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RESEARCH ARTICLE

Breaking Down the Bill: An analysis of the financial participation and governance fees in Nigerian Food Markets

[version 1]

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Abstract

This paper examines the costs of doing business (CoDB) in wholesale markets (WMs) across eight Nigerian states, with a focus on how governance structures shape these costs. Using primary data from a census of 299 vegetable and fish markets and 471 product-specific governance structures, we find limited financial barriers to entry with low participation costs, averaging less than 0.1% of traders' revenues. Volume-based fees, largely among horticultural markets, represent about 1% of trader's gross revenue. We also find that market governance significantly affects both the likelihood and magnitude of these fees, with democratic leadership selection and female participation in leadership emerging as important factors. Considerable variation is observed across regions, commodities, and cost types. The results underscore the importance of governance-sensitive and regionally differentiated policy interventions to improve market efficiency, strengthen food system performance, and reduce food costs for consumers in developing regions.

Keywords

Cost of doing business, governance, vegetables, fish, wholesale markets



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1. Introduction

Business costs include both the firm's production costs (costs of land, labor, and capital to produce their product) as well as the transaction costs to obtain their inputs and sell their outputs. The second set, transaction costs, we will call here "the costs of doing business" to distinguish them from production costs per se. These transaction costs cover a broad set of items, including physical inputs for transport (such as fuel), service payments (such as road tolls), and institutional costs (such as business registration costs and taxes, and even extra-legal costs like bribes). [World Bank \(2020\)](#), in its multi-country study of the "ease of doing business" reflected in the costs of doing business, lists the following categories of costs: (i) meeting business start-up requirements, which can involve registration, licensing, and hiring workers; (ii) getting a business location (e.g. obtaining construction permits, setting up an electricity link, and registering property); (iii) accessing finance and credit; (iv) costs for enforcing contracts and resolving insolvency; and (v) institutional costs related to the formal or informal regulatory environment, such as taxes and bribes.

The above costs, both production costs as well as the broad set of transaction costs, have a wide range of effects on business development. The costs of doing business, per se, affect business start-up, profitability, and competitiveness ([Canare et al., 2017](#); [Djankov et al., 2002](#)), foreign direct investment: incentives to make investment, whether by domestic firms or foreign firms ([Corcoran & Gillanders, 2015](#); [Nketiah-Amponsah & Sarpong, 2020](#)), and overall economic growth ([Raimi & Haini, 2024](#)). There has been substantial empirical research on the cost of doing business (CoDB), our second set of costs (transaction costs), for both food and non-food firms across developed and developing countries ([Eifert et al., 2008](#); [Rogge & Archer, 2021](#); [World Bank, 2020](#)). The studies have mainly been at the country level and on the costs faced by individual firms. Three gaps stand out in this literature.

The first gap is that while there has been research at the firm or micro level on CoDB in the above-named surveys (and others), the meso level (e.g., the CoDB of food wholesale markets (WMs)) has been largely neglected in empirical research. This is a crucial gap because WMs play a central role in food systems in developing regions, especially in the stages of transformation before large modern food companies dominate food WMs in terms of share of volumes. Thus, for grains as well as horticulture and fish, the great majority of food purchased from WMs in Africa and South Asia goes through WMs on to small retailers and food service firms. The food products flow through purchases from WMs is estimated at around 80% of food consumed nationally in those regions, nearly fully for urban areas and more than half in rural areas ([Reardon et al. 2021](#)).

The second gap is that even where CoDB is studied in markets, there has been little research on how governance of WMs (such as whether the WM has democratic selection of its leaders or whether women serve as leaders) affect those costs. Even less studied is the differentiation of cost types such as those affecting business start-ups (e.g., trader licensing and registration) versus everyday operations (such as accessing services or information on clients and prices). This link between governance and CoDB is what is missing, despite an emerging literature on WM governance per se in developing regions such as Africa ([Asante, 2020](#); [Battersby & Watson, 2018](#); [Blekking et al., 2017](#); [Davies et al., 2022](#); [Resnick et al., 2025](#); [Smit, 2016](#)). However, these studies have not examined the cost implications of different governance structures in food WMs.

The third gap is that research has largely neglected the heterogeneity - over national, regional, product type, and type of cost. One expects there to be variation over a country's regions, influenced for example by differences in infrastructure and local governance and social norms. However, very few studies investigate these aspects. For example, [Eifert et al. \(2008\)](#) examine the variation in cost structures of firms in different countries and how these are influenced by differences in infrastructure and services. However, they do not empirically investigate the variation in costs related to local governance.

We address the above three gaps by providing new empirical evidence on the costs associated with trading in food WMs in Nigeria. We analyze data from our own primary survey of 299 food WMs (the universe of vegetable and fish WMs in 8 states) and the 471 product-specific observations in those 299 WMs concerning fees paid in those WMs by fish and vegetable traders. We focus on three research questions.

- (1) What are the CoDB in WMs in Nigeria, by cost category (for enterprise start-up versus daily operations in the WM)?
- (2) How do CoDB vary over: (a) governance characteristics such as democratically elected WM leadership and women participating in leadership; (b) region (poorer North versus richer South), (c) product type (highly perishable green leafy vegetables and fresh fish; versus moderately perishable tomatoes; and less perishable processed fish); (d) and cost type.

To address these questions, we examine: (1) the costs related to start-up requirements in the WMs (such as registration); (2) the governance or regulatory costs incurred by traders in the WMs (such as payments to product associations apart from registration and informal payments made to various entities that are separate from the authority that oversees day to day running of the WM); and (3) a selection of operational costs found in some WMs (e.g. stall rental costs).

We analyze the determinants of CoDB: (1) WM characteristics such as (1) size (number of traders in the WM); (2) days and hours of operation; (3) location (poorer North versus richer South region, and urban versus rural); (4) governance variables such as the WM's leaders gender and education and the modes of selecting leaders (election versus appointment or inheritance), as well as the extent of WM oversight by local government authorities (LGAs) and whether WM interests are represented at state and/or national level associations.

Our paper makes three contributions to the empirical literature on CoDB in developing countries.

First, we use a unique dataset of ~300 WMs. We are not aware of any other studies that have used a large (and census) WM sample, covering key differentiators of rural and urban and poorer and richer regions, for CoDB analysis. Most studies of food WMs focused on either urban WMs (e.g., [Assefa et al., 2016](#); [Battersby & Watson, 2018](#)) or rural WMs ([Headey et al., 2019](#); [Matita et al., 2021](#)).

Second, we study WM governance and its impact on CoDB. Research has shown the importance of WM governance ([Battersby & Watson, 2018](#); [Blekking et al., 2017](#); [Davies et al., 2022](#); [Resnick et al., 2025](#)), but there has been no test of the relation between WM governance structures and CoDB.

Third, our data disaggregates WM services provision to WM traders by diverse entities, including WM authorities, product associations, and local government authorities (LGAs), and this diversity of service provision affects CoDB differently.

The rest of the paper is structured as follows: Section 2 lays out the study data, context, and regression methods. Section 3 presents descriptive and regression results. Section 4 concludes.

2. Methods

2.1 Data and study context

The data comes from a survey of 299 WMs for fish, tomatoes, and green leafy vegetables (GLV) across eight states in Nigeria. The states were selected based on being major regional producers of at least one of those products and reflect the diverse agro-ecological zones and socio-economic settings of Nigeria ([NAERLS, 2022](#)). We classify the eight states according to region: (i) North (Kebbi, Borno, FCT, Plateau, and Kaduna), and (ii) South (Oyo, Ebonyi, and Cross River). The South is more affluent ([Adesola & Akerle, 2025](#)). The North has been held back by the Boko Haram insurgency, lower education, and its tendency to desertification and drought ([Nwankpa, 2021](#)). The South benefits from oil revenue, higher education, better infrastructure, and urban development ([Nkechi, 2018](#)).

The WMs were selected as follows. First, a list of WMs was compiled from websites and government agencies. These lists were expanded through field visits to the WMs on the list and consultations with wholesalers, retailers, processors, and local government officials. Snowball sampling was then used to identify additional WMs. We define a WM as a place where two or more wholesalers engage in the sale of at least one of the study products in recognized wholesale locations, whether or not they are formally registered and/or covered with a roof.

The survey was conducted using questionnaires administered in each WM through focus group discussions with WM leaders (such as chairpersons, treasurers, and executive members), heads of product-level associations (like those for tomatoes, fish, or green leafy vegetables), female traders, youth, and traders with long experience in the WM. The data include 299 WM-level observations and 471 product-level observations. We use the product-level observations to identify the fees that traders of specific products pay. The survey data also provides information on WM characteristics (e.g., size, operation times, and infrastructure) and the governance structures specific to each product. The participants provided their written informed consent to participate in this study.

2.2 Indicators of the cost of WM participation

We developed indicators to measure the cost of trader participation: trader financial start-up requirements; trader fees to fund WM governance; and trader operating costs ([Table 1](#)). The indicators are used as dependent variables in regressions explaining trader WM participation.

Table 1. Indicators used to measure the cost of participation in the WMs.

Category	Specific indicators
1. Start-up requirements	Fees paid by wholesalers to the WM authority
	- A dummy variable that equals 1 if wholesalers in the WM pay registration fees to the WM authority. - A dummy variable that equals 1 if wholesalers in the WM pay non-registration fees to the WM authority.
2. Governance costs	Fees paid by wholesalers to product and product form associations
	- A dummy variable that equals 1 if wholesalers in the WM pay product association fees. - A dummy variable that equals 1 if wholesalers in the WM pay product form association registration fees. - A dummy variable that equals 1 if wholesalers in the WM pay product form association non-registration fees. - A dummy variable that equals 1 if wholesalers in the WM pay fees directly to other entities.
3. Operational costs	Operational fees incurred by wholesalers
	- A dummy variable that equals 1 if wholesalers in the WM pay stall rental fees. - A dummy variable that equals 1 if wholesalers in the WM pay a fee attached to their volume of sales.
4. Aggregate indicators	Aggregate cost of doing business indicators
	- Share of participation fees paid by wholesalers. - Annual cost of doing business. - Annual cost of doing business per number of participation fees paid by wholesalers.

Source: Authors.

The start-up fees include: (1) registration fees; (2) non-registration fees paid to the market authority for services such as securing a trading spot, a license to trade, protection of goods from confiscation, security, maintenance of WM infrastructure, waste disposal, water, and electricity (Table 9 for a detailed breakdown). Some markets require traders to pay association fees to product associations (tomato, GLV, or fish), or to product form associations (e.g., dried fish), while some require payments to the LGA, the host community, and/or informal entities, including bribes or fees to tax collectors. We capture operational fees as fees paid by wholesalers to secure a trading stall, while market fees for vegetables are charged based on sales volume.

We also explore three aggregate measures of CoDB. The first aggregate measure is the number of types of fees paid divided by the total of eight possible fees.

$$\text{Share of participation fees paid by wholesaler (\%)} = \frac{\text{Number of fees paid by wholesaler}}{\text{Total number of possible fees in the WM}} * 100$$

The second aggregate measure is the sum of all 8 fees paid over the year in Naira (₦). The third aggregate measure is the second measure (annual cost of doing business) divided by the number of fees paid. This normalization ensures the third measure is useful as the number of fees paid varies a lot over markets.

$$\text{Annual cost of doing business per number of fees paid} = \frac{\text{Annual cost of doing business}}{\text{Number of fees paid by wholesaler}}$$

2.3 Empirical analysis

The outcome variables on the requirement to pay various participation fees are binary variables. Discrete choice probit models are used to test the relationship between the outcome variables and WM-level characteristics. The probit regression assumes an underlying normally distributed latent variable, and uses Maximum Likelihood Estimation

(MLE) (Wooldridge, 2012). We also use the multivariate probit (MVP) model to analyze the different payment requirements as multiple correlated binary outcomes. The MVP model extends the standard probit to account for interdependence among binary outcomes by modelling the underlying latent variables with a multivariate normal distribution (Cappellari & Jenkins, 2003). This allows for correlation among the error terms across equations, offering a more comprehensive understanding of the factors that jointly influence multiple decisions. We present the average marginal effects to understand how the probability of paying different fees changes when continuous variables (such as WM age or the number of businesses in the WM) change by a small amount or when we change a dummy variable from 0 to 1 (such as whether a WM is in a rural area).

The outcome variables capturing the amount paid in participation fees are continuous variables. Since a non-trivial number of markets do not require some of the fees, a Tobit model is used to test the relationship between the continuous cost/payment outcome variables and WM-level characteristics. We use the multivariate Tobit (MVT) model to analyze the payment decisions as multiple correlated outcomes (dependent variables). The MVT model extends the standard Tobit framework to simultaneously analyze systems of multiple censored continuous equations and is particularly suited for data in which dependent variables are censored within a restricted range (Lee, 1993). The Wald test is reported as a measure of the goodness-of-fit of the Probit and Tobit models.

We use Generalized Linear Models (GLMs) to analyze the aggregate cost of doing business measures, where the dependent variables are continuous (annual cost of doing business, and annual cost of doing business per fee) or expressed as a percentage (share of participation fees paid by wholesalers). We include the `vce(robust)` option in all the GLM models to obtain robust standard errors which are useful if the distribution families are mis-specified.

2.4 Research hypotheses

The explanatory variables used in the regressions test three main hypotheses (see Table 2 for a summary). Our first hypothesis examines how WM location influences the CoDB. The literature indicates that regional differences affect the CoDB (Eifert et al., 2008; Nave & Rodrigues, 2022). We distinguish between WMs in the poorer North and the more affluent South. Compared to the North, the South is likely to have better WM infrastructure and provide more services which may increase the startup, governance, and operational fees incurred by traders. Thus, we hypothesize that the wholesalers in the South will have higher CoDB than those in the North. The assumption is that the South WMs do not have economies of scale and more efficiency to offer more services and charge less fees per trader. To supplement infrastructural differences, we distinguish between WMs in rural versus urban or peri-urban areas, and WMs near cities of at least 50,000 people. WMs further from cities would face higher transaction costs and thus higher CoDB.

Our second hypothesis is that the governance of WMs matter. WMs with simple governance (where there is only one WM authority that oversees the running of the WM and trading activities for all traders of all products) incur lower governance costs which translate into lower CoDB, compared to complex governance structures where there is both a WM authority as well as product-level associations. Markets with multiple levels of governance may enhance service provision, but the resulting power hierarchies may hinder communication between actors at different levels and increase operational costs to finance both sets of governance structures (Battersby & Watson, 2018; Blekking et al., 2017). Market and product associations typically play an important role in governance, managing market places to support trade, and in some markets they are involved in the provision of services to traders (Battersby & Watson, 2018; Davies et al., 2022). Market associations whose leaders are engaged in state or national-level associations and thus have broader networks and opportunities for support which could lower governance and operational costs, might lower the CoDB. But that engagement may introduce layers of governance which could raise startup, governance, and operational fees thereby increasing the CoDB.

Moreover, WMs where the LGA has an office representing official government oversight could have better governance and better WM infrastructure with more services. But this could also cause more startup, governance, and operational fees, thereby increasing the CoDB. However, some research shows that African LGAs lack adequate power to plan, regulate and provide infrastructure and services, thereby limiting their role to collecting fees (Battersby & Watson, 2018). Finally, we expect that WMs governed by more educated and democratically elected leadership would be more effective in responding to the needs of traders and are likely to deliver more WM infrastructure and services. We expect more women in leadership to create more services (like access to toilets) at least for small-scale traders who tend to be women

Table 2. Key hypotheses related to the cost of doing business.

Variables	Expected direction
Market location factors	
1 = Market is located in the south region, 0 = Otherwise (dummy)	+
1 = Market is located in a rural area, 0 = Otherwise (dummy)	+/-
Distance to town of population of 50,000 people (km)	+/-
Market governance aspects	
1 = Simple WM governance, 0 = Otherwise (dummy)	-
1 = LGA has an office in the WM, 0 = Otherwise (dummy)	+
1 = Market leader is elected, 0 = Otherwise (dummy)	+
1 = Market leader has completed secondary education, 0 = Otherwise (dummy)	+
1 = Market interests are represented at state and/or national level associations, 0 = Otherwise (dummy)	-+
Gender: Share of female leadership in the WM (%)	?
Market characteristics	
Number of traders in the WM on a typical day in the year	-
Number of businesses operating in the WM	-
Market age (years)	+
Share of WM space that is located on government land (%)	-
Share of WM space that is located on community land (%)	-
Number of trading requirements in the WM	+
Number of WM services provided by the WM authority	+
Number of days WM is open per week	+
Number of hours WM is open per day	+
1 = Tomato is sold in the WM in wholesale, 0 = Otherwise (dummy)	+/-
1 = GLV is sold in the WM in wholesale, 0 = Otherwise (dummy)	+/-
1 = Fish is sold in the WM in wholesale, 0 = Otherwise (dummy)	+/-

For the third hypothesis, our hypothesis is that market characteristics matter and thus, we include a list of explanatory variables to capture WM characteristics that may influence the CoDB:

- (i) Larger WMs (with more wholesalers) are expected to charge lower costs for traders to do business because the governance, operational fees, transaction costs, and other logistics costs can be spread across more traders (economies of scale).
- (ii) CoDB may be higher in older WMs that have to spend more on maintaining old infrastructure.
- (iii) We anticipate that CoDB may be lower in WMs located on government or community land which are likely to receive public support that could lower startup, governance, and operational costs.
- (iv) WMs with more trading requirements could raise CoDB.
- (v) WMs with more services will result in higher CoDB to traders.
- (vi) WMs with longer opening times would have higher CoDB.
- (vii) WM product-level coordination is more prevalent for tomatoes and GLV than fish which is sold processed (Babalola et al., 2025). That coordination might create higher CoDB. But costs of processing fish or preserving the cold chain (e.g. electricity for freezers) might also differ for fish versus tomatoes and GLVs. Thus, we include product dummies.

3. Results

3.1 Descriptive results

Four key points stand out regarding payment of startup and/or governance costs in [Table 3](#):

Table 3. Nature and extent of paying startup, governance, and operational costs in WMs.

	Share of WMs (%)			
	Overall (N = 299)	North (N = 180)	South (N = 119)	t-tests of regional differences
Wholesalers pay startup fees fees				
Registration fees to the WM authority	0.43 (0.50)	0.46 (0.50)	0.39 (0.49)	0.07
Non-registration fees to the WM authority	0.28 (0.45)	0.21 (0.41)	0.39 (0.49)	-0.18***
Registration fees only (do not pay non-registration fees)	0.28 (0.45)	0.32 (0.47)	0.23 (0.42)	0.09*
Non-registration fees only (do not pay registration fees)	0.13 (0.34)	0.07 (0.25)	0.24 (0.43)	-0.17***
Either registration or non-registration fees	0.56 (0.50)	0.52 (0.50)	0.62 (0.49)	-0.10*
Both registration and non-registration fees	0.15 (0.35)	0.14 (0.35)	0.16 (0.37)	-0.02
Wholesalers pay governance fees				
Product association fees	0.21 (0.41)	0.22 (0.41)	0.19 (0.40)	0.03
Product association fees only (do not pay registration or non-registration)	0.15 (0.36)	0.16 (0.37)	0.14 (0.35)	0.02
Both registration and non-registration fees, and product association fees	0.05 (0.23)	0.06 (0.23)	0.05 (0.22)	0.01
Product-form association registration fees	0.02 (0.13)	0.02 (0.13)	0.02 (0.13)	0.00
Product-form association non-registration fees	0.01 (0.08)	0.00 (0.00)	0.02 (0.13)	-0.02*
Both WM (registration and non-registration fees), and product-form (registration and non-registration fees)	0.003 (0.06)	0.00 (0.00)	0.01 (0.09)	-0.01
Other fees to other regulatory entities	0.17 (0.37)	0.13 (0.34)	0.23 (0.42)	-0.10**
Other fees to other regulatory entities, and product association fees	0.06 (0.24)	0.07 (0.25)	0.05 (0.22)	0.02
Other fees to other regulatory entities, and WM registration or non-registration	0.07 (0.26)	0.09 (0.29)	0.15 (0.36)	-0.06
Wholesalers pay any of the startup or governance fees listed above	0.67 (0.47)	0.61 (0.49)	0.75 (0.44)	-0.14**
Wholesalers pay the selected operational costs				
Stall rental fees	0.52 (0.50)	0.37 (0.48)	0.75 (0.43)	-0.38***
Sales volume-based fees	0.13 (0.33)	0.19 (0.40)	0.03 (0.16)	0.16***

Table 3. *Continued*

	Share of WM traders (%)			
*Aggregate cost of doing business indicators				
	Overall (N = 471)	North (N = 268)	South (N = 203)	
Share of participation fees paid by wholesalers (%)	24 (16) [25]	21 (16) [19]	28 (15) [25]	-7***
Costs in Nigerian Naira (₦)				
	Overall (N = 466)	North (N = 265)	South (N = 201)	
Annual cost of the fee based on sales volume (₦), conditional on paying	1,798,853 (4,086,135) [113,929]	911,754 (2,196,329) [96,990]	6,411,767 (7,592,091) [3,379,093]	-5,500,013***
	Overall (N = 466)	North (N = 264)	South (N = 202)	
Annual cost of participation and governance fees only (₦), conditional on paying	83,695 (321,140) [19,200]	91,969 (432,343) [10,000]	74,770 (114,519) [36,000]	17,199
	Overall (N = 466)	North (N = 265)	South (N = 201)	
Annual total cost of doing business (₦)	441,819 (2,158,451) [25,000]	479,255 (2,079,939) [20,000]	399,287 (2,249,069) [36,000]	79,968
	Overall (N = 408)	North (N = 217)	South (N = 191)	
Annual cost of doing business relative to the number of participation fees paid (₦)	216,703 (1,118,150) [12,188]	265,962 (1,308,522) [10,000]	160,737 (851,900) [18,000]	105,225
	Overall (N = 466)	North (N = 264)	South (N = 202)	
Average annual revenue per trader in the WMs (₦)	145,000,000 (768,000,000) [17,700,000]	72,300,000 (249,000,000) [12,800,000]	241,000,000 (1,130,000,000) [29,800,000]	-169,000,000**
	Overall (N = 470)	North (N = 267)	South (N = 203)	
Share of annual revenue per trader going to fees based on volume	0.012	0.013	0.02	
Share of annual revenue per trader going to participation and governance fees	0.0006	0.0012	0.00031	

Note: Mean values are presented, and in brackets () is the standard deviation, and [] is the median value. N is the number of observations. For t-tests of regional differences (north vs south)

***p < 0.01,

**p < 0.05,

*p < 0.1 indicate statistical significance at 1%, 5%, and 10% levels, respectively.

*For the aggregate cost of doing business indicators (except the percent share of participation fees paid), five outliers with extreme values were excluded during regression analysis, based on visual methods (boxplots) and cook's distance. The annual revenue per trader in a market by product was calculated by dividing the annual total revenue generated per product in the market by the number of product wholesalers in the market. The annual total revenue generated per product in the market was calculated by multiplying the price per kilogram of product by the annual total amount of product moved in the market.

First, nearly all WMs (99%) have some requirement for wholesale trading. But only 67% of WMs impose a financial registration or participation fee, with the share being 75% in the South and 61% in the North. The main non-financial participation requirement is being introduced by a guarantor (someone known by the market leadership).

Second, of those who charge some participation fees, 43% of WMs require a registration fee; 28% impose non-registration fees mainly for government levies and taxes, permits or licensing fees, administrative fees, and WM or product association fees. Only 15% of WMs require traders to pay both registration and non-registration fees to the WM

authority; this is consistent across regions. The share of WMs with registration fees is 39% in the South versus 46% in the North. The WMs with non-registration fees are 39% in the South and 21% in the North.

Third, some WMs impose multiple participation costs on their traders: 21% of WMs are required to pay a fee to a product association that oversees traders of specific products; in 15% of these latter, the product association fees are the only fees required; for the other 85% of those WMs, this fee is in addition to other participation fees paid to the WM authority. Only 5% of the WMs require traders to pay both registration and non-registration fees to the WM authority, along with these product association fees. Traders in 17% of the WMs must pay fees to other regulatory authorities besides the WM authority or product-related associations, particularly in WMs in the South. These are to the host community or the LGA or are informal payments. In 6% of the WMs, traders pay these fees alongside fees to their product associations. For 7% of the WMs, these fees to other entities are paid in addition to either registration or non-registration fees. Traders in the WMs incur operational costs. Stall rental fees are required by 52% of the WMs, varying from 75% in the South to 37% in North. This reflects regional variation in market infrastructure, governance arrangements, and the formalization of trading spaces in Nigeria (Omobowale & Omobowale, 2019). Fees based on volume of sales are imposed in 13% of the WMs. It is mostly WMs in the North where most tomatoes are grown that impose fees based on volume of sales (19%), but these are less common in the South (3%). This is as expected since most tomatoes in Nigeria are grown in the Northern states (Ugonna et al., 2015).

Fourth, we find that though ~70% of markets have financial requirements for participation, the total cost of fees paid in the market is low relative to the average gross revenue of traders. On average, the total cost of participation and governance fees accounts for less than 0.1% of traders' revenues. Where volume-based fees are paid, largely among horticultural traders representing less than 1% of trader's gross revenue (See Table 11 and 12 for the details of these fees and share of gross revenue for all products).

When considering all the possible financial requirements in WMs, wholesale traders pay varying numbers of fees, with up to eight possible types. While some WMs impose no fees, others require as many as seven (see Table 10 for details). On average, most wholesalers pay 2-3 participation fees. For the aggregate cost of doing business, the first indicator is the share of possible participation fees paid by wholesalers (Table 3). Most wholesalers pay 24% of all possible fees, varying from 21% in the North to 28% in the South. The second indicator is the annual CoDB, with a median value of ₦19,200, thrice higher in the South (₦33,300) compared to the North (₦10,000). The third indicator is the annual CoDB per participation fee average. This is two times higher in the South (₦16,400) compared to the North (₦6,000). There is a substantial difference in the median values of annual CoDB relative to the median values of annual trader revenues, suggesting that the direct financial costs associated with market participation are relatively low. However, the magnitude of traders' revenues compared to their reported costs may reflect significant heterogeneity in market operations, including differences in scale, product type, and regional market dynamics.

Table 4 shows that 40% of the study WMs are in the South, while 60% in the North; 46% are in rural areas, and most WMs are 12 km from a town with at least 50,000 people. Markets in the South are less remote (8 km) than in the North (14 km).

Table 4. Descriptives of explanatory variables used in the regression model.

Variables	Share of WMs (%)		
	Overall (N = 299)	North (N = 180)	South (N = 119)
Region of Nigeria where WM is located, dummy (1 = South region, 0 = Otherwise)		0.60 (0.49) [1]	0.40 (0.49) [0]
Rural WM, dummy (1 = Market is in a rural area, 0 = Otherwise)	0.46 (0.50) [0]	0.48 (0.50) [0]	0.43 (0.50) [0]
Distance to town of population of 50,000 people (km)	12 (18) [5]	14 (21) [1]	8 (10) [5]
Simple governance, dummy (1 = Simple WM governance structure, 0 = Otherwise)	0.35 (0.48) [0]	0.28 (0.45) [0]	0.45 (0.50) [0]
LGA has office, dummy (1 = LGA has an office in the WM, 0 = Otherwise)	0.38 (0.49) [0]	0.34 (0.48) [0]	0.42 (0.50) [0]

Table 4. *Continued*

Variables	Share of WMs (%)		
	Overall (N = 299)	North (N = 180)	South (N = 119)
Market leader elected, dummy (1 = Market leader is elected, 0 = Otherwise)	0.37 (0.48) [0]	0.44 (0.50) [0]	0.26 (0.44) [0]
Market leader educated, dummy (1 = Market leader completed secondary school, 0 = Otherwise)	0.33 (0.47) [0]	0.36 (0.48) [0]	0.30 (0.46) [0]
Share of female leadership in the WM (%)	0.16 (0.25) [0]	0.08 (0.15) [0]	0.28 (0.32) [0.17]
Market interests, dummy (1 = Market interests are represented at the state and/or national level, 0 = Otherwise)	0.50 (0.50) [0]	0.46 (0.50) [0]	0.55 (0.50) [1]
Number of traders operating at the WM on a typical day in the year	1,897 (2,394) [1,000]	1,528 (2,040) [500]	2,457 (2,765) [1500]
Number of businesses operating in the WM	8 (4) [8]	9 (3) [9]	7 (4) [6]
Age of WM (years)	48 (28) [44]	45 (23) [44]	53 (35) [49]
Share of WM space on government land (%)	52 (48) [60]	67 (47) [100]	29 (41) [0]
Share of WM space on community land (%)	41 (48) [0]	23 (42) [0]	69 (42) [100]
Number of trading requirements, index	1.23 (0.58) [1]	1.14 (0.53) [1]	1.37 (0.64) [1]
Number of days that WM is open per week	4 (3) [2]	4 (3) [7]	3 (3) [2]
Number of hours that WM is open per day	12 (2) [12]	12 (2) [12]	12 (2) [12]
Number of WM services provided by the WM authority, index	0.53 (1.12) [0]	0.34 (0.98) [0]	0.82 (1.25) [0]
Share of product-WM observations (%)			
Product variables	Overall (N = 471)	North (N = 268)	South (N = 203)
Apply to tomato traders	0.43 (0.50) [0]	0.50 (0.50) [0.5]	0.33 (0.47) [0]
Apply to GLV traders	0.37 (0.48) [0]	0.34 (0.47) [0]	0.42 (0.49) [0]
Apply to fish traders	0.20 (0.40) [0]	0.16 (0.37) [0]	0.25 (0.43) [0]

Note: Mean values are presented, and in brackets () is the standard deviation, and [] is the median value.

About 35% of the WMs have a simple governance structure while 65% have complex ones (defined above). This differs between the South (45%) compared to the North (28%). Only 38% of the WMs have an LGA office, varying between 42% in the South to 34% in the North.

Market leaders are elected in 37% of the WMs versus leaders being appointed, volunteering or assuming leadership by inheritance. Overall, 33% of the WMs have a WM leader who completed secondary education, and only 16% of the WM leadership committee members are female. The share of female leadership is much higher in the South (28%) than in the North (8%). This corroborates studies that show that Southern Nigeria has considerably higher rates of women's political participation than those in Northern Nigeria (Oladapo et al., 2021).

Overall, WM interests are represented at state and/or national level associations in half of the WMs (50%), with a slightly higher share of WMs in the south (55%) compared to the north (46%).

The WMs with wholesalers that sell tomatoes are 43% of the sample, which is a universe in the states sampled, followed by GLV (37%), and fish (20%). Tomato WMs are more in the North (50% of the universe), as tomato producing areas are mainly in the North, while WMs where wholesalers sell GLV and fish are as common in the south (42% and 25%, compared to the North with 34% and 16 % for GLV and fish, respectively).

Table 5. Drivers of paying startup and/or governance fees for trading in the market.

Variables	Multivariate Probit (MVP), average marginal effects			Multivariate Tobit (MVT), average marginal effects		
	Wholesalers pay fees to the market authority (1/0)	Wholesalers pay fees to product or product-form associations (1/0)	Wholesalers pay fees to other entities (1/0)	Fees paid to the market authority (¥)	Fees paid to product or product-form associations (¥)	Fees paid to other entities (¥)
South region market, dummy	0.266 (0.175)	0.0627 (0.234)	-0.0480 (0.204)	16,643*** (3,302)	20,913* (12,170)	-4,621 (13,162)
Rural market, dummy	0.0728 (0.138)	-0.419** (0.169)	0.239 (0.156)	-1,720 (2,214)	-16,072* (9,436)	3,315 (8,341)
Distance to town of 50,000 people (km)	0.00157 (0.00376)	-0.00662 (0.00538)	0.00277 (0.00414)	-33.63 (56.01)	-344.7 (294.0)	-47.51 (256.2)
Simple market governance, dummy	0.343** (0.169)	-1.204*** (0.241)	-0.382* (0.205)	2,813 (2,964)	-74,028*** (16,560)	-22,608* (12,975)
LGA has office in the market, dummy	0.518*** (0.142)	0.971*** (0.159)	0.0195 (0.151)	7,394*** (2,651)	45,092*** (9,054)	14,083 (8,835)
Market leader elected, dummy	0.261** (0.131)	-0.491*** (0.148)	0.142 (0.144)	4,517* (2,567)	-9,250 (7,360)	14,921 (9,303)
Market leader educated, dummy	0.181 (0.131)	0.156 (0.164)	-0.312** (0.149)	-147.2 (2,072)	553.5 (7,937)	-19,734** (9,310)
Share of female leadership (%)	0.0722 (0.164)	-0.508*** (0.195)	0.320* (0.187)	2,980 (2,705)	-28,685** (11,344)	25,093* (13,429)
Market interests represented, dummy	0.188 (0.145)	0.849*** (0.174)	0.402** (0.165)	-1,135 (2,953)	40,928*** (12,909)	23,498** (10,300)

Table 5. Continued

Variables	Multivariate Probit (MVP), average marginal effects			Multivariate Tobit (MVT), average marginal effects		
	Wholesalers pay fees to the market authority (1/0)	Wholesalers pay fees to product or product-form associations (1/0)	Wholesalers pay fees to other entities (1/0)	Fees paid to the market authority (¥)	Fees paid to product or product-form associations (¥)	Fees paid to other entities (¥)
Number of traders on a typical day	0.00005**	0.00005**	-0.00002	1.601**	1.869	-2.674
	(2.22e-05)	(2.46e-05)	(2.38e-05)	(0.687)	(1.644)	(1.716)
Number of businesses in the market	-0.0003***	-0.00002	0.0002**	-4.648**	4.224	16.37**
	(9.05e-05)	(0.000107)	(8.54e-05)	(2.032)	(6.949)	(7.794)
Market age (years)	-0.000296	-0.00179	0.00187	-83.62**	-14.27	99.66
	(0.00185)	(0.00219)	(0.00189)	(34.85)	(95.43)	(123.0)
Market space on government land (%)	-0.000525	-0.013***	-0.00230	19.76	-551.6***	-52.51
	(0.00283)	(0.00289)	(0.00343)	(43.09)	(140.4)	(178.2)
Market space on community land (%)	-0.00472	-0.007**	-0.00111	-58.62	-205.2	40.69
	(0.00295)	(0.00317)	(0.00349)	(49.72)	(130.9)	(187.6)
Number of trading requirements, index	0.243***	0.0681	0.112	860.7	-4,721	8,725
	(0.0869)	(0.0836)	(0.0858)	(1,278)	(4,804)	(5,574)
Number of days market is open/week	-0.0112	0.096***	-0.0166	1,257**	3,039**	-474.0
	(0.0257)	(0.0297)	(0.0283)	(576.5)	(1,351)	(1,573)
Number of hours market is open/day	0.068**	-0.0159	0.0124	1,074**	-2,621	-927.0
	(0.0308)	(0.0282)	(0.0356)	(499.8)	(1,620)	(2,003)
Tomato dummy (Base is fish)	-0.361*	-0.00601	-0.810***	-4,753	-3,284	-57,458***
	(0.188)	(0.229)	(0.202)	(3,841)	(11,939)	(20,505)
GLV dummy (Base is fish)	-0.290	-0.0315	-0.384*	-3,826	-48.66	-27,236*
	(0.192)	(0.224)	(0.197)	(3,760)	(12,134)	(14,016)

Table 5. Continued

Variables	Multivariate Probit (MVP), average marginal effects		Multivariate Tobit (MVT), average marginal effects			
	Wholesalers pay fees to the market authority (1/0)	Wholesalers pay fees to product or product-form associations (1/0)	Wholesalers pay fees to other entities (1/0)	Fees paid to the market authority (¥)	Fees paid to product or product-form associations (¥)	Fees paid to other entities (¥)
<i>Goodness of fit</i>						
Number of observations	469			462		
Log pseudolikelihood	-670.0781			-6030.4384		
Wald Chi2 (57)	323.84***			177.18***		
Likelihood ratio test	rho21 = rho31 = rho32 = 0: chi2(3) = 0.9657 rho12 = rho13 = rho23 = 0: chi2(3) = 8.1467**					

Note:

***p < 0.01,

**p < 0.05,

*p < 0.1 indicate statistical significance at 1%, 5%, and 10% levels, respectively. Heteroscedasticity robust standard errors are in parentheses. Based on visual methods (boxplots) and cook's distance analysis, some outliers with extreme values were excluded from the analysis in the MVP regression (one from fees to market authority, one from fees to product or product-form associations, and five from fees paid to other entities).

Source: Authors' calculation from the wholesale market data.

Table 6. Drivers of aggregate cost of doing business indicators (GLM Regressions, average marginal effects).

Variables	Share of participation fees paid by wholesalers (%)	Annual cost of doing business (₹)	Annual cost of doing business relative to participation fees (₹)	Annual cost of doing business, without a fee based on sales volume (₹)	Annual cost of doing business relative to participation fees, without a fee based on sales volume (₹)
South region market, dummy	1.049	235,300	50,915	-50,064	-9,895
	(1.641)	(352,224)	(151,390)	(57,385)	(19,611)
Rural market, dummy	-2.188*	79,874	55,282	7,423	1,833
	(1.304)	(229,507)	(124,287)	(26,205)	(9,026)
Distance to town of 50,000 people (km)	0.077**	-5,048*	-3,521**	-159.9	-55.80
	(0.0312)	(2,945)	(1,761)	(767.2)	(281.2)
Simple market governance, dummy	-2.650*	242,283	225,572	35,586	8,868
	(1.392)	(303,132)	(204,038)	(45,343)	(15,198)
LGA has office in the market, dummy	7.223***	-147,960	-3,402	20,343	3,623
	(1.296)	(235,265)	(122,975)	(21,702)	(8,390)
Market leader elected, dummy	0.288	221,334	142,082	39,861*	12,202
	(1.165)	(228,461)	(124,253)	(21,622)	(7,983)
Market leader educated, dummy	1.234	-90,486	-2,710	-40,420**	-15,790**
	(1.202)	(169,616)	(86,096)	(20,516)	(7,382)
Share of female leadership (%)	-0.433	-263,074	-138,663	40,552	9,507
	(1.527)	(212,781)	(91,161)	(30,919)	(9,740)
Market interests represented, dummy	5.733***	451,460**	275,159**	-3,833	-4,104
	(1.360)	(197,179)	(126,801)	(29,180)	(10,535)

Table 6. Continued

Variables	Share of participation fees paid by wholesalers (%)	Annual cost of doing business (¥)	Annual cost of doing business relative to participation fees (¥)	Annual cost of doing business, without a fee based on sales volume (¥)	Annual cost of doing business relative to participation fees, without a fee based on sales volume (¥)
Number of traders on a typical day	0.0004*	-31.22*	-16.61*	0.656	0.419
Number of businesses in the market	(0.0002)	(17.78)	(8.585)	(2.896)	(0.997)
Market age (years)	0.00009	110.2	59.20	77.28*	29.60*
Market space on government land (%)	(0.0009)	(82.43)	(49.27)	(46.32)	(17.85)
	0.025	-290.2	-108.0	-438.3*	-94.20
	(0.015)	(2,569)	(1,247)	(228.3)	(105.8)
Market space on government land (%)	-0.042**	4,901**	2,218**	117.2	56.86
	(0.0191)	(2,365)	(1,013)	(249.7)	(96.88)
Market space on community land (%)	-0.035*	2,324	1,233	379.9	135.8
Number of trading requirements, index	(0.0201)	(2,397)	(1,824)	(470.3)	(164.1)
	2.737***	-109,930	-63,678	44,084**	13,239**
Number of days market is open/week	(0.729)	(111,282)	(50,882)	(19,138)	(5,875)
	0.374	32,114	-349.9	13,825***	5,256***
Number of hours market is open/day	(0.240)	(32,887)	(19,336)	(4,401)	(1,548)
	-0.151	51,618	19,784	555.5	1,087
Number of market services, index	(0.231)	(50,344)	(27,282)	(6,956)	(2,397)
	4.287***	36,198	-4,056	38,436	9,839
Tomato dummy (Base is fish)	(0.609)	(67,836)	(27,779)	(36,508)	(12,232)
	-6.497***	30,636	47,489	-72,073*	-21,450
	(1.695)	(135,881)	(74,866)	(38,135)	(13,695)

Table 6. *Continued*

Variables	Share of participation fees paid by wholesalers (%)	Annual cost of doing business (¥)	Annual cost of doing business relative to participation fees (¥)	Annual cost of doing business, without a fee based on sales volume (¥)	Annual cost of doing business relative to participation fees, without a fee based on sales volume (¥)
GLV dummy (Base is fish)	-4.624*** (1.681)	207,195 (192,597)	52,316 (88,778)	-85,716*** (30,833)	-24,838** (11,122)
<i>Goodness of fit</i>					
Number of observations	469	464	464	464	464
Residual df	448	443	443	443	443
Log pseudolikelihood	-1836.5788	-7384.9065	-7078.9334	-6469.6739	-5966.9874
Deviance	69190.4656	1.81253e+15	4.84749e+14	3.50758e+13	4.01790e+12
(1/df) Deviance	154.443	4.09e+12	1.09e+12	7.92e+10	9.07e+09
AIC	7.9214	31.9220	30.6032	27.9770	25.8103
BIC	66435	1.81e+15	4.85e+14	3.51e+13	4.02e+12

Note: For regression estimates

***p < 0.01,

**p < 0.05,

*p < 0.1 indicate statistical significance at 1%, 5%, and 10% levels, respectively.

Heteroscedasticity robust standard errors are in parentheses. Based on visual methods (boxplots) and cook's distance analysis, five outliers with extreme values were excluded from the analysis in each regression, except for the percent share of participation fees paid by wholesalers. Source: Authors' calculation from the wholesale market data.

3.2 Regressions

3.2.1 Determinants of startup and governance-related fees for trading

Table 5 shows regression for drivers of markets charging startup and governance fees over WMs. Four main results emerge:

First, traders in WMs in the South pay higher startup fees by ₦16,643 compared to those in WMs in the North. South traders also pay higher governance fees to product or product-form associations—by an average of ₦20,913—compared to those in the North. This is consistent with our hypothesis that WMs in the South would have higher startup and governance fees because they are likely to provide more services than in the North and may require more coordination costs.

The WM being in urban or peri-urban areas are much more likely to charge fees for product or product-form associations' services. Traders in rural WMs have a lower probability of paying those fees by 42 percentage points (pp) compared to WMs in peri-urban or urban areas, which translates to paying ₦16,072 less than peri-urban or urban traders. This reflects differences in market organization and the influence of trader associations in the urban or peri-urban markets.

Second, when the WM has a simple governance structure (as defined above) it is more likely to charge traders startup registration and/or non-registration fees paid to the WM authority by 34 pp, but less likely to charge governance fees paid to product or product-form associations with a reduction of fees of ₦74,028. This confirms our hypothesis that multiple governance structures would increase operational costs to finance both sets of governance entities. Besides the payment of market and stall fees, traders must receive approval of the micro-level traders' associations which prioritize market unity for social progress; however this does not rule out personal interests and the politics of dominance and competition (Omobowale & Omobowale, 2019).

The regressions show that the government's daily presence (an LGA office in the market) in the WM makes it more likely that the WM charges startup and governance fees, with a 52 percent probability and associated with a hike of ₦7,394 in fees paid. An LGA office in the WM is associated with a 97 percent higher probability of the WM charging governance fees to product or product-form associations and increases the CoDB by ₦45,092. It is obvious but still worth noting here that the LGA's putting an office in WMs means they value getting that revenue. We did not test whether the presence of an LGA office increases or decreases the provision of services.

The WM leaders' being elected increases the WM's traders' chance of paying startup fees to the WM authority by 26 pp, and increases the amount paid by ₦4,517. Educated WM leaders are associated with a lower probability of paying governance fees to other regulatory entities. Having more females in WM leadership strongly reduces the probability of traders' paying governance fees to product or product-form associations by 51 pp but increases the probability of paying governance fees to other regulatory entities by 32 pp. This pattern suggests that gender composition in market leadership may influence the structure and distribution of governance costs. More research is needed into contextual factors to better understand the relationship between gender and market governance aspects.

Potentially increasing the chance that WM interests are represented at the state and/or national level (by WM leaders holding positions in state or national level trade or WM organizations) is associated with it being more likely that traders in their WMs pay fees to product or product-form associations and to other regulatory entities. We know there is a correlation between these, but we do not know the causal direction: the fees may enable leaders to hold those positions, or their holding positions might encourage the leaders to have their WM well-funded by traders paying fees. This is consistent with our study hypothesis that WM leader participation in state and/or national level associations may introduce multiple layers of governance, which could raise governance and operational fees.

Third, as expected, larger WMs with more traders and businesses, and those with more trading requirements are associated with traders' paying startup fees. The WMs with more trading requirements have a higher probability of charging traders fees to the WM authority, suggesting that increased regulatory complexity drives higher participation costs. However, older WMs charge lower fees possibly reflecting the stability of governance structures and long-standing relationships between traders and market authorities.

The WMs on land owned by the government or community have only a tiny effect on whether the WM charges fees to product or product-form associations (at or less than 5% effect on likelihood). WMs being open for more days a week and those with longer opening hours are likely to pay more fees to the WM authority, but the effect is surprisingly small, only by ₦1,257 and ₦1,074. This suggests that extended market activity does not substantially translate into higher governance costs.

Tomato-selling WMs tend to have a lower likelihood of charging traders startup fees to the WM authority by 36 pp and governance fees to other entities by 81 pp, when compared to fish-selling WMs. In addition, when tomato traders are charged governance fees, they pay a lot less (by ₦57,458) than other product traders. On the other hand, the GLV wholesalers are less likely to be required by their WMs to pay startup fees to the WM authority compared to fish wholesalers, and they pay less governance fees to other entities by ₦27,236. These results could mean that regulatory oversight is higher in fish markets compared to vegetable markets, resulting in higher levies and other charges imposed on fish traders by LGA agents, youth leaders and security agents as indicated by [Bassey et al. \(2015\)](#).

3.2.2 Drivers of aggregate cost of doing business indicators

Regression results for the aggregate cost of doing business in the WMs are presented in [Table 6](#). Three key results emerge.

First, traders in rural WMs pay a lower share of possible participation fees by 2%, compared to those in peri-urban or urban WMs. This confirms our hypothesis.

Table 7. Market governance structure of the WMs.

Description of the WM governance structure	Overall	Region		Product is sold in the WM		
		North	South	Tomato	GLV	Fish
There is only one WM authority that oversees the whole WM, for all products (simple structure)	34.8	27.8	45.4	35.5	30.3	23.2
In addition to the WM authority, there is a product WM association that oversees all products, but there are no separate sections for different product forms	59.5	67.2	47.9	60.6	64.6	67.4
In addition to the WM authority, there are sections for each type of product form, and each section has its own governance (ability to make and enforce rules for that section)	3.7	4.4	2.5	3.0	3.4	6.3
In addition to the WM authority, there are both product associations and product-form associations	0.7	0.0	1.7	0.0	0.6	1.1
Other complex types of WM governance	1.3	0.6	2.5	1.0	1.1	2.1
Number of WMs	299	180	119	203	175	95

Table 8. Requirements for trading in the WMs.

Trading requirements	Overall	Region		Product is sold in the WM		
		North	South	Tomato	GLV	Fish
A formal application to the leadership of product association, product-form association or broader WM authority/association	20.1	19.4	21	21.2	22.9	25.3
Operating a stall in the WM	12.7	5.0	24.4	10.8	13.7	14.7
Paying a one-off registration fee	42.1	40.0	45.4	40.4	42.3	49.5
Paying a periodic trading fee	19.1	8.9	34.5	12.8	20.6	25.3
Informal application or introduction by a guarantor or someone who is known by the product association, or WM authority, or leadership and/or other traders	28.4	39.4	11.8	33.0	24.6	12.6
Market requires any of the above listed trading requirements	99.0	98.3	100	99.5	100	97.9
Number of WMs	299	180	119	203	175	95

Note: Some WMs may have multiple trading requirements.

Table 9. Market services provided for wholesalers by different entities.

Services provided by the WM authority	Overall (N = 85)	North (N = 38)	South (N = 47)
Secure trading spot	0.33	0.18	0.45
License to trade	0.20	0.16	0.23
Protection of goods from confiscation	0.07	0.08	0.06
Protection of goods from violence	0.04	0.03	0.04
Waste disposal	0.26	0.24	0.28
Security	0.45	0.42	0.47
Water	0.05	0.05	0.04
Electricity	0.06	0.03	0.09
Maintenance and repairs of WM infrastructure	0.24	0.26	0.21
Welfare or social support	0.15	0.18	0.13
No services	0.05	0.11	0.00
Services provided by multiple entities (e.g. LGA, Host community, etc)	Overall (N = 51)	North (N = 23)	South (N = 28)
Secure trading spot	0.39	0.22	0.54
License to trade	0.24	0.09	0.36
Protection of goods from confiscation	0.08	0.04	0.11
Protection of goods from violence	0.02	0.00	0.04
Waste disposal	0.24	0.13	0.32
Security	0.16	0.13	0.18
Water	0.08	0.17	0.00
Electricity	0.04	0.09	0.00
Cleaning of the WM and financial support	0.06	0.00	0.11
No services	0.33	0.65	0.07
Support services provided by multiple entities (e.g. WM authority, product association or product form association, LGA, Host community, etc)	Overall (N = 299)	North (N = 180)	South (N = 119)
If trader is dissatisfied with the quality of services within the WM	0.92	0.97	0.83
If trader has dispute with other traders in the WM	0.96	0.99	0.91
If trader's goods are stolen in the WM	0.94	0.97	0.91
If trader's goods are stolen/hijacked on the way to the WM	0.81	0.86	0.75
If a trader's goods are confiscated or held up by police on the way to WM	0.87	0.96	0.73

Table 10. Number of fees paid by wholesalers in the WM.

	min	mean	median	max	SD	N
Number of fees overall						
Overall	0	2.6	3	7	1.6	471
North	0	2.3	2	6	1.4	268
South	0	3.1	3	7	1.6	203
Number of participation fees paid						
Overall	0	1.9	2.0	6.0	1.3	471
North	0	1.7	1.5	5.0	1.3	268
South	0	2.2	2.0	6.0	1.2	203

Table 11. Average fee based on volume of sales per trader in the WMs (₺).

Is a fee based on volume charged (1/0)				
Product	Region	Mean	SD	N
Tomato	North	0.22	0.41	223
	South	0.06	0.24	144
GLV	North	0.23	0.42	176
	South	0.05	0.23	167
Fish	North	0.10	0.31	48
	South	0.03	0.17	106
Market charge for fee based on volume (₺ per ton)				
Product	Region	Mean	SD	N
Tomato	North	1,272	8,456	268
	South	8,168	72,796	203
GLV	North	1,191	8,434	268
	South	8,184	72,796	203
Fish	North	1,979	30,555	268
	South	543	7,050	203
The total annual amount moved per trader in markets (tons)				
Product	Region	Mean	SD	N
Tomato	North	174	338	222
	South	186	405	144
GLV	North	72	137	176
	South	41	104	167
Fish	North	81	237	48
	South	342	1334	104
The total annual amount paid as fee based on volume per trader (₺)				
Product	Region	Mean	SD	N
Tomato	North	256,127	1,428,647	222
	South	840,394	4,886,084	144
GLV	North	148,565	806,135	176
	South	59,368	375,495	167
Fish	North	11,518	47,088	48
	South	438	3,887	104
The total annual amount paid per trader for participation in the market (₺)				
Product	Region	Mean	SD	N
Tomato	North	40,279	327,723	219
	South	87,893	125,800	143
GLV	North	21,815	44,303	173
	South	77,504	120,501	166
Fish	North	214,692	547,559	48
	South	91,161	132,854	106
The total annual revenue per trader in the WM (₺ million)				
Product	Region	Mean	SD	N
Tomato	North	46	109	222
	South	259	940	144

Table 11. *Continued*

Is a fee based on volume charged (1/0)				
Product	Region	Mean	SD	N
GLV	North	22	66	176
	South	55	206	167
Fish	North	234	537	48
	South	755	4,041	104

Note: The average annual amount of product moved by a trader in a market was calculated by dividing the annual total amount of product moved in the market by the number of product wholesalers in the market. The annual total amount of product moved in the market was calculated by multiplying the daily amount of product moved in the market by the number of days of operation of the market per year. Annual revenue per trader in a market by product was calculated by dividing the annual total revenue generated per product in the market by the number of product wholesalers in the market. The annual total revenue generated per product in the market was calculated by multiplying the price per kilogram of product by the annual total amount of product moved in the market.

Table 12. Share of WMs' annual gross revenue accounted for by fee based on sales per trader.

Product	Region	Share of revenue that goes to participation fees	Share of revenue that goes to fee based on volume sold
Tomato	North	0.09	0.56
	South	0.03	0.32
GLV	North	0.10	0.68
	South	0.14	0.11
Fish	North	0.09	0.00
	South	0.01	0.00

Traders in remote WMs that are further from large towns with at least 50,000 people pay a higher share of possible participation fees but by less than 0.1%. Traders in WMs that are further from these large towns incur a lower annual CoDB by ₦5,048, and a lower annual CoDB per number of participation fees paid (by ₦3,521). This confirms our hypothesis.

Second, WMs with simple governance structures pay a lower share of the possible participation fees in the WM by a scant 2.7%. Complex governance structures may have a higher number of participation fees paid to provide additional services to traders.

The WMs with an LGA office in the WM have higher shares of possible participation fees paid by wholesalers by 7%, suggesting that the presence of local government oversight raises governance-related costs.

Markets with elected leaders are associated with a higher CoDB when sales volume fees are excluded (by ₦39,861). If sales volume fees are excluded, WMs with educated leaders are associated with a lower annual CoDB (by ₦40,420), and a lower annual CoDB per fee paid (by ₦15,790). Revenue collection is influenced by the accountability relationships among leaders, revenue collectors, and traders (Chukwunwike et al., 2021).

When WM leaders are engaged in national and state level associations it increases the share of possible participation fees paid by wholesalers by 6%, increases the annual CoDB by a huge ₦451,460, and increases the annual CoDB per fee paid by a huge ₦275,159. This indicates that these broader institutional linkages reinforce fee payments and enhance compliance with the established governance structures.

Third, markets with more traders pay a higher share of participation fees, but it is only by an extremely low percentage, so essentially has no effect. Bigger WMs incur lower annual CoDB but by a tiny amount (₦31.22), and a lower annual CoDB by a negligible amount per fee paid (₦16.61). This suggests that market size has a minimal impact on overall governance costs.

The WMs with a higher share of government land pay a lower share of the possible participation fees in the WM by a very tiny percentage (less than 1%) and have a higher annual CoDB by a small amount (₦4,901) and per fee paid (₦2,218). WMs with a higher share of community land pay a lower share of the participation fees but by a very tiny share. These

results do not confirm our hypothesis as they are negligible. This also suggests that land ownership structure has a minimal impact on traders' overall governance costs.

The number of trading requirements and the number of WM services provided by the WM authority increase the share of possible participation fees paid by a small 2.7% and 4.3%, respectively. Moreover, when sales volume fees are excluded from the calculations, the number of trading requirements increases the annual CoDB by ₦44,084, and the annual CoDB per fee paid by ₦13,239. Similarly, WMs that operate for more days a week are associated with a higher CoDB (by ₦13,825), and a higher CoDB per fee paid (by ₦5,256), when sales volume fees are excluded. This suggests that additional regulatory and service obligations only marginally raise overall participation costs.

The tomato and GLV product dummies (compared to fish) have a negative sign in the regression on the share of participation fees paid by wholesalers, and they tend to incur lower annual CoDB by a stunning ₦72,073 and ₦85,716, respectively, compared to fish traders. Moreover, tomato traders are less likely to pay startup costs to the WM authority, compared to fish traders. Again, higher costs in fish markets point to more regulatory oversight in fish markets compared to vegetable markets. Thus, the results do not support our hypothesis that vegetable wholesalers incur higher startup and/or governance costs compared to fish wholesalers.

4. Conclusions

Across the universe of wholesale markets for tomatoes, GLVs and fish in eight Nigerian states, we find limited financial barriers to entry for wholesalers. The total annual cost for fees for trader participation in markets averages at less than 0.1% of the average traders' revenues. In the relatively low share of markets that charge volume-based fees, these fees are non-trivial but account for about 1% of the average trader's gross revenue.

We also find that WMs in Nigeria's more affluent South are more likely to charge startup costs for participation in form of registration and/or non-registration fees. Moreover, the traders in the South WMs pay significantly higher participation fees in the form of startup and governance fees to the WM authority and to product or product-form associations, compared to their counterparts in the North.

We also find evidence that WMs in rural areas tend to pay a significantly lower share of participation costs likely correlated with the fewer services they receive.

Our findings indicate that WMs with a Local Government Authority (LGA) office located on the premises are more likely to impose a wider range of startup and governance fees, resulting in a higher aggregate cost of doing business (CoDB).

Our study reveals that WMs with a simple WM governance structure (i.e. just one overall WM authority versus having a WM authority and other product specific associations for traders) are associated with fewer governance fees, and this translates into a lower total cost of operating in the WM for traders. In contrast, our results suggest that more complex governance structures allow for product specific needs/services to be met which might mean more different costs to meet these needs and a higher cost of operation overall.

We find that female engagement in leadership is associated with paying fewer governance costs related to product or product form associations, suggesting that female leaders may play an important role in the governance of product or product form associations. The impact of gender on WM governance warrants further investigation.

We also find that WM leaders being members of national or state level trade associations are positively associated with paying more governance fees to product or product form associations, and to other regulatory entities which translate into higher total costs of doing business.

Finally, when compared to fish WMs, the wholesalers in vegetable WMs pay a lower share of participation costs due to paying less governance costs. Vegetable wholesalers are less likely to pay governance fees to other regulatory entities, and when they do, the amounts are generally lower than those paid by fish traders. In addition, vegetable wholesalers incur lower total CoDB, if sales volume-based fees are not considered. The higher costs in fish markets point to more regulatory oversight in fish markets compared to vegetable markets. Hence, the results do not support our hypothesis that vegetable wholesalers incur higher startup and/or governance costs compared to fish wholesalers.

Ethical approval and consent statement

All studies in this project involving humans were approved by Michigan State University Institutional Review Board and were conducted in accordance with the local legislation and institutional requirements. This project has the Michigan State University IRB Study ID: STUDY00007403 and was determined exempt Category: Exempt 2ii.

The participants provided their written informed consent to participate in this study.

Data availability statement

Data will be made available on request.

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