Effect of Financial Constraint on Export Performance of Manufacturing Firms in SSA: Does ICT Adoption Matter?

SSA'daki İmalat Firmalarının İhracat Performansı Üzerine Finansal Kısıtların Etkisi: BİT Benimsemenin Önemi Var mı?

Adeyemi O. Babasanya[ID],
Bukonla G. Osisanwo[ID],
Musa O. Oduola[ID]

Department of Economics, Olabisi Onabanjo,
Ago, Iwoye, Nigeria

Abstract

This research investigates the intricate relationship between financial constraints, Information and Communication Technology (ICT) adoption, and export performance among manufacturing firms in sub-Saharan Africa (SSA). The study based its empirical investigation on the standard probit model and employed data from the Enterprise Surveys, World Bank. The findings emphasize the significant impact of financial constraints on export performance, revealing that firms categorized as "Total Constraint" face a substantial 42.1 percentage point reduction in export probability. Importantly, the presence of "No Constraint" does not significantly alter export performance, highlighting the distinct impact of different levels of financial constraint. Moreover, the study reveals the transformative power of ICT adoption on export performance, with "Mobile Phone (ICTMOB)" and "Internet (ICTINT)" usage showing statistically significant positive coefficients, underscoring the critical role of connectivity and information exchange in global markets. The research further explores the interactive effects of financial constraints and ICT usage, demonstrating that firms facing financial constraints benefit significantly from adopting ICT, with substantial percentage point increases in export intensity. These findings contribute to our understanding of how ICT adoption bridges financial constraints and export performance in SSA's manufacturing sector, offering valuable insights for policymakers and stakeholders seeking to foster economic growth and development in the region. To harness the potential revealed in this study, policymakers in SSA should prioritize investments in ICT infrastructure development and accessibility, particularly in regions with lower penetration rates. Additionally, targeted financial support programs tailored to the specific needs of manufacturing firms facing financial constraints should be designed and implemented to alleviate initial barriers to export market entry. By combining ICT development with targeted financial support, SSA countries can empower their manufacturing sectors, promote economic growth, and reduce the disparity in export performance observed in comparison to other global regions, fostering greater economic resilience and development.

Keywords: Constraints, export, firms, financial, manufacturings, performance

ÖZ

Bu araştırma, Sahra Altı Afrika'daki (SSA) imalat firmaları arasında finansal kısıtlar, Bilgi ve İletişim Teknolojisi (BİT) benimseme ve ihracat performansı arasındaki karmaşık ilişkiyi inceler. Standard probit modeline dayanan ve Dünya Bankası'nın Şirket Anketleri'nden elde edilen verileri kullanan çalışma, finansal kısıtların ihracat performansı üzerinde önemli bir etkisi olduğunu vurgulamakta, "Tam Kısıtlama" olarak sınıflandırılan firmaların ihracat olasılığında önemli bir azalma yaşadığını göstermektedir. Özellikle, BİT benimsemenin ihracat performansı üzerinde dönüştürücü bir güce sahip olduğu, "Mobil Telefon (BİTMOB)" ve "İnternet (BİTİNT)" kullanımının istatistiksel olarak anlamlı pozitif katsayılar gösterdiği belirtilmektedir. Bu bulgular, BİT benimsemenin SSA'nın imalat sektöründe finansal kısıtlar ile ihracat performansı arasında bir köprü kurduğunu ve bölgede ekonomik büyüme ve gelişimi teşvik etmeye çalışan politika yapıcılar ve paydaşlar için değerli içgörüler sunduğunu ortaya koymaktadır.

Anahtar Kelimeler: Kısıtlar, ihracat, finansal, imalat firmaları, performans

Babasanya et al.
ICT Role on Financial Constraint-Exporting Link

JBASS 2024; 8(1): 81-91
Journal of Business Administration and Social Studies

Introduction

A firm's capacity to extend its business operations beyond its home country and export products and services is vital to its growth. Clearly, when domestic firms participate in the export markets, they experience various advantages, including greater diversification and positive feedback effects that lead to increased productivity due to heightened international competitiveness. It is thus not surprising that export promotion strategies have received significant consideration in many countries. Despite the aforementioned, exporting is frequently entwined with many factors, among which finance prominently stands. Theoretical exposition of the finance-exporting nexus reveals a profound impact of financial constraints on a firm's export performance. These constraints act as formidable barriers, obstructing market entry and expansion, curtailing product development and innovation investments, hampering advertising and promotion endeavors, and constricting adherence to stringent quality standards and certifications.

Additionally, constrained firms struggle with effective working capital management, exposing them to currency and exchange rate risks. At the same time, their inability to invest in export-related knowledge affects decision-making in international trade. Furthermore, constrained firms find it challenging to achieve competitiveness and scale, diminishing their ability to compete with well-funded rivals in the export market?

Furthermore, information and communication technology (ICT)-export market participation essentiality has generated growing contributions in the literature. The argument is that ICT can impact how firms engage in export markets directly and indirectly. For the direct channel, the presence of ICT can enable firms to overcome the initial financial barrier of entering the export market, known as the sunk cost, by facilitating a reduction of their production costs and improving their comparative advantages (Rangan & Sengul, 2009). ICT can assist in reducing the expenses linked to entering the export market by lowering marketing costs and enhancing market research and networking capabilities (Muto & Yamano, 2009). ICT can aid allocative efficiency, resource utilization, and time optimization. In addition, ICT ensures efficient and affordable information access, thereby connecting buyers and exporters effectively (Singh & Maiti, 2020). For the indirect channel, ICT can have implications for export market entry through its role in enhancing financial access. ICT can reduce information asymmetry and improve information flow in the demand and supply of financial services (Andonova, 2006; Asongu et al., 2019; Kpodar & Andrianaivo, 2011; Lapukeni, 2015). ICT has become increasingly crucial in assisting financial institutions to expand credit opportunities for businesses and households. ICT use may mitigate information asymmetry by facilitating the sharing of relevant data, making it more straightforward for financial institutions to evaluate potential borrowers' risk profiles and creditworthiness (Asongu & Nnanna, 2018). ICT use permits authorized financial institutions and credit bureaus to collaborate in sharing borrower risk profile information. With this data, banks can better assess creditworthiness and make informed decisions about whom they should lend to, thereby reducing the chances of adverse selection.

Moreover, this sharing affords banks a more thorough examination of a borrower's collateral, resulting in improved accuracy when it comes to credit assessments. This process can have implications for financial access within households and firms (Asongu & Nnanna, 2018). In addition, ICT can increase credit options for companies by enabling access to lenders regardless of their physical location, thus providing more flexibility in securing loans (Singh & Maiti, 2020).

Likewise, the potential for ICT in sub-Saharan Africa (SSA), especially with its recent increase in adoption, brings to the fore its potential contribution toward efficient access in the region. Significantly, ICT penetration in SSA has risen over a consistent period. For instance, mobile phone and Internet penetration have increased tremendously over the last two decades. Internet penetration grew from 0.068% in 1996 to 30.04% in 2020 (World Bank, 2021). Its annual penetration rate (21%) over the previous 20 years (2001–2020) has surpassed that of East Asia and the Pacific (EAS) (12%), Central Europe and the Baltics (CEB) (11%), Latin America and the Caribbean (LCN) (14%), the Middle East and North Africa (MENA) (20%), and slightly behind South Asia (SAS) at 23% (World Bank, 2021). A similar trajectory also exists for mobile phone penetration. To this end, the aforementioned suggests that the role of ICT is critical in the nexus between a firm's access to financial resources and its ability to engage in the foreign market.

Sub-Saharan Africa (SSA) has long been characterized by its limited presence in the global manufacturing export landscape, historically representing a relatively small share of the global export market. This stark contrast with the rapid growth of manufacturing export industries in regions like Asia underscores the remarkable economic transformations seen over the past few decades. A key contributing factor to this disparity lies in SSA's struggle with comparatively low levels of industrialization compared to its global counterparts, curbing the region's capacity for value-added manufacturing and subsequent exportation of such products. Furthermore, a distinctive feature of many SSA economies is their heavy reliance on exporting raw materials and commodities, such as oil, minerals, and agricultural products, exposing them to the vagaries of global commodity price fluctuations. Nevertheless, the manufacturing sector's advantages cannot be overstated, as it plays a pivotal role in poverty alleviation by reducing unemployment and, given its labor-intensive nature, generating more employment opportunities compared to sectors like agriculture or mining. Similarly, the manufacturing sector inherently enhances the value of raw materials through processing and transformation into finished goods, resulting in higher export revenues relative to raw material exports, thanks to the premium prices commanded by finished products in the global market.

Despite the acknowledged significance of ICT in facilitating firm internationalization and its indirect impact on financial

JBASS 2024; 8(1): 81-91
Journal of Business Administration and Social Studies

Babasanya et al.
ICT Role on Financial Constraint-Exporting Link

access, a critical research gap persists, especially within the SSA region, which has witnessed a remarkable surge in ICT adoption. This study fills this gap by investigating how ICT adoption is a pivotal catalyst in mitigating financial constraints and empowering manufacturing firms in SSA to enter and excel in export markets. By delving into the multifaceted role of ICT within this framework, this research endeavors to deliver empirically grounded insights and practical implications for policymakers, stakeholders, and scholars alike. Ultimately, the findings of this study are poised to significantly contribute to the literature on firm internationalization, fostering economic growth and development within the SSA region.

In this study, we have undertaken our literature review through the lens of two distinct thematic areas, aiming to better to understand the interplay between our variables of interest. While the first strand of the literature focused on the financing constraint-exporting discourse, the second strand focused on the interplay of interactive variables in the relationship between finance and firms exporting.

Within the purview of a firm's internationalization and financial dynamics, pivotal research studies have illuminated the intricate nexus between financial constraints and firms' export behavior. Berman and Héricourt (2010) emphasize that the role of productivity in influencing exporting decisions hinges critically on firms' access to external financial resources, underscoring that productivity becomes a decisive factor solely when such access is adequate. Secchi et al. (2014) extend this exploration by revealing that financial constraints associated with narrower product/destination margins, an increased likelihood of discontinuing products and destinations, more considerable export value losses tied to market exits, and a propensity to withdraw from larger, economically affluent, and geographically proximate markets. Jinjarak and Wignaraja (2016) conducted a comprehensive analysis, revealing a noteworthy relationship between export participation and the proportion of exports within the overall sales volume. Their findings illuminated a discernible positive correlation, notably accentuated in the case of small- and medium-sized enterprises (SMEs) that exhibited a requirement for loan facilities, particularly overdraft provisions. Nagaraj (2014) finds a strong link between financial constraints and manufacturing firms' decisions to enter export markets in India. He also notes that financially healthier companies are more likely to trade with other countries, which shows how crucial financial health is in determining export market entry decisions. This result is similar to Forte and Salomé Moreira's (2018) findings for Portuguese small and medium-scale manufacturing firms. Mansilla-Fernández and Milgram-Baleix (2023) highlight the negative influence of financial constraints on European and US manufacturers' exports, while Botrić's (2021) study in Croatia underscores their significance, particularly for small- and medium-sized enterprises. Máñez and Vicente-Chirivella's studies in 2021 emphasize financial constraints' adverse effects on export persistence and the broader spectrum of firms' exporting behavior. Financial constraints harm the export activities of manufacturing firms in Africa (Konte & Ndubuisi, 2021). SMEs in Africa are more likely to be affected by financial constraints but also more likely to benefit from a higher level of personal and interpersonal trust, while for larger firms, only interpersonal trust matters (Máñez & Vicente-Chirivella, 2021).

Additionally, in lower-middle-income countries, being less financially constrained is a vital determinant of firms' export participation decisions (Eramudugoda & Ramos, 2023). The undeveloped financial system and heavy reliance on bank loans for external finance in Pakistan may explain this finding (Qasim et al., 2021). Evidence shows that future exporters improve their financial conditions before entering the export markets. However, no evidence exists that exporting improves firms' financial conditions after entry (Kim, 2019). These findings underscore the universal and multifaceted impact of financial constraints on firms' international trade endeavors, underscoring the necessity of addressing this issue to enhance competitiveness in the global marketplace. The literature on the impact of financial constraints on firms' export activities is replete with empirical investigations that majorly affirm the deleterious consequences of financial constraints on export performance.

While the preceding review espouses the financial constraint-export link, the following studies, although limited, reviewed related studies on the role of intervening variables on the financial constraint-exporting relationship. Konte and Ndubuisi's (2021) research in Africa reveals that financial constraints impede export activities. However, their result suggests that the negative effect of financial constraint and export performance is attenuated for firms located in trust-intensive societies (Konte & Ndubuisi, 2021). Héricourt and Poncet (2015) found that firms' decision to begin exporting and the exported value decrease for destinations with higher exchange rate volatility and that this effect is magnified for financially vulnerable firms. As expected, financial development dampens this negative impact, especially on the intensive export margin. In similitude, export tax rebates can smooth financial constraints by increasing cash flow, substituting working capital, and financing fixed asset investment and R&D investment (Zhang, 2019). In a study focusing on developing countries, Fauceglia's (2015) result highlights the importance of financial development in reducing credit constraints. The study suggests that financing obstacles and the benefits of better access to finance are exceptionally high for firms belonging to innovative sectors dependent on external finance. Considering the role of corruption, Ullah (2020) concludes that both firm- and country-level corruption hinder SMEs' access to financing and growth. Overall, the existing literature on the effects of ICT on firm exports is limited, meaning that the present study makes a crucial contribution by investigating the relationship between ICT and export performance in manufacturing firms in sub-Saharan Africa. This empirical research has important implications for policy-making. This empirical research adds to the current body of knowledge by recognizing ICT as a key determiner in firms' export performance and has important implications for policy-making.

Babasanya et al.
ICT Role on Financial Constraint-Exporting Link

JBASS 2024; 8(1): 81-91
Journal of Business Administration and Social Studies

Material and Methods

Theoretical framework
The theoretical framework employed in this study is the New-New Trade Theory. This theory is attributed to the works of Bernard et al. (2003) and Melitz (2003); also extended by Helpman, Melitz, and Yeaple (2004), Chaney (2005), and Manova (2013). Since this study is concerned with the effect of financial access and ICT on exporting, situating it within the New-New trade theory is justified. This is because the New-New Trade theory argued for the relevance of financial capabilities for export-entering firms. The assumptions are that firms are heterogeneous in nature and firms with higher productivity margin are capable of offsetting the financial requirements needed for export participation and hence these firms can choose to either engage or not in the export market? In this framework, trade gains are impeded by barriers that promote firm exit and relapse expansion, making low barriers to entry a desirable complementarity.

This theory operates on the following representations:

The domestic profit π_d is given by

$$\pi_d = R(\omega,\rho,\sigma) - \qquad \tag{1}$$

and

$$\pi_{i,d} \geq 0 \text{ if } \omega_i \geq \omega \tag{2}$$

Where $\mathcal{F}$ is the fixed production cost, R is the revenue of the firm i which is a function of its productivity (ω), price (P), and elasticity of demand (σ) of the product. Exporting ability depends on the firms that are able to overcome their financial barriers and raise productivity to offset the required fixed cost attached to the export market? These firms are able to raise their productivity above ω and hence will remain in the export market? All other firms below this productivity level are forced to exit the export market? For a firm to export, its productivity should be higher than the threshold of those firms that play only in the domestic market.

The Melitz (2003) New-New trade theory, however, does not account for the methods by which export entry costs $_x$ are financed. Drawing on Fazzari et al. (1988) capital market imperfections, Nagaraj's (2014) analysis shows that the cost and accessibility of credit for companies in the economy are affected by the existence of information asymmetry, imperfections in the capital market, and regulated credit. These factors create disparities in credit availability and cost across firms. The variation in the capital cost among firms indicates that export market entry costs could be funded through diverse ways by each firm. Firms with limited access to internal or external funding sources are likely to face higher capital costs, while those with ample cash reserves or the ability to secure funds easily can expect lower costs of capital.

The existence of varying financial capacities within firms can result in a division between exporters and non-exporters, regardless of their productivity levels. As a consequence, the profit function for an exporting company can be expressed as follows:

$$\pi_x = R(\omega,\rho,\sigma) - (\quad + \quad _x)(1+r_i) \tag{3}$$

where $_x$ is the fixed export entry cost. It is a function of the firms' specific cost of capital r_i. Explaining his zero cutoff and in line with Melitz (2003), he showed that new firms are drawn to the sector by the opportunity of achieving positive profits. Businesses continue to enter the sector until the final one earns no profits. This is given as:

$$R(\omega,\rho,\sigma) = (\quad _{X} + \quad)(1 + r_{i}) \tag{4}$$

The cut-off productivity is then given as;

$$\omega = R^{-1}(\quad _x + \quad)(1+r_i),\rho,\sigma \tag{5}$$

Firms with productivity over this threshold ω are the only ones likely to contemplate expanding overseas, such that the firm will engage in export.

When $\omega^* > \omega$, $\tag{6}$

where ω^* are the condition to participate in the export market?

Nonetheless, whether these enterprises can penetrate the export market hinges on the capital cost r_i that they incur. The limitations on financial resources instigate capital expenditures of firms seeking to enter the export market to increase. Consequently, the likelihood that a firm will engage in export activities is highly dependent on the firm's ability to fulfill the fixed costs of entrance. The firm's financial position hence becomes an important determinant of firms participating in export activities or not. Such that:

$$r_i + fc = h \tag{7}$$

where r_i is the cost of capital; fc is the financial constraint; and h represents the financial health. Given that a firm's ability to export depends on its financial health, the equation that a firm will export is therefore given as:

$$\omega^* = f(h) \tag{8}$$

where ω^* is the possibility that a firm export; h is the financial health of the exporting firm.

JBASS 2024; 8(1): 81-91
Journal of Business Administration and Social Studies

Babasanya et al.
ICT Role on Financial Constraint-Exporting Link

The Melitz new-new trade theory does, however, represent a significant departure from both traditional trade theories, such as the Ricardian and Heckscher–Ohlin models, and the new trade theories that emerged later. It introduces several innovative concepts and assumptions that shed light on the complex dynamics of international trade. One of the foundational distinctions lies in the treatment of firm heterogeneity. Traditional trade theories often assume homogeneity among firms within a country, an assumption that can oversimplify the real-world landscape of international commerce. In contrast, the Melitz Model boldly incorporates the notion of heterogeneity among firms operating within the same industry. This move away from the assumption of uniformity is crucial, as it recognizes that firms exhibit varying productivity levels and technological prowess. Building upon this recognition of firm heterogeneity, the Melitz model introduces the dynamic element of entry and exit decisions. Traditional trade theories typically overlook firms entering and exiting markets based on market conditions and trade policy changes. In the Melitz model, however, this becomes a central feature. Firms, it posits, may exit the market if their productivity levels fail to support their participation in export markets. Simultaneously, more productive firms seize opportunities and enter the export arena. This dynamism generates a selection effect where only the most productive firms thrive in international markets. One of the most groundbreaking aspects of the Melitz model is the incorporation of endogenous export decisions. Unlike traditional trade theories, which often lack an explanation for why certain firms choose to export while others remain domestically oriented, the Melitz model addresses this issue comprehensively. It argues that firms choose to export based on their productivity levels and the associated costs of exporting. If a firm's productivity is high enough to cover these costs, it opts for export, while less productive firms confine themselves to the domestic market. Furthermore, the Melitz model again stands apart from traditional and even new trade theories when examining trade patterns. Traditional models predict trade patterns primarily through the lens of comparative advantage, factor endowments, and technological disparities between countries. While introducing economies of scale and product differentiation, new trade theories did not delve deeply into the intricacies of firm-level behavior. In contrast, the Melitz model provides a more nuanced explanation for trade patterns by considering firm-level heterogeneity and the fluidity of firm entry and exit decisions.

Model Specification
The model for this study follows the theoretical framework, and in doing so, we specified the standard probit model consistently with the goal of this study. The rationale for choosing the standard probit regression lies in the categorical nature of our dependent variable. Probit regression is based on the assumption that the error terms in the model are normally distributed. In contrast, this normal distribution assumption is particularly relevant in fields like economics, where normality is a common assumption for error terms in various models. This distributional assumption influences the rationale for choosing probit regression over logit regression. While logit

regression assumes a logistic distribution of the error terms, probit regression's reliance on the normal distribution might make it more suitable in contexts where this assumption is more appropriate or where normality is theoretically justified (Scott, 1997).

We therefore specify a model that incorporates interaction terms to ascertain the role of ICT variables within the financial access-export performance relationship. The final augmented model enables us to examine the impact of ICT penetration within the financial constraint–exporting relationship. The model distinctively measures the role of mobile phone usage (*ICTMOB*) and internet usage (ICTINT) on the financial access–export performance relationship. The model is presented as:

$$
\begin{aligned}
\text{Prob}\left(\omega^{*}_{it}=1\right) = \varnothing(\alpha &+ \beta_1 \text{DFC}_{it} + \beta_2 \text{ICTMOB}_{it} + \beta_3 \text{ICTINT}_{it} \\
&+ \beta_4 \text{DFC*ICTMOB}_{it} + \beta_5 \text{DFC*ICTINT}_{it} \\
&+ \beta_6 \text{AGE}_{it} + \beta_7 \text{SIZ}_{it} + \beta_8 \text{OWN}_{it} + \beta_9 \varphi_{it} + \varepsilon_{it})
\end{aligned}
\tag{9}
$$

where DFC*ICTMOB denotes the interaction of access to bank finance and mobile phone usage; DFC*ICTINT represents the interaction of access to bank finance and internet use; $\alpha, \beta_1 .. \beta_9$ are parameter estimates.

Description of Variables
In Table 1 the variables used in this study are described. DFC is the measure of financial constraint and it is determined using three-pronged variables including total constraint (TC)=1, partly constrained (PC)=2, and no constraint (NC). This variable is therefore informed by the work of Kuntchev et al. (2013) and Fowowe (2017). ICTMOB is measured using mobile cellular telephone subscriptions and by the World Bank Enterprise Survey, which refers to the usage of cell phones in the operations of the firm. ICTINT is measured using the firm's usage of the internet in its operation. It is defined by the World Bank Enterprise Survey as firms that have used the internet through email or website in their operation. AGE is expressed as how long the business has been in operation, measured in years. The selection of this variable is also informed by Nagaraj (2014), Beck and Cull (2014). We define firm size (SIZ) as the productive strength of a firm, measured as the number of employees of the firm. It is also a categorical variable that takes the form (1=small) for firms with 1–99 workers and (2=large) if the firm has above 100 employees. The selection of this variable as a control variable is also informed by Sharma (2018) and Minetti and Zhu (2011). Ownership (OWN) is defined and determined by the amount of capital owned by either governmental or private entities, such as domestic and foreign individuals and organizations, measured in terms of percentages. The study used the foreign private form of ownership, taking the value 1 if Private foreign individuals, companies, or organisations own more than 10% share, and 0 if otherwise. Also, 1 when the firm is owned partly or fully by the government and 0 if otherwise. This selection is consistent with Cieślik and Michałek (2018).

Babasanya et al.
ICT Role on Financial Constraint-Exporting Link

JBASS 2024; 8(1): 81-91
Journal of Business Administration and Social Studies

Table 1.
Description of Variables

Variables	Description	Measurement	Source
ω^{*}	Export Performance	Binary variable that takes the value 1 if it exports at least 1% of its sales, whether through direct or indirect channels. zero if otherwise.	WBES
DFC	Finance constraint	Financial constraint (Degree of difficulty in accessing finance, including TC, PC, and NC).	WBES
ICTMOB	Mobile Phone	Firms' usage of mobile cellular telephone in their operations.	WBES
ICTINT	Internet	Firms' usage of the internet in their operations.	WBES
DFC*ICTMOB	Interaction of financial constraint and mobile phone	Interaction of ICT variables with access to finance variables	Author
DFC*ICTINT	Interaction of financial constraint and internet	Interaction of ICT variables with access to finance variables	Author
AGE	Firm age	the number of years since the establishment of the firm	WBES
SIZ	Firm size	number of permanent, full-time employees in the firm at the end of the last fiscal year.	WBES
	Small sized	A categorical variable that takes the value 1 if the firm has 1 – 99 employees and 0 if otherwise.	WBES
	Large sized	A categorical variable that takes the value 1 if the firm has above 100 employees and 0 if otherwise.	WBES
OWN	Ownership type		
	Foreign ownership	Share of capital owned by private foreign entities	WBES
	State ownership	Share of capital owned by the government	WBES
Source: Authors compilation, 2023			

Data

The study utilized the surveys conducted by the World Bank on enterprises, a recently acquired dataset of firm-level details made available by the World Bank and its affiliates worldwide. The data used for this study covers 40 SSA countries that have available data for the core variables of this study. Countries with limited data were excluded from the final observation and analysis of this study. After combining the data for the 40 SSA countries selected for this study and the removal of outliers and missing values from the dataset through the data cleaning process, 9,001 observations are produced and were used for the analysis.

Between 2006 and 2021, the enterprise surveys have encompassed over 130 000 companies across 125 nations. These surveys concentrate on various aspects that influence the business climate, some of which facilitate or hinder firms, ultimately impacting the overall prosperity of a country (World Bank, 2012). The surveys are carried out using a representative sample of businesses in the non-agricultural formal private economy and make use of a standardized universe, methodology, and core questionnaire, allowing comparisons to be made between different nations and survey years. The primary survey instrument consists of a set of questions that business owners and senior managers from all over the world answer. These inquiries offer both subjective and factual data regarding the challenges that businesses encounter in their operational setting. On a rating system of between 1 and 5, with 1 denoting no difficulty and 5 denoting severe difficulty, respondents are asked to rate 16 aspects of the business environment in terms of importance. The subjective judgements are meant to reflect the severity of obstacles that organizations face. This method enables the identification of the main challenges and an examination of the obstacles that companies perceived the most crucial. It is also necessary to note that mobile phone and internet usage are aggregates.

The research objective of this study is to empirically examine the interactive effect relationship between financial access and ICT on manufacturing firms' export performance in SSA. This objective mainly examines how the use of ICT would impact the financial access–manufacturing firms' export performance relationship. The study relies on the standard Probit regression model to achieve this objective. Between 2006 and 2021, the enterprise surveys have encompassed over 130 000 companies across 125 nations. These surveys concentrate on various aspects that influence the business climate, some of which facilitate or hinder firms, ultimately impacting the overall prosperity of a country (World Bank, 2014). The dataset comprises various variables representing characteristics of a sample population. Notably, the majority

JBASS 2024; 8(1): 81-91
Journal of Business Administration and Social Studies

Babasanya et al.
ICT Role on Financial Constraint-Exporting Link

of individuals within the dataset have some level of financial constraint, as indicated by the low mean values for "Export," "Total Constraint," and "No Constraint." This constraint is further accentuated by the positive skewness and kurtosis values, suggesting a non-normal distribution with a prolonged right tail and heavy tails. Among the sample, "Mobile Phone" and "Internet" adoption rates are relatively high, while the presence of "Small Firms" is moderately prevalent, and "Large Firms" and "Government-owned" entities are less common. The dataset also provides information on the age of firms, with a mean firm age of 26.44 years, indicating a relatively mature sample.

Table 2 presents the study's summary statistics while Table 3 presents the correlation matrix and it illustrates the relationships between our variables. Notably, none of the correlation coefficients exceed the 0.5 threshold, indicating that the variables are not strongly correlated with each other. Specifically, the "Export" variable shows a weak negative correlation with "Total Constraint" (−0.23) and a weak positive correlation with "Mobile Phone" (0.25) and "Internet" (0.19). The correlations among other variables, such as "Small Firm," "Large Firm," "Private owned," "Government owned," and "Firm Age," generally remain below the 0.5 threshold, reflecting limited linear associations among these factors.

Table 2.
Summary Statistics

Variable	Mean	Std. dev.	Skewness	Kurtosis	Min	Max	Obs.
Export	0.141	0.348	2.066	5.268	0	1	9,001
Total Constraint	0.001	0.032	31.577	998.112	0	1	9,001
Partly Constrained	0.349	0.477	0.632	1.400	0	1	9,001
No Constraint	0.316	0.465	0.793	1.629	0	1	9,001
Mobile Phone	0.642	0.479	-0.593	1.351	0	1	7,948
Internet	0.602	0.490	-0.415	1.173	0	1	8,842
Small Firm	0.514	0.500	-0.055	1.003	0	1	9,001
Large Firm	0.159	0.366	1.864	4.475	0	1	9,001
Private owned	0.179	0.383	1.678	3.819	0	1	9,001
Government owned	0.034	0.182	5.115	27.165	0	1	9,001
Firm Age	26.441	16.941	2.416	13.340	1	199	8,817

Note: Std. dev. = standard deviation; Min = minimum; Max = Maximum; Obs. = observation.
Source: Authors computation, 2023.

Table 3.
Correlation Matrix

	ω^*	TC	PC	NC	Mobile Phone	Internet	Small Firm	Large Firm	Private Owned	Gov. Owned	Firm Age
ω^*	1										
TC	−0.23	1									
PC	−0.12	−0.15	1								
NC	0.08	0.22	−0.1	1							
Mobile Phone	0.25	−0.06	0.14	0.03	1						
Internet	0.19	−0.08	0.11	0.07	0.25	1					
Small Firm	−0.18	−0.05	−0.12	−0.08	−0.14	−0.11	1				
Large Firm	0.11	0.15	0.13	−0.05	0.08	0.12	−0.09	1			
Private owned	−0.1	0.03	−0.12	0.07	0.01	−0.05	0.03	−0.06	1		
Gov. owned	0.07	0.11	0.01	−0.09	−0.03	0.04	0.05	0.06	−0.12	1	
Firm Age	0.15	-0.18	0.11	0.07	0.09	0.06	−0.15	0.13	0.03	−0.05	1

Source: Authors computation, 2023.

Babasanya et al.
ICT Role on Financial Constraint-Exporting Link

JBASS 2024; 8(1): 81-91
Journal of Business Administration and Social Studies

Empirical Results and Discussion

The research objective of this study is to empirically examine the effect of the interactive relationship between financial constraint and ICT on manufacturing firms' export performance in SSA. This objective primarily focuses on analyzing the effect of ICT on the relationship between financial constraints and the export performance of manufacturing firms. To accomplish this, the study employs the standard Probit regression model.

Table 4 presents the results of an empirical investigation into the intricate relationship between financial constraint, ICT, and export performance among manufacturing firms in SSA. From the table, partly constrained has a marginal effect of −0.272. Thus, partly financially constrained manufacturing firms in SSA have a 27.2% lower probability of performing in the export market? These results are significant at a 1% level of significance. This effect is even more pronounced for firms categorized as "Total Constraint," where the coefficient drops to −0.421. This implies that manufacturing firms in SSA that are totally financially constrained have a 42.1 percentage point less probability of performing in the export market? These results suggest that financial limitations can substantially hinder a firm's ability to perform in export markets. Notably, the study finds that the presence of "No Constraint" does not significantly alter export performance, emphasizing the distinct impact of different levels of financial constraint on export outcomes.

This result suggests that financial liquidity enables firms to engage effectively in international markets. This is likely because financial resources are essential for overcoming the various barriers to export, such as the costs associated with market research, adaptation of products to foreign standards, logistics, and credit insurance. Interestingly, the lack of a significant effect for firms with no financial constraints implies that while alleviating financial constraints is essential for enabling export performance, simply being free of such constraints does not automatically enhance a firm's export capabilities.

This result implies that financial constraints profoundly influence businesses, extending their impact across various critical dimensions of operations. These constraints, often stemming from limited access to capital, can curtail a company's capacity to invest in innovation and technological upgrades, hindering its competitiveness and long-term sustainability. Market expansion becomes challenging as financial resources are stretched thin, impeding a firm's ability to seize growth opportunities. Moreover, cost-cutting measures may compromise product and service quality, adversely affecting customer satisfaction and brand reputation. Higher borrowing costs, potentially exacerbated by limited financial resources, increase the debt burden. In severe cases, protracted financial constraints can push businesses toward insolvency, with far-reaching consequences for stakeholders. Competitors with more substantial financial positions may exploit the vulnerability of constrained firms, leading to the loss of market share. The capacity for innovation dwindles, and relationships with suppliers and partners may deteriorate. Financial constraints can stifle strategic agility, inhibiting a company's ability to pivot in response to changing market conditions. Thus, prudent financial management and strategies to mitigate the impact of constraints are imperative for business resilience and success. These results are consistent with the findings of Qasim et al. (2021), Ullah (2020), and Zhang (2019).

Furthermore, the result presents the impact of ICT on export performance and provides a compelling academic insight into the dynamics of modern international trade. The positive coefficients associated with mobile phone and internet usage, at

Table 4.
Result of the Empirical Investigation of the Interactive Effect of ICT on the Relationship Between Financial Access and Manufacturing Firms' Export Performance in SSA

Dependent Variable: Export Performance (Export Intensity ($_{\omega}*$))				
Variables	Coeff.	Std.Eerr	z	Prob.
Total Constraint	−0.421	0.048	−8.810	0.000*
Partly Constrained	−0.272	0.071	−3.834	0.000*
No Constraint	0.020	0.043	0.450	0.651
Mobile Phone (ICTMOB)	0.141	0.005	26.410	0.000*
Internet (ICTNIT)	0.137	0.005	25.630	0.000*
TC × ICTMOB	0.101	0.011	9.182	0.000*
PC × ICTMOB	0.043	0.010	4.219	0.001*
NC × ICTMOB	0.452	0.150	2.023	0.068
TC × ICTINT	0.058	0.016	3.720	0.003*
PC × ICTINT	0.115	0.010	11.500	0.000*
NC × ICTINT	0.602	0.456	1.320	0.214
Firm Age (AGE)	0.127	0.005	24.620	0.861
Small Firm (SMALL)	0.100	0.006	15.830	0.000*
Large Firm (LARGE)	0.135	0.010	13.040	0.000*
Private owned (OWNFP)	0.172	0.012	14.670	0.000*
Government owned (OWNST)	0.245	0.039	6.250	0.000*
Log likelihood	LR chi^2	Prob. chi^2	Regional dummies	
−2295.91	169.81	0.000 *	Yes	

Note: *p < .01; **P < 0.05; Coeff. = marginal effects; Std. err = standard error; z = z-statistics; Prob. = probability; LR = likelihood ratio; Alf × Ictmob and Nbf × Ictmob represent the interaction of mobile phone use with access to bank and non-bank finance; Alf × Ictint and Nbf × Ictint represent the interaction of internet use with bank and non-bank finance; SSA = Sub-Saharan Africa.
Source: Authors computation, 2023.

JBASS 2024; 8(1): 81-91
Journal of Business Administration and Social Studies

Babasanya et al.
ICT Role on Financial Constraint-Exporting Link

0.141 percentage points and 0.137 percentage points, respectively, underscore the criticality of ICT in enhancing firms' export capabilities. This phenomenon may be attributed to several factors. First, ICT, mainly through mobile phones and the internet, drastically reduces the information asymmetry between market participants, allowing firms to identify and exploit overseas market opportunities more effectively. Second, using ICT enhances operational efficiency by facilitating better coordination of supply chains and streamlined communication with clients and distributors, which are essential components of successful exporting. Third, these technologies are crucial in marketing and customer outreach, enabling firms to penetrate foreign markets more effectively. Moreover, the ubiquity and accessibility of ICT tools democratize the ability to engage in international trade, potentially leveling the playing field for smaller firms. The result of this objective is consistent with the findings of Makanyeza and Ndlovu (2016), Nath and Liu (2017), and Shetewy et al. (2022).

Moreover, the result delves into the interactive effects of financial constraints and ICT usage on export performance. Notably, interactions between total constraint (TC) and mobile phone usage, partly constrained (PC) and mobile phone usage, total constraint (TC) and internet usage, and partly constrained (PC) and internet usage exhibit statistically significant positive effects, signifying that firms facing financial constraints benefit significantly from the adoption of mobile phones and the internet in enhancing their export intensity. Conversely, while positive effects are observed for firms categorized as having no financial constraint (NC), they fail to reach statistical significance, implying that the presence of financial constraint may amplify the positive impact of ICT adoption on export performance. Regarding the magnitude, for firms facing total financial constraint (TC), the interaction with mobile phone usage yields a notable coefficient of 0.101, signifying that such firms experience a considerable 10.1 percentage point increase in export intensity when they utilize mobile phones.

Similarly, the interaction between partly constrained firms (PC) and mobile phone usage has a significant coefficient of 0.043, indicating a meaningful 4.3 percentage point boost in export intensity. Furthermore, the impact of internet usage is even more pronounced, with the interaction between total constraint (TC) and internet usage showing a substantial coefficient of 0.058, signifying a noteworthy 5.8 percentage point increase in export intensity. The interaction between partly constrained firms (PC) and internet usage is particularly striking, with a substantial coefficient of 0.115, emphasizing an impressive 11.5 percentage point enhancement in export intensity.

Conclusion

In this study, we investigate the intricate relationship between financial constraints, ICT adoption, and export performance among manufacturing firms in SSA. The research addresses a critical gap in the literature by emphasizing the pivotal role of ICT in mitigating financial constraints and empowering firms

to excel in export markets. Our findings underscore the significant impact of financial constraints on export performance, with "Total Constraint" firms facing a substantial 42.1 percentage point reduction in export probability, highlighting the formidable barrier of financial limitations. Notably, "No Constraint" does not significantly alter export performance, emphasizing the distinct impact of different levels of financial constraint on export outcomes. Furthermore, our study reveals the transformative power of ICT adoption on export performance. Both "Mobile Phone (ICTMOB)" and "Internet (ICTINT)" usage exhibit statistically significant positive coefficients, reflecting the critical role of connectivity and information exchange in modern global markets. Firms embracing mobile phones and the internet for communication purposes are poised to achieve significantly higher export performance levels. Additionally, we delve into the interactive effects of financial constraints and ICT adoption, finding that firms facing financial constraints benefit notably from adopting ICT, with substantial percentage point increases in export intensity. Overall, our research contributes to understanding how ICT adoption can act as a catalyst, bridging financial constraints and export performance in SSA's manufacturing sector, and offers valuable insights for policymakers, stakeholders, and scholars aiming to foster economic growth and development within the region.

In light of the empirical findings, it is imperative for policymakers and stakeholders in SSA to take proactive measures to harness the potential of ICT in facilitating manufacturing firms' access to international markets. First, fostering ICT infrastructure development and accessibility should be prioritized, particularly in regions with lower penetration rates. This includes investments in expanding mobile phone and internet coverage and initiatives aimed at enhancing digital literacy and skills among the workforce. Second, targeted financial support programs tailored to the specific needs of manufacturing firms facing financial constraints should be designed and implemented. These programs should alleviate the initial barriers to export market entry, providing firms with the necessary resources to compete in global markets effectively. By combining ICT development with targeted financial support, SSA countries can empower their manufacturing sectors, promote economic growth, and reduce the disparity in export performance observed compared to other global regions, thus fostering greater economic resilience and development.

In operationalizing these recommendations, adopting a comprehensive strategy that combines the development of ICT infrastructure with customized financial support is crucial. This approach calls for an integrated framework involving government initiatives and collaboration with the private sector. First, the expansion and improvement of ICT infrastructure are of utmost importance. Beyond simply increasing coverage, it is essential to focus on ensuring quality and reliable connectivity. Collaborating with telecommunications companies through incentives such as favorable policy frameworks and tax benefits is vital. Such partnerships are critical in bridging the digital divide, particularly in rural areas, and require solid public-private cooperation models. Simultaneously, promoting digital

Babasanya et al.
ICT Role on Financial Constraint-Exporting Link

JBASS 2024; 8(1): 81-91
Journal of Business Administration and Social Studies

literacy is vital. This can be achieved through comprehensive educational reforms incorporating ICT competencies into the core curriculum and establishing accessible adult training programs. Creating innovation hubs and incubators focused on technology would provide practical support for businesses aiming to enter international markets, thereby stimulating entrepreneurial efforts. The aspect of targeted financial support requires a tailored approach. The manufacturing sector in SSA faces specific challenges that demand solutions such as subsidized export financing, grants for market research, and risk mitigation insurance products. Microfinancing frameworks and facilitated credit access through local financial institutions present viable avenues for SMEs to obtain capital necessary for technological upgrades and export ventures.

As suggestions for further studies, this study opines that in the presence of reliable data on various non-bank informal financial sources, further research could examine the effect of access to various forms of non-bank informal finance on the export performance of manufacturing firms in SSA. Furthermore, other studies could consider disaggregating the manufacturing sector. In doing that, further research could explore how financial access affects different industries within the manufacturing sector.

References

Andonova, V. (2006). Mobile phones, the Internet and the institutional environment. *Telecommunications Policy*, *30*(1), 29–45. [CrossRef]

Asongu, S., le Roux, S., Nwachukwu, J., & Pyke, C. (2019). Reducing information asymmetry with ICT. *International Journal of Managerial Finance*, *15*(2), 130–163. [CrossRef]

Asongu, S., & Nnanna, J. (2018). ICT in reducing information asymmetry for financial sector competition. AGDI Working Paper no. WP/18/035. *SSRN Electronic Journal*. [CrossRef]

Basu, S., & Fernald, J. (2007). Information and communications technology as a general-purpose technology: Evidence from US industry data. *German Economic Review*, *8*(2), 146–173. [CrossRef]

Beck, T., & Cull, R. (2014). SME finance in Africa. *Journal of African Economies*, *23*(5), 583–613. [CrossRef]

Berman, N., & Héricourt, J. (2010). Financial factors and the margins of trade: Evidence from cross-country firm-level data. *Journal of Development Economics*, *93*(2), 206–217. [CrossRef]

Bernard, A. B., Eaton, J., Jensen, J. B., & Kortum, S. (2003). Plants and productivity in international trade. *American Economic Review*, *93*(4), 1268–1290. [CrossRef]

Bianchi, C., & Mathews, S. (2016). Internet marketing and export market growth in Chile. *Journal of Business Research*, *69*(2), 426–434. [CrossRef]

Botrić, V. (2021). The different impact of financial constraints on firm-level exports in manufacturing and service sector: Evidence from Croatia. In G. Karanovic, P. Polychronidou, & A. Karasavvoglou (Eds.), *The changing financial landscape*. *Contributions to economics* (pp. 29–40). Springer. [CrossRef]

Chaney, T. (2005). *Liquidity constrained exporters* [Working paper]. University of Chicago.

Cieślik, A., & Michałek, J. J. (2018). Firm-level determinants of direct and indirect exports: Empirical evidence for C.E.E. and M.E.N.A. countries. *Economic Research-Ekonomska Istraživanja*, *31*(1), 982–996. [CrossRef]

Eramudugoda, R., & Ramos, M. A. (2023). Bribery and export intensity: The role of formal institutional constraint susceptibility. *Cross Cultural and Strategic Management*, *30*(2), 248–271. [CrossRef]

Fauceglia, D. (2015). Credit constraints, firm exports and financial development: Evidence from developing countries. *Quarterly Review of Economics and Finance*, *55*, 53–66. [CrossRef]

Fazzari, S. M., Hubbard, R. G., Petersen, B. C., Blinder, A. S., & Poterba, J. M. (1988). Financing constraints and corporate investment. *Brookings Papers on Economic Activity*, *1988*(1), 141. [CrossRef]

Forte, R., & Salomé Moreira, A. (2018). Financial constraints and small and medium-sized firms' export propensity: Evidence from Portuguese manufacturing firms. *International Journal of the Economics of Business*, *25*(2), 223–241. [CrossRef]

Fowowe, B. (2017). Access to finance and firm performance: Evidence from African countries. *Review of Development Finance*, *7*(1), 6–17. [CrossRef]

Freund, C. L., & Weinhold, D. (2004). The effect of the Internet on international trade. *Journal of International Economics*, *62*(1), 171–189. [CrossRef]

Helpman, E., Melitz, M. J., & Yeaple, S. R. (2004). Export versus FDI with heterogeneous firms. *American Economic Review*, *94*(1), 300–316. [CrossRef]

Héricourt, J., & Poncet, S. (2015). Exchange rate volatility, financial constraints, and trade: Empirical evidence from Chinese firms. *World Bank Economic Review*, *29*(3), 550–578. [CrossRef]

Ismail, N. W., & Mahyideen, J. M. (2015). The impact of infrastructure on trade and economic growth in selected economies in Asia, *ADBI Working Paper Series (No. 553). Asian Development Bank Institute*. [CrossRef]

Jinjarak, Y., & Wignaraja, G. (2016). An empirical assessment of the export–Financial constraint relationship: How different are small and medium enterprises? *World Development*, *79*, 152–163. [CrossRef]

Kim, M. (2019). Effects of financial constraints on export performance of firms during the global financial crisis: Microeconomic evidence from Korea. *Applied Economics Letters*, *26*(1), 10–15. [CrossRef]

Kneller, R., & Timmis, J. (2016). ICT and exporting: The effects of broadband on the extensive margin of business service exports. *Review of International Economics*, *24*(4), 757–796. [CrossRef]

JBASS 2024; 8(1): 81-91
Journal of Business Administration and Social Studies

Babasanya et al.
ICT Role on Financial Constraint-Exporting Link

Konte, M., & Ndubuisi, G. (2021). Financial constraint, trust, and export performances: Firm-level evidence from Africa. *Journal of Institutional Economics*, *17*(4), 583–605. **[CrossRef]**

Kpodar, K., & Andrianaivo, M. (2011). ICT, financial inclusion, and growth : Evidence from African countries (No. 11/73; Working Paper). **[CrossRef]**

Kuntchev, V., Ramalho, R., Rodríguez-Meza, J., & Yang, J. S. (2013). *What have we learned from the enterprise surveys regarding access to credit by SMEs?* World Bank policy research working paper, 6670.

Lapukeni, A. F. (2015). Financial inclusion and the impact of ICT: An overview. *American Journal of Economics*, *5*(5), 495–500.

Makanyeza, C., & Ndlovu, A. (2016). ICT usage and its effect on export performance: Empirical evidence from small and medium enterprises in the manufacturing sector in Zimbabwe. *Botswana Journal of Business*, *9*(1), 9–36.

Máñez, J. A., & Vicente-Chirivella, Ó. (2021). Exports of Spanish manufacturing firms and financial constraints. *BRQ Business Research Quarterly*, *24*(1), 53–90. **[CrossRef]**

Manova, K. (2013). Credit constraints, heterogeneous firms, and international trade. *Review of Economic Studies*, *80*(2), 711–744. **[CrossRef]**

Mansilla-Fernández, J. M., & Milgram-Baleix, J. (2023). Working capital management, financial constraints and exports: Evidence from European and US manufacturers. *Empirical Economics*, *64*(4), 1769–1810. **[CrossRef]**

Melitz, M. J. (2003). The impact of trade on intra-industry reallocations and aggregate industry productivity. *Econometrica*, *71*(6), 1695–1725. **[CrossRef]**

Minetti, R., & Zhu, S. C. (2011). Credit constraints and firm export: Microeconomic evidence from Italy. *Journal of International Economics*, *83*(2), 109–125. **[CrossRef]**

Muto, M., & Yamano, T. (2009). The impact of mobile phone coverage expansion on market participation: Panel data evidence from Uganda. *World Development*, *37*(12), 1887–1896. **[CrossRef]**

Nagaraj, P. (2014). Financial constraints and export participation in India. *International Economics*, *140*, 19–35. **[CrossRef]**

Nath, H. K., & Liu, L. (2017). Information and Communications Technology (ICT) and services trade. *Information Economics and Policy*, *41*, 81–87. **[CrossRef]**

Puri, S. K. (2007). Integrating scientific with indigenous knowledge: Constructing knowledge alliances for land management in India. *MIS Quarterly*, *31*(2), 355–379. **[CrossRef]**

Qasim, S., Rizov, M., & Zhang, X. (2021). Financial constraints and the export decision of Pakistani firms. *International Journal of Finance and Economics*, *26*(3), 4557–4573. **[CrossRef]**

Rangan, S., & Sengul, M. (2009). Information technology and transnational integration: Theory and evidence on the evolution of the modern multinational enterprise. *Journal of International Business Studies*, *40*(9), 1496–1514. **[CrossRef]**

Scott Long, J. (1997). Regression models for categorical and limited dependent variables. *Advanced Quantitative Techniques in the Social Sciences*, *7*.

Secchi, A., Tamagni, F., & Tomasi, C. (2014). The micro patterns of export diversification under financial constraints. *Industrial and Corporate Change*, *23*(6), 1595–1622. **[CrossRef]**

Sharma, C. (2018). Exporting, access of foreign technology, and firms' performance: Searching the link in Indian manufacturing. *Quarterly Review of Economics and Finance*, *68*, 46–62. **[CrossRef]**

Shetewy, N., Shahin, A. I., Omri, A., & Dai, K. (2022). Impact of financial development and internet use on export growth: New evidence from machine learning models. *Research in International Business and Finance*, *61*, 101643. **[CrossRef]**

Singh, P., & Maiti, D. (2020). ICT, access to finance and firm exports: A cross-country study. In *Digitalisation and development* (pp. 161–181). Springer. **[CrossRef]**

Ullah, B. (2020). Financial constraints, corruption, and SME growth in transition economies. *Quarterly Review of Economics and Finance*, *75*, 120–132. **[CrossRef]**

World Bank. (2014). *Global financial development report 2014: Financial inclusion*. The World Bank. **[CrossRef]**

World Bank. (2021). *World Development Indicators | DataBank*. https://databank.worldbank.org/source/world-development-indicators

Zhang, D. (2019). Can export tax rebate alleviate financial constraint to increase firm productivity? Evidence from China. *International Review of Economics and Finance*, *64*, 529–540. **[CrossRef]**