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ORIGINAL ARTICLE

Disentangling the gender-differentiated determinants of home-based self-employment choices in Nigeria

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Abstract

Understanding gender disparities in home-based self-employment (HBS) and their links to homeownership and socioeconomic factors is crucial for advancing sustainable development goals (SDGs) in Sub-Saharan Africa, especially Nigeria. This study uses data from the 2010/2011, 2012/13, 2015/16, and 2018/19 waves of the Nigerian General Household Survey (GHS). It employs random effect probit regression, the LASSO method for identifying predictors, and the Blinder–Oaxaca decomposition technique to analyse gender differences in nonlinear binary outcomes. The results show that female business owners are more likely to engage in HBS compared to males, highlighting the importance of gender equality (SDG 5) and decent work (SDG 8). While male entrepreneurs are mainly driven by profit, females prioritise balancing paid and unpaid work, reflecting motivations beyond profit within heterodox economics. Significant gender-differentiated impacts are observed in relation to monthly rent, post-secondary education, dwelling space, energy, and regional locations. Notably, the presence of children significantly increases female involvement in HBS, a trend not seen among males. Marriage also influences female participation, suggesting that marital circumstances and economic benefits play a role. These findings highlight the need for policies addressing gender-specific constraints, challenging traditional gender roles, and promoting inclusive human development within the SDG framework.

Keywords: Decomposition; gender gap; home-based businesses; institutions; LASSO; self-employment

JEL Classification: J12; J46; L26; M2; O18

Introduction

Gender equality, decent work, and adequate housing are essential components of the sustainable development goals (SDGs), fostering inclusive and sustainable human development. In Nigeria and other African or developing countries, the impact of homeownership, family structure, gender, and other variables on self-employment decisions remains mixed, primarily due to the heterogeneity in self-employment. This heterogeneity encompasses various sub-groups within self-employment, with gender differences playing a significant role (Gindling and Newhouse 2014; Grimm et al 2012; Nwaka et al 2016).

One facet of this heterogeneity lies in the decision to pursue home-based self-employment (HBS), which is where businesses operate within the home. Despite evidence

of both positive and negative effects of homeownership on the decision to be self-employed (Chen and Hu 2018), the significance of homeownership in determining HBS has been under-researched, especially in developing countries. Homeownership can act as collateral for financing a new business, increasing the likelihood of self-employment (Blanchflower and Oswald 2013), and reducing costs associated with setting up new business locations (Reuschke 2016). However, it may also deter (self)employment due to the risks associated with business failure (Bracke et al 2014; Chen and Hu 2018). Compared to men, HBS is more prevalent among women, offering flexibility in balancing paid and unpaid work (Thompson et al 2009; Aridakis et al 2014). Nevertheless, female-owned HBS businesses face challenges, particularly in smaller, lower-income cities, suggesting that HBS may be a choice for the economically disadvantaged due to its lower capital requirements (Mason et al 2011).

This research aims to investigate the socioeconomic factors influencing HBS and assess whether homeownership could help address the gender gap in self-employment. Departing from conventional economic paradigms, the study focuses on the motivations behind HBS, particularly the decisions of female business owners. It provides a nuanced understanding distinct from traditional mainstream models that typically emphasise profit maximisation as the primary motivator for entrepreneurial decisions. The research emphasises that the choice of HBS goes beyond monetary gains, considering factors such as the need for flexible work schedules, social institutions that perpetuate gender norms, family dynamics, household infrastructure, and homeownership. To the best of the authors' knowledge, no other study has attempted to ascertain the gender-differentiated determinants of HBS in Nigeria. Close to our study is that of Reuschke (2016) which ascertains the importance of housing for home-based business decisions in the UK but does not address gender-specific effects or apply robust empirical techniques, such as econometric and machine learning approaches, to disentangle the gender gap as this paper does.

The case for Nigeria is compelling due to its unique characteristics—a population of 218 million people and the highest proportion of self-employment to total employment, with females (86%) outnumbering males (77%) (World Bank 2024a). This sizeable population provides a strong sample for examining various aspects of self-employment, allowing for more in-depth and potentially generalisable findings. Also, from a policy perspective, in Nigeria and other developing countries, it is noteworthy that many business owners who are engaged in informal employment and home-based own-account work, particularly women, are unsuccessful entrepreneurs. Thus, unravelling the gender-differentiated impact of HBS choices in Nigeria is imperative for understanding the motivations behind these choices. Unlike the conventional mainstream thought emphasising profit maximisation, other factors such as marriage, having children, and household responsibilities significantly impact women's choices, leading many to opt for home-based work as a viable alternative (Nwaka et al 2016; Guven-Lisaniler et al 2018; Joona 2018). Additionally, female engagement in HBS may be driven more by necessity than a desire for profit, hindering progress towards SDGs related to gender equality (SDG 5), decent work and economic growth (SDG 8), poverty eradication (SDG 1) and reduced inequalities (SDG 10).

The present study contributes to the literature in multiple ways. Firstly, the research, for the first time ascertains the gender differentiated determinants of HBS engagements in Nigeria. Second, the study applies the probit model, the random effects model and the Blinder–Oaxaca (B–O) decomposition technique to analyse cross-sectional household survey data from 2010 to 2018. The B–O technique has been applied in the determination of the gender wage gap in Nigeria (Orji & Nwosu, 2024), the present study is however oriented towards self-employment dynamics which contrasts with employee-oriented wage dynamics. Lastly, the study also employs the LASSO estimator as a robustness test for

Table 1. Average employment and unemployment statistics (2010–2019)

	Nigeria (A)	sub–Saharan Africa (B)	World (C)	Difference (A-B)	p-value	Difference (A-C)	p-value
Self-employed (%)							
Total	82.54	77.793	48.9	4.74	0.000	33.64	0.000
Females	86.47	83.934	48.01	2.53	0.000	38.46	0.000
Male	79.1	72.524	72.52	6.58	0.000	6.58	0.000
Wage Employed (%)							
Total	17.46	22.207	51.1	–4.74	0.000	–33.64	0.000
Females	13.53	16.066	51.99	–2.53	0.000	–38.46	0.000
Male	20.9	27.476	50.52	–6.58	0.000	–29.62	0.000
Unemployment							
Total	4.09	5.983	6.09	–1.9	0.000	–2	0.000
Females	3.83	6.438	6.14	–2.6	0.000	–2.31	0.000
Male	4.3	5.589	6.05	–1.29	0.000	–1.75	0.000

Source: World Development Indicators (2024b)

the validity of the coefficients. This is the first study in Nigeria and Africa to use the machine learning LASSO estimator to evaluate gender gaps in self-employment.

Key results from this research show that female business owners are more inclined towards home-based self-employment (HBS) compared to their male counterparts, underscoring the importance of gender equality (SDG 5) and decent work (SDG 8). While male HBS owners are mainly motivated by profit, females emphasise balancing paid and unpaid work. These insights, framed within heterodox economics, reveal that self-employment motivations extend beyond profit and highlight the necessity for gender-inclusive policies. Addressing gender-specific challenges in HBS can inform governments in developing policies that foster equitable economic opportunities and promote sustainable growth.

The study proceeds by presenting data on self-employment outcomes in Nigeria, then developing hypotheses on the effects of homeownership on HBS based on existing literature. Subsequent sections discuss data, methodology and results, followed by further discussion and conclusions.

Self-employment business trends in Nigeria: some stylised facts

Nigeria, with a population exceeding 200 million, constitutes approximately 18% of the Sub-Saharan African population (World Bank 2024b). Despite being acknowledged as the largest economy in Africa, it remains one of the world's poorest countries. Table 1 outlines the role of self-employment in employment generation in Sub-Saharan Africa (SSA), with particular emphasis on Nigeria. Notably, Nigeria surpasses SSA and global averages in the proportion of self-employed individuals. Conversely, wage employment claims a relatively smaller share for both males and females compared to SSA or the global average.

According to the International Labour Organization (ILO), Nigeria maintains a modest unemployment rate of about 5%, which aligns with the global average. However, persistent economic challenges have pushed approximately 47% of the population into absolute poverty, defined as individuals living on less than 1.90 US dollars daily. This reality

supports Fields' (2014) perspective, asserting that the prevalent absolute poverty is not merely an issue of unemployment but stems from employment vulnerability, limited earning opportunities, and the heterogeneous nature of self-employment.

According to the Nigeria Bureau of Statistics (NBS), by the third quarter of 2023, 87% of working-age Nigerians were self-employed. Disaggregating by gender, there is a 6.3% gap, with 90.5% of females engaged in self-employment. This high rate of self-employment may reflect necessity rather than opportunity due to the scarcity of formal job opportunities in Nigeria. At the same time, 92.3% of the Nigerian workforce was involved in informal employment.

Data from the ILO for 2022 show that the high level of self-employment (over 87%) in Nigeria contrasts sharply with 6.3% in the US, 8.7% in Germany, 29% in South Africa, 15.6% in the UK, 30% in Turkey, 75% in Ghana, and 81% in Uganda. Evidently, advanced economies have a much lower proportion of self-employed individuals compared to low-income and emerging economies.

Gender disparities in self-employment are also evident. In the US, 8.4% of male employment was self-employed compared to 6.3% for females. In Germany, the figures were 10.74% for males and 6.5% for females, while in the UK, it was 19.7% for males and 11.3% for females. In Uganda, 86% of females and 76% of males were self-employed, whereas in Ghana, the figures were 82% for females and 69% for males. These disparities suggest that self-employment in emerging and low-income economies may often be driven by a lack of formal job opportunities rather than profit potential.

Studies on Nigeria's labour market have consistently highlighted the varied characteristics of labour demand and supply across different employment types. (Guven-Lisaniler et al 2018; Nwaka et al 2016). Demand heterogeneity is associated with employment features such as type, location and occupation, while worker attributes influence supply. Within this context, a prominent characteristic of self-employment in Nigeria is the prevalence of home-based businesses compared to those operating beyond the household realm.

Figures 1–4 report the distribution of HBS and non-HBS by gender, educational level, sector of activity and homeownership. While non-HBS appear to be male-dominated, the HBS is female-dominated, as found in other studies (Thompson et al 2009). Individuals with primary education as the highest qualifications are more oriented towards HBS, while those with secondary education are predominantly in non-HBS employment. From Figure 5, it can also be observed that home-based businesses have a higher distribution in the north relative to the southern part of Nigeria. From Figure 6, heterogeneity in household earnings from home-based and non-homebased businesses can be observed, with the oil rich Niger Delta in the south having the highest earners in home-based businesses. The descriptive scenario explains the low-skill attributes in most HBS establishments. Also, compared to other sectors (manufacturing and services), HBS is more oriented towards wholesale and trade businesses. In Nigeria, wholesale/trade businesses come in various sizes and types, such as street hawking, and the low-scale sale of various electronic and household utilities, groceries and food items. HBS is also more common amongst homeowners than renters and, indeed offers insights into homeownership-driven self-employment motives.

Literature review and hypotheses development: HBS, gender and homeownership effects

Scholarly literature often cites self-employment as a diverse category comprising various groups of skilled and unskilled individuals, including agricultural workers, formal and informal household enterprises, employers, employees and own account workers – also

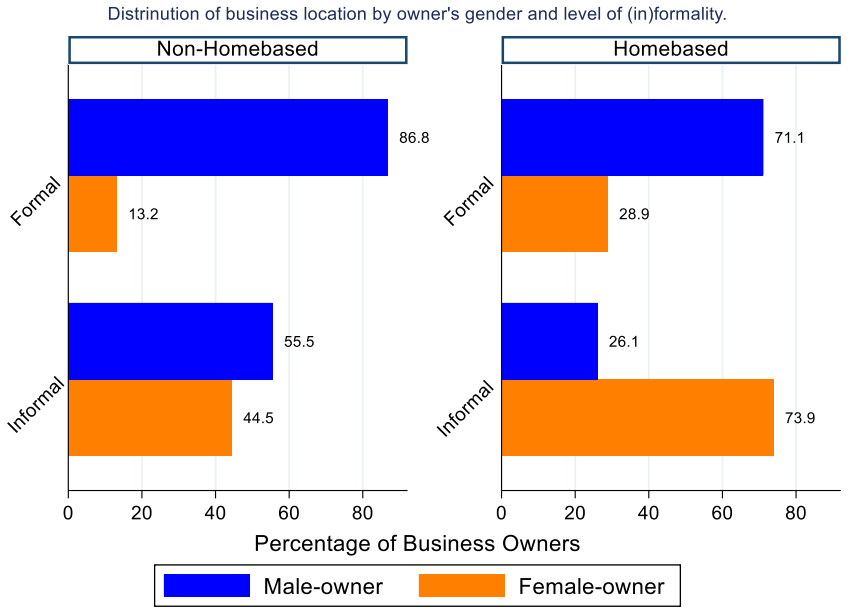

Figure 1. Distribution of business location by owner's gender and (in)formality (2010–2018 Survey Weights).
Source: Authors' Computation from General Household Survey–Nigeria Bureau of Statistics (2010–2018).

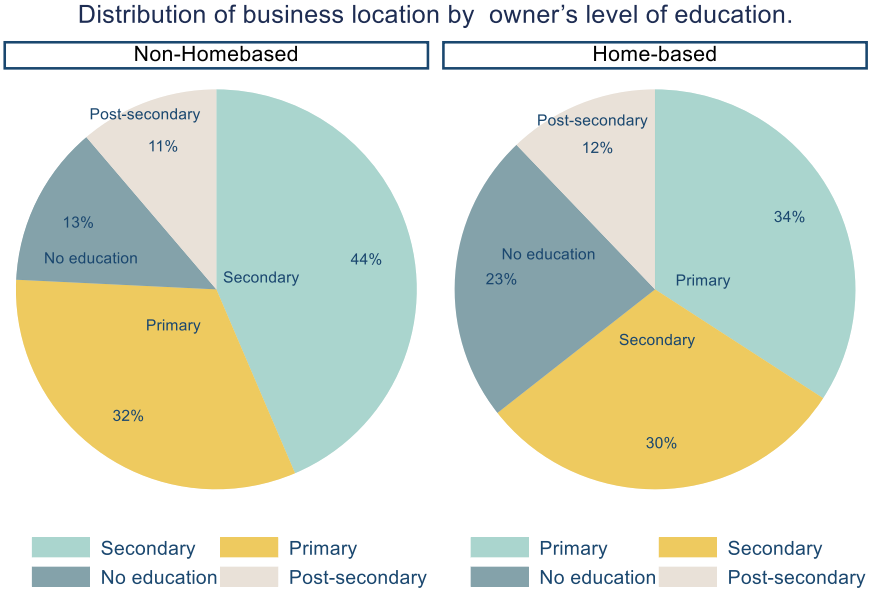

Figure 2. Distribution of business location by owner's level of education (2010–2018 Survey).
Source: Authors' Computation from General Household Survey–Nigeria Bureau of Statistics (2010–2018).

known as small business owners (Burrows and Ford 1998; Gindling and Newhouse 2014; Nwaka et al 2016; Guven-Lisaniler et al 2018). Within this context, businesses can operate either within the home premises (HBS) or outside the home (non-HBS). For simplicity, we

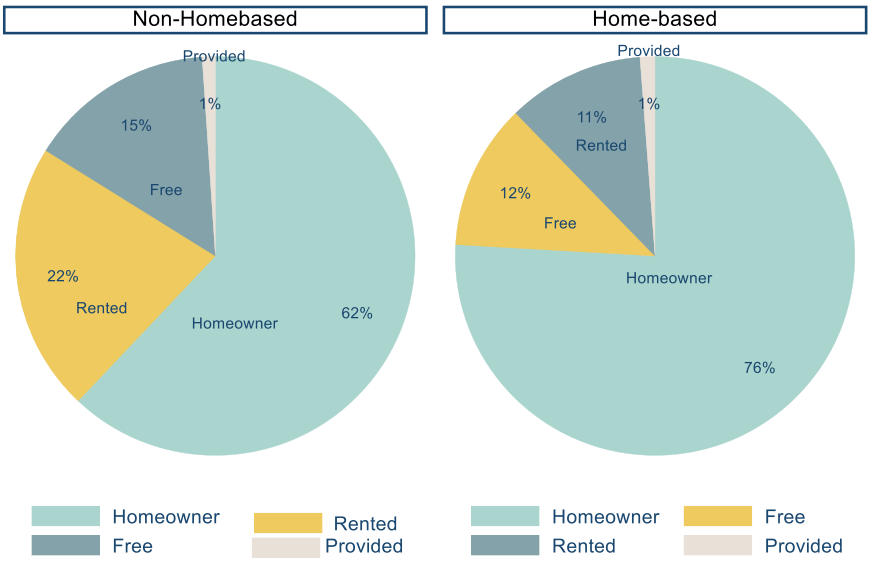

Figure 3. Distribution of homeownership status by business location (2010–2018 survey weights).
Source: Authors' Computation from General Household Survey–Nigeria Bureau of Statistics (2010–2018).

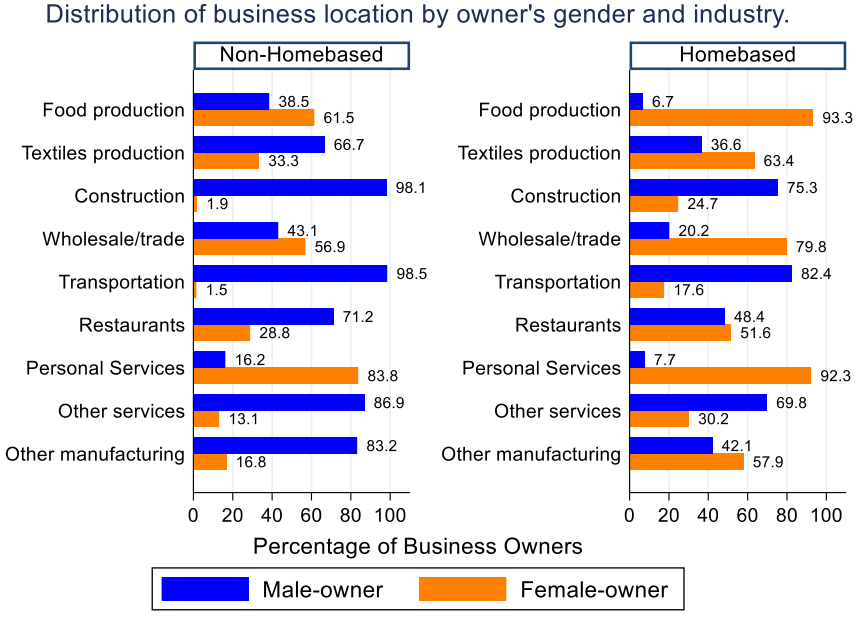

Figure 4. Percentage distribution of homebased business location by owner's gender and industry.
Source: Authors' Computation from General Household Survey–Nigeria Bureau of Statistics (2010–2018).

exclude agricultural workers from our self-employment characterisation. In developing countries, home-based occupations are primarily informal, producing various goods for local and international markets, such as services (hair-cutting, beautification, laundry,

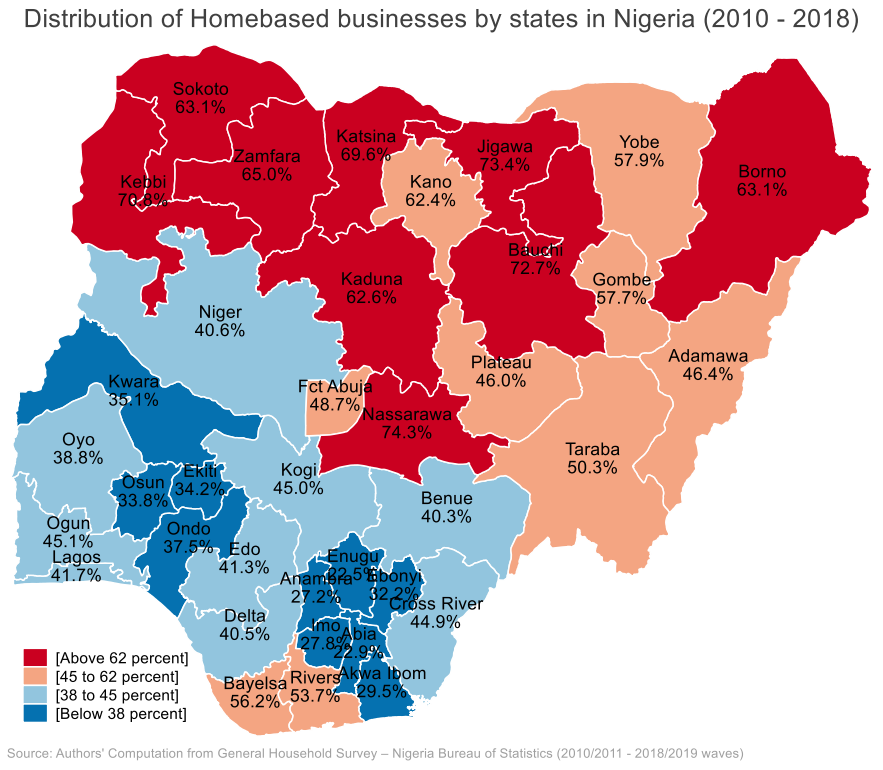

Figure 5. Percentage distribution of homebased businesses by states in Nigeria (2010–2018).

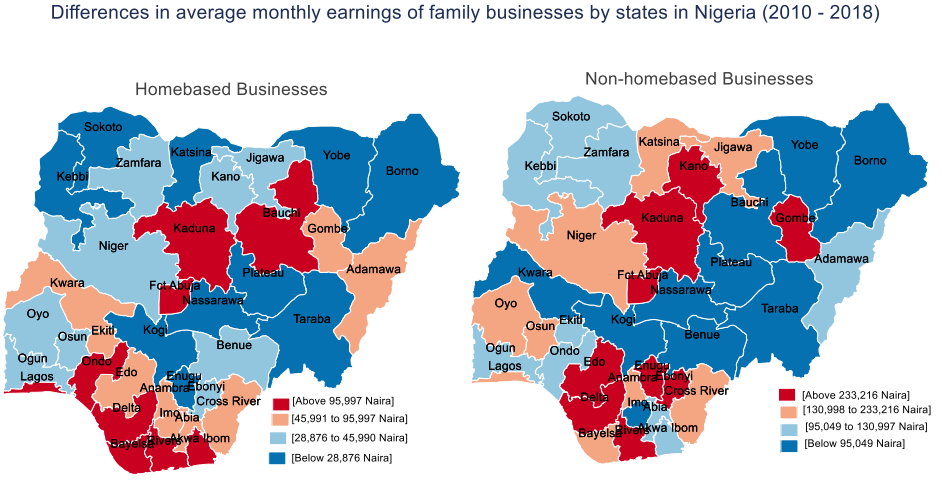

Figure 6. Earning differences by states in Nigeria (2010–2018).

dry-cleaning, shoe repairs), wholesale and trade, as well as various forms of manufacturing (textiles, crafts, garments, shoemaking, cosmetics) (Chen 2014).

Existing literature suggests that decisions to operate ventures from home are often linked to cost minimisation, as start-up costs can be easily financed from an individual's savings (Vorley and Rodgers 2014; Daniel et al 2015). In contrast, non-home-based ventures in industrial layouts or towns may require significant capital for operation (Reuschke 2016). Home-based establishments are characterised by fungible resource allocations, facilitating swift and efficient transfers of resources without value losses (Kellet and Tipple 2000). This allows participants to easily reinvest cash from sales into the business or spend it on household needs, so improving their living or working conditions.

Flexibility is often presented as a critical attribute of running HBS especially for women who are more likely to undertake HBS due to the burden of unpaid work (Walker 2004; Thompson et al 2009; Nwaka et al 2016; Heck 1991). However, this flexibility comes with costs, as women tend to bear a major burden for their associated expenses (Thompson et al 2009; Meisam et al 2017). Childcare responsibilities, in particular, can reduce self-employment duration and so, earnings (Williams, 2004; Joona, 2018), thus female business owners' engagement in HBS is an outcome from necessity for achieving a work–life balance rather than pursuing profit.

Such necessity highlights how, to a large extent, social institutions shape women's entrepreneurial decisions. Staveren and Oyebode (2007) perceive gender norms as asymmetric institutions, the expression of which is mediated by other institutions such as the household. Unlike formal institutions such as the household, informal institutions such as role models have been shown to influence women's propensity to engage in entrepreneurial activity in some environments (Noguera et al 2015). However, this may occur in different forms in a less egalitarian society such as Nigeria where gender norms are deeply entrenched in the culture and find dominant expression in both informal and formal institutions. These norms, by their very nature, deny women access to property ownership (Ajala, 2017) and constrain their self-empowerment (Farnworth et al 2020).

Cultural and tribal heterogeneity and socioeconomic differences necessitate examining what are determinants of self-employment choices and homeownership in Nigeria, and the extent to which they align with the extant literature. This leads to the first set of hypotheses.

Hypothesis 1a: *The female gender positively influences the propensity of female business owners to engage in home-based self-employment.*

Hypothesis 1b: *Childcare responsibilities positively correlate with the propensity of business owners to choose home-based self-employment.*

Hypothesis 1c: *The positive relationship between home-based self-employment and childcare responsibilities is valid for female business owners but not males.*

Hypothesis 1d: *Marital status positively influences the propensity of female business owners to choose home-based self-employment.*

The literature highlights three essential housing features in examining the link between homeownership and self-employment choices. Firstly, homeownership is a financial asset in financing a business, known as the 'collateral effects', where houses act as collateral for securing loans (Chen and Hu 2018; Reuschke 2016). Secondly, studies suggest that owning a home may act as security and pose a risk by creating wealth or crowding out potential employment respectively, depending on circumstances (Blanchflower and Oswald, 2013). Thirdly, spatial or locational attributes can encourage small business formation, an aspect

yet to be explored in the self-employment literature. Also, given the existence of owned homes, entrance into HBS may be more flexible for female business owners with dependents, reflecting the strong influence of gender roles linked to ancient traditional norms in developing economies like Nigeria. This sets the stage for the second set of hypotheses.

Hypothesis 2a: *Outright homeownership positively influences the propensity of business owners to engage in home-based self-employment.*

Hypothesis 2b: *The positive relationship between home-based self-employment and homeownership is stronger for male than female business owners.*

Understanding the factors associated with female home-based employment choices in Nigeria, considering cultural inclinations, is crucial for implementing policies to minimise observed gender inequality. This study proceeds as a foundational step towards unravelling inherent gender-differentiated determinants in the decision to engage in HBS in Nigeria, addressing these differences, and proposing potential policies to mitigate any resulting adverse outcomes.

Data and empirical methodology

Data and self-employment definition

This study uses data from the Nigeria General Household Surveys Panel (GHS-Panel), conducted in 2010/2011, 2012/13, 2015/16, and 2018/19. This nationally representative survey of 5,000 households results from collaboration between the Nigeria Bureau of Statistics (NBS), the Bill and Melinda Gates Foundation (BMGF), and the World Bank. The GHS-Panel data has been widely used in various studies of Nigeria (Guven-Lisaniler et al 2018; Nwaka et al 2016; Nwaka et al 2020). Vijverberg (1992) show that household surveys provide a more accurate representation of small-scale enterprises than dedicated enterprise surveys.

We used data from the four GHS-Panel waves, sourced from the World Bank's Living Standard Measurement Study (LSMS) microdata library (see Nigeria Bureau of Statistics, 2010 for more details). The survey includes questionnaires on personal, labour and household characteristics, as well as inquiries into non-farm household enterprises and housing details. Typically, household heads or those most knowledgeable about household business operations serve as respondents.

Focusing on the gender gap in family business choices—home-based or non-home-based—we restricted the sample to female and male owners aged 20 to 64 who own at least one family enterprise. This age range includes crucial decision-makers in self-employment and household management. We matched individuals based on their characteristics, households and business attributes. Each wave's sample comprises an average of about 2,014 unique households, 2,840 non-farm enterprises, and 11,396 observations. We used survey weights to accurately reflect the broader population and adjust for any survey biases. Detailed definitions of the variables used in the estimation, along with descriptive statistics, are presented in Table 2.

Dependent variable

The primary focus of this study revolves around family businesses or self-employment jobs primarily conducted from home. The International Classification of Status in Employment

Table 2. Variable's definition and description statistics by business owner's gender

		Non-Homebased	Home-based	
		N = 6,542	N = 4,854	*p*-value
Owner's Gender	Gender of the business owner (self-employed)			<0.001
Male-owned	=0 if business is owned and managed by a man.	3,999 (61%)	1,588 (33%)	
Female-owned	=1 if business is owned and managed by a woman.	2,543 (39%)	3,266 (67%)	
Education				<0.001
<=Primary	Self-employed with primary or no education (base category)	2,869 (44%)	2,656 (55%)	
Secondary	=1 if self-employed completed secondary education	2,900 (44%)	1,547 (32%)	
Tertiary	=1 if self-employed completed Tertiary education	773 (12%)	651 (13%)	
Age	Owner's age (in years)	40 (11)	39 (12)	<0.001
Age2	Owner's age (in years)	1713 (958)	1663 (977)	0.006
Marital status	Marrital status			<0.001
Married	=1 if married	4,931 (75%)	3,920 (81%)	
Divorced/Separated	=1 if business owner is divorced/separated	496 (8%)	463 (10%)	
Single	Base category: if business owner is never married	1,115 (17%)	471 (9%)	
Work hours(hours)	Number of hours dedicated to self-employment/week	23 (26)	18 (24)	<0.001
Children < 19	Total number of children (0 to 18) years in the household	3 (2)	4 (3)	<0.001
Real household income (in Naira)	Household income (in real 2010 Naira values)	43493 (518260)	36432 (331288)	0.41
Dependency ratio	Dependency ratio(<=14 & >65 per 15–65 years)	94 (80)	112 (89)	<0.001
Family size	Number of individuals in the household	7 (3)	8 (4)	<0.001
Monthly rent (in log naira)	Log of monthly housing rent (in 2010 Naira)	9 (1)	8.9 (1.1)	<0.001
Electricity expenditure (in log Naira)	Log of monthly electricity expenditure (in 2010 Naira)	5 (4)	3.8 (4.1)	<0.001
Shocks:Death/Illness	Shocks due to death/illness of income earner = 0 versus none =1			<0.001

(*Continued*)

Table 2. (*Continued*)

		Non-Homebased	Home-based	
		N = 6,542	*N* = 4,854	*p*-value
No		1,513 (23%)	1,393 (29%)	
Yes		5,029 (77%)	3,461 (71%)	
Shocks: Business failure	Shocks due non-farm business failure= 0 versus none =1			<0.001
No		1,497 (23%)	1,286 (27%)	
Yes		5,045 (77%)	3,568 (74%)	
Shocks: Property loss	Shocks due to property loss by fire/theft= 0 versus none =1			<0.001
No		1,416 (22%)	1,262 (26%)	
Yes		5,126 (78%)	3,592 (74%)	
Shocks: Output prices	Shocks due to rise on output prices= 0 versus none =1			0.015
No		1,948 (30%)	1,549 (32%)	
Yes		4,594 (70%)	3,305 (68%)	
Business Sector				<0.001
Manufacturing	=1 if manufacturing oriented	800 (12%)	1,218 (25%)	
Wholesale retail/trade	business is wholesale, retail and trade oriented (base category	3,327 (51%)	2,396 (49%)	
Other Services	=1 if business is service oriented (haircuts, dry-cleaning or fashion)	2,415 (37%)	1,240 (2%)	
Availability of credit	Credit availability for business operation= 0 versus unavailability =1			<0.001
No		6,119 (93.5%)	4,641 (95.6%)	
Yes		423 (6.5%)	213 (4.4%)	
lnsales		10 (2.8)	9.5 (2.5)	<0.001
Formality status				<0.001

(*Continued*)

Table 2. (*Continued*)

		Non-Homebased	Home-based	
		N = 6,542	*N* = 4,854	*p*-value
Formal	Officially registered businesses (reference group)	800 (12.2%)	190 (3.9%)	
Informal	= 1 if business is not officially registered and 0 otherwise	5,742 (87.8%)	4,664 (96.1%)	
Capital structure	Log of monthly capital structure (in 2010 Naira values)	11.33593 (1.8)	10.55954 (1.7)	<0.001
Homeownership types	Homeownership status			<0.001
Home-owned	= 1 if self-employed belongs to households with outright homeownership	3,986 (60.9%)	3,531 (72.7%)	
Rented	self-employed belongs to households where home rented (base category)	1,518 (23.2%)	605 (12.5%)	
Freely-provided	= 1 if self-employed belongs to households where home is provided by external body.	1,038 (15.9%)	718 (14.8%)	
Dwelling size	Number of separate rooms in the households.	3.61113 (2.3)	4.01731 (2.8)	<0.001
Wall types	Concrete/brick wall = 1 versus non-concrete/brick wall = 0 types			<0.001
Non-concrete/cement		2,171 (33.2%)	2,368 (48.8%)	
Concrete/cement wall		4,371 (66.8%)	2,486 (51.2%)	
Housing roof types	Corrugated iron sheets=1 versus others =0			0.008
Non-corrugated iron sheets		1,261 (19.3%)	1,033 (21.3%)	
Corrugated iron sheets		5,281 (80.7%)	3,821 (78.7%)	
Housing floor	Smooth cement floor=1 versus others=0			<0.001
Non-Smooth cement/concrete		1,477 (22.6%)	1,434 (29.5%)	
Smooth cement/concrete		5,065 (77.4%)	3,420 (70.5%)	
Electricity	**Electricity connection in household's dwelling**			0.30
No	No electricity connection	3,410 (52.1%)	2,578 (53.1%)	
Yes	Electricity connection	3,132 (47.9%)	2,276 (46.9%)	

(*Continued*)

Table 2. (*Continued*)

		Non-Homebased	Home-based	
		N = 6,542	*N* = 4,854	*p*-value
Geopolitical zones				<0.001
North-Central	=1 if business/self-employee is resident in the North-Central	951 (14.5%)	605 (12.5%)	
North-East	=1 if business/self-employee is resident in the North-East	651 (10.0%)	756 (15.6%)	
North-West	=1 if business/self-employee is resident in the North-West	843 (12.9%)	1,383 (28.5%)	
South-East	=1 if business/self-employee is resident in the South-East	1,360 (20.8%)	400 (8.2%)	
South-South	Base category	1,219 (18.6%)	847 (17.4%)	
South-West	=1 if business/self-employee is resident in the South-West	1,518 (23.2%)	863 (17.8%)	
Sector	=1 if business/self-employee is resident in rural areas versus 0= urban areas.			<0.001
1. Urban		2,966 (45.3%)	1,774 (36.5%)	
2. Rural		3,576 (54.7%)	3,080 (63.5%)	
Distance to market (in km)	Business distance to the nearest market (in kilometers)	64.5 (46.7)	63.8(44.0)	0.42
Distance to city center (in km)	Business distance to the nearest city center (in kilometers)	43.2 (43.8)	51.3 (49.9)	<0.001
Distance to road (in km)	Business distance to the nearest major road (in kilometers)	6 (9.1)	7.4 (11)	<0.001
Population density	Population density at district level	3940.3 (7011.4)	3618.3 (6893.6)	0.015
Bank account ownership	Whether business owns a bank account versus none=0			<0.001
No		4,277 (65.4%)	3,811 (78.5%)	
Yes		2,265 (34.6%)	1,043 (21.5%)	
Informal Saving	Whether business owner belongs an informal saving group =1 versus none=0			0.24
No		4,145 (63.4%)	3,127 (64.4%)	
Yes		2,397 (36.6%)	1,727 (35.6%)	

(*Continued*)

Table 2. (*Continued*)

		Non-Homebased	Home-based	
		N = 6,542	*N* = 4,854	*p*-value
Women group membership	Whether business owner belongs an women group =1 versus none=0			<0.001
No		4,139 (63.3%)	3,231 (66.6%)	
Yes		2,403 (36.7%)	1,623 (33.4%)	
Business group membership	Whether business owner belongs a business association group =1 versus none=0			0.12
No		5,476 (83.7%)	4,010 (82.6%)	
Yes		1,066 (16.3%)	844 (17.4%)	
Number of religious institutions	Number of religious institutions within districts	7.4 (8)	8.2 (9.2)	<0.001
Number of women cultural groups	Number or women cultural groups within province.	1 (1.3)	1 (1)	<0.001
Waves				<0.001
1. Wave 1-2010/11		1,176 (18.0%)	1,102 (22.7%)	
2. Wave 2-2012/13		1,654 (25.3%)	1,272 (26.2%)	
3. Wave 3-2015/16		1,816 (27.8%)	1,350 (27.8%)	
4. Wave 4-2018/19		1,896 (29.0%)	1,130 (23.3%)	

(ICSE-93) categorises employment into paid (employees) and self-employment (ILO, 1993). According to ICSE-93, self-employment encompasses:

i. Those employers who employ workers continuously
ii. Own-account workers without external workers – self-managed businesses
iii. Producer cooperative societies and their members
iv. Family workers in market-oriented establishments

Hence, an affirmative response to the GHS questionnaire, such as 'During the past 12 months has any member of the Household worked for himself other than a farm or raising animals', is employed to capture self-employment, aligning with the fourth definition according to ICSE-93. Similarly, we also determine whether self-employment is home-based, based on whether it operates within the home's vicinity (inside and outside the residence) or otherwise. The dependent variable, HBS, is binary (HBS vs. non-HBS). Table 2 indicates that approximately 43% of family enterprises are home-based.

Independent variables

Individual characteristics

To account for self-employment characteristics, we include the owner's gender, age and work hours. The literature suggests that, for flexibility and the ability to contribute to home goods, females are more inclined towards HBS than males (Walker, 2004; Thompson et al 2009; Nwaka et al 2016). As Table 2 indicates, a higher proportion (67%) of female-owned businesses are home-based, while males dominate the non-home-based category at around 61%. Educational levels (primary or less, secondary, and tertiary) have been included to minimise potential measurement errors associated with the years of schooling indicator. The age variable plays a crucial role in homeownership and self-employment choices, with expectations that self-employment choices are more profound among older workers due to possible accumulation of entrepreneurial human capital or the time needed to intensify networks for entrepreneurial opportunities (Millan et al 2012). The signs of coefficients for marital status and work hours in self-employment vary and differ by gender in the literature. Additionally, the impact of multiple exogenous shocks on households varies due to different coping strategies and perception to risks between genders (Nguyen et al 2020).

Business/Regional characteristics

Factors affecting the economic structure or location of self-employment represent business characteristics. These include self-employment, industrial structure (manufacturing, wholesale retail/trade, and services), business earnings, informality, and credit availability. Regional/community-based variables (geopolitical zones, business proximity to the nearest market, distance to the main road and urban-rural differences) capture spatial/regional attributes influencing the decision to engage in HBS in Nigeria.

Given that a higher proportion of female owners operate informal HBS, most HBS are expected to be informal (Burrows and Ford 1998; Gindling and Newhouse 2014). However, due to the limited earning potential of HBS, earnings are anticipated to be relatively lower than those of non-HBS. The occupational concentration of HBS may result in varying signs of the self-employment sectoral structure variables due to potential disparities related to sectoral opportunities. As depicted in Table 2, while many occupations in the HBS and non-HBS categories are wholesale retail and trade-oriented, manufacturing-related ones appear more home-based. Geopolitical zones capture diverse economic opportunities influencing self-employment outcomes (Nwaka et al 2016; Guven-Lisaniler et al 2018).

Hence, geopolitical zones present varied economic opportunities needed for business growth. In Table 2, many HBS are in the North (North West), while 23% of non-HBS are in the South-West. Urban locations generally offer better economic opportunities, while rural locations are more oriented towards agriculture and other forms of self-employment (Nwaka et al 2016). Consequently, HBS are more dominant in rural areas than urban areas, as shown in Table 2.

Housing characteristics

Homeownership status and housing characteristics (electricity connection, floor type, wall types and occupancy rate) may also influence the decision to engage in HBS. Homeownership, as pointed out in the literature, inspires self-employment through collateral effects (Fairlie and Krashinsky 2012; Gaetano 2017; Jani-Petri 2018). Table 2 also reveals a higher proportion of HBS with outright homeownership (73%) than non-HBS (61%). While the choice of HBS is expected to rise with an increase in dwelling space, as evidenced in the literature (Reuschke 2016), the effects of children on self-employment are mixed (Nwaka et al 2016).

Institutional characteristics

Studies have underscored the critical role of institutions in entrepreneurship (Estrin and Mickiewicz, 2011). Baumol (1990) contends that the impact of institutions varies with a country's development level, while Staveren and Ode Bode (2007) view gender norms as asymmetric institutions reflected in others, like the household. Informal institutions in particular, are significant in mediating gender norms that exclude women from various social privileges (Noguera et al 2015; Ajala, 2017; Horak & Suseno, 2023).

In this paper, we examine several institutional variables: bank account ownership, informal savings memberships, women's group membership, business association membership and the number of religious and cultural institutions. These variables capture both formal and informal institutional influences. Bank account ownership and informal savings memberships highlight the role of financial inclusion in home-based work. Memberships in women's groups, business associations and religious and cultural institutions underscore the importance of community-based support networks (Horak and Suseno, 2023; Anderson et al 2002). Additionally, we incorporate formal institutional variables to reflect family context, including marriage, the number of children under 19, dependency ratios, family size, income and household shocks such as business failure, property loss, price increases and illness or death of family members. Income is measured by real household income in Naira, and education by secondary and post-secondary attainment.

Empirical methodology

In this study, self-employment participation is examined based on whether owners run businesses at their residence or elsewhere. The owner's gender and other relevant factors influence the choice of home-based self-employment (HBS). We use a standard probability model to explore how gender and these factors impact the decision to engage in HBS as follows:

$$HBS_{it}^{*} = \beta_0 + \beta_1 X_{it} + \varepsilon_{it} + \mu_i \tag{1}$$

$$HBS_{it} = \left\{ \begin{array}{l} 1 \; if \; HBS_i^{*} > 0 \; ie \; homebased \\ 0 \; if \; HBS_i^{*} \leq 0 \; ie \; nonhomebased \end{array} \right\} \tag{2}$$

where HBS_{it}^{*} is the unobserved latent variable and HBS_{it} represents a binary variable that denotes an individual's probability of operating home-based self-employment given period (t). X_i is a vector of variables determining HBS choices including individual, household, business, regional, housing and institutional characteristics. The parameters to be estimated are represented by β_0, β_1 and β_2. ε_{it} is a normally distributed stochastic error term with zero mean and unit standard deviation, μ_i capture individual fixed effects. Since both ε_{it} and μ_i are independent normal random variables, it follows that $\varepsilon_{it} + \mu_i$ is normally distributed with zero mean and variance of $1 + \sigma_{\mu}^{2}$. Given the panel structure of the data, Equation 1 estimated using both pooled probit ($Probit^{all}$) and random effects probit[1] (REP^{all}) estimators as follows:

$$\Pr(HBS_{it} = 1 | X_{it}) = \Phi\left(\frac{\beta_0 + \beta_1 X_{it}}{\sqrt{1 + \sigma_{\mu}^{2}}}\right) \tag{3}$$

where $\Phi(.)$ capture the standard normal cumulative function (see Bland and Cook 2019)

Machine learning estimator

To identify factors predicting HBS, we use machine learning estimators. Unlike baseline models like $Probit^{all}$ and REP^{all}, these estimators minimise residuals with a tuning parameter (Böheim and Stöllinger, 2021). We apply the least absolute shrinkage and selection operator (LASSO), which has seldom been used for examining the gender gap in HBS. LASSO selects relevant variables, eliminates correlated ones, and shrinks some coefficients by adding a penalty to the conventional models (Probit and Random Effects Probit), penalising the sum of absolute coefficient values. Given n observations, each labelled with i, and p variables, Equation 3 is modified as follows:

$$\widehat{\beta}_l = \arg min \sum_{i=1}^{n} \left(\Pr(HBS_{it} = 1 | X_{it}) - \Phi\left(\frac{\beta_0 + \beta_1 X_{it}}{\sqrt{1 + \sigma_{\mu}^{2}}}\right)\right)^2 + \lambda \sum_{j=1}^{p} |\beta_j| \tag{4}$$

where $\widehat{\beta}_l$ captures the LASSO coefficients in vector form, while p and λ are the number of independent variables and tuning parameter respectively. As λ increases, the LASSO estimator diverges from the probit model, increasing the bias (Bonaccolto-Töpfer and Briel 2022, Böheim and Stöllinger 2021). A λ of zero produces the original probit model. The choice of λ is determined by the algorithm. Figure 7 shows the cross-validated λ using the one standard error bound, and λ_{cv} show the chosen λ value=0.0096 according to this bound as well as the number of variables included in the model. Refer to the Online Supplementary Material for the post-selection goodness of fit test result (Table A).

Following Böheim and Stöllinger 2021, we apply pooled probit and random effects probit models to all variables listed in Table 2 for both female and male business owners, conducting separate analyses for each group. We then re-run the regression using only the variables selected by LASSO estimator (POSTLASSO models).

To analyse how individual, household, business, regional and housing characteristics contribute to the gender gap in HBS choices, we employed the Blinder–Oaxaca (B–O) decomposition technique for nonlinear binary outcomes. According to Averkamp et al. (2024), the extended decomposition method used in gender wage gap analysis attributes a larger portion of the gender gap to differences in observed endowments. In this study, the characteristics of male business owners are key determinants of the gender gap in HBS. This approach examines whether the gender gap in HBS engagement would be greater if male business owners were assumed to possess female characteristics, and vice versa. The B–O method (Blinder 1973; Oaxaca 1973) is commonly used to study gender and

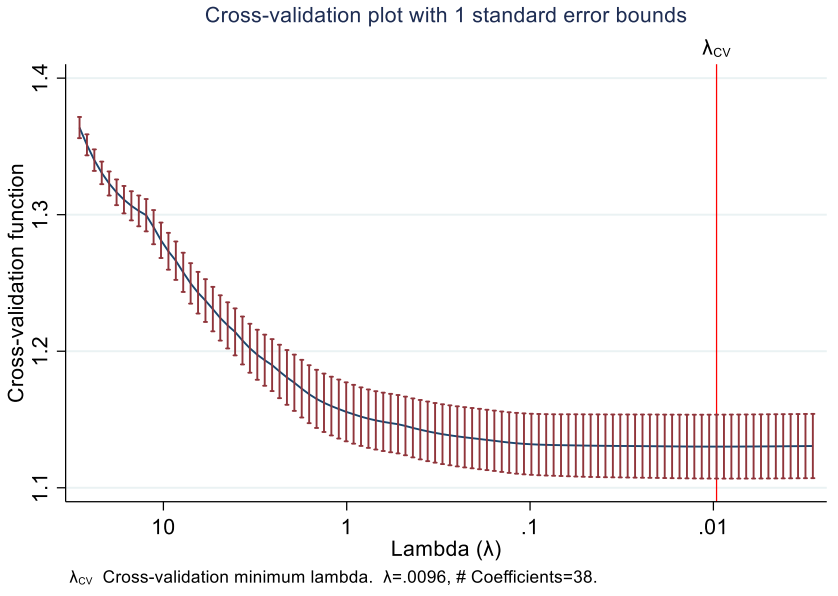

Figure 7. Cross-validation for Lambda.

group-based wage differences and has been applied in health (Fagbamigbe et al., 2022), food security (Zingwe et al., 2023), and entrepreneurship (Hewa-Wellalage et al., 2022). Details of the decomposition model are provided in the Online Supplementary Material.

Empirical results and discussions

Table 3 presents estimates of factors influencing home-based business (HBS) engagements. Following Böheim and Stöllinger 2021, we use three specifications: a probit regression with all explanatory variables (PROBIT^{all}, Model 1), a random effects probit regression with all explanatory variables (REP^{all}, Model 2), and the POSTLASSO specification, which re-estimates the probit and random effects probit regressions using only the variables selected by the LASSO model (POSTLASSO^{probit} and POSTLASSO^{rep}). The POSTLASSO model is applied to the overall sample (Models 3 and 4) as well as to female and male samples (Models 5 and 6). All models are statistically significantly different from 0 at the 1% level, indicating that observable characteristics collectively explain the probability of HBS operation among surveyed business owners.

The likelihood of engaging in home-based self-employment (HBS) is significantly higher for female business owners, as shown in models 1 to 4, supporting hypothesis 1a. This finding contrasts with Reuschke (2016) for the UK, where gender does not influence HBS decisions. Developmental disparities between countries may explain this difference. In the UK, gender norms are less pronounced due to established institutions and human rights, unlike Nigeria, where gender-biased patriarchy and traditional values confine women to domestic roles (Anderson & Ojediran, 2022). Age affects HBS engagement non-linearly for females, with older women being more inclined due to household responsibilities and intensified networks for entrepreneurial opportunities (Millan et al 2012). Although work hours are insignificant overall, they impact genders differently: increased self-employment time raises HBS likelihood for females but decreases it for males. Higher monthly rent also boosts HBS participation for females, indicating how economic burdens affect HBS decisions differently for women.

Table 3. Probit (Random Effect Probit) average marginal effects of factors determining homebased business choices, overall sample and business owner's gender (compared to Non-homebased)

	Overall sample				Female owners	Male owners
	$PROBIT^{all}$	REP^{all}	$POSTLASSO^{probit}$	$POSTLASSO^{rep}$	$POSTLASSO^{rep}$	
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
Individual Characteristics						
Female business owner	0.282***	0.295***	0.281***	0.295***		
	(0.013)	(0.012)	(0.013)	(0.011)		
Age	–0.012***	–0.009***	–0.012***	–0.009***	–0.009**	–0.005
	(0.003)	(0.003)	(0.003)	(0.003)	(0.004)	(0.005)
Age2	0.000***	0.000***	0.000***	0.000***	0.000***	0.000*
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Work hours	–0.000	–0.000	–0.000	–0.000	0.001***	–0.002***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Monthly rent (in log naira)	0.010	0.009	0.011	0.009	0.024***	–0.012
	(0.008)	(0.007)	(0.007)	(0.006)	(0.009)	(0.010)
Institutional variables						
Absence of Shocks (ref: Yes)						
No Death/illness	–0.049**	–0.029	–0.049**	–0.028	–0.033	–0.038
	(0.021)	(0.018)	(0.021)	(0.018)	(0.027)	(0.027)
No Business failure	0.049**	0.040**	0.049**	0.039*	0.038	0.049
	(0.022)	(0.020)	(0.022)	(0.020)	(0.030)	(0.032)
No property loss	–0.014	–0.017	–0.013	–0.016	0.008	–0.019

(*Continued*)

Table 3. (*Continued*)

	Overall sample				Female owners	Male owners
	$PROBIT^{all}$	REP^{all}	$POSTLASSO^{probit}$	$POSTLASSO^{rep}$	$POSTLASSO^{rep}$	
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
	(0.028)	(0.026)	(0.028)	(0.026)	(0.037)	(0.037)
No rise in output prices	0.053***	0.042***	0.053***	0.042***	0.054**	0.058**
	(0.017)	(0.015)	(0.017)	(0.015)	(0.021)	(0.024)
Married (ref: Never married)	0.090***	0.071***	0.089***	0.069***	0.073***	0.021
	(0.020)	(0.019)	(0.020)	(0.018)	(0.028)	(0.027)
Divorced/Separated (ref: Never married)	0.095***	0.076***	0.095***	0.074***	0.088***	0.071
	(0.029)	(0.026)	(0.028)	(0.026)	(0.034)	(0.051)
Secondary (ref: Primary and none)	–0.024**	–0.019*	–0.023*	–0.018	–0.023	0.011
	(0.012)	(0.011)	(0.012)	(0.011)	(0.015)	(0.017)
Post-secondary (ref: ref: Primary and none)	0.053***	0.037**	0.054***	0.038**	0.018	0.082***
	(0.018)	(0.016)	(0.018)	(0.016)	(0.025)	(0.022)
Real household income (in Naira)	–0.000	–0.000	–0.000	–0.000	–0.000*	0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Children <19	0.009*	0.004	0.009***	0.005**	0.017***	–0.004
	(0.005)	(0.004)	(0.003)	(0.003)	(0.004)	(0.004)
Dependency ratio	0.000	0.000***	0.000	0.000***	0.000**	0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Family size	0.000	0.001				
	(0.003)	(0.003)				

(*Continued*)

Table 3. (*Continued*)

	Overall sample				Female owners	Male owners
	$PROBIT^{all}$	REP^{all}	$POSTLASSO^{probit}$	$POSTLASSO^{rep}$	$POSTLASSO^{rep}$	
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
Bank account (vs none)	0.011	–0.003	0.011	–0.003	–0.033*	0.021
	(0.013)	(0.012)	(0.013)	(0.012)	(0.018)	(0.017)
Informal saving (vs none	–0.008	–0.009				
	(0.011)	(0.009)				
Women group member (vs none)	0.003	0.009				
	(0.013)	(0.011)				
Business association member (vs none)	–0.023*	–0.034***	–0.022*	–0.031***	–0.034**	–0.038**
	(0.014)	(0.012)	(0.013)	(0.011)	(0.016)	(0.018)
Number of religious institutions	0.000	0.000				
	(0.001)	(0.000)				
Number of female cultural groups	–0.004	–0.004	–0.003	–0.003	–0.007	0.002
	(0.005)	(0.004)	(0.004)	(0.004)	(0.005)	(0.006)
Business Characteristics						
Manufacturing (Ref: wholesale and trade)	0.189***	0.175***	0.190***	0.175***	0.171***	0.119***
	(0.015)	(0.014)	(0.014)	(0.014)	(0.020)	(0.020)
Services (Ref: wholesale and trade)	0.053***	0.050***	0.054***	0.050***	0.084***	–0.013
	(0.013)	(0.012)	(0.013)	(0.012)	(0.018)	(0.017)
Available credit (vs. None)	–0.020	–0.020				
	(0.022)	(0.019)				

(*Continued*)

Table 3. (*Continued*)

	Overall sample				Female owners	Male owners
	$PROBIT^{all}$	REP^{all}	$POSTLASSO^{probit}$	$POSTLASSO^{rep}$	$POSTLASSO^{rep}$	
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
Sales (in log Naira)	–0.012***	–0.008***	–0.012***	–0.008***	–0.019***	–0.005**
	(0.002)	(0.002)	(0.002)	(0.002)	(0.004)	(0.002)
Informal (vs Formal	0.121***	0.099***	0.121***	0.099***	0.108***	0.107***
	(0.019)	(0.018)	(0.019)	(0.018)	(0.040)	(0.022)
Capital stock (in log naira)	–0.011***	–0.011***	–0.011***	–0.011***	–0.002	–0.016***
	(0.003)	(0.003)	(0.003)	(0.003)	(0.005)	(0.004)
Housing Characteristics						
Rented (ref: Homeowned)	–0.072***	–0.041***	–0.073***	–0.047***	–0.064***	–0.075***
	(0.016)	(0.015)	(0.015)	(0.014)	(0.018)	(0.022)
Freely provided (ref: Homeowned)	0.003	0.016				
	(0.016)	(0.014)				
Dwelling space	0.003	0.004*	0.003	0.004*	–0.001	0.007**
	(0.002)	(0.002)	(0.002)	(0.002)	(0.003)	(0.003)
Concrete/brick wall vs none	–0.017	–0.017	–0.018	–0.017	–0.010	–0.031
	(0.014)	(0.012)	(0.014)	(0.012)	(0.017)	(0.019)
Iron roof vs none-iron-roof	0.001	0.008				
	(0.013)	(0.011)				
Smooth cement/concrete vs others	–0.003	–0.008	–0.003	–0.007	0.023	–0.024
	(0.013)	(0.011)	(0.013)	(0.011)	(0.016)	(0.017)

(*Continued*)

Table 3. (*Continued*)

	Overall sample				Female owners	Male owners
	$PROBIT^{all}$	REP^{all}	$POSTLASSO^{probit}$	$POSTLASSO^{rep}$	$POSTLASSO^{rep}$	
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
Energy						
Electricity connection(ref: None)	0.033**	0.004	0.034**	0.008	0.033*	0.001
	(0.016)	(0.014)	(0.014)	(0.012)	(0.018)	(0.019)
Electricity expenditure (in log Naira)	0.000	0.001				
	(0.002)	(0.001)				
Region/Community charact						
North-Central (ref: South-South)	–0.043**	–0.034*	–0.042**	–0.034*	0.036	–0.098***
	(0.021)	(0.020)	(0.021)	(0.019)	(0.023)	(0.029)
North-East (ref: South-South)	0.096***	0.128***	0.098***	0.126***	0.359***	–0.071**
	(0.024)	(0.022)	(0.023)	(0.021)	(0.033)	(0.029)
North-West(ref: South-South)	0.162***	0.192***	0.164***	0.189***	0.392***	–0.000
	(0.022)	(0.020)	(0.021)	(0.019)	(0.028)	(0.026)
South-East (ref: South-South)	–0.182***	–0.176***	–0.182***	–0.177***	–0.172***	–0.191***
	(0.020)	(0.018)	(0.020)	(0.018)	(0.023)	(0.029)
South-West (ref: South-South)	–0.049**	–0.045**	–0.051**	–0.048***	0.000	–0.096***
	(0.020)	(0.019)	(0.020)	(0.019)	(0.022)	(0.029)
Rural vs Urban	0.028**	0.024*	0.028**	0.023*	0.011	0.028
	(0.014)	(0.013)	(0.014)	(0.012)	(0.017)	(0.019)

(*Continued*)

Table 3. (*Continued*)

	Overall sample				Female owners	Male owners
	$PROBIT^{all}$	REP^{all}	$POSTLASSO^{probit}$	$POSTLASSO^{rep}$	$POSTLASSO^{rep}$	
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
Geographical variables						
Distance to market (in KM)	–0.000***	–0.000***	–0.000***	–0.000***	–0.001***	–0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Distance to administration center (KM)	0.000	0.000				
	(0.000)	(0.000)				
Distance to road (KM)	0.001	0.000	0.001	0.000	0.001*	0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.001)	(0.001)
Population density	0.000	0.000	0.000	0.000	0.000	0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Waves:						
2012/2013 (ref: 2010/2011	–0.083**	–0.071**	–0.084**	–0.069**	–0.100**	–0.079
	(0.038)	(0.034)	(0.038)	(0.034)	(0.047)	(0.049)
2015/2016 (ref: 2010/2011	–0.078*	–0.064*	–0.080*	–0.064*	–0.160***	–0.004
	(0.042)	(0.037)	(0.041)	(0.036)	(0.052)	(0.054)
2018/2019 (ref: 2010/2011	–0.065	–0.086**	–0.068	–0.084**	–0.114**	–0.050
	(0.043)	(0.038)	(0.042)	(0.037)	(0.053)	(0.055)
Observations	11,396	11,396	11,396	11,396	5,809	5,587

Note: Robust standard errors clustered at the enterprise and household levels are shown in parentheses. $PROBIT^{all}$ and REP^{all} are the probit and random effects probit model specification that utilized all explanatory variables. POSTLASSO is the re-estimation of the probit regressions of the homebased business choices that includes only the explanatory variables selected by the LASSO model according to the one standard error rule.

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Regarding institutional variables, the absence of household shocks affects HBS engagement similarly for both genders. Marriage positively influences HBS engagement overall but is insignificant for males, supporting hypothesis 1d. For females, marital circumstances, including the need to balance paid and unpaid work and enhance household income, are factors that drive HBS participation. Economic benefits from marriage also prompt female HBS engagement, as seen in Tanzania where sales among small business owners increase during marriage seasons due to gifts and incentives (Anderson & Ojediran, 2022). Divorced and separated individuals, particularly females, exhibit higher HBS engagement compared to never-married individuals, indicating persistent work balance needs post-separation (Nwaka et al 2016).

HBS owners with post-secondary education are generally more likely to engage in home-based self-employment, but this trend does not hold for females. Higher household income slightly reduces the likelihood of HBS for females, suggesting that HBS is neither particularly risky nor profitable and that it is not complementary to higher income, supporting the notion of subsistence self-employment (Nwaka & Uma, 2021). The presence of children under 19 increases HBS likelihood in both the full sample and among males, indicating a greater burden on females. These findings contrast with Reuschke (2016) for the UK, highlighting how gender norms and social barriers differently affect female HBS motivations.

The choice of HBS among female business owners is linked to flexibility and balancing economic and household responsibilities, reflecting the primary caregiving role of Nigerian females. Higher dependency ratios slightly increase female HBS participation, reinforcing gender norms. Ownership of a bank account reduces HBS likelihood for females, indicating some financial empowerment and linkage to formal sector employment, though the evidence is weak. Membership in business associations significantly decreases HBS likelihood across all specifications, suggesting a preference for formal sector employment among members.

Business characteristics further influence HBS participation. Compared to the wholesale and trade sector, HBS is more prevalent in the manufacturing sector and, to a lesser extent, the services sector, though the latter effect is absent in the male sub-sample. This finding is consistent with Reuschke (2016). Manufacturing sector businesses are highly capital intensive and outright ownership of a home can form a significant portion of that capital. Higher sales and capital stock reduce HBS likelihood, particularly for males, revealing the economic disadvantages of HBS. Gender norms constrain female business owners, who remain primary caregivers despite higher capital. Consequently, males view higher capital as an opportunity to maximise profits through non-HBS engagements, while females prioritise balancing paid and unpaid work.

Housing characteristics show that renting a home significantly decreases HBS likelihood across all samples, supporting hypotheses 2a and 2b. This effect is stronger for males, suggesting that homeownership compels both genders to participate in HBS. This finding is consistent with Reuschke (2016) and validates the assumption that home ownership reduces the start-up capital that would likely accumulate if the business was non-home-based. Larger dwelling spaces increase HBS participation only for males, implying that females are indifferent to dwelling size and prioritise work–life balance. Electricity connection increases HBS likelihood for females but not males, reflecting economic constraints and a persistent need to balance work-life despite challenges. Energy intensity is not significant across self-employment types, although small-scale business operations generally require some form of energy.

Regional characteristics reveal significant differences across Nigeria's geopolitical zones. Business owners in the North-East are more likely to engage in HBS than those in the South-South. Female business owners in the North-Central have a higher HBS likelihood compared to males, reflecting varying social and religious norms. In the North-

West, a predominantly Muslim region, similar patterns are observed, though males do not differ significantly from South-South counterparts. In the South-East, business owners are less likely to engage in HBS compared to the South-South, a significant effect for both genders. In the South-West, HBS likelihood is lower in the full sample but not for females, indicating no statistical difference between South-West and South-South female business owners. These variations are influenced by religious and cultural differences between Northern and Southern regions.

Geographical factors further affect HBS engagement. The greater the distance between the business owner's home and the market, the less likely they are to engage in HBS, a significant effect for females only. Over time, the likelihood of female HBS engagement has decreased across different survey waves from 2010/2011 to 2018/2019, suggesting changing dynamics in female self-employment.

Gender gaps in HBS

This section presents the B–O decomposition model results. A set of nonlinear decomposition models is initially estimated using all explanatory variables as well as POSTLASSO selected variables, as reported in Table 4. Further analyses are conducted by waves and homeownership status (Figure 8), educational level and industry types, (Figure 9), geopolitical zones (Figure 10) and owner's membership to an organisation.

The results from Table 4 and Figures 7 and 8 reveal a significant gender gap in HBS operation across all categories. In Table 4, the average probability of females operating an HBS is 27.9% higher than that of males. The gender gap is more pronounced among homeowners (Figure 8), and businesses in wholesale trade show lower gender gaps than those in manufacturing and services (Figure 9). Primary education or less exhibits the highest gender gaps (Figure 9), while Northern geopolitical zones have higher gender gaps than Southern zones (Figure 10). Also, relative to non-registered businesses, registered businesses revealed lower gender gaps with statistically insignificant endowment effects (Figure 11).

Furthermore, Table 4 confirms that if male business owners had characteristics similar to females, their HBS probability would increase by 4.8% (endowment effect). Conversely, if male business owners had female business owners' coefficients, their HBS probability would decrease by 25.4% (coefficient effect). In essence, if male business owners had female characteristics, it would slightly close the gap (4.8%), but if they had female returns, the gap would increase significantly (25.4%).

About 91% of the total gender gap in the non-HBS group is explained by coefficient effects, while the remaining gap is due to interaction effects (26.16%) and endowment effects (-17.20%). From Table 4, 3.5% (-0.013/0.048) and 43% (-0.111/-0.254) of the endowment and coefficient gaps, respectively, come from returns to formal institutions (marriage and children). Additionally, about 64% (-0.047/-0.073) of the interaction gap is due to informal institutions (such as business association membership or financial inclusion). Additionally, Table B (see the Online Supplementary Material) reveals a larger gender gap among married business owners (-0.304) compared to non-married owners (-0.207), with partner characteristics contributing marginally. This highlights the impact of institutions, cultural differences and socioeconomic factors on gender disparity in home-based self-employment.

Conclusion and implications

This study explores how homeownership and other factors influence the decision to operate HBS versus non-home-based businesses in Nigeria, and whether the owner's

Table 4. B-O decomposition between male and female business owners: female coefficients–Grouped variables

	Probit[all]				Postlasso			
		Detailed decomposition				Detailed decomposition		
	Overall	Endowments	Coefficients	Interaction	Overall	Endowments	Coefficients	Interaction
Overall								
Male business owner	0.284***				0.283***			
	(0.008)				(0.008)			
Female business owner	0.563***				0.562***			
	(0.008)				(0.009)			
Average Gender Gap	–0.279***				–0.279***			
	(0.011)				(0.012)			
Overall Effects		0.052***	–0.254***	–0.077***		0.048***	–0.254***	–0.073***
		(0.012)	(0.015)	(0.016)		(0.012)	(0.015)	(0.016)
% of Gap		**–18.64**	**91.04**	**27.60**		**–17.20**	**91.04**	**26.16**
Selected characteristics								
Institutions: Formal		–0.013**	–0.047	0.002		–0.013**	–0.111**	0.002
		(0.006)	(0.066)	(0.008)		(0.006)	(0.052)	(0.008)
Institutions: Informal		–0.001	0.006	–0.047***		–0.006	0.026	–0.047***
		(0.004)	(0.015)	(0.011)		(0.010)	(0.007)	(0.011)
Home		–0.003	–0.054	0.004*		0.000	–0.007	0.001
		(0.002)	(0.035)	(0.003)		(0.002)	(0.031)	(0.002)
Business		0.013	0.018	0.004		0.012	0.009	0.009*
		(0.010)	(0.100)	(0.005)		(0.004)	(0.100)	(0.005)

(*Continued*)

Table 4. (*Continued*)

	Probit[all]				Postlasso			
		Detailed decomposition				Detailed decomposition		
	Overall	Endowments	Coefficients	Interaction	Overall	Endowments	Coefficients	Interaction
Other characteristics		0.056***	–0.275	–0.041***		0.056***	–0.244	–0.040***
		(0.006)	(0.198)	(0.007)		(0.006)	(0.215)	(0.007)
Year		0.001	0.044	–0.002		0.001	0.045	–0.002
		(0.001)	(0.062)	(0.002)		(0.001)	(0.061)	(0.002)
Constant			0.055				0.030	
			(0.210)				(0.209)	
Observations	11,396	11,396	11,396	11,396	11,233	11,233	11,233	11,233

Note: Robust standard errors clustered at the enterprise and household levels are shown in parentheses. PROBIT[all] is a probit model specification that utilized all explanatory variables. POSTLASSO is the re-estimation of the probit regression of the homebased business choices that includes only the explanatory variables selected by the LASSO model according to the one standard error rule.
*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

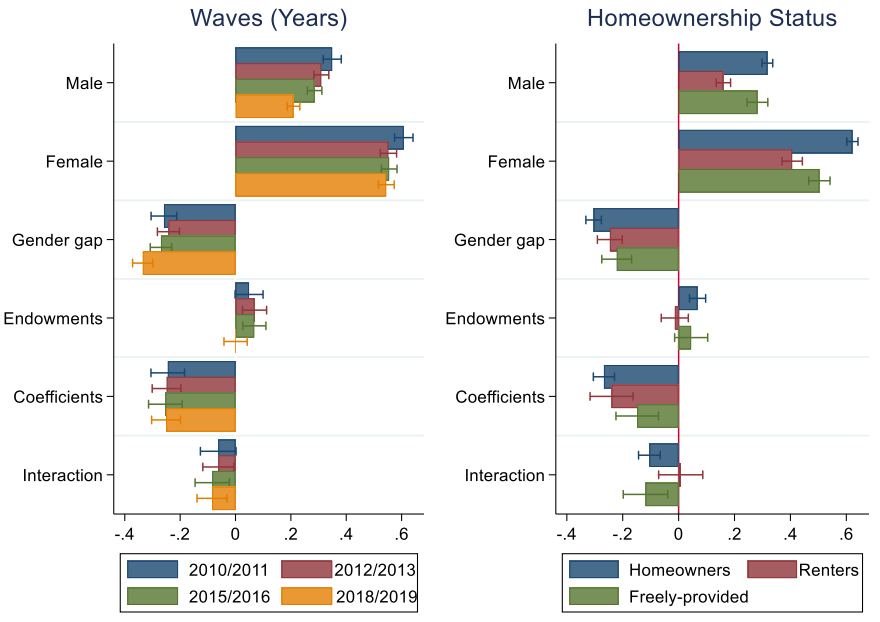

Figure 8. POSTLASSO B-O decomposition: gender gap by waves (years) and homeownership status.
Source: Authors' computation using Nigerian GHS-Panel data (2010–2019).

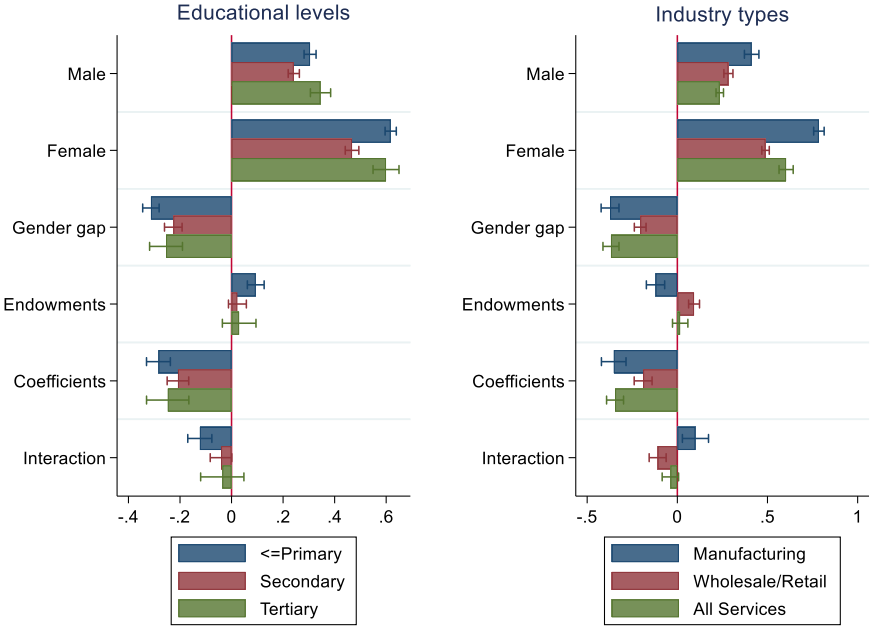

Figure 9. POSTLASSO B-O decomposition: gender gap by owner's educational level and industry types.
Source: Authors' computation using Nigerian GHS-Panel data (2010–2019).

gender plays a role. Existing labour literature highlights the diversity within HBS and underscores the role of housing as a financial enabler for business creation. We used the LASSO estimator to select explanatory variables and applied these in probit regression,

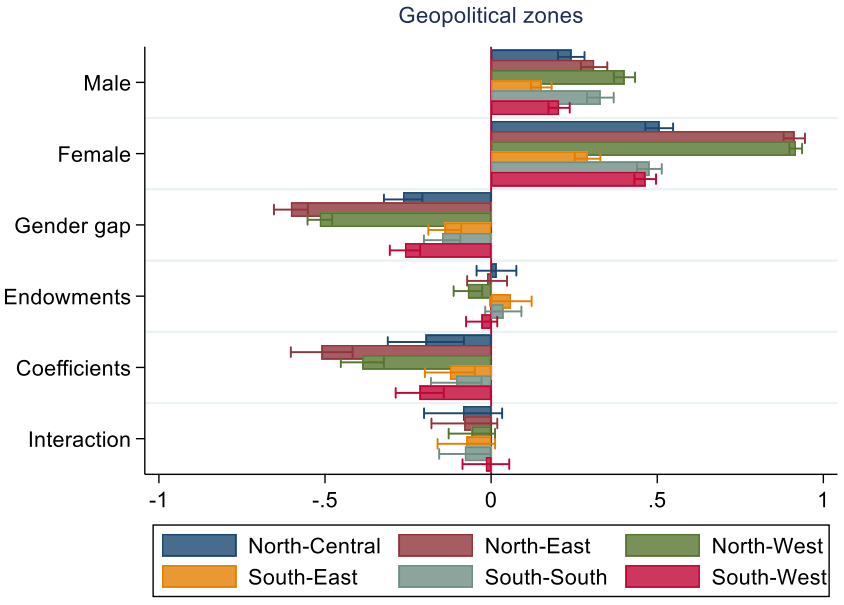

Figure 10. POSTLASSO B-O decomposition: Gender gap by geopolitical zones.
Source: Authors' computation using Nigerian GHS-Panel data (2010–2019).

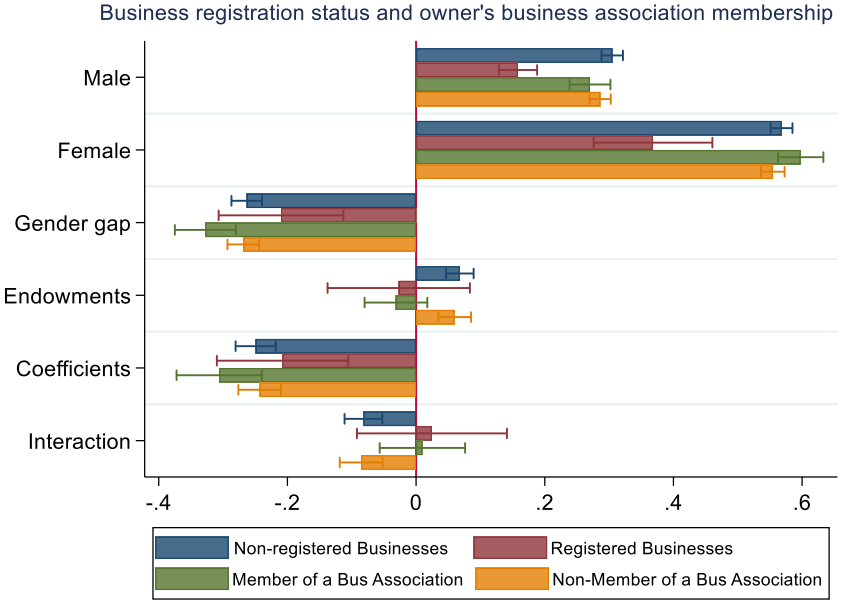

Figure 11. POSTLASSO B-O decomposition: Gender gap by business registration status (formality) and owner's membership to an association.
Source: Authors' computation using Nigerian GHS-Panel data (2010–2019).

random-effects probit, and the B–O decomposition technique on longitudinal household survey data from four waves.

Our findings indicate that individual characteristics (such as gender and age), formal institutional factors (including marriage and number of children), and business attributes are crucial in determining HBS choices in Nigeria. Significant gender differences are evident: female business owners are more likely to engage in HBS compared to their male counterparts. While men are driven by profit and convenience, women are motivated by the need to balance paid and unpaid work. Notably, having children increases the likelihood of HBS for women but has no such effect on men. Higher sales reduce the likelihood of HBS, suggesting that HBS participants often operate at lower economic levels. Marriage increases the likelihood of HBS only for women, indicating that marital circumstances or economic benefits influence this choice.

These results underscore the significance of gender-based institutional and societal constraints that shape self-employment outcomes and perpetuate the gender gap (Noguera et al 2015; Ajala, 2017; Horak & Suseno, 2023; Horak and Suseno, 2023; Anderson et al 2002). From a heterodox economic perspective, our findings reveal how these constraints, which extend beyond mere economic incentives, exacerbate the gender disparity in HBS. For example, we observed that women's membership in business associations or access to bank accounts reduces the likelihood of female engagement in HBS. Conversely, if male business owners had characteristics typically associated with females, their probability of engaging in HBS would decrease. This suggests that female HBS choices are often driven by the need to balance market and non-market work, influenced by societal constraints, as reflected in the coefficient effects observed in the Oaxaca decomposition model.

Cultural preferences for male heirs complicate women's access to homeownership and economic resources. Cultural practices in Nigeria favour male inheritance, which affects women's ability to own property and, consequently, their engagement in HBS. Nigeria's lower homeownership rates compared to countries like Indonesia, Kenya, and South Africa (Center for Affordable Housing in Africa 2018) reflect this issue. Affordable housing remains a significant constraint, particularly for women, impacting their welfare and business efficiency (Nwuba et al 2015). Public policy should focus on housing as a means to support household livelihoods, especially for women.

Electricity connection positively impacts female HBS participation but shows no effect for men, again reflecting economic disparities. Overall, motivations for HBS differ significantly by gender in Nigeria. Women face greater constraints in balancing work and life (Heck, 1991; Nwaka et al 2020; Nwaka et al 2020a; Nwaka and Emeagwali 2024). Female-headed households, often with fewer members (Mberu, 2007; Akerele and Adewuyi 2011), bear a greater burden, increasing their vulnerability to poverty.

Building on the recent findings of Nwaka and Emeagwali (2024), this study underscores that HBS is most prevalent among owners in the manufacturing sector, surpassing those in services or trade. Given the vulnerable nature of self-employment and gender disparities in HBS representation (Gindling and Newhouse 2014; Nwaka et al 2016; Guven-Lisaniler et al 2018; Lakemann 2023), enhancing best practices in home-based entrepreneurship, especially for women, is crucial for advancing the Sustainable Development Goals (SDGs). Nigeria can progress towards SDGs 5 (Gender Equality), 1 (No Poverty), and 8 (Decent Work) by not only supporting home-based businesses with grants and loans, particularly for women, but also implementing gender-inclusive policies. Subsidising internet access for vulnerable female entrepreneurs could also enhance their business exposure and sales.

While this study makes a valuable contribution, it has limitations. The survey did not include certain housing characteristics, such as house type (detached, terraced or apartment), which could have provided additional insights into homeownership. Nevertheless, the research remains robust despite this omission.

Supplementary material. To view supplementary material for this article, please visit https://doi.org/10.1017/elr.2024.45

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Note

1 Probit^{all} ignores the panel structure while the REP^{all} accounts for them and thus controls for unobserved heterogeneity.

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