Impact of trade facilitation on intra-manufacturing export among ECOWAS member states

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Abstract

This study investigates the effects of trade facilitation policies on intra-manufacturing exports among ECOWAS member states. Utilizing the Generalized Method of Moments (GMM) linear model, this research analyzes data from 2015–2020 for the ECOWAS member states. The findings reveal that trade facilitation policies in the ECOWAS region fall below the global average. This discrepancy is primarily due to the extensive bureaucratic processes in the region, leading to increased costs for exporting and importing goods. Consequently, there is a significant need for trade facilitation to enhance intra-manufacturing exports within ECOWAS. Based on these insights, the study recommends several policy interventions to improve trade flow and bolster intra-manufacturing exports in the ECOWAS region. These include a stronger commitment to trade agreements among ECOWAS member states, the adoption of information and communication technology (ICT) to streamline trade processes and reduce bureaucratic delays associated with document processing for exports and imports, the strengthening of institutional frameworks within the member states, and the formulation of policies aimed at increasing industrialization levels to enhance manufacturing exports throughout the ECOWAS region.

Keywords: *Economic integration, Gravity model, Trade facilitation, Trade flows*

JEL classification: C23, F10, F43, O47, O55

INTRODUCTION

The increasing production of manufacturing exports necessitates countries establishing open, predictable trade and investment systems, addressing tariffs and non-tariff barrier measures that impact foreign suppliers and domestic producers. The global market competitiveness hinges on a country's ability to import world-class inputs to bolster its export capacity. Barriers to importing, whether intermediate or finished products, elevate production costs and diminish a country's competitiveness on the

global stage. Tariffs and other non-tariff barriers, including inefficient border procedures, undermine the competitiveness of exports.

Research concurs that the complexity of cross-border procedures significantly hinders intra-regional manufacturing trade. This includes dealing with excessive documentation requirements, unstable and opaque procedures, high fees, and protracted and intricate conformity assessments (covering sanitary and phytosanitary requirements and technical trade barriers), which pose obstacles to trade (Odularu & Odularu, 2017; Odularu, 2019). A study conducted by the International Trade Committee (ITC) on non-tariff barriers within the ECOWAS region in 2016 revealed that supply chain barriers comprise 73% of procedural obstacles encountered by firms. These procedural obstacles often manifest as informal payments, time constraints, institutional problems with regulations, and discriminatory behaviour by officials. Trade facilitation policy addresses these issues by fostering a conducive environment for cross-border trade.

Specifically, trade facilitation policies are crucial in enhancing intraregional trade, promoting regional economic integration, and reducing trade costs. Consequently, these policies attract investors and multinational corporations to invest in the region and outsource their supply chains, considering trade facilitation policy reforms as key factors in their decision-making process. Obstfeld & Rogoff (2001), as cited in Olayiwola et al. (2015), argue that the problems of international macroeconomics can be analyzed through the lens of trade costs. According to Olayiwola et al. (2015), trade costs within an economy significantly influence the distribution of surplus and the cost of adjusting policies and shocks between regions and countries. Previous literature posited that if exchange rates, tariffs, and non-tariff barriers do not impede the flow of goods and services between countries, then trade disagreements between countries would be minimal (Agnosteva et al., 2019). However, recent studies have indicated that, even in advanced economies such as China, Canada, and the United States, intra-country trade disagreements are substantial (Sakyi et al., 2018; Agnosteva et al., 2019).

Notably, disagreements over distribution within a country that is part of a regional agreement can hinder regional development and diminish the incentive for countries to implement such agreements (Olayiwola et al., 2015). Despite the advantages associated with trade facilitation, it has not garnered significant attention in trade studies within the ECOWAS context, and its impact on intra-manufacturing trade among ECOWAS member states remains unclear.

Leveraging trade facilitation measures enhances regional economic agreements and reduces regional trade costs. Lower trade costs can stimulate the growth of local firms' manufacturing, thereby increasing their trade volume and competitiveness in international markets. ECOWAS countries face a significant challenge due to their lack of production capacity to transform primary products into consumable, value-added products. This deficiency has been a persistent issue for ECOWAS member states, contributing to the rising poverty rates. Consequently, despite regional economic integrations (REI), ECOWAS member states experience reduced intra-trade, highlighting the unsatisfactory state of intra-manufacturing exports within the region. This paper investigates the impact of trade facilitation on promoting intra-manufacturing exports in the region. To achieve this objective, the study investigates the following questions: Can trade facilitation aid in promoting intra-manufacturing exports in the region, and what are the significant obstacles to trade facilitation in enhancing intra-manufacturing exports within the region?

REI represents a process that eliminates discrimination between national economies, essentially an agreement within a regional bloc to reduce or altogether

remove tariffs and non-tariff measures, facilitating the free trade of goods and services between countries within the region. REI aims to drive growth and enhance the economic well-being of countries by creating regional value chains that increase economic efficiency. The objectives of economic integration include increasing the economic well-being of any country, reducing economic inequalities among integrating countries through expanded markets that foster competition and enable economies of scale, increasing innovation, lowering input and consumer prices, facilitating specialization of economies, and encouraging the development of regional production activities. For developing and least-developed countries, economic integration is a crucial driver for poverty reduction, reducing social inequality, and economic divergence through trade and investment cooperation (Ndulu & Reinikka, 2005).

Trade facilitation represents a comprehensive approach by national, regional, and multilateral authorities to reduce the time and costs associated with processing trade. The significance of trade facilitation has been heightened in World Trade Organization (WTO) trade policy negotiations despite the relatively limited detail in the General Agreement on Tariffs and Trade (GATT) and previous shortcomings in achieving intended outcomes. Recent developments align Regional Economic Integration (REI) more closely with trade facilitation dimensions, as noted in WTO trade policy negotiations (Safaeimanesh & Jenkins, 2020).

In essence, trade facilitation encompasses measures designed to streamline and reduce the time and costs of border document processing and transportation associated with trade flows. These policies target many areas, including transport, transit, customs transparency, banking, insurance, business practices, telecommunications, and adherence to international and regional standards (Narayanan et al., 2016; Sakyi et al., 2018).

The supply chain encompasses all activities involved in producing goods and delivering them to end consumers, including the procurement of raw materials, transportation, obtaining import licenses, managing customs clearance documents, handling payments, and final delivery to consumers. Given the various complexities within the supply chain, a theoretical model is often employed to simplify and better understand its intricacies; thus, a reference model is essential. The supply chain barriers model of economic regional integration primarily aims to eliminate or minimize tariffs with third countries or regions (Ndulu & Reinikka, 2005). The World Economic Forum identifies four types of supply chain barriers:

i. Lack of transport infrastructure: This includes inadequate road, rail, sea, and air transportation networks, which escalate costs and hinder the cross-border trade of goods and services.
ii. Non-tariff measures are safety and sanitary requirements, technical standards, and additional regulations that increase the compliance costs for importing or exporting goods.
iii. Border administration refers to inefficient border control and burdensome or non-transparent import or export procedures.
iv. Business environments: This involves discriminatory and unstable regulatory environments and physical security issues along the supply chain.

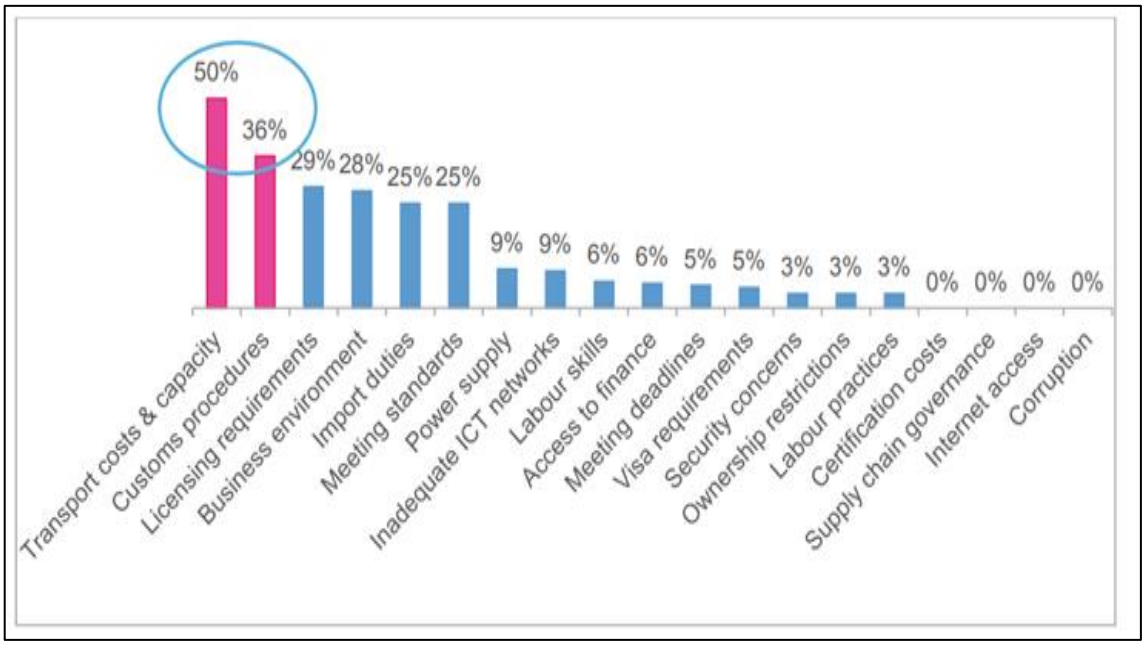

Figure 1. The main barriers in supply value chains

Source: *OECD/WTO Aid.*

Trade facilitation is a strategic tool to mitigate barriers within the supply value chain by integrating policies that promote trade into long-term development strategies (Olayiwola et al., 2015). It pertains to the sector producing durable and non-durable goods, such as machines, tools, and materials processed or formulated through chemical and biological means. This sector, known as industrial production, utilizes raw materials to manufacture semi-finished and finished goods on a large scale. Semi-finished goods may undergo further processing to become complex products like aircraft, automobiles, and household appliances. The manufacturing sector represents a crucial component of an economy, contributing to nearly two-thirds of industrial GDP. Within this sector are various sub-sectors, including food processing, metallurgy, machinery and tools, and chemical products, among which food processing is notably significant and often benefits from public incentives (World Trade Organization, 2019).

The trading environment is multifaceted, offering extensive opportunities for trade facilitation efforts. With approximately 60 or more distinct exchange procedures outlined by Grainger (2007a) for goods and services, including the vehicles that transport these goods (ships, planes, and trucks) and their operators (drivers, seafarers, and crew), the complexity of international trade is evident. The regulation of the international trade environment encompasses various controls, including those for protection and safety, environmental and health considerations, consumer protection, trade policy, and revenue collection, often managed by customs authorities.

Global trade involves a complex process. The global movement of products entails several stages before export, such as packaging, storage, transportation, port entry, customs procedures, and loading onto ships. At the destination port, the process includes off-loading, storage, port and customs clearance, transportation to the client, unpacking, and post-sale services (such as assembly, warranties, and guarantees). The contractual obligations between the buyer and seller, depending on the agreed terms of purchase and sale, can be unilateral or mutual (ICC, 1999).

Endogenous growth theory posits that capital formation, technological advancement, and the accumulation of knowledge are pivotal factors that drive economic growth (Romer, 1986). Furthermore, if a state experiences a significant

increase in these variables, it suggests an endowment of factors conducive to a comparative advantage, as originally proposed by Heckscher (1919) and Ohlin (1933). According to their theory, for a country to have a comparative advantage, it should predominantly import goods for which it lacks factor endowments and export goods for which it has abundant factor endowments (Romer, 1986). Endogenous growth theory elucidates that exports and imports exert long-term impacts on production growth.

To elaborate on the role of exports and imports in the sustained growth of a country's economy, Romer (1986) refined Solow's neoclassical growth model to account for the fact that imports from developing countries can stimulate exports and imports as long-term economic growth catalysts through the perpetual transfer of knowledge, thereby facilitating the diffusion of technology from more developed to less developed nations through foreign direct investment flows. The theory suggests that exports, foreign direct investment (FDI), and imports positively affect economic growth. Conversely, fluctuations in FDI inflows are believed to impact economic growth negatively. It highlights that exports, FDI, and imports foster growth by encouraging innovation and reducing research and development (R&D) costs (Solow, 2000).

Despite numerous studies on trade facilitation in West Africa, only a few have employed econometric methods to investigate the impact of trade facilitation policies on intra-manufacturing trade among ECOWAS member states.

Adegboye et al. (2020) explored the effects of trade liberalization on economic growth in the ECOWAS region, using pooled data from 14 ECOWAS countries from 2000 to 2017 and employing techniques such as pooled ordinary least squares regression, fixed, and random effect models. Their findings indicated that trade liberalization has an insignificant relationship with economic growth in the ECOWAS region. The study further suggests that member countries are not adequately prepared for their technicalities despite the liberalization policy, leading to minimal intra-regional trade.

Okoro et al. (2020) examined the nexus between regional and non-regional trade and economic growth in the ECOWAS region from 2007 to 2017, utilizing dynamic system GMM models. Their analysis revealed that the trade coefficient of ECOWAS is positively and statistically significantly associated with growth. In contrast, the coefficient for non-regional trade is negative and not statistically significant in determining growth.

Nguenkwe et al. (2019) analyzed trade facilitation and intra-regional manufacturing goods trade between two communities, focusing on the role of ICT and corridor environment indicators. Using an augmented gravity model based on data from the UN Conference on Trade and Development, they found that the internet positively and significantly influences intra-ECCAS trade but has no significant impact on intra-ECOWAS trade.

Osabuohien et al. (2019) analyzed regional trade agreements among ECOWAS member states, employing an augmented gravity model to assess the determinants of bilateral trade in the region. Their findings indicate that bilateral trade barriers significantly impede trade flows among member countries. Conversely, trade complementarity measures positively and significantly influence bilateral trade within the region, underscoring the importance of resisting multilateral trade in favour of fostering economic integration agreements to enhance intra-regional trade. The study suggests that implementing trade facilitation policies in ECOWAS member states could facilitate achieving the West African Economic and Monetary Union (WAEMU) goals.

In a related study, Olayiwola et al. (2015) utilized the system general method of moments (GMM) with instrumental variable (IV) estimation on a dynamic panel data model from 15 ECOWAS member states to investigate the impact of trade facilitation and regional economic integration on intra-regional manufacturing exports. The study used the required processing days and documents as a proxy for trade facilitation and found that a 1% decrease in the number of days required to process the export of agricultural commodities is associated with a 0.07% increase in manufacturing exports. The findings suggest that trade facilitation measures, which aim to reduce border and documentary compliance time and costs associated with international trade administration, offer a comprehensive and integrated approach to simplifying and lowering the costs of trade transactions. This, in turn, enhances international trade flows' efficiency, transparency, and predictability. A significant gap identified from the existing literature is the lack of studies directly linking trade facilitation to intra-manufacturing export performance within the context of ECOWAS member states, thereby highlighting the need for research on the impact of trade facilitation on intra-manufacturing export performance among these states.

METHODS

Manufacturing export performance is posited to be significantly influenced by trade facilitation measures. The data utilized for the study are derived from various reputable sources, including ECOWAS trade data, World Trade Indicators, World Governance Indicators, and World Development Indicators, which are accessible via the World Bank's website (http://data.worldbank.org/).

Model specification

As outlined by Olayiwola et al. (2015), trade facilitation, represented by the number of days required to process import or export documents, can be mathematically expressed as follows:

$$TF = day_{si} = f(integration, Institution, Infrastructure, Macro) \quad \text{..... (1)}$$

Where:

- *TF* (trade facilitation) denotes the days to process exports/import documents (*xdays* or *mdays*) for country *i*.
- *Institution* refers to the rule of law index and control of corruption index.
- *Infrastructure* encompasses internet users per 100 inhabitants and telephone lines (fixed + mobile) per 100 inhabitants.
- *Macro* represents Per capita Real Gross Domestic Product (PCRGDP).

In a more detailed formulation, equation (1), when presented in its static form, is divided into separate equations for the number of days required to process exports and imports, respectively. These can be rewritten as follows:

For exports:

$$xdays_{it} = \delta_0 + \delta_1 institution_{it} + \delta_2 infrastructure_{it} + \delta_3\, macro_{it} + \in \text{.....} \quad (2)$$

For imports:

$$mdays_i = \beta_0 + \beta_1 institution_{it} + \beta_2 infrastructure_{it} + \beta_3\, macro_{it} + \varepsilon \quad \text{.....(3)}$$

Where:

- *xdaysit* represents the days required to process exports from country *i* to country *t*.
- *mdaysi* denotes the days required to process imports for country *i* from country *t*.
- ε and ϵ are the error terms, which are assumed to be independently and identically distributed (i.i.d).

Based on a priori expectations, it is anticipated that $\delta_j < 0 \; and \; \beta_k < 0$. (where j, k=1,2,3), indicating that improvements in institutions, infrastructure, and higher per capita real Gross Domestic Product (PCRGDP) are associated with a reduction in the number of days required to process exports or imports. This means that as the quality of institutions, the level of infrastructure, and economic output per capita increase, the efficiency of trade processes, as measured by the time needed for document processing, improves.

Incorporating dynamics into the model, we consider the influence of the previous period's processing times, leading to the following dynamic formulations:

For exports:

$$xdaysit = \delta_0 + \delta_1 xdays_{i,t-1} + \delta_2 institution_{it} + \delta_3 infrastructure_{it} + \delta_4\ macro_{it} + \epsilon \text{ …… (4)}$$

For imports:

$$mdaysi = \beta_0 + \beta_1 mdays_{i,t-1} + \beta_2 institution_{it} + \beta_3 infrastructureit + \beta_4 macroit + \varepsilon \quad \text{…(5)}$$

The expectation here, based on theoretical relationships, is that $\delta_j < 0 \; and \; \beta_k < 0$. (where j, k =1,2,3,4), suggesting that improvements in the model's variables lead to a decrease in the number of days to process exports/imports from one period to the next.

The analysis model for manufacturing exports (expressed as a percentage of a country's GDP) as a function of the country's manufacturing production, political institutions, infrastructure services, regional integration, and trade facilitation can be specified as:

$$manex = f\ (integration, institution, infrastructure, TF, manpdtn) \text{ ………….. (6)}$$

Where:

- *Macro* Variables:
- *man*Ex = Manufacturing export, measured as a percentage of country *i*'s GDP..
- $manpdt_i$ = Manufacturing production of country *i*, and per capita real Gross Domestic Products (PCRGDP).
- *Integration* = Trade integration variable, proxied as the intra-regional manufacturing export share of country *i*'s GDP.
- *lnstitutions* = Political institution variable, proxied by the regulatory quality (RQ) indicators (the rule of law and corruption) for country *i*. Corruption is proxied with the control of the corruption index.
- *Infrastructure* = Proxied by the number of internet users and telephone lines (fixed + mobile) per 100 inhabitants.
- *TF* = Number of days needed to process documents for exports and imports, that is, exports (xdays) and imports (mdays).

In a more explicit form, Equations (6) in their static and dynamic versions can be rewritten respectively as:

$$manex_{it} = \gamma_0 + \gamma_1 integration_{it} + \gamma_2 institution_{it} + \gamma_3 infrastructure_{it} + \gamma_4 TFit + \gamma_5 manpdtnit + \varphi \text{ …………………………(7)}$$

$$manex_{it} = \pi_0 + \pi_1 manex_{it-1} + \pi_2 integration_{it} + \pi_3 institution_{it} + \pi_4 infrastructure_{it} + \pi_5 TF_{it} + \pi_6 manpdtnit + \omega \text{ …………………………..(8)}$$

These equations model the manufacturing exports from country *i* to country *t* in year *y*, where φ and ω represent error terms assumed to be randomly and normally distributed. The theoretical relationships expected from this study are $\gamma_0, \gamma_1, \gamma_2, \gamma_3, \gamma_5 > 0$; and $\gamma_4 < 0$ and $\pi_0, \pi_1, \pi_2, \pi_3, \pi_4, \pi_6 > 0$; and $\pi_5 < 0$, indicating that exports decrease with *xdays* but increase with all other factors.

The gravity model, as utilized by Olayiwola et al. (2015) for agricultural exports, is adapted in this study to measure intra-manufacturing exports within the ECOWAS region. The study employs Ordinary Least Squares (OLS), fixed effects, and Generalized Methods of Moments (GMM) for estimation. The GMM (gravity model) is extensively used to analyze trade flows between countries, focusing on the supply potential (proxied by the ratio of manufacturing exports to GDP) of the exporting states, the market demand potential (proxied by real GDP) of the importing states, and the trade costs (proxied by the days and number of documents needed for exports and imports) between the exporting and importing countries (Nguenkwe et al., 2019).

Furthermore, the Generalized Methods of Moments (system GMM) addresses the endogeneity issue in dynamic panel models, which is a significant concern. The Instrumental Variable (IV) estimation is primarily used to tackle this problem, provided the instruments strongly correlate with the potentially endogenous variables and are genuinely exogenous to the model. This allows for over-identification of the model and facilitates tests for exogeneity and excludability. The Two-Stage Least Squares (TSLS) and Generalized Methods of Moments (GMM) are commonly employed in IV estimation. The GMM method yields identical results to TSLS for just-identified models but can provide more precise estimates for over-identified models.

Additionally, GMM utilizes internal instruments, unlike TSLS, which requires finding suitable external instruments. Hence, the GMM method is deemed appropriate for estimation in this study. Equations (2, 3, and 7) will be estimated using the panel fixed effect estimator, and Equations (4, 5, and 8) will be estimated using the system GMM. The dynamic system GMM estimation allows all variables not correlated with the error term (lagged and differenced variables) to be valid instruments (Greene, 2008).

RESULTS AND DISCUSSION

Table 1 presents the results from the fixed effects and the one-step system GMM models for the number of days needed to process exports and imports for manufacturing exports. The system GMM results utilize an optimal set of endogenous instruments, applying the collapse option to handle the instruments efficiently. All estimations undergo tests for heteroscedasticity or autocorrelation, regardless of whether they are analyzed under fixed effects or the system GMM framework. In the dynamic panel data models, lagged dependent variables (such as the number of days needed for exports and imports, denoted as *x*days and *m*days) are treated as predetermined endogenous variables. Consequently, the study employs internal instruments to address the endogeneity of dependent variables in their lagged forms as regressors. These instruments include lagged levels of the standard differenced equation and lagged differences of the levels equation, ensuring a rigorous control for endogeneity.

The results presented in Table 1 highlight that the estimation of ρ indicates variations in the number of days needed for processing exports/imports (*x*days, *m*days) and manufacturing exports (*manuex*) primarily reflect the differences in these processes across ECOWAS member states. The zero F-test residuals signify significant country-level effects, suggesting that pooled Ordinary Least Squares (OLS) estimates would be inappropriate for this analysis, as Nguenkwe et al. (2019) noted.

For the system Generalized Method of Moments (GMM), the Doornik-Hansen test for normality, based on skewness and kurtosis of multivariate data, is employed to ensure the independence of transformed data. This test is preferred over the Shapiro-Wilk test for multivariate distributions due to its greater power in handling idiosyncratic errors, which are unobserved factors affecting the dependent variables (Doornik & Hansen,. 2008). The acceptance of the null hypothesis, due to a p-value higher than the

significance level α (0.01), indicates that the distribution of the test scores is normal with a 99% probability. Consequently, there is no evidence of serial correlation, which supports the consistency of the estimates. The Panel Cross-section Heteroskedasticity LR Test supports the null hypothesis that residuals are homoscedastic.

Table 1. Estimated results

Estimator	Fixed effects			System GMM		
Dependent Variable	xdays (1)	mdays (2)	manex (3)	xdays (4)	mdays (5)	manex (6)
Regressors						
l.xdays				1.329156*		
				-6.51		
l.mdays					1.233*	
					-9.47	
xshare	-0.241*		0.025	-0.129***		0.211**
	(-3.06)		-0.79	(-1.10)		-2.68
mshare		0.031			-0.025	
		-0.23			(-0.24)	
RL	-5.211	-8.275		-0.662	-1.274	
	(-0.72)	(-0.86)		(-0.15)	(-0.28)	
CC	-3.338	-2.388		-0.447	-0.572	
	(-1.09)	(-0.56)		(-0.09)	(-0.11)	
PCRGDP	-9.644*	-1.326*		0.028	0.027	
	(-4.42)	(-3.92)		-0.45	-0.47	
ITNET	-0.201**	-0.203***	-0.099**	0.094	0.052	-0.121**
	(-2.47)	(-1.93)	(-2.44)	-0.89	-0.67	(-2.02)
TEL	-0.094**	-0.031	0.062**	0.049	0.075	0.066**
	(-2.36)	(-0.79)	-2.52	-0.88	-1.34	-2.42
xdays			-0.010*			-0.096*
			(-3.02)			(-2.98)
manpdtn			8.42***			7.45***
			-1.69			-1.65
RQ			-0.674			1.219
			(-0.43)			-0.89
CONS	96.462*	98.965*	5.675**	-16.884	-20.209**	1.117
	-6.68	-5.41	-2.65	(-1.39)	(-2.41)	-0.64
No. of Group	7	7	10	6	6	10
Instruments				6	6	6
Time dummy				Yes	Yes	Yes
rho	0.913	0.932	0.9			
R^2	0.866	0.126	0.003			
F-stat	9.03	4.34	5.48	25.3	28.94	8.89
P-value	0	0.003	0.0001	0	0	0
F-stat (residual)	12.4	21.05	25.81			
P-value	0	0	0			
AR (2) (p-value)				0.812	0.45	0.501
Sargan (p-value)				0.855	0.181	0.064

*Notes: t-statistics are in parenthesis for each coefficient * (**) *** and indicate significance at 1, (5), and 10 % levels, respectively*

Furthermore, the study employs the Sargan statistic to assess the validity of instruments by comparing the number of instruments to their related parameters. In the one-step, non-robust system GMM estimation, the minimized value of the Sargan statistic is crucial for the one-step system GMM criterion function. The null hypothesis,

which posits that the population moment conditions are valid, is not rejected if the p-value is greater than 0.05, indicating the appropriateness of the instruments used in the analysis.

The analysis of the one-step system GMM dynamic panel models for the 15 ECOWAS member states reveals the use of 6 instruments and 4 parameters, resulting in a total of 2 over-identifying restrictions in each case. Additionally, a configuration involving 10 instruments and 6 parameters indicates 4 over-identifying restrictions. The Sargan statistic, in this context, does not reject the Over-Identifying Restrictions (OIR) hypothesis, thereby validating the set of instruments used. The F-statistic, analogous to the Wald (Chi-Squared) statistic, measures the goodness of fit of the estimated models. The values obtained in the specifications are deemed reasonably satisfactory at a 1% significance level for each specification. This suggests that all the exogenous variables collectively and significantly explain the trade facilitation process and manufacturing exports across the ECOWAS member countries during the period studied.

The results from the fixed effect model estimations align with theoretical expectations, indicating that all explanatory variables, except for the political institutional variables (the rule of law and control of corruption), significantly influence the number of days required to process export documents (xdays) within the ECOWAS region. Notably, the trade infrastructure variable, encompassing telecommunications and internet access, is negatively correlated and highly significant at the 1% level. Specifically, a 100% increase in the trade integration variable correlates with approximately a 24% reduction in the number of days needed to process exports in the ECOWAS region, highlighting the significance of enhanced trade facilitation. This finding contrasts with expectations based on previous studies like Nguenkwe et al. (2019), who highlighted the positive impact of ICT on intra-regional trade in other contexts.

The analysis further demonstrates that the macroeconomic variable, per capita GDP, exhibits a negative correlation and is highly significant at the 1% level. The coefficient of this variable indicates that a 100% increase in per capita GDP is associated with an approximate 96% reduction in the number of days required for trade flow (xdays), thereby enhancing trade facilitation. Similarly, the service infrastructure variables, internet users (itnet) and telephone users (tel) are negatively correlated and significant at the 5% level. Specifically, a 100% increase in internet users per 100 inhabitants is expected to reduce xdays by about 20%. A similar increase in telephone users per 100 inhabitants could result in approximately a 9% reduction in xdays, indicating improved trade facilitation across ECOWAS member countries. These findings align with the broader literature, such as the work of Olayiwola et al. (2015), underscoring the critical role of economic development and infrastructure in enhancing trade efficiency.

The model incorporates a constant term of 96.46, highly significant at the 1% level. This suggests that processing exports within the ECOWAS region would take approximately 96 days without any explanatory variables.

Regarding the processing of imports within the ECOWAS region (mdays), most explanatory variables exhibit the anticipated negative sign. The macroeconomic variables (PCGDP) and the service infrastructure (ITNET) are significant at 1% and 10%, respectively. The results show that a 100% increase in PCGDP leads to a 132% reduction in mdays, and a 100% increase in ITNET results in approximately a 20% reduction in mdays. Notably, the pronounced effect of PCGDP on reducing mdays significantly extends the understanding from previous studies, such as those by Olayiwola et al. (2015), which also recognized the positive impact of economic and infrastructural development on trade facilitation but did not quantify such a dramatic

reduction in processing times. The constant term of 98.96 is highly significant at the 1% level, indicating that it takes about 99 days to process import documents across the ECOWAS member countries when all explanatory variables are considered zero.

The political institutional variables align with theoretical expectations but are statistically insignificant. This highlights the necessity for strengthening political institutions in the ECOWAS region to achieve higher and more significant trade flows. The estimation results for manufacturing exports closely match theoretical expectations, indicating a well-founded model. However, the trade agreement variable (xshare), despite aligning with the theoretical expectation of a positive relationship, is not statistically significant. This suggests enhancing trade flows to boost manufacturing exports within the ECOWAS region.

Regarding service infrastructure variables, internet users (itnet) and telephone users (tel) are significant at 5%. However, only the telephone users variable (tel) meets a priori expectations, indicating that a 100% increase in telephone users could enhance manufacturing exports by approximately 6%. The trade facilitation indicator (xdays) also aligns with a priori expectations. It is significant at the 1% level, suggesting that a 10% reduction in the time required to process export documents could increase manufacturing exports across the ECOWAS region by about 10%. The expectations for manufacturing production are met and are statistically significant at the 10% level, indicating that a 10% increase in manufacturing production could result in an 84% increase in manufacturing exports across the ECOWAS region.

However, the variable representing political institution quality, specifically regulatory quality, did not meet a priori expectations and is statistically insignificant. This implies that a poor regulatory environment, caused by weak institutions across ECOWAS member states, could negatively impact the region's trade dynamics.

The system GMM analysis indicates that the trade agreement variable (xshare) and the lagged xdays significantly impact variations in xdays, with significance levels of 1% and 10%, respectively. Specifically, a 100% increase in xshare leads to approximately a 13% reduction in xdays, thereby enhancing trade facilitation within the ECOWAS region. For the number of days required to process imports within the ECOWAS region, only the lagged dependent variable (l.mdays) and the constant term are significant, with some other independent variables aligning with a priori expectations. Notably, the manufacturing exports estimation results are statistically significant and conform to a priori expectations, with all independent variables being statistically significant at either the 1% or 5% level, except for the regulatory quality (RQ) variable, which is statistically insignificant.

The trade agreement indicator (xshare) is positively associated with manufacturing exports, indicating that a 10% increase in the intra-regional export share of total exports leads to a 2.1% increase in manufacturing exports within the ECOWAS region. The internet users variable (itnet) did not meet theoretical expectations. In contrast, the telephone users variable (tel) did, with a 100% increase in telephone users, resulting in a 6.6% increase in manufacturing exports across the ECOWAS region. The trade facilitation variable (xdays) aligns with a priori expectations, suggesting that a 10% reduction in the days required to process export documents can increase manufacturing exports across the ECOWAS member countries by about 0.9%. The macroeconomic factor, measured by manufacturing production, is positively correlated and statistically significant at the 10% level, indicating that a 10% increase in manufacturing production can enhance manufacturing exports in the ECOWAS region by approximately 74%. The regulatory quality variable aligns with a priori expectations. Still, it remains statistically insignificant, reflecting the impact of weak political institutions that do not foster intra-manufacture trade among ECOWAS member states.

CONCLUSION AND RECOMMENDATIONS

Conclusion

This paper investigates the impact of trade facilitation on intra-manufacturing exports within the ECOWAS region, utilizing a gravity model to address the econometric issue of zero flows in trade data. Zero trade flows, often due to small trade volumes between countries, lead to selection bias, a challenge noted in previous studies on African trade flows (Sakyi et al., 2019; Afesorgbor, 2017). By focusing on a more recent period (2015-2020) and excluding zero flows from the dataset, the study aims to mitigate this issue. The research incorporates various trade facilitation indicators, including the required documents, time, and cost to export/import.

The findings highlight several implications. Firstly, trade agreements can potentially enhance intra-trade flows among ECOWAS member states, suggesting that increased political commitment to trade agreements could significantly reduce the time required to prepare export documents. Secondly, lagged trade facilitation processes positively affect future trade flow, supporting the macroeconomic convergence criteria. This indicates that economic growth in integrating economies positively influences trade. The study also finds that internet infrastructure significantly impacts trade facilitation, pointing to the importance of ICT adoption in reducing bureaucratic delays in export document processing. However, institutional quality indicators like the corruption control index and the rule of law index, while aligning with theoretical expectations, are statistically insignificant. This underscores the need to strengthen institutional frameworks to enhance trade flows.

Recommendations

Enhancing trade facilitation and intra-manufacturing exports within the ECOWAS region necessitates a multifaceted approach. A greater commitment to trade agreements is imperative. The findings underscore the importance of political will among member states to advance the agenda of trade agreements. Such commitments are fundamental for reducing the time required to prepare export documents, which in turn, facilitates trade and boosts manufacturing exports. Furthermore, the adoption of ICT in trade processes emerges as a critical factor. Investment in internet infrastructure and the digitalization of trade procedures can significantly mitigate bureaucratic delays associated with processing export documents. This streamlines trade facilitation and leverages technology to enhance regional efficiency.

Addressing the weaknesses in institutional frameworks is equally crucial. The study points to the necessity of curbing corruption and ensuring adherence to regulations to foster a conducive environment for trade. Strengthening these frameworks will enhance trade flows and create a more transparent and efficient trade ecosystem. Additionally, promoting industrialization through supportive policies is essential for increasing regional manufacturing exports. Encouraging manufacturing production, which has significantly influenced exports, can lead to sustainable economic growth and development.

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