Investment Climate, Foreign Networks and Exporting – Evidence from Africa

Vlad Manole and Mariana Spatareanu

Abstract:

This paper investigates the impact of investment climate variables and foreign networks on exporting decisions of African firms. We use data from the World Bank Investment Climate Survey for over 7000 firms in 24 Sub-Saharan African countries. The results highlight the crucial role of the access to and the quality of investment climate characteristics – infrastructure, external finance and telecommunications for Sub-Saharan African firms' exporting propensities. Our results show that improving the investment climate to the level of best performers in the sample will considerably increase the propensity of domestic firms to export. The paper also finds that foreign networks have a significantly positive impact on firms' export propensities.

JEL Codes: L8, F2, D24

Keywords: exporting, investment climate, foreign networks, Africa

I.   Introduction

There has been a significant move towards trade liberalization in Africa, however, Africa's share of world trade has decreased over the past decades from a low 3.4 percent in 1980 to an even lower 0.6 percent in 2007 (Fofack (2009)). One possible cause is that trade liberalization has not been accompanied by an improvement in various areas of investment climate, which may negatively affect the propensity of African firms to export, thus preventing African economies from getting the benefits of more integration with world markets and higher growth. As Iwanow and Kirkpatrick (2009) show, liberalizing trade is not sufficient to achieve high export performance, especially in the case of African countries. One of the main factors behind the low trade performance of Sub-Saharan African countries is inefficient trade facilitation (Limao and Venables (2001)).

This paper investigates the impact of investment climate variables and foreign networks on African firms' export propensities. Both factors have been identified, particularly in developing countries' context, as significant determinants of exporting.[1] We conjecture that they would be even more important in the context of African firms. Investment climate captures the institutional and regulatory environment in which firms operate and which impact their ability to export. A favorable business environment decreases the costs of exporting and leads to higher participation in foreign markets (Dollar et al. (2006)). We argue that better investment climate, like better access to and a higher quality of physical infrastructure, external finance, and telecommunications directly

impact the ability to move goods in and out of the country, to bear the costs associated with selling in foreign markets, and to communicate with foreign clients, thus leading to more exporting.

In addition to investment climate, we also investigate the role of foreign networks in promoting exporting. Rauch and Trinidade (2002) argue that business and social networks may attenuate informational problems associated with international trade. Foreign networks may play an important role in decreasing the information costs associated with selling in foreign markets as success in foreign markets requires detailed information about consumer preferences, market structure, regulations, distribution channels, and other market characteristics. The higher these costs the less likely will firms find it profitable to export. However, information costs decrease in the presence of foreign networks, as knowledge about foreign market conditions may increase with such networks. We capture foreign networks by the foreign ownership in a firm, the direct import of intermediate inputs, and the information externalities associated with the existence of other exporters in the same sector.

Our paper adds to the literature in several ways: first, it focuses exclusively on Africa, a continent whose share in world trade has gone down in the last decades despite efforts to liberalize trade and increase integration with world markets. Therefore, it is crucial to carefully investigate and understand what constraints African exports. Second, it improves upon exiting studies by highlighting both the importance of investment climate and foreign networks for African firms' exporting propensities. Finally, we also account

for endogeneity in estimation, which has been overlooked by previous studies.[2] Endogeneity in estimation is a particularly important issue when using Investment Climate Surveys. Failing to correct for it may significantly bias the results.

We use a comprehensive firm level investment climate survey data from the World Bank to find a strong relation between investment climate variables, foreign networks and firms' export propensities. We find that the access to and the reliability of electric power provision, external finance, and telecommunications have a significant effect on African firms' export status. The results are robust to controlling for country and sector specific effects, for various other potential determinants of exporting, and also to accounting for endogeneity in estimation. The estimated coefficients are economically meaningful. We calculated that if Angola improves the quality of investment climate to the level of South Africa (the best performer in the sample) the probability of exporting for firms from Angola increases more than three times. Similarly, if Gabon improves the quality of its financial sector to the level of Botswana (the best in the sample) the probability of exporting of Gabon's firms increases by close to 45 percent. The above results emphasize the relevance of these behind-the-border constraints for fostering the international integration of African firms.

Our results have important policy implications: we find that policies aimed at upgrading physical infrastructure, access to financial services, and telecommunications at least to the level of the best performers in the region will greatly increase the number of exporters in African countries, possibly enhancing productivity and stimulating economic growth. Active policies to inform potential exporters about possible exports markets and

governmental help for domestic firms that open new export markets will also reduce the costs associated with exporting and increase the number of new exporters.

The paper proceeds as follows: the next section discusses the related literature. Section III presents the theoretical model and the empirical strategy. Section IV describes the data. Section V presents the main results and the robustness checks. Section VI concludes.

II.   Literature review

There are two strings of literature to which our paper is related. The first one investigates the importance of investment climate characteristics for the internationalization of firms through exporting and FDI. Our paper builds on previous studies by Dollar et al. (2006), Kinda (2010, 2013), Freund and Rocha (2011) which focused on various aspects of the behind the border constraints. Dollar et al. (2006) use firm level data from 8 developing countries (none of them from Africa) to analyse the relationship between investment climate and international integration. They proxy investment climate by the number of days to clear customs, losses from power outages, inefficient government services and access to overdraft and find that a sound investment climate helps domestic firms export and attracts FDI. Freund and Rocha (2011) investigate the effects of transit documentation and ports and customs delays on Africa's exports. They highlight the significant impact of transportation and geography on exporting, their results showing that a one-day reduction in inland travel times leads to a 7 percent increase in exports. Similarly, Kinda (2010, 2013) and Nnadozie (2013) investigate the role of investment climate characteristics in attracting FDI. While Kinda (2010) uses data from 77

developing countries, Kinda (2013) and Nnadozie (2013) focus on African countries only. They both find that better investment climate, proxied by the access to physical and financial infrastructure, telecommunication and informal finance attracts more FDI. The development of internet and the growth of international trade in the last twenty years suggest the possibility of a causal link between the two, a topic pursued by a number of researchers. Using country-level data, Freund and Weinhold (2002) find that higher use of internet positively impacts the growth of services export to US. In a more recent paper, Choi (2010) analyses the impact of the use of internet for trade in services for 151 countries and finds that a 10% increase in Internet users per hundred people increases the export of services by almost half of percent. Similarly, Freund and Weinhold (2004) conclude that the use of internet increases by 1 percent the annual export growth for the average country in their sample. Clarke and Wallsten (2006) analyse the impact of internet for developing and developed countries and find that higher use of internet stimulates exports from developing countries to developed economies, but there is no impacts on export from developed countries or export toward developing economies. Using firm-level data, Timmis (2013) uses a new instrumental variable approach to show that access to internet helps firms from developing countries to switch from using intermediaries to export to direct export. Using similar data, Ricci and Trionfetti (2012) find that firm's probability to export is positively impacted by firm's use of email or web site and also if the firm belongs to foreign networks (financial linkages, joint ventures, foreign ownership).

Our paper also adds to the previous literature which stressed the importance of

information about foreign markets for firms' exports. Sjoholm (2003) identifies the cost of obtaining information about foreign markets as one of the main components of the sunk cost associated with the exporting. Using Indonesian data he finds that imports and foreign ownership, which decrease the information costs associated with selling in foreign markets, have a positive effect on the firm's probability to export. Bas and Strauss-Kahn (2011) find empirical arguments for a secondary channel through which imports may promote exports: firms that import have access to more varieties of intermediate goods, which result in higher productivity for importers. The rise in productivity may increase the probability of exporting for these firms. Directly importing intermediate inputs may also reduce the cost of information, foster learning opportunities about foreign markets conditions and facilitate exporting (see Cadot et al. (2011)). Similarly, Portes and Rey (2005) analyse bilateral gross cross-border equity flows between 14 countries and highlight the key role of informational asymmetries for international transactions. Aitken et al. (1997) using data from Mexico find that the probability of exporting by domestic firms is higher, the more export oriented foreign firms operate in the same industry and region as domestic companies. Kokko et al. (2001) find for Uruguay that the presence of foreign firms positively affects the probability of exporting for domestic firms, as they decrease the information costs related to foreign markets

Our paper builds on the previous two strands of literature by investigating both the role of investment climate as well as access to information for African firms' exporting propensities. We believe that both matter in the context of Africa, where surveys show

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that investment climate characteristics are among the most significant impediments to firms' activities, and where the cost of obtaining information about foreign markets are high.

III. Theoretical model and empirical strategy

We use the framework proposed by Melitz (2003) as the theoretical framework behind the reduced form exporting probit model that we estimate in the paper.

Following Dollar et al. (2006) we assume that profits from exporting for a firm i, $\pi_{X\,i}(\theta_i, \tau, f_X)$, can be approximated by the following linear specification :

$$h(\theta_i, \tau, f_X, \varepsilon_i) = a\,\theta_i + b\,\tau + c\,f_X + \varepsilon_i \qquad (1)$$

where θ_i is a productivity indicator, f_x is the sunk cost associated with exporting and τ is the variable cost supported by the exporting firm where ε_i is an iid standard normal random error.

The export status of a firm i is given by the variable $Export_i$, which equals 1 if the profit $\pi_{x,i}$ associated with exporting is positive and 0 otherwise. Therefore, we can write:

$$Export_i = \begin{cases} 1 & if \quad \pi_{x,i}(\theta_i, \tau, f_x) > 0 \\ 0 & otherwise \end{cases} \qquad (2)$$

Based on the above we thus derive the reduced form probit model we propose to estimate. In our model, the firm's export propensity depends on: i) the sunk costs associated with entering the foreign market, ii) the specific costs associated with exporting, and iii) firm's productivity that may (or may not) allow the firm to bear these costs. A large part of sunk costs are informational costs, as African firms search for the

right foreign market to enter and for the right products to export. Foreign connections like foreign ownership in a firm, importing inputs directly from foreign firms or domestic models of successful exporters may significantly reduce these costs, thus promoting export. Therefore sunk costs will be proxied by foreign networks or connections as explained above. In addition to sunk costs, the firm may have to cover variable costs associated with exporting, like transportation costs or the costs associated with producing higher quality products on a tighter schedule, as required by a more demanding external market. As in Dollar et al. (2006) we use in our probit estimations investment climate variables and producers' characteristics as determinants of productivity and specific trade costs. In addition, the characteristics of the firm, of the economy and of the industry may impact the level of the productivity of the firm and thus its capacity to export, which we control for by using country and industry dummies.

Based on the theoretical framework described above, the empirical equation to be estimated can be written as:

$$Exporter_{ijk} = 1 \qquad if\ Exporter^*_{ijk} > 0 \qquad\qquad (3)$$
$$= 0 \qquad otherwise$$

where

$$Exporter^*_{ijk} = \alpha + \beta_1\ Firm\ characteristics_i\ + \beta_2\ Investment\ Climate_i\ + \beta_3\ Foreign$$
$$Networks + v_j + v_k + \varepsilon_{ijk} \qquad\qquad (4)$$

where $Exporter_{ijk}$ is a dummy variable taking the value 1 if firm i in country j in sector k exports a positive amount. $Firm\ characteristics_i$ include the age and the size of the firm. Age is determined as the difference between the year of the survey and the year when the

firm was created. The *size* of the firm is captured by dummy variables: Size_Medium is a dummy variable taking the value 1 for medium firms (with between 20 and 99 employees) and 0 otherwise, while Size_Large takes the value 1 for large firms (more than 100 employees) and zero otherwise. The base dummy variable captures small firms.

The *Investment climate$_i$* used in regressions includes proxies for *physical* and *financial infrastructure* as well as for *access to telecommunication*. We use two proxies for physical infrastructure: i) one capturing the efficiency of the transportation and the distribution system, measured here by the *number of days of inventories*, larger inventories corresponding to less efficient transportation and distribution systems; ii) the second one capturing the access to and the quality of the electric power grid, was calculated as the *share of sales lost due to power outages* in a given year.[3] Access to finance (as a measure of the quality of financial infrastructure) is captured by the *proportion of working capital financed from outside sources*: private commercial banks, state-owned banks and/or government agency, or non-bank financial institutions.[4] The access to telecommunications is captured by the *use of email and the availability of a website*[5].

We use three proxies for *Foreign networks*. The *foreign ownership* in the firm is captured by FDI, a dummy variable that takes the value 1 if the foreign ownership share is greater than 10 percent. *Import_intermediates* is defined as a dummy variable taking the value 1 if the firm directly imports intermediate inputs, zero otherwise. We also account for the presence of other exporters in the industry, as it may induce further exporting through knowledge spillover effects. The *exporting spillovers* variable is defined as the share of exporting firms in a sector. It is meant to capture learning about opportunities abroad and

about the characteristics of foreign markets coming from exporters operating in the same industries.[6]

Finally, country dummies control for country specific characteristics, including trade and other economic policies, political and macro stability of the country, the quality of its legal system, and the cost of labor and the availability of skills. Industry dummies account for industry specific characteristics that are common to all countries. Standard errors of the regressions are robust.

Although we employed objective measures of investment climate variables,[7] concerns about possible endogeneity in estimation still remain. It is possible that more successful and efficient firms are more likely to become exporters, but they are also more likely to have an easier time getting bank loans, insuring electricity services, or getting access to phone or emails. It may also be the case that exporters self-select to locations with better investment climate. Or, that a higher regional concentration of exporters could lead to improvements in investment climate through lobbying government agencies. In order to correct for possible endogeneity and reverse causation in estimation we use an instrumental variable technique. We use as instruments the region averages of each endogenous variable[8].

IV. Data description

World Bank Investment Climate Surveys represent a comprehensive effort to survey the investment climate in developing countries. The project is particularly important for a

comparative analysis of African economies, as there is a lack of reliable data for this continent. These standardized surveys were undertaken between 2006 and 2009 and cover large, representative samples of firms in manufacturing and services sectors across countries. In this paper we use World Bank's investment climate surveys for 24 African countries. The Surveys are all based on very similar questionnaires and sample designs.

The surveys request information on firm characteristics like the age and the size of the firm, the ownership structure, etc. They also ask questions concerning the access to and the effect of infrastructure and services on the activity of the enterprise.

Out of the 48 countries in sub-Saharan Africa[9], the World Bank Investment Climate Surveys gathered data on 35 countries. Due to missing values for important variables, we restricted our analysis to 24 countries, presented in Table 1. The surveyed countries that are not considered in our analysis are: Benin, Burundi, Chad, DRC, Guinea-Bissau, Lesotho, Liberia, Niger, Rwanda and Togo. However, these are relatively small economies[10] - all World Bank surveyed countries cover 65 percent of total exports of goods and services from sub-Saharan Africa versus 64 percent for the countries in our estimation sample. Alternatively, using the GDP measure, the World Bank surveyed countries represent 72 percent of the GDP of sub-Saharan Africa, relative to 67 percent covered by the countries in our sample[11]. Large countries that are not covered by the World Bank survey and implicitly are missing from our analysis are Nigeria, Sudan, Ethiopia and Kenya. While the first two countries are major oil exporters, Ethiopia and Kenya would have been an interesting addition to our study due to the more diversified structure of their exports.

- Table 1 here

Table 1 shows the distribution of surveyed firms by exporting categories and countries. The sample shows significant variation in the share of exporting firms in the total number of surveyed firms, ranging from 24 percent in South Africa and 16 percent in Madagascar to 1 percent in Angola and 2 percent in Sierra Leone. The structure of the economy and international trade environment significantly influence the number of firms that export. A more complex economy, like South Africa has a larger numbers of exporting firms covering more sectors. With exporting firms in 11 industrial sectors, South Africa has the most diverse exports in Sub-Saharan region. Alternatively, countries with a strong natural resources sector, like Angola, have few exporting firms that are large, foreign owned or controlled by the government. Industries like textiles and garments are less concentrated, with a relatively large number of exporters (for ex. Madagascar). As a less developed country Madagascar had favoured access[12] to US and EU markets for its textile and garment exports; as a result, 45 percent of its exporting firms are in these two sectors – the highest percent among countries in our sample.[13] Swaziland is in a similar situation, benefiting from AGOA, thus 40 percent of its exporters are in textiles and garments.

- Table 2 here

Table 2 above shows the distribution of exporters by industrial sector. The largest number of exporters is in "Other manufacturing" – a rather heterogeneous residual sector that collects 165 exporters. It is followed, as expected, by "Food", with 114 exporters, "Retail

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and wholesale trade" with 90 exporters and "Garments" with 74 exporters. The industrial sectors with the largest share of exporting firms are "Electronics", with 40 percent, "Leather" with 38 percent and "Textiles", with 31 percent. While "Electronics" are highly concentrated in South Africa, the "Textile" sector is more widely distributed, even though 32 percent of textile producers are in Madagascar and Mauritius; the "Leather" sector, with a small number of firms, seems to be mostly a niche specialization for Eritrea.

The World Bank Investment Climate Surveys identify the most severe obstacle for firms' activities as perceived by the firms themselves. In Table 3 below we order these obstacles starting with the most severe from the exporters' point of view. Interestingly, there is a relative similarity between the answers of exporters and non-exporters. By far the largest impediment to firms' activity is the access to the electrical power grid and the existence of power outages – as 25 percent of firms testify. The second most severe obstacle to firms' activity is access to finance, identified by 12 percent of exporters and 19 percent of non-exporters. This difference may very well be due to the different distribution of firms' size between exporters and non-exporters. Practices of competitors in the informal sector are identified as the most significant obstacle by almost the same proportion of exporting and non-exporting firms, around 9 percent. The inadequately educated workforce is perceived as the most severe obstacle by 8 percent of the exporting firms versus just 3 percent of non-exporting firms, being the second major difference between these two categories of firms. The information presented in Table 3, together with suggestions from the relevant literature motivate us to select the variables that impact firms' export propensities.

- Table 3 here

Table 4 presents the summary statistics for the variables we subsequently use in the econometric specifications. They include firm characteristics as well as variables illustrating the environment faced by the firm: infrastructure, finance and telecommunications. We also include proxies for foreign networks. Table 4 shows that exporters are older, larger and more likely to be foreign owned. They also are more likely to have access to external financing, use email, and have a website.

- Table 4 here

V.   Discussion of Results

We therefore estimate instrumental variables probit regressions to analyse the impact of investment climate variables and foreign networks on firms' exporting propensities. We start by presenting the first set of results estimated on a sample of both domestic and foreign firms operating in African countries.[14] In each regression we control for various firm characteristics, like the age and the size of the firm and account for the presence of foreign networks using an FDI dummy, an importing intermediates dummy and a variable which controls for exporters spillovers. We introduce one by one the investment climate variables – losses from power outages, access to outside loans, access to email and web, and the number of days of input inventories. The results are presented in Table 5. We present both the first stage results (where the endogeneous investment climate

variables are instrumented by region averages of each endogenous variable) and the second stage results. [15]

- Table 5 here

The coefficients of firms' characteristics variables have the expected sign and are statistically significant. We find that older and larger African firms are more likely to become exporters.

The coefficients of foreign networks proxies are also highly statistically significant. We find that firms with foreign capital are more likely to export. There are also significant sectoral externalities, as the presence of exporters in an industry encourages other firms from the same industry to export. The coefficient of the share of exporters in the industry is positive and highly statistically significant in all regressions. Not surprisingly, importing intermediate inputs is also positively correlated with the propensity to export - the coefficient is positive and statistically significant at 1 percent in all regressions. Importing intermediates reduces the cost of information about foreign markets opportunities, fosters learning and facilitates exporting.

The coefficients of the investment climate variables are also statistically significant. The quality of physical infrastructure has a statistically significant impact on exporting - exporting is more likely when the share of sales lost due to power outages is low. Access to financing is important, its coefficient is positive and statistically significant, which confirms our hypothesis that access to external loans facilitates exporting. Similarly

telecommunications services, measured by access to email and web, are positively correlated with the propensity to export, comparable with the results presented by Ricci and Trionfetti (2012). Also, a higher number of days of inventories in intermediate inputs, capturing inefficiencies in the transportation and distribution systems, statistically negatively affect exporting.

The investment climate variables have so far been introduced in the regression one by one. However, if all of them matter the regressions suffer from omitted variables bias. One the other hand, if we include all of them in the regression, we may introduce multicollinearity in estimation. Therefore we follow previous studies and use the principal component analysis[16] to calculate a condensed variable called "Composite index", which includes all investment climate variables at the same time. The last column of Table 5 presents the results after including the Composite index variable. The previous results carry through - we find that a better overall investment climate increases the propensity of firms to become exporters. This finding highlights the importance of access to credit, to telecommunications and to good quality, reliable infrastructure for exporting. We find that firms' participation in export markets is constrained by the difficulty of accessing good quality, reliable services at home.

Subsequently, we restrict our sample to manufacturing firms only, as this sector is often viewed as key to generating broad based economic growth, increased employment and improvements in standards of living. Exporting may benefit African manufacturing firms through higher economies of scale and by allowing access to foreign, superior

technologies. Manufacturing industries use intensively investment climate services, therefore a good investment climate in Africa would significantly decrease transaction costs and improve manufacturing sector's ability to export. We therefore re-estimate our regressions and focus on manufacturing firms only. The results are presented in Table 6.

- Table 6 here

We again find that firms' characteristics and foreign networks statistically significantly affect African firms' export propensities. We also find that after accounting for several other exporting determinants, investment climate variables significantly impact firms' export propensities, confirming our previous hypothesis. The only exception is the coefficient of losses from electric power outages which becomes only marginally significant. The coefficients of all other variables are statistically significant and have the expected sign.

Next, we restrict our attention to domestic firms only and analyse the importance of investment climate variables for the propensity of exporting of African firms in manufacturing sector. Focusing in domestic firms only is important as foreign firms may be affected less by the investment climate variables. In many cases, they do not need to rely on local services provisions. For example, foreign subsidiaries may be less in need of local finances as they could instead tap into their parents' financial resources. Or foreign firms may have an easier time getting access to email or have better knowledge of and expertise in creating web pages. The results, presented in Table 7 highlight again the importance of investment climate variables in stimulating domestic firms' exporting.

Investment climate is especially important in the context of Africa, where firms often have difficulties accessing reliable, good quality services. The coefficients of all variables of interest are statistically significant and have the expected signs.

- Table 7 here

VI.   Robustness checks

As a robustness check, we also account for other firm level characteristics that may impact firms' ability to export. Having an ISO certification may increase firms' propensity to export, as foreign clients may be more likely to import from firms that possess international quality certifications, as Martincus et al. (2010) found for Argentina.   Also, manager's years of experience may make it more likely for firm to export. We therefore re-estimate the instrumental probit regressions adding these new variables (focusing on domestic manufacturing firms only). The results, presented in Table 8 below show that the coefficients of the investment climate variables have the expected signs and are again statistically significant. All our other previous results carry through. We also find that having ISO certifications significantly enhance the propensity of African firms to export, while the coefficient of manager's experience is only marginally significant.

- Table 8 here

As another robustness check we control for the availability of skilled labour in the industry, which may also positively impact firms' ability to export. Inadequately educated labour force was ranked by surveyed firms as the 4th most important obstacle to firms' activities, behind only access to electricity, access to finance and practices of firms in the informal sector (see Table 3). We calculate averages by country and sector of skilled labour availability, using data from the Investment climate surveys. The results, presented in Table 9 below show that the easier it is to hire skilled labour, the more likely are domestic firms to export. All the coefficients of the other variables have the expected sign and significance levels.

- Table 9 here

Finally, to make sure that our results are not driven by South Africa we re-estimate our regressions after dropping South African firms. The results, not presented here to save space, are robust and confirm our previous findings. We also drop Angola as its overwhelming exports are in natural resource sectors. The results support our previous findings.

To have a better understanding of the magnitude of our results, we perform several counterfactual experiments. We rank countries based on the quality of several investment climate variables. We perform a thought experiment by assigning to lower ranking countries the values of the investment climate variables of the top performers. We subsequently calculate the probability of exporting generated by this improvement in investment climate. In most of our rankings we find that South Africa, Mauritius and

Botswana have the best performance. Using the composite indicator of investment climate, we find that an improvement of the investment climate of Angola to the level of South Africa will increase the probability of export of firms from Angola more than three times. Comparing small economies of insular countries, we find that an improvement of investment climate in Cape Verde to the level of Mauritius will increase the export probability of Cape Verde firms by 40 percent. Focusing on specific types of infrastructure, we find that an improvement of the electric power system in Guinea at the level of South Africa will increase the probability to export of Guinean firms by 70 percent, all else being equal. An improvement of the financial sector performance in Gabon at the level of Botswana will increase the probability of export of the Gabon's firms by close to 45 percent.

Conclusions

Participating in global markets is crucial for the economic growth and development of African firms. We apply instrumental variables probit analysis to a large sample of firms from Sub Saharan Africa to identify the factors that influence firms' exporting. In particular, we focus on the effect of investment climate and foreign networks on African firms' exporting propensities.

We find that investment climate, which captures the institutional and regulatory environment in which firms operate, acts as trade barrier, and significantly affect firms' propensities to sell in international markets. Our results highlight the importance of access to credit, telecommunications and good quality infrastructure for exporting. We find that, after accounting for other possible determinants of exporting, African

producers' participation in export markets is severely constrained by the difficulty of accessing good quality, reliable services at home. Besides trade liberalization, African countries must insure that their firms have access to good quality physical infrastructure, telecommunications and financial services, which would significantly improve their exports.

We also find that foreign networks considerably decrease the informational costs associated with selling in foreign markets, and consequently promote exporting. Our results show that firms with foreign capital are more likely to export. There are also significant sectoral externalities, as the presence of exporters in an industry encourages other firms in the same industry to export. Importing intermediate inputs reduces the cost of information about foreign markets opportunities, fosters learning and facilitates exporting.

Our findings have important policy implications. The results highlight the crucial role that investment climate plays in increasing African firms' participation in global markets. We find that policies aimed at upgrading physical infrastructure, financial services, and telecommunications at least to the level of the best performers in the region will greatly increase the number of exporters in African countries, possibly enhancing productivity and stimulating economic growth. Active policies to inform potential exporters about possible exports markets and governmental help[17] for domestic firms that open new export markets will reduce the costs associated with exporting and increase the number of new exporters.

Notes

[1] Dollar et al. (2006), Sjoholm (2003).

[2] Among related papers only Kinda (2010, 2013) accounts for endogeneity in estimation but his papers focus on the impact of investment climate constraints on FDI, not exporting. Kinda (2010) used firm-level data across 77 developing countries, while Kinda (2013) uses data from Africa to show that constraints related to investment climate hamper FDI.

[3] As a robustness check we also account for the availability of electricity generators.

[4] As alternative proxies for financial infrastructure we also considered the availability of overdraft or the use of informal finance as a percentage of working capital. The results, available upon request confirm our findings that financial infrastructure is crucial in determining firms' propensity to export. For a discussion of the impact of access to finance on export, see Manole and Spatareanu (2010).

[5] We use principal component analysis to construct a composite index of these two variables.

[6] Detailed description of variables construction is available in Appendix.

[7] The surveys contain both subjective and objective measures of investment climate variables. In order to minimize the potential endogeneity we focus on responses that objectively measure the investment climate. The subjective measures are based on firms' valuation of how much of a constraint electricity provision, telecommunications and access to finance are for firms' activities. The objective measures come from questions about the share of sales lost due to power outages in previous year, whether firms have access to external finance, whether the firm has access to email or has a website.

[8] Aterido et al. (2009), Honorati and Mengistae (2007) and Kinda (2010) use sector-region averages of endogenous variables. Since data at such level of disaggregation is not available in Africa we use regional averages (for geographic region within a country).

[9] We considered Sub – Saharan Africa that is all Africa except North African countries (Morocco, Algeria, Tunisia, Libya and Egypt).

[10] To be more precise, these economies are small or it is very difficult to obtain relevant data.

[11] These numbers are based on exports and GDP data for 2006, the starting year of some of our surveys (World Development Indicators – online, accessed March 3rd, 2014).

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Table 1. The distribution of surveyed firms (exporting and non-exporting) at country level

Country	Survey's year	Nr. of non-exporting firms	Nr. of exporting firms	Total number of firms
Ghana	2007	317	17	334
Angola	2006	417	6	423
Botswana	2006	312	30	342
Gambia	2006	161	11	172
Guinea	2006	203	17	220
Mauritania	2006	223	14	237
Namibia	2006	292	37	329
Swaziland	2006	264	35	299
Tanzania	2006	379	36	415
Uganda	2006	509	44	553
South Africa	2007	415	129	544
Mozambique	2007	215	21	236
Senegal	2007	313	45	358
Madagascar	2009	371	71	442
Mauritius	2009	285	47	332
Congo	2009	114	8	122
Gabon	2009	150	16	166
Sierra Leone	2009	143	3	146
Ivory Coast	2009	489	25	514
Eritrea	2009	131	11	142
Burkina Faso	2009	354	19	373
Cameroon	2009	321	38	359
Cape Verde	2009	141	5	146
Malawi	2009	131	17	148
Total		6,650	702	7,352

Source: Authors' computations based on World Bank Investment Climate Surveys

Table 2. The distribution of surveyed firms (exporting and non-exporting) at industry level

Industry	Nr. of non-exporting firms	Nr. of exporting firms	Total number of firms
Textiles	58	26	84
Leather	5	3	8
Garments	379	74	453
Food	610	114	724
Metals and machinery	179	60	239
Electronics	18	12	30
Chemicals and pharmac	125	48	173
Wood and furniture	33	1	34
Non-metallic and plas	109	30	139
Other manufacturing	1,246	165	1,411
Retail and wholesale	2,059	90	2,149
Hotels and restaurant	355	4	359
Other services	1,130	55	1,185
Other: Construction,	344	20	364
Total	6,650	702	7,352

Source: Authors' computations based on World Bank Investment Climate Surveys

Table 3. The most severe obstacle for the activity of the company

Obstacles	Non-exporters (%)	Exporters (%)
Electricity	26	25
Access to finance	19	12
Practices of competitors in the informal sector	10	9
Inadequately educated workforce	3	8
Crime, theft and disorder	8	7
Transport	4	7
Customs and trade regulation	3	5
Tax rates	7	5
Corruption	5	5
Political instability	4	4
Tax administration	3	4
Access to land	4	3
Labor regulations	1	3
Business licensing	2	2
Courts	1	1
Total	100	100

Source: Authors' computations based on World Bank Investment Climate Surveys

Table 4. Variables characterizing exporting and non-exporting firms

Variable	Non-exporters		Exporters	
	Mean	Standard deviation	Mean	Standard deviation
Age	13	12.97	21	19.35
Size (employees)	46	405	249	673
FDI	0.18	0.38	0.42	0.49
ISO dummy	0.12	0.33	0.42	0.49
Manager's experience	12.73	9.18	16.80	10.03
Import intermediates dummy	0.12	0.33	0.55	0.50
Telecommunications				
Email	0.45	0.50	0.88	0.33
Website	0.18	0.38	0.48	0.50
Finance				
Overdraft facility	0.30	0.46	0.59	0.49
Loans from financial institutions (% of working capital)	0.09	0.29	0.18	0.38
Informal finance (% of working capital)	0.72	5.09	0.28	2.48
Infrastructure				
Days of inventory for inputs	18.51	23.16	32.09	33.76
Sales lost due to power outages(%)	6.82	10.72	5.68	8.99
Own generators	0.36	0.48	0.50	0.50

Source: Authors' computations based on World Bank Investment Climate Surveys

Table 5. Instrumental Variable Probit Estimate of Exporting Status
All firms, all sectors

First Stage					
Instrument^	1.012***	0.308***	0.706***	0.838***	0.775***
	[0.1100]	[0.0423]	[0.0522]	[0.1356]	[0.0891]
Constant	2.588	1.112	-0.724	3.247	-0.676***
	[2.7410]	[2.0096]	[0.1272]	[7.6787]	[0.1973]
Second Stage					
Age(log)	0.146***	0.135***	0.0884***	0.149***	0.109***
	[0.0349]	[0.0298]	[0.0320]	[0.0326]	[0.0392]
Size Medium	0.369***	0.316***	-0.002	0.335***	0.167
	[0.0737]	[0.0803]	[0.116]	[0.0716]	[0.113]
Size Large	0.879***	0.717***	0.213	0.849***	0.449*
	[0.102]	[0.162]	[0.208]	[0.102]	[0.259]
Exporting spillovers	0.0132***	0.0130***	0.0112***	0.00911***	0.0130***
	[0.0026]	[0.0024]	[0.0024]	[0.0028]	[0.0030]
Direct imports	0.600***	0.479***	0.274**	0.732***	0.453***
	[0.0766]	[0.0956]	[0.108]	[0.0737]	[0.120]
FDI	0.402***	0.380***	0.140	0.298***	0.317***
	[0.070]	[0.061]	[0.092]	[0.071]	[0.092]
Losses from power outages	-0.0234*				
	[0.0137]				
Outside loans		0.0359*			
		[0.0188]			
Access to email & web			0.651***		
			[0.134]		
Inventories of inputs(nr days)				-0.0170**	
				[0.0068]	
Composite index					0.507**
					[0.204]
Observations	4861	7437	7350	4009	4849
R-squared	0.240	0.184	0.210	0.154	0.189
Shea partial R-squared	0.05	0.05	0.05	0.05	0.02
(Kleibergen-Paap rk LM statistic) Underid	60.561	48.066	177.826	35.242	65.450
Chi-sq K	0.000	0.000	0.000	0.000	0.000
Angrist-Pischke multivariate F test of excluded instruments:	88.430	53.180	88.580	37.750	75.440
p-value	0.000	0.000	0.000	0.000	0.000

Robust standard errors in brackets

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

^We use as instruments the region averages of each endogenous variable, i.e. investment climate variable.

In the first stage we regress endogenous variables on their instruments.

All regressions contain country and industry fixed effects.

Table 6. IV Probit Estimate of Exporting Status
All firms, manufacturing

	First Stage				
Instrument^	1.256***	0.374***	0.636***	0.939***	0.889***
	[0.1528]	[0.0564]	[0.0735]	[0.1644]	[0.1261]
Constant	-4.914	-1.223	-0.889***	-1.564	-0.635**
	[3.4004]	[2.4374]	[0.1505]	[8.2396]	[0.2726]
	Second Stage				
Age(log)	0.162***	0.0814**	0.0439	0.140***	0.0883*
	[0.0446]	[0.0380]	[0.0403]	[0.0352]	[0.0500]
Size Medium	0.378***	0.266**	-0.014	0.319***	0.13
	[0.0967]	[0.108]	[0.148]	[0.0785]	[0.119]
Size Large	0.968***	0.626***	0.193	0.852***	0.334
	[0.124]	[0.216]	[0.282]	[0.112]	[0.296]
Exporting spillovers	0.0097***	0.0112***	0.0102***	0.0086***	0.0110***
	[0.0029]	[0.0024]	[0.0026]	[0.0028]	[0.0029]
Direct imports	0.615***	0.449***	0.202	0.709***	0.372***
	[0.0844]	[0.105]	[0.150]	[0.0714]	[0.143]
FDI	0.378***	0.358***	0.149	0.316***	0.266**
	[0.0920]	[0.0832]	[0.115]	[0.0788]	[0.109]
Losses from power outages	**-0.0275***				
	[0.0157]				
Outside loans		**0.0438***			
		[0.0151]			
Access to email & web			**0.780***		
			[0.186]		
Inventories of inputs(nr days)				**-0.0177***	
				[0.00603]	
Composite index					**0.618***
					[0.183]
Observations	2,266	3,362	3,295	2,745	2,240
R-squared	0.28	0.18	0.24	0.11	0.24
Shea partial R-squared	0.076	0.076	0.076	0.076	0.0244
(Kleibergen-Paap rk LM statistic) Underid	36.379	38.186	74.882	29.754	42.94
Chi-sq K	0.000	0.000	0.000	0.000	0.000
Angrist-Pischke multivariate F test of excluded instruments:	71.73	44.09	88.58	32.03	51.08
p-value	0.000	0.000	0.000	0.000	0.000

Robust standard errors in brackets

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

^We use as instruments the region averages of each endogenous variable, i.e. investment climate variable.

In the first stage we regress endogenous variables on their instruments.

All regressions contain country and industry fixed effects.

Table 7. IV Probit Estimate of Exporting Status
Domestic firms, manufacturing

	First Stage				
Instrument^	1.270***	0.368***	0.640***	0.8619***	0.840***
	[0.1557]	[0.0618]	[0.0886]	[0.1818]	[0.1431]
Constant	-4.757	-1.183	-0.8580***	-1.727	-0.738**
	[4.0921]	[2.8342]	[0.1938]	[9.3538]	[0.3288]
	Second Stage				
Age(log)	0.205***	0.127***	0.166***	0.0927*	0.156**
	[0.0565]	[0.0482]	[0.0430]	[0.0509]	[0.0701]
Size Medium	0.398***	0.328***	0.308***	0.027	0.217
	[0.118]	[0.126]	[0.0912]	[0.181]	[0.157]
Size Large	1.021***	0.746***	0.912***	0.182	0.521
	[0.151]	[0.246]	[0.132]	[0.370]	[0.393]
Exporting spillovers	0.0102***	0.0121***	0.00915***	0.0102***	0.00886**
	[0.0038]	[0.0031]	[0.0034]	[0.0034]	[0.0040]
Direct imports	0.724***	0.579***	0.809***	0.292	0.548***
	[0.105]	[0.123]	[0.0851]	[0.203]	[0.183]
Losses from power outages	**-0.003**				
	[0.0193]				
Outside loans		**0.0357***			
		[0.0216]			
Access to email & web			**-0.0184****		
			[0.00751]		
Inventories of inputs(nr days)				**0.769****	
				[0.246]	
Composite index					**0.498***
					[0.283]
Observations	1527	2570	2185	2491	1508
R-squared	0.249	0.173	0.065	0.206	0.221
Shea partial R-squared	0.066	0.066	0.066	0.066	0.024
(Kleibergen-Paap rk LM statistic) Underid	76.130	34.800	22.010	69.240	37.320
Chi-sq K	0.000	0.000	0.000	0.000	0.000
Angrist-Pischke multivariate F test of excluded instruments:	34.619	30.082	20.668	58.879	31.400
p-value	0.000	0.000	0.000	0.000	0.000

Robust standard errors in brackets

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

^We use as instruments the region averages of each endogenous variable, i.e. investment climate variable.

In the first stage we regress endogenous variables on their instruments.

All regressions contain country and industry fixed effects.

Table 8. IV Probit Estimates of Exporting Status

Domestic firms, manufacturing Account for ISO certifications and manager experience					
First Stage					
Instrument^	1.251***	0.366***	0.621***	0.856***	0.840***
	[0.1575]	[0.0619]	[0.0878]	[0.1818]	[0.1411]
Constant	-4.750	-1.018	-.8720***	-2.714	-.748*
	[4.1929]	[2.888]	[0.1961]	[9.4802]	[0.3362]
Second Stage					
Age (log)	0.133**	0.071	0.069	0.0991**	0.095
	[0.0620]	[0.0495]	[0.0502]	[0.0485]	[0.0665]
Size medium	0.357***	0.316**	0.022	0.291***	0.193
	[0.121]	[0.125]	[0.180]	[0.0928]	[0.153]
Size large	0.939***	0.702***	0.162	0.844***	0.442
	[0.157]	[0.238]	[0.354]	[0.133]	[0.367]
Exporting spillovers	0.011***	0.012***	0.010***	0.009***	0.009**
	[0.004]	[0.003]	[0.004]	[0.003]	[0.004]
Direct imports	0.701***	0.555***	0.275	0.758***	0.514***
	[0.108]	[0.121]	[0.199]	[0.0879]	[0.179]
Manager experience	0.008	0.006	0.002	0.00861*	0.007
	[0.005]	[0.004]	[0.004]	[0.004]	[0.005]
ISO	0.598***	0.533***	0.256	0.588***	0.366*
	[0.120]	[0.118]	[0.185]	[0.104]	[0.202]
Losses from power outages	**-0.003**				
	[0.0182]				
Outside loans		**0.0334#**			
		[0.0229]			
Access to email & web			**0.761***		
			[0.255]		
Inventories of inputs (nr days)				**-0.0183**	
				[0.00773]	
Composite index					**0.519***
					[0.273]
Constant	-2.440***	-2.209***	-1.378**	-1.522***	-1.778***
	[0.458]	[0.428]	[0.613]	[0.526]	[0.684]
Observations	1,515	2,550	2,476	2,175	1,499
R-squared	0.261	0.214	0.203	0.1	0.199
Shea partial R-squared	0.068	0.016	0.018	0.022	0.024
Angrist-Pischke multivariate F test of excluded instruments:	61.644	34.478	49.292	21.86	34.612
p-value	0	0	0	0	0
Kleibergen-Paap underidentification test	107.103	41.186	45.776	47.56	35.746
Chi-sq K	0	0	0	0	0

Robust standard errors in brackets

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

significant at 12%

^We use as instruments the region averages of each endogenous variable, i.e. investment climate variable.

In the first stage we regress endogenous variables on their instruments.

All regressions contain country and industry fixed effects.

Table 9. IV Probit Estimates of Exporting Status

Domestic firms, manufacturing

Account for Skilled labor availability

	First Stage				
Instrument^	1.269***	0.3683***	0.638***	0.865***	0.840***
	[0.1548]	[0.0617]	[0.0887]	[0.1818]	[0.1430]
Constant	0.761	0.528	-.9689***	-7.404	-.830**
	[4.8524]	[3.6228]	[0.2411]	[11.3225]	[0.4098]
	Second Stage				
Age (log)	0.208***	0.127***	0.0930*	0.166***	0.154**
	[0.0568]	[0.0483]	[0.0510]	[0.0431]	[0.0707]
Size medium	0.398***	0.324**	0.0305	0.308***	0.214
	[0.119]	[0.126]	[0.181]	[0.0918]	[0.158]
Size large	1.023***	0.742***	0.189	0.922***	0.506
	[0.151]	[0.248]	[0.372]	[0.132]	[0.393]
Exporting spillovers	0.007*	0.010***	0.009***	0.007*	0.006
	[0.004]	[0.003]	[0.003]	[0.004]	[0.004]
Direct imports	0.719***	0.575***	0.295	0.799***	0.534***
	[0.105]	[0.124]	[0.203]	[0.0862]	[0.183]
Skilled labor availability	0.337**	0.224*	0.144	0.290**	0.327**
	[0.158]	[0.119]	[0.135]	[0.129]	[0.164]
Losses from power outages	-0.00346				
	[0.0192]				
Outside loans		**0.0359***			
		[0.0216]			
Access to email & web			**0.764***		
			[0.248]		
Inventories of inputs (nr days)				**-0.0181**	
				[0.008]	
Composite index					**0.513***
					[0.277]
Constant	-3.100***	-2.606***	-1.670**	-1.993***	-2.446***
	[0.623]	[0.521]	[0.719]	[0.612]	[0.851]
Observations	1,527	2,569	2,491	2,185	1,508
R-squared	0.251	0.174	0.207	0.073	0.198
Shea partial R-squared	0.051	0.0147	0.021	0.022	0.0238
Angrist-Pischke multivariate F test of excluded instruments:	88.019	34.88	67.42	22.33	37.4
p-value	0	0	0	0	0
Kleibergen-Paap underidentification test	34.424	30.171	58.882	20.822	31.475
Chi-sq K	0	0	0	0	0

Robust standard errors in brackets

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

^We use as instruments the region averages of each endogenous variable, i.e. investment climate variable.

In the first stage we regress endogenous variables on their instruments.

All regressions contain country and industry fixed effects.

Appendix

Variables names	Variables definition
Age	determined as the difference between the year of the survey and the year when the firm was created
Size (employees)	captured by dummy variables: Size_Medium = 1 for medium firms (between 20 and 99 employees) and zero otherwise, Size_Large takes the value 1 for large firms (more than 100 employees) and zero otherwise. The base dummy variable captures small firms.
FDI	a dummy variable that takes the value 1 if the foreign ownership share is greater than 10 percent
Exporting spillovers	defined as the share of firms in a sector that are exporters
Direct imports	dummy variable taking the value 1 if the firm directly imports intermediate inputs
Losses from power outages	share of total sales lost due to power outages, as reported in survey
Outside loans	proportion of working capital financed with loans from private commercial banks, state-owned banks, governmental agencies or non bank financial institutions
Access to email & web	composite measure of access to email and to web (calculated using principal component analysis)
Inventories of inputs(nr days)	number of days of inventories for inputs that firms hold
Composite index	composite measure of access to and quality of infrastructure, finance, email and web (calculated using principal component analysis)
ISO dummy	ISO = 1 if the firm has an internationally-recognized quality certification and zero otherwise
Manager's experience	number of years of experience working in the industry for the top manager of the company

Source: World Bank Investment Climate Surveys