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Export Diversification and Business Startups in Africa

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ABSTRACT

Purpose: This study examines the impact of export diversification on new business formation.

Design/methodology/approach: Using an instrumental variable approach within a count data framework that relies on a panel dataset of 10 African countries (Algeria, Gabon, Lesotho, Morocco, Nigeria, Sierra Leone, Togo, Tunisia, Uganda and Zambia) observed between 2008 and 2018 annually, the evidence shows a non-trivial effect of export diversification on business start-ups. In particular, the odds of a new business being registered increase by 1.7 – 3.5 times in response to a percentage point increase in export diversification.

Findings: This result reinforces the need for supportive policies aimed at moving away from concentrated export baskets towards more diversified ones to leverage entrepreneurial effort in the selected African countries.

Paper type: Research Paper

Keywords: *Export diversification, Business Start-ups, Africa, Economic Development.*

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I. INTRODUCTION

Entrepreneurship and business start-ups are now widely regarded as paramount to employment creation in the developing world (see Stoica, Roman and Rusu, 2020; Peprah and Adekoya, 2020 and more recently Ivanović-Đukić, Krstić, and RaĐenović, 2022). This understanding has steered research seeking to understand the relevant drivers of entrepreneurship. From this new line of research, most common drivers highlighted in literature range from credit access (Charfeddine and Zaouali, 2022), the quality of institutions (Audretsch, Belitski, Caiazza, and Desai 2022), entrepreneurship education (Colombelli, Loccisano, Panelli, Pennisi, and Serraino, 2022) to information, communication and technology (ICT) (Brown, Saxena, and Wall, 2022) and energy constraints (Owusu, Agyemang, and Agyeman, 2022). In the process of identifying factors affecting entrepreneurship, existing studies have neglected the potential effects of export diversification which is surprising given the potentially strong link between the two both theoretically and empirically.

Export diversification can be described as an increase in the number of distinct products in the export base, combined with a reduction in dependence on any one product as a source of foreign exchange earnings. It essentially reflects the degree to which a country's exports are spread across a large number of products and/or trading partners which contrasts with export concentration where a greater focus of trade is on a small number of commodities and/or trading partners. For export dependent countries, export diversification supports a shift from an overreliance on commodities to higher-value added products and services for export dependent countries helping them build, in the process, resilience against demand and external price shocks. This understanding has dominated international trade platforms concerned with the implications of commodity price volatility such as the 2009 sixty-seventh session of the committee on commodity problems hosted by the Food and Agriculture Organization (FAO) in Rome and the 2019 seminar on commodity dependence and sustainable development hosted by the United Nations Conference on Trade and Development in Geneva. The purpose of this paper is to neither challenge nor vilify this existing understanding but to complement through suggesting and empirically testing the potential connection between export diversification and entrepreneurship.

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In theory, export diversification can be linked to entrepreneurship on at least three grounds. Firstly, by implication, a diversified export basket tends to be naturally associated with the inclusion of small and medium-sized enterprises, an old experience that has become popular in recent years on the back of rising global value chains. Mauritius' successful export diversification away from agricultural products in the early 70s illustratively led to the emergence of small to medium enterprises in the textiles and clothing industries. The intuition is that increasing the product lines in the export basket creates new opportunities to those with an entrepreneurial mind set, ability and resources. In other words, diversification of a country's export basket likely promotes entrepreneurship in the tradable sector in so far as it entails adding new products or services to the range of existing ones. The interconnectedness of tradable and non-tradable sectors owing to local supply chains and spillover effects means that export diversification is capable of creating new businesses in the non-tradable sector too. Secondly, the creation of markets due to export diversification facilitates innovation which has been found to correlate positively with entrepreneurship in several studies. Thirdly, export markets are usually profitable but naturally riskier than domestic markets due to volatility of exchange rates and external demand shocks, two features which are consistent with the definition of entrepreneurship.

Despite the above compelling theoretical avenues, there is no systematic evidence on export diversification and entrepreneurship in empirical literature. The closest studies such as Van Hoa (2011), Chen and Peng (2017), Coulibaly, Erbao and Mekongcho (2018) and more recently Moore, Dau, and Mingo (2021) have rather focused on either international trade shares or international trade integration which are a similar but different concepts. These studies can be broadly categorised into two groups with the first group comprising studies reliant on standard regression models and the second group comprising those based on general equilibrium models. Recent examples of the former group include Moore, Dau, and Mingo (2021) who probe the effect of trade integration on entrepreneurship (both formal and informal) in a panel data framework of 68 countries observed over a 11-year period and Coulibaly, Erbao and Mekongcho (2018) who sought to answer a similar question in the context of BRICS countries (Brazil, Russia, India, China, and South Africa). In both cases, trade integration is found to correlate positively with entrepreneurship. Intuitively, the explanation provided by Moore, Dau, and Mingo (2021) is that trade agreements (which promote trade integration) lead to the formation of sound institutions that encourage entrepreneurial activity. Coulibaly, Erbao and Mekongcho (2018) raise a distinct mechanism which is that trade integration facilitates a mutual reliance between local or global entities which ultimately leads to a profit yielding free flow of production factors, small business practices, innovation and risk ventures. The desire to tap into these profitable albeit risky ventures to them is what explains the strong positive association between trade integration and entrepreneurship.

For Chen and Peng (2017), a general equilibrium approach is employed with a particular focus on the implications of heterogeneous entrepreneurs for the welfare gains from trade in a monopolistic competition model with a demand system of constant elasticity of substitution (CES). Similar to the result confirmed in standard regression based studies, Chen and Peng (2017) find free trade prelude to a sizeable increase in entrepreneurship and its contribution on welfare growth. This conclusion is consistent with a position reached in one of the earlier papers on entrepreneurship by Rauch and Watson (2004) based on a similar methodological approach. In particular, the hypothesis raised by Rauch and Watson (2004) which they found empirical support for in a simple general-equilibrium model framework is that agents who become international trade intermediaries first accumulate networks of foreign contacts while working as employees in production or sales, then become entrepreneurs who sell access to and use of the networks they accumulated. In other words, being involved in a trade network as an employee increases one's probability of becoming an entrepreneur. Similarly, from a theoretical point of view, Murphy et al. (1991) provide a supportive argument that trade-promoting factors such as lower communication and transportation costs are prelude to what they termed 'productive entrepreneurial activities' referring to formal entrepreneurship that withstands competition.

The above studies have obvious limitations. Firstly, international trade shares measure, at best, trade intensity and do not, by measurement, reflect the extent to which a trade basket is diversified. In other words, by observing high trade shares, one cannot tell whether that is driven by an expansion of new product lines or an increase in the concentration of existing products. The latter is in our view not conducive for entrepreneurship in so far as it limits business opportunities due to the narrowness of the export market. International trade integration on the other hand gauges the extent to which a country is integrated into global trade and does not, by definition, reflect the extent to which the country's export basket is diversified.

Aside from the studies reliant on trade shares and trade integration, the rest of the literature in general comprises broad studies on the determinants of entrepreneurship which include Cuervo (2005), Gómez-Gras, Mira-Solves and Martinez-Mateo (2010), Ghani, Kerr and O'connell (2014), Arin, Huang, Minniti, Nandialath, and Reich (2015), Dvouletý (2018), Igielski (2021), Kalisz, Schiavone, Rivieccio, Viala and Chen (2021) and Zmami and Salha (2021). Some of the key determinants highlighted in this literature includes national culture, entrepreneurial training, the quality of institutions and macroeconomic performance. We improve this literature by paying exclusive focus on export diversification as a determinant of entrepreneurship.

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It is important at the outset to stress that literature generally lacks a solid and unified theoretical model from which the effect of export diversification on entrepreneurship can be examined. This is not uncanny however given the general lack of formal theories on trade itself and entrepreneurship as argued by Murphy, Shleifer, Vishny (1991). In the absence of a unified theoretical framework, majority of existing studies have heavily relied on existing and plausible theoretical arguments most of which are sub variants of the Grossman and Helpman's (1991) quality ladders theory. Grossman and Helpman (1991) particularly developed a model of repeated product improvements in a continuum of sectors and view product innovation as a process of generating an ever-expanding range of horizontally differentiated products. Our interest here is on export diversification, the degree to which a country's exports are spread across a large number of products and/or trading partners, hence we need a similar but distinct theoretical model that suits our objective.

In the absence of such a model, we develop one in which export diversification incentivizes those with an entrepreneurial mind-set to start new businesses. We then test the predictions of this theoretical model using a panel dataset of 10 countries (Algeria, Gabon, Lesotho, Morocco, Nigeria, Sierra Leone, Togo, Tunisia, Uganda, Zambia) observed between 1980 and 2018. Africa has been one of the most underdeveloped regions of the World in the last three decades. Poverty and unemployment remain relatively high. Growth is sluggish while trade is heavily subdued by supply side constraints. These developmental challenges have seen structural change, export diversification and entrepreneurship emerge within policy circles as necessary vehicles for advancing economic transformation in the region. Our hope in this regard is to provide empirical evidence that complement these policy efforts by quantifying the impact of export diversification on entrepreneurship within the African context.

The remainder of the paper is organised as follows: section 2.1 outlines the methodological approach of the study. Results are presented, interpreted and discussed in section 3. The last section provides concluding remarks.

II. METHODS

We rely on a panel dataset of 10 African countries (Algeria, Gabon, Lesotho, Morocco, Nigeria, Sierra Leone, Togo, Tunisia, Uganda, Zambia) observed between 2008 and 2018 annually. This represents a panel dataset of dimensions T=11 and N=10 which yields a total of 110 annual observations (i.e. N=11×10). It would have been desirable to stretch our analysis beyond 2018 but we are similarly constrained by data unavailability in relation to export diversification as it ends in 2018 from our primary data source. From the literature, entrepreneurship has been measured mostly based on the total entrepreneurial activity (TEA) variable from the Global Entrepreneurship Monitor (GEM) which essentially capture entrepreneurial behaviour and attitudes of individuals such as ownership of young firms and the intentions to become and entrepreneur. Studies reliant on such measures include, but are not limited to, Cervený, Pilcová and Rehák (2016), Rusu and Roman (2017), Maduku (2019) and Tunio et al. (2021). While these measures are useful in their own right, we find them undesirable for our analysis on two grounds. Firstly, they are hardly available consistently across countries over time making it extremely difficult to gather a sufficiently large sample size necessary for a meaningful analysis. Secondly, they are survey based indicators largely based on perceptions which, as a result of potential inaccuracies, make them capable of underestimating or overestimating the true extent of entrepreneurial activity in a given country. Cognisant of these two limitations, we resort to an alternative measure which we believe is a better indicator of entrepreneurship and it is the number of new businesses registered in each country on a yearly basis as measured by the World Bank. This indicator narrows our focus down to formal entrepreneurship as informal entrepreneurs are not registered and therefore omitted by measurement. We sourced data on newly registered businesses from the World Bank's Entrepreneurship Database (WBED) which is a reliable data source at international level.

A. Model Specification

The dependent variable here is the number of newly registered businesses. Since this measurement implies the presence of non-negative integers, conventional approaches such as the OLS method may not be appropriate (Rufrancos et al., 2013) as residual normality may not be guaranteed (Chib and Winkelmann, 2001, Osgood, 2000, Kelly, 2000). Under this circumstance, an ideal approach is one that relies on count data models (Hausman et al., 1984; Cameron and Trivedi, 1998). The usual starting point is the Poisson model whose loglinear specification takes the following form.

$$\ln \lambda_{it} = c_i + \tau_t + x'_{it}\theta + \mu_{it} \qquad (1)$$

where subscripts i and t denote country and time, respectively, ln represents natural logarithm, λ is the count of newly registered businesses, c_i serves to absorb unobservable individual specific effects (which represent heterogeneity endogeneity) and τ_t captures common time dependent shocks, x is a vector of explanatory variables which include a measure of export diversification, θ is the corresponding vector of unknown coefficients to be

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estimated and μ is the error term. Inclusion of export diversification in vector x is guided by our theoretical model while control variables in the same are selected on the basis of empirical literature. The control variables particularly include an institutional index following Chowdhury, Audretsch, and Belitski (2019), an information, communication and technology (ICT) index following Afawubo and Noglo (2022), an index for energy following Malen and Marcus (2017) and human capital in line with Nguyen, Canh, and Thanh (2021) all sourced from the United Nations Conference of Trade and Development (UNCTAD). From the literature, we expect all the control variables to associate positively with new business formation.

Regarding the main variable of interest following standard literature (Duru and Ehidiamhen, 2018; Basile, Parteka and Pittiglio, 2018; Mania and Rieber, 2019), we rely on a slightly modified version of the Herfindahl-Hirschmann Index (Product HHI) which is a measure of the degree of product concentration based on the following formula.

$$H_j = 1 - \left(\frac{\sqrt{\sum_{i=1}^{n} \left(\frac{x_{ij}}{X_j}\right)^2} - \sqrt{\frac{1}{n}}}{1 - \sqrt{\frac{1}{n}}} \right)$$

where H_j is a country index, x_{ij} is the value of export for country j and product i so that

$$X_j = \sum_{i=1}^{n} x_{ij}$$

And n = number of products (SITC Revision 3 at 3-digit group level). Measured this way, an index value closer to 1 indicates a country's exports are more homogeneously distributed among a series of products and are therefore diversified while an index value closer to 0 indicates that exports are less diversified and highly concentrated on a few products.

Table 1. Table of Variables

Variable	*Description/ measurement*	*Source*	*Expected sign*
Entrepreneurship	*Number of newly registered businesses*	*WDI*	
Export diversification	*1- Herfindahl-Hirschmann Index*	*UNCTAD*	+
Human capital	*Human capital index*	*UNCTAD*	+
Energy	*Energy index*	*UNCTAD*	+
Institutions	*Institutions index*	*UNCTAD*	+
ICT	*ICT index*	*UNCTAD*	+
Real exchange rate	*Real effective exchange rate*	*WDI*	+/-
Industrialization	*Share of industry on GDP*	*WDI*	+
Terms of trade instability	*5 year rolling standard deviation of terms of trade*	*WDI*	+/-

Note: UNCTAD=United Nations Conference on Trade and Development, WDI=World Development Indicators

Technically, equation (1) lays to rest concerns of time-invariant factors specific to each country that may affect both x and λ through the explicit inclusion of c_i. By so doing, it addresses heterogeneity endogeneity but leaves open the problem of idiosyncratic endogeneity which we fear might arise from relevant time-varying factors

ISSN: 2597-4785 (ONLINE)
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nested in the error term. One of these factors could be credit access, an important determinant of both entrepreneurship and export diversification (see Bassetto, Cagetti, and De Nardi., 2015; Herkenhoff, Phillips and Cohen-Cole, 2021) which we could not control for because of data unavailability. With the predicted positive effect of credit access on both entrepreneurship and export diversification, a positive sign on export diversification in equation (1) would consequently overstate the true effect of export diversification on entrepreneurship. There is also a plausible possibility of new businesses influencing a country's level of diversification. The consequences of both scenarios are serious as they imply having a slope coefficient on export diversification that is exposed to a small sample bias that does not disappear asymptotically. Dealing with this kind of endogeneity is straightforward in linear regression methods but considerably less so in non-linear regression methods. Within a Poisson cross sectional regression framework, the Generalised Method of Moments (GMM) can be applied with appropriate instruments as discussed in Wooldridge (2010). This approach is problematic however and mulled by scepticism in panel data Poisson regression given two additional challenges that panel data brings; unobserved heterogeneity and period effects often controlled by N-1 and T-1 dummies respectively both which have a tendency of violating order conditions as the structural equation is likely to have more parameters than instruments.

Given the above challenge, we follow a CF procedure of Papke and Wooldridge (2008) recently modified by Lin and Wooldridge (2018), (the LW procedure, hereafter). The LW procedure essentially proceeds in stages. Firstly in this context, the idea is to estimate the expected number of newly registered businesses conditioned on an endogenous export diversification index ($\boldsymbol{y}_{it2}$), exogenous variables ($\boldsymbol{z}_{it1}$), country-specific effects i.e. unobserved heterogeneity (c_{i1}) and time-varying omitted factors (r_{it1}). This can be represented by the following expressions.

$$\ln \lambda_{it} = E(y_{it1}|\boldsymbol{y}_{i2}, \boldsymbol{z}_i, c_{i1}, r_{it1}) = E(y_{it1}|\boldsymbol{y}_{it2}, \boldsymbol{z}_{it1}, c_{i1}, r_{it1}) = c_{i1} \exp(\boldsymbol{x}_{it1}\theta_1 + r_{it1}),$$

where,

$$\boldsymbol{x}_{it1} = (\boldsymbol{y}_{it2}, \boldsymbol{z}_{it1})$$

Vector $\boldsymbol{z}_{it1}$ also includes $T-1$ time dummies denoted by τ_t in equation (2). The first step estimates the reduced form equation for the endogenous regressor ($\boldsymbol{y}_{it2}$) by the fixed effects (FE) approach and obtain the FE residuals. In the reduced form equation, we need valid instruments which should typically be correlated with export diversification but uncorrelated with new businesses. Here we propose three instruments namely the share of manufacturing on GDP, the real exchange rate and a measure of terms of trade instability. The choice of these variables as relevant possible instruments is based on two considerations. First, there is an overwhelming literature citing these variables as relevant determinants of export diversification (see for example Agosin, Alvarez and Bravo-Ortega, 2012; Elhiraika and Mbate, 2014; Fonchamnyo and Akame, 2017). Secondly, we do not find any direct link between new business registration and these variables plausible. Further supporting the latter point is the dearth of studies showing a statistically significant and direct association between the proposed instruments and the formation of new businesses.

The three proposed instruments are included in the first step regression along with fixed effects and other control variables that appear in the structural equation (described shortly). The intuition here is that the selected instruments embedded in $\ddot{\boldsymbol{z}}_{it}$ become strictly exogenous once we control for country-specific effects. FE residuals are then computed as,

$$\widehat{\ddot{u}_{it2}} = \ddot{y}_{it2} - \ddot{\boldsymbol{z}}_{it}\widehat{\Pi}_2$$

where the hat denotes predicted values and the two upper dots signal time averages i.e.,

$$\ddot{\boldsymbol{y}}_{it2} = \boldsymbol{y}_{it2} - T^{-1}\sum_{r=1}^{T}\boldsymbol{y}_{ir2}, \quad \ddot{\boldsymbol{z}}_{it} = \boldsymbol{z}_{it} - T^{-1}\sum_{r=1}^{T}\boldsymbol{z}_{ir}$$

and, in the second stage, plugged in the FE Poisson regression mean specification (with bootstrapped standard errors) given by,

$$E\left(y_{it1}|z_{it1}, y_{it2}, \widehat{\ddot{u}_{it2}}, c_{i1}\right) = c_{i1} \exp(\boldsymbol{x}_{it1}\theta_1 + \widehat{\ddot{u}_{it2}}\rho_1)$$

in which robust Wald test of ρ_1 will be a test for exogeneity with respect to idiosyncratic shocks. The next section presents, interprets and discusses the empirical findings.

III. RESULTS AND DISCUSSION

Summary statistics presented in Table 3.1 indicate a minimum and maximum diversification index of 0.16 and 0.87 observed in Nigeria and Tunisia, respectively. Nigeria's export basket is narrow primarily centered on petroleum and petroleum products, cocoa and rubber. On the contrary, Tunisia has a number of comparative advantages that have helped it develop a diversified economy including its geographical location that facilitate easy access to European, Middle Eastern, and African markets and enable its companies to link into EU supply

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chains. With regard to entrepreneurship, the lowest number of newly registered businesses is 62 from Togo observed in 2008 possibly reflecting the effects of the 2008/09 Global Financial Crises (GFC). The maximum number of newly registered companies is 86309 from Nigeria in 2018.

Table 2. Summary Statistics

	Obs	*Mean*	*St.Dev*	*Min*	*Max*
MANUF	*110*	*13.83392*	*8.465899*	*1.532609*	*48.95478*
reer	*110*	*99.67427*	*10.63832*	*71.45553*	*142.5592*
logtot_sd5	*110*	*0.0992007*	*0.0722713*	*0.0174821*	*0.2818537*
Institution index	*110*	*42.33862*	*6.811768*	*28.83452*	*53.94338*
ICT index	*110*	*6.690194*	*2.274621*	*3.268088*	*11.25017*
Energy index	*110*	*22.44379*	*10.17738*	*5.606929*	*59.21154*
Human capital index	*110*	*40.65272*	*7.538712*	*28.76007*	*56.81438*
New businesses	*110*	*15424.61*	*21780.83*	*62*	*86309*
Diversification	*110*	*0.5897995*	*0.236292*	*0.157234*	*0.8659139*

Visually looking at Figure 1, export diversification correlates positively with new businesses conditioned on unobservable country-specific effects, time effects and control variables. In other words, the correlation results displayed in Figure 3.1 confirms our prior expectations; the number of new businesses is high in highly diversified countries and less so in less diversified economies. Technically, this is a conditional association that disregards possible idiosyncratic endogeneity which we will address shortly in our baseline regression estimates. The correlation coefficient accompanying the positive linear line is 0.12 with a standard error of 0.016 and a sizeable t-statistic of 7.6.

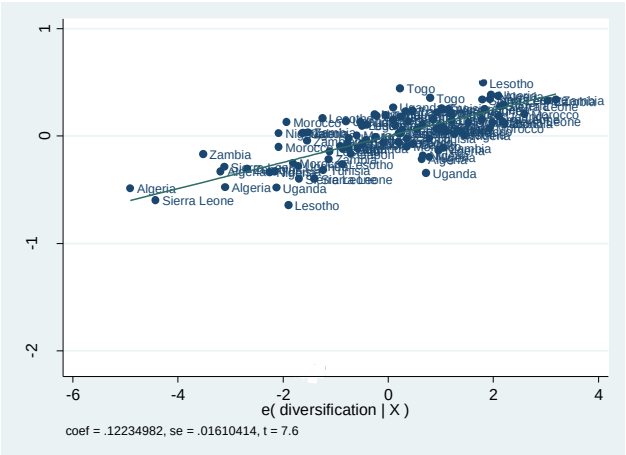

Figure 1. Export Diversification and Entrepreneurship

We proceed to formally inspect the association between the pair in Table 3.2. We have partitioned the table into three columns. The first column contains estimates from the first stage regression in which our export

ISSN: 2597-4785 (ONLINE)
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diversification variable is regressed on three instruments (terms of trade volatility, the share of manufacturing and the real exchange rate) along with other variables that essentially explain entrepreneurship. The second column then uses the residuals computed from the first column as an explanatory variable the intuition being that the remaining variation in export diversification becomes exogenous once this residual series is controlled for. What distinguishes the second and the third variants is simply a case of specification as the latter excludes other explanatory variables. As Table 3. shows, we find evidence of a significant association between all our three instruments and export diversification which is encouraging in so far as it suggests that the three variables could be relied upon as relevant instruments with some considerable degree of confidence. Across all three variants, time dummies were included (but not reported for brevity sake) as an attempt to control for unobservable time-dependent shocks. Their inclusion was statistically supported by a Wald test for joint significance which produced a highly significant probably values.

Turning to the interpretation of our empirical estimates, our export diversification index enters, positively, sizeably and significantly in the two regression variants which it appears as an explanatory variable confirming our prior expectations. The positive and significant coefficient of export diversification particularly suggests that diversifying export baskets significantly increases the odds of a new business being registered in each given year by 1.7 – 3.5 times controlling for terms of trade volatility, exchange rate movements, technological progress, the quality of institutions, the level of industrialization, human capital accumulation and energy availability. The residual component computed in the first stage regression is statistically significant demonstrating the importance of addressing endogeneity when probing the effect of export diversification on entrepreneurship. In other words, failure to include the residual component in the second and third regression variants would have rendered the positive effect of export diversification on entrepreneurship biased and inconsistent.

Table 3. Export Diversification and Entrepreneurship

	(1)	*(2)*	*(3)*
	1st stage reg.	*2nd stage reg.*	*2nd stage reg.*
	FE	*FE-Poisson*	*FE-Poisson*
logtot_st5	*-0.334****		
	(0.0372)		
manuf	*0.00548**		
	(0.00291)		
logreer	*-0.271**		
	(0.135)		
loghc	*0.831****	*0.669****	
	(0.0752)	*(0.0497)*	
logict	*0.203****	*0.743****	
	(0.0321)	*(0.0176)*	
logenergy	*0.110****	*0.0516****	

ISSN: 2597-4785 (ONLINE)
ISSN: 2597-4750 (PRINTED)

	(0.0154)	*(0.0132)*	
loginst	*0.187***	*0.00238***	
	(0.0773)	*(0.00101)*	
diversification		*0.220****	*0.548****
		(0.0132)	*(0.0115)*
error		*-1.491****	*-1.468****
		(0.0375)	*(0.0351)*
Period effects	*yes*	*yes*	*yes*
Observations	*110*	*110*	*110*
Number of id	*10*	*10*	*10*

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

Other control variables enter with expected signs. The human capital index is positively signed and statistically significant at 1 percent level corroborating the importance of human capital as a precondition for leveraging entrepreneurship. Human capital captures the skills and knowhow necessary to formulate business ideas and translate them into new businesses. This notion is widely supported by the experiences of several countries worldwide such as Rwanda, Hong Kong and China where support in education has been accompanied by a surge of new businesses. From an empirical standpoint, the result is in tandem with Estrin, Mickiewicz and Stephan (2016) and more recently Nguyen, Canh and Thanh (2021). ICT enters positively and significantly as expected validating the results observed in Afawubo and Noglo (2022). Intuitively, ICT boost entrepreneurship through several channels which include the reduction in transaction costs, improvements in organizational routines, and the strengthening of relationships between clients and suppliers (Afawubo and Noglo, 2022).

The energy index enters positively adding empirical weight to the common narrative that access to energy enhances economic development and stimulates the establishment of enterprises. As de Groot, Mohlakoana, Knox and Bressers (2017) posit, improved access to energy provides a platform from which enterprises can operate efficiently and effectively in their day to day operations. Our results particularly suggest that the odds of having new businesses registered each year are much higher in countries with improved access to energy. Regarding institutions, a plethora of studies such as Chowdhury, Audretsch and Belitski (2019), Khalilov and Yi (2021) and Su (2021) has shown that property rights, impartial court systems and a robust rule of law are vital in stimulating entrepreneurial ventures. The next sub section attempts to test the robustness of our central finding that export diversification positively and significantly influences entrepreneurship.

A. Robustness Check

We begin with the common post estimation question, to what extent is our central result sensitive to the presence of outliers? Atypical observations, if present, have important implications in so far as they potentially invite a small sample bias on our key estimate which does not disappear asymptotically. With this in mind, we employ the blocked adaptive computationally efficient outlier nominators (BACON) algorithm proposed by Billor, Hadi, and Velleman (2000) to try and detect the presence of atypical observations. As Figure 3.2a clearly shows, the BACON algorithm identifies a total of 11 outliers which essentially represent Nigeria as Figure 3.2b confirms.

ISSN: 2597-4785 (ONLINE)
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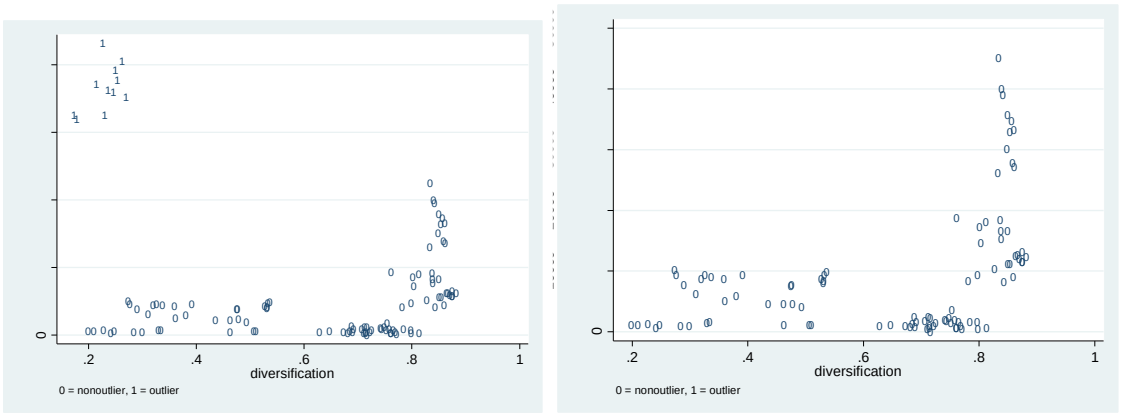

Figure 2. (a) Total Sample, (b) Without Nigeria

Against this background, we dropped Nigeria and repeated our estimations. Interestingly, the exclusion of Nigeria from the sample does not appear to influence our central as the export diversification index remains positive, sizeable and highly significant across the three regression variants. In fact, the exclusion of Nigeria actually makes the effect of export bigger as the coefficient rises from 0.220 to 0.573 in the baseline specification and from 0.548 to 0.68 in the parsimonious specification. This observation clearly puts to bed concerns that the coefficient of export diversification reported in Table 3.2 could be exaggerated by outliers. All our control variables still enter with the same expected signs. Evidence still validate the positive effect of human capital, energy, institutions and ICT.

Table 4. Export Diversification and Export Diversification (without Nigeria)

	(1)	*(2)*	*(3)*
	1st stage reg.	*2nd stage reg.*	*2nd stage reg.*
	FE	*FE-Poisson*	*FE-Poisson*
logtot_sd5	*-0.167****		
	(0.0351)		
manuf	*0.00216****		
	(0.000662)		
logreer	*-0.483****		
	(0.0277)		
loghc	*2.121****	*2.646****	
	(0.0640)	*(0.0610)*	
logict	*0.950****	*0.738****	

ISSN: 2597-4785 (ONLINE)
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	(0.0236)	*(0.0201)*	
logenergy	*0.215***	*0.239***	
	(0.0147)	*(0.0134)*	
loginst	*2.177***	*1.316***	
	(0.0715)	*(0.0610)*	
diversif		*0.573***	*0.675***
		(0.0388)	*(0.0373)*
error		*-1.368***	*-1.702***
		(0.0262)	*(0.0186)*
Period effects	*yes*	*yes*	*yes*
Observations	*99*	*99*	*99*
Number of id	*9*	*9*	*9*

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

As a second robustness check, we consider a completely different methodological approach by (i) categorizing countries into highly diversified and moderate to less diversified economies and (ii) proceed to use the difference-in-difference estimation approach. We particularly consider a country's export basket diversified if its average diversification index during the sampling period is at least 75 percent otherwise a country's export basket will be regarded as moderate to less diversified if the average diversification index is less than 75 percent. Noteworthy is that Nigeria is included in this robustness exercise as Table 3.3 has proved that its exclusion does not significantly alter our central result. With this categorization, we have Morocco, Togo, Tunisia and Uganda as our highly diversified economies and Algeria, Gabon, Lesotho, Nigeria, Sierra Leone and Zambia as our moderate to less diversified economies (see Table 3.4).

Table 5. Categorisation by the extent of diversification

Highly Diversified Economies		*Moderate to Less Diversified economies*	
Country	*Average export diversification index*	*Country*	*Average export diversification index*
Morocco	*0.83*	*Algeria*	*0.48*
Togo	*0.75*	*Gabon*	*0.31*
Tunisia	*0.85*	*Lesotho*	*0.71*

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Uganda	*0.80*	*Nigeria*	*0.21*
		Sierra Leone	*0.61*
		Zambia	*0.31*

Source: authors' categorization based on the diversification index

As already indicated, we then considered the difference-in-difference method where the dependent variable is now the logarithm of newly registered businesses and the right-hand side variables remain the same apart from a dummy that separates highly diversified economies from moderate to less diversified ones and additional two terms capturing country fixed effects ($COUNTRY_i$) and year-fixed effects ($YEAR_t$). The intercept of this specification would essentially represent the average percentage newly registered businesses over the entire sample period after controlling for country-fixed effects while the slope coefficient of interest next to the diversification dummy would gauge the extent to which an exogenous shock having nothing to do with export diversification drives up the number of newly registered businesses in highly diversified economies.

As one would likely and rightly suspect, the residual term of such a specification which we do not report for brevity would raise serious methodological concerns as the standard distributional assumptions needed for valid statistical inference will not hold in the presence of autocorrelation across countries within a given time period and or autocorrelation within a given country over time. The former matters because the push for export diversification may occur at the same time for different countries possibly inducing correlation in the newly registered businesses residuals across countries at a given point in time. The latter matters since it generally takes time for the number of newly registered businesses to adjust to their new trajectory owing to structural impediments and inertia effects. Thus for a given country, the number of newly registered businesses may remain elevated below its steady-state rate for a number of years highly diversified economies, thereby inducing serial correlation in the country's newly registered businesses residuals. To compute standard errors that are correct in this regard, we construct clusters of residuals which allow for correlation within each cluster of observations. First, we cluster by year to produce standard errors that account for the possibility that shocks to the number of newly registered businesses are correlated across countries within a given year. Second, we cluster by country to produce standard errors that account for the possibility that the shocks to the number of newly registered businesses are correlated over time within a given country. We also report estimates that correct for heteroscedasticity.

Table 4.5 shows the results from this robustness exercise partitioned into three regression variants. Variant 1 is the baseline specification. Variants 2 and 3 construct standard errors by year and country, respectively. As the results indicate across all the four variants, the impact of high export diversification on the number of newly registered businesses is economically large and statistically significant. The estimate of the coefficient on the export diversification dummy ranges from 0.959 to 1.499. This means that in highly diversified economies, a typical country's average percentage of new businesses is significantly higher than its long-run mean by an average of 95 – 150 percent per year.

An exogenous shock to newly registered businesses does not seem to drive the result as our specification controls for time effects. In addition, as we mentioned shortly above, a possible concern could be that heteroscedasticity and autocorrelation might distort statistical inference. This is not the case as the diversification dummy remains highly significant in variants 2 and 3 after adjusting the standard errors.

Table 6. Difference-in-Difference results – Diversification and Entrepreneurship

	Baseline	*Cluster (year)*	*Cluster (country)*
	(1)	*(2)*	*(3)*
loghc	*0.0274**	*0.0274*	*0.0274**

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	(0.0146)	*(0.0454)*	*(0.0158)*
logict	*0.0321****	*0.0221****	*0.0253****
	(0.00370)	*(0.00360)*	*(0.00370)*
logenergy	*-0.320****	*-0.320****	*-0.320****
	(0.0247)	*(0.116)*	*(0.0308)*
loginst	*-0.000543*	*-0.000543*	*-0.000543*
	(0.000633)	*(0.000595)*	*(0.000428)*
loghc	*1.956****	*1.956*	*1.956****
	(0.294)	*(1.406)*	*(0.376)*
logict	*0.671****	*0.671****	*0.726*
	(0.231)	*(0.022)*	*(0.813)*
Year	*0.6311*	*1.1602*	*0.8261*
	(0.5813)	*(0.9821)*	*(0.6833)*
Diversification	*0.9594****	*1.194****	*1.499****
	(0.063)	*(0.058)*	*(0.045)*
Constant	*54.80****	*54.80**	*54.80****
	(5.814)	*(27.44)*	*(7.473)*
Diversification =YEAR	*prob=0.0001*	*prob=0.0000*	*prob=0.0000*
Observations	*110*	*110*	*110*

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

As similarly observed in Table 3.2, all the control variables enter with the expected signs which is reassuring. Evidence still points to the importance of human capital accumulation, the quality of institutions, technological progress and energy availability as relevant drivers of entrepreneurship in the selected countries.

In our third attempt to check the robustness of our central result, we resort to graphs for visual inferences. In particular, we begin with the most diversified economy, Morocco, and try to trace the co-movements of new businesses and export diversification using a line graph. A quick visual inspection of Figure 3.3 provides some reassurance. As the most notable periods in circles indicate, an increase in export diversification appears to be followed by an increase in the number of new businesses. Although this observation alone may not be sufficient

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in determining the direction of causality, one thing it does is to dismiss any possible claim that export diversification is not good for entrepreneurship.

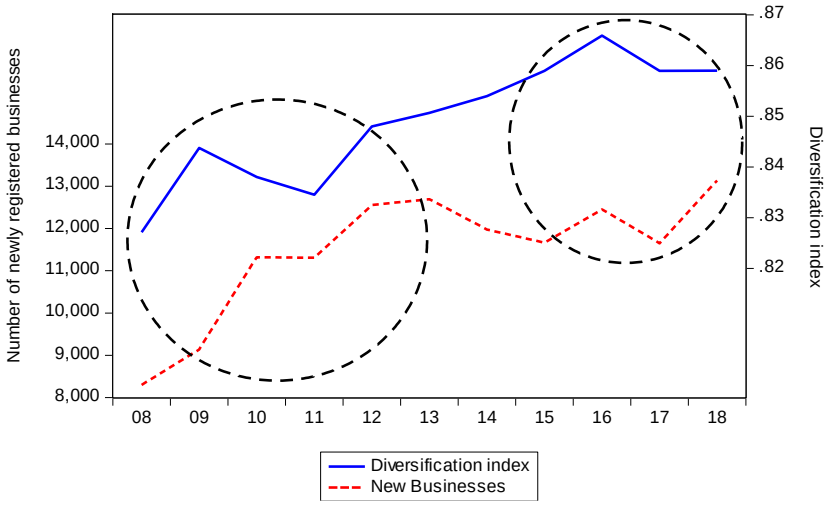

Figure 3. Export Diversification and Entrepreneurship in Morocco

Source: Authors' own computation

Next, we consider a simple exercise in which we look for a period in which Morocco experienced its highest growth in export diversification during the sampling period. We then plot a graph that compares the number of new businesses before and after this growth. As Figure 4.5 shows, Morocco's biggest growth in export diversification came in 2009, 3.5%.

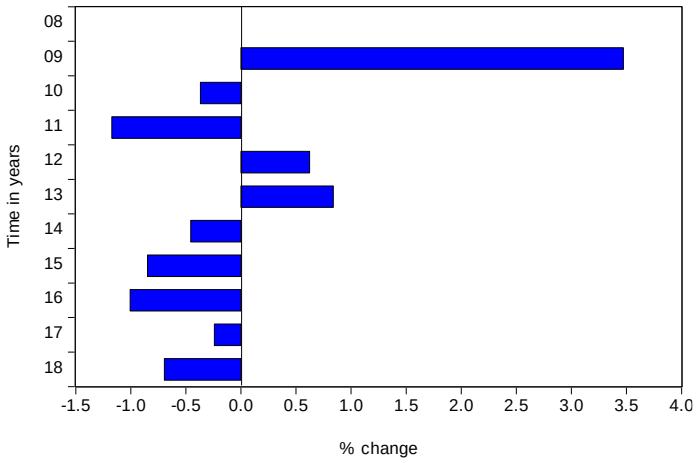

Figure 4. Morocco's Export Diversification Growth

Source: Authors' own computation

Figure 3.6 then compares Morocco's number of new businesses before and after the 3.5% growth in export diversification. The results are confirmatory. The number of new businesses registered in 2010 (t+1) was much higher than the number of new businesses registered in 2008 (t-1) adding weight to our central result that diversifying an economy's export basket is subsequently accompanied by an increase in the number of new businesses being registered.

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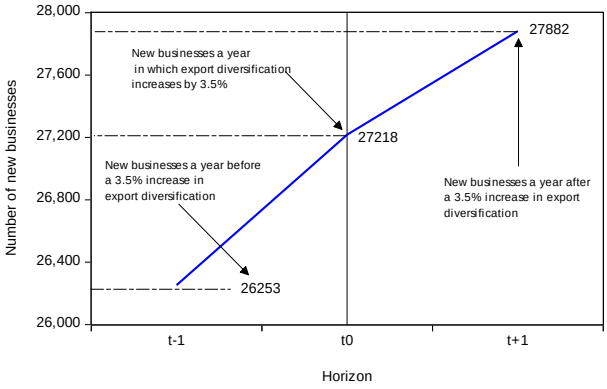

Figure 5: Morocco's New businesses pre and post the 3.5% Growth

Source: Authors' own computation

Overall, our empirical analysis confirms that export diversification has a positive, sizeable and statistically significant effect on entrepreneurship controlling for human capital accumulation, energy, the quality of institutions and technological progress. This central result lends empirical support to the notion that diversifying an economy's export basket creates business opportunities.

IV. CONCLUSION

Empirical evidence based on the experience of 10 African economies between 2008 and 2018 has confirmed a significantly positive association between export diversification and entrepreneurship. The analysis particularly finds a 1.7 – 3.5 times increase in the odds of a new business being registered in response to every percentage point increase in export diversification. This result can be taken with a considerable amount of confidence as we found it robust to the use of a different estimation approach and the presence of outliers. Our conclusion is essentially that export diversification matters and should be considered in the same bracket as other common determinants of entrepreneurship (i.e., access to credit, ICT and human capital among others). From a policymaking perspective, this conclusion reinforces the need for supportive policies aimed at moving away from concentrated export baskets towards more diversified ones in order to leverage entrepreneurial effort in the selected African countries. Future work might benefit from expanding the dataset to include the experiences of non-African countries.

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