.26	21 558.17	1.31	5.99	12.24	CEPII (2023)
ln pop_{jt}	16 176	9.29	29 093.94	1.53	5.59	12.71	CEPII (2023)
ln $dist_{ij}$	16 176	8.39	5 315.91	0.69	4.69	9.80	CEPII (2023)
FC_{ij}	16 176	/	/	/	/	/	CEPII (2023)
CC_{ij}	16 176	/	/	/	/	/	CEPII (2023)
COL_{ij}	16 176	/	/	/	/	/	CEPII (2023)
LC_{ij}	16 176	/	/	/	/	/	CEPII (2023)
RM_{ijt}	16 176	0.00017	0.00017	0.00047	2.3e-07	0.022	Built by the authors

[15] Means of non-log-transformed variables, in thousands of US dollars for nominal variables.
[16] UN: United Nations.
[17] CEPII: Centre d'Études Prospectives et d'Informations Internationales.

Table 7: Correlation matrix

Variables	(0)	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
(0) *ln X_{ijt} (Total)*	1.000														
(1) *ln M_{ijt} (Total)*		1.000													
(2) *ln $MigStock_{ijt}$*	0.496*	0.544*	1.000												
(3) *PR_{it}*	0.158*		0.161*	1.000											
(4) *KD_{jt}*		0.257*	-0.460*	-0.079*	1.000										
(5) *ln PIB_{jt}*	0.412*	0.386*	0.250*	0.250*	-0.195*	1.000									
(6) *ln PIB_{it}*	0.324*	0.531*	0.168*	0.017*	0.015	0.087*	1.000								
(7) *ln pop_{it}*	0.283*	0.296*	0.234*	0.278*	-0.183*	0.778*	0.033*	1.000							
(8) *ln pop_{jt}*	0.261*	0.331*	0.276*	0.005	0.000	0.032*	0.650*	0.008	1.000						
(9) *ln $dist_{ij}$*	-0.162*	-0.108*	-0.388*	-0.051*	0.334*	-0.040*	0.392*	-0.036*	0.110*	1.000					
(10) *FC_{ij}*	0.171*	0.134*	0.351*	-0.009	-0.442*	0.038*	-0.142*	0.035*	0.014	-0.492*	1.000				
(11) *CC_{ij}*	-0.038*	-0.058*	0.172*	0.022*	-0.061*	-0.009	-0.292*	0.008	-0.124*	-0.282*	0.193*	1.000			
(12) *COL_{ij}*	0.153*	0.172*	0.259*	-0.006	-0.071*	-0.007	0.160*	-0.010	0.108*	0.006	0.009	-0.049*	1.000		
(13) *LC_{ij}*	0.098*	0.060*	0.398*	0.006	-0.135*	0.038*	-0.126*	0.048*	0.034*	-0.225*	0.196*	0.510*	0.203*	1.000	
(14) *RM_{ijt}*	-0.348*	-0.380*	-0.172*	-0.103*	0.069*	-0.270*	-0.455*	-0.208*	-0.264*	0.054*	-0.051*	0.048*	-0.042*	-0.006	1.00

*** p<0.01, ** p<0.05, * p<0.1*

Figure 4: Mean scatterplot between African imports, migrant stock and the variable capturing the diffusion of migrant knowledge

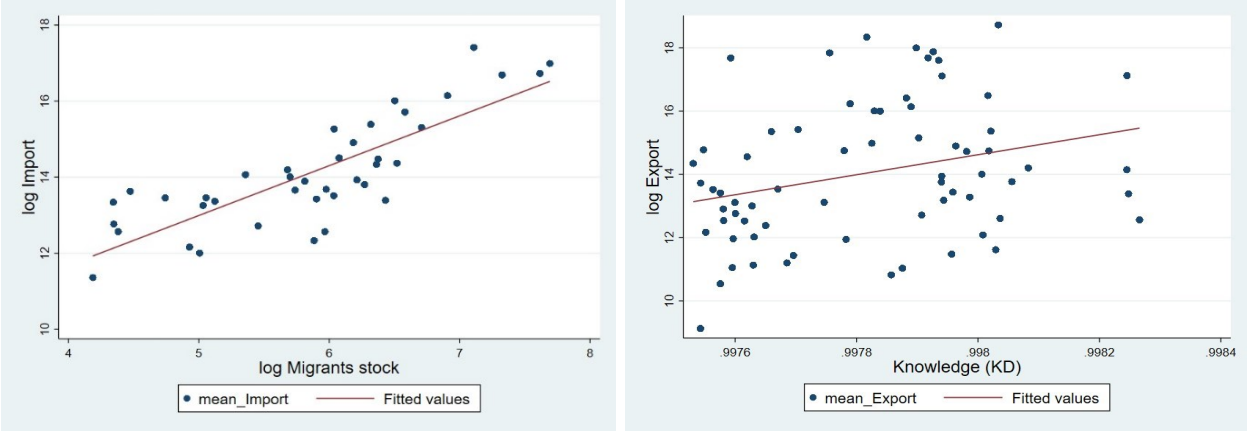


Figure 5: Mean scatterplot between African exports, migrant stock and the variable capturing migrant preference

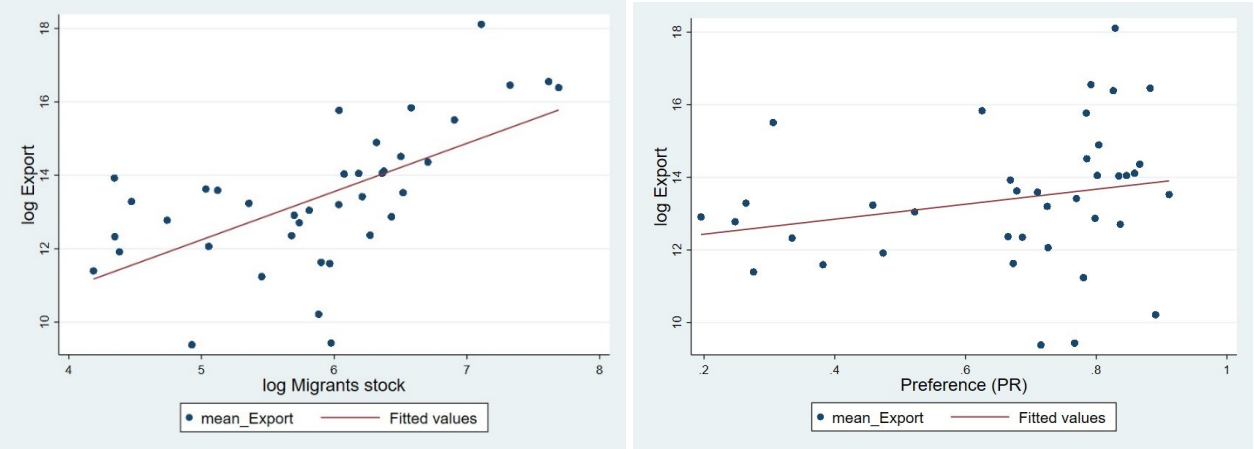


Table 8: Robustness of the diaspora effects on African trade by specific goods (ZINB)

VARIABLES	Raw materials		Intermediate goods		Consumer goods		Capital goods	
	Export	Import	Export	Import	Export	Import	Export	Import
$ln\_MigStock_{ijt}$	0.019***	0.031***	0.020***	0.025***	0.022***	0.030***	0.025***	0.025***
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
PR_{it}	0.157*		0.184*		0.275***		0.141	
	(0.083)		(0.101)		(0.094)		(0.111)	
KD_{ijt}		1.080**		0.950**		1.351***		0.771
		(0.530)		(0.482)		(0.470)		(0.497)
ln_PIB_{it}	0.033*	0.014	0.052***	0.027*	0.051***	0.034**	0.026	0.024
	(0.018)	(0.018)	(0.020)	(0.015)	(0.019)	(0.014)	(0.022)	(0.015)
ln_PIB_{jt}	0.014	0.005	0.024	0.009	0.020	0.030*	0.026	0.049***
	(0.021)	(0.021)	(0.022)	(0.018)	(0.021)	(0.018)	(0.025)	(0.019)
ln_pop_{it}	-0.054	0.072	-0.108	0.060	0.061	-0.028	0.039	0.075
	(0.077)	(0.073)	(0.084)	(0.062)	(0.080)	(0.059)	(0.095)	(0.062)
ln_pop_{jt}	0.123***	-0.030	0.053	0.040	0.016	0.015	0.015	-0.008
	(0.047)	(0.050)	(0.050)	(0.041)	(0.046)	(0.040)	(0.056)	(0.044)
ln_dist_{ij}	-0.082***	-0.066***	-0.084***	-0.082***	-0.106***	-0.099***	-0.083***	-0.084***
	(0.010)	(0.010)	(0.011)	(0.009)	(0.010)	(0.009)	(0.011)	(0.010)
RM_{ijt}	38.010	24.706	-49.598	-87.754	-135.909*	-78.836	-219.353*	-161.313**
	(88.334)	(88.384)	(95.458)	(72.054)	(74.528)	(56.001)	(116.158)	(66.952)
Log(α)_cons	-251.04***	-111.27***	-17.92	-92.29***	-17.97	-19.84	-26.94	-62.115**
	(38.367)	(37.67)	(40.381)	(31.359)	(0.000)	(29.549)	(40.923)	(30.229)
Constant	1.129	0.840	1.481*	0.081	0.546	0.247	1.193	-0.235
	(0.818)	(0.972)	(0.870)	(0.853)	(0.803)	(0.822)	(0.941)	(0.866)
Observations	4,831	4,991	4,488	6,128	5,019	6,632	4,223	6,359
Effets i, j and t	oui	oui	oui	oui	oui	oui	oui	oui
LR chi2	2312	2542	2443	3316	3442	3598	2615	3762
Prob > F	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

Robust standard errors in parentheses
**** p<0.01, ** p<0.05, * p<0.1*

Table 9: Robustness of the diaspora effect on African trade by specific goods (OLS)

VARIABLES	Raw materials		Intermediate goods		Consumer goods		Capital goods	
	Export	Import	Export	Import	Export	Import	Export	Import
$ln\_MigStock_{ijt}$	0.280***	0.402***	0.266***	0.347***	0.263***	0.410***	0.274***	0.350***
	(0.028)	(0.030)	(0.029)	(0.022)	(0.023)	(0.018)	(0.025)	(0.018)
PR_{it}	2.232***		1.914**		3.128***		1.354*	
	(0.797)		(0.920)		(0.726)		(0.813)	
KD_{ijt}		12.006**		11.14***		17.69***		11.66***
		(5.044)		(3.827)		(3.277)		(3.292)
ln_PIB_{it}	0.519***	0.227	0.625***	0.433***	0.727***	0.531***	0.301*	0.446***
	(0.180)	(0.159)	(0.182)	(0.113)	(0.153)	(0.096)	(0.168)	(0.096)
ln_PIB_{jt}	0.252	0.099	0.423**	0.211	0.430**	0.399***	0.430**	0.639***
	(0.205)	(0.193)	(0.209)	(0.136)	(0.170)	(0.115)	(0.193)	(0.116)
ln_pop_{it}	-0.723	0.615	-1.359*	0.660	0.219	-0.615	-0.142	0.624
	(0.762)	(0.662)	(0.787)	(0.466)	(0.643)	(0.393)	(0.713)	(0.396)
ln_pop_{jt}	1.708***	-0.233	0.731	0.675**	0.331	0.306	0.305	-0.217
	(0.457)	(0.465)	(0.471)	(0.309)	(0.384)	(0.259)	(0.433)	(0.271)
ln_dist_{ij}	-1.25***	-0.96***	-1.31***	-1.34***	-1.66***	-1.57***	-1.21***	-1.282***
	(0.104)	(0.096)	(0.104)	(0.073)	(0.085)	(0.062)	(0.091)	(0.062)
RM_{ijt}	2,653.8***	2,311.3***	1,510.15*	1,809.4***	375.101	1,215.0***	-37.682	1,011.89***
	(773.004)	(735.496)	(796.622)	(467.962)	(535.587)	(321.279)	(752.996)	(358.522)
Constant	-9.472	-7.286	-1.295	-20.69***	-11.385*	-16.23***	0.991	-22.53***
	(8.096)	(9.007)	(8.321)	(6.563)	(6.678)	(5.561)	(7.242)	(5.590)
Observations	4,831	4,991	4,488	6,128	5,019	6,632	4,223	6,359
Effets i, j et t	oui	oui	oui	oui	oui	oui	oui	oui
R-squared	0.50	0.52	0.53	0.66	0.65	0.71	0.61	0.73
Root MSE	2.64	2.54	2.61	2.02	2.28	1.78	2.21	1.74
Prob > F	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

Robust standard errors in parentheses
**** p<0.01, ** p<0.05, * p<0.1*

Table 10: List of trading partners

African countries (40)	***Partner countries (68)***
Angola, Burundi, Benin, Burkina Faso, Botswana, Central African Republic, Cote d'Ivoire, Cameroon, Congo Rep., Comoros, Cape Verde, Algeria, Egypt, Arab Rep., Ethiopia, Gabon, Ghana, Guinea, Gambia, Guinea-Bissau, Kenya, Morocco, Madagascar, Mali, Mozambique, Mauritania, Malawi, Namibia, Niger, Nigeria, Rwanda, Senegal, Sierra Leone, Chad, Togo, Tunisia, Tanzania, Uganda, South Africa, Zambia, Zimbabwe	Angola, United Arab Emirates, Argentina, Australia, Austria, Belgium, Bulgaria, Bahrain, Botswana, Canada, Switzerland, Cote d'Ivoire, Cameroon, Congo Rep., Cape Verde, Costa Rica, Cyprus, Czech Republic, Germany, Denmark, Egypt, Spain, Estonia, Finland, France, Gabon, United Kingdom, Ghana, Greece, Hungary, Iceland, Italy, Jordan, Kenya, Kuwait, Liberia, Libya, Lesotho, Morocco, Mexico, Mali, Malta, Mozambique, Mauritania, Namibia, Niger, Nigeria, Netherlands, Norway, Philippines, Poland, Portugal, Qatar, Russian Federation, Senegal, Sierra Leone, Slovak Republic, Sweden, Eswatini, Togo, Tunisia, Turkey, Tanzania, Uganda, United States, Venezuela, South Africa, Zambia

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