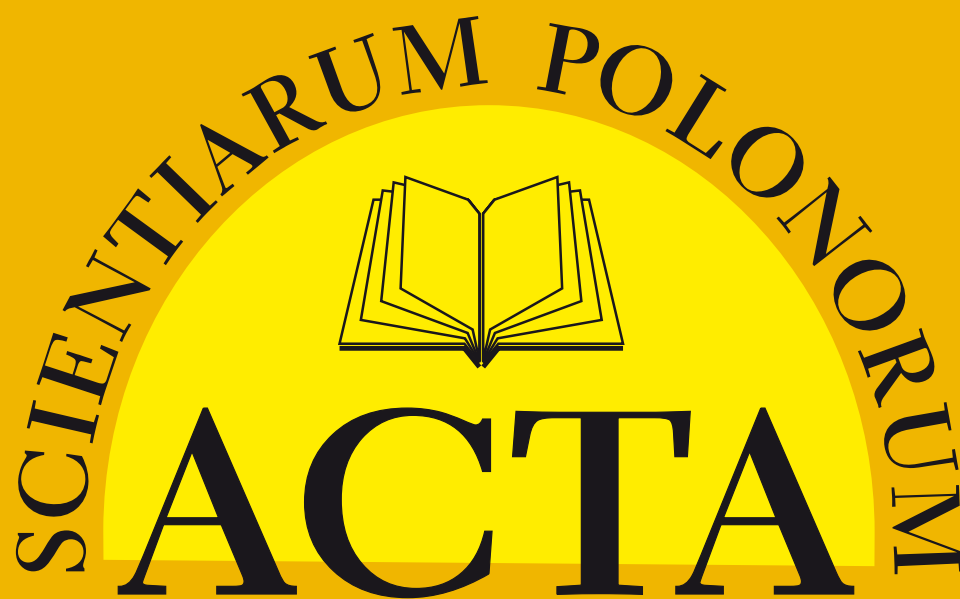


ISSN 1644-0757
eISSN 2450-047X



Oeconomia

24 (3) 2025

ISSN 1644-0757
eISSN 2450-047X

ACTA SCIENTIARUM POLONORUM

Czasopismo naukowe założone w 2001 roku przez polskie uczelnie rolnicze
Scientific journal established in 2001 by Polish life sciences universities

Oeconomia

Economics

Ekonomia

24 (3) 2025

July–September



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Printed version of *Acta Scientiarum Polonorum. Oeconomia* is an initial version of the journal.

ISSN 1644-0757
eISSN 2450-047X



Warsaw University of Life Sciences Press, Nowoursynowska 161, 02-787 Warsaw
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CORPORATE FINANCING AND THE STRUCTURE OF THE FINANCIAL SYSTEM IN ALBANIA: A MACROECONOMIC PERSPECTIVE AND IMPLICATIONS FOR ECONOMIC GROWTH

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University of Tirana, Albania

ABSTRACT

Aim: The aim of the paper is to assess the impact of corporate financing structure on economic growth in Albania, given the dominance of the banking sector and the lack of a developed capital market. The paper combines the theory of economic growth with the analysis of business financing in a transitional economy. **Methods:** The study was based on a literature review and desk research analysis of official data from the Bank of Albania for the years 2020–2024. It considered loan structure by public and private financial and non-financial sectors, as well as the currency structure of loans. **Results:** The results indicate that debt financing, especially in the banking sector, remains the main source of capital for companies, with a simultaneous lack of alternative capital market instruments. This phenomenon may limit economic growth potential, consistent with endogenous growth theories that emphasize the importance of access to diversified sources of capital. **Conclusions:** The study concludes that the Albanian financial system is dominated by banks, with limited financial instruments for businesses to diversify their capital structure. There is a need for policies that promote the development of a capital market to ensure sustainable financing options for businesses and reduce excessive reliance on debt. Developing the capital market in Albania is necessary to diversify financing and strengthen the economy's resilience to external shocks, which would support long-term GDP growth.

Key words: capital structure, banking sector, economic growth, financial system, Albania

JEL codes: E58, F65, G21

INTRODUCTION

The financing structure of enterprises is a key element influencing economic growth from a macroeconomic perspective. Solow's theory [1956] emphasizes the importance of capital accumulation as a growth engine, while endogenous growth models [Romer 1986, Lucas 1988, Merton 1990] highlight the role

of financial sector development in increasing productivity and long-term economic potential. Kumbhakar and Mavrotas [2005], Adekunle et al. [2013], and Paun et al. [2019] agree that an efficient financial system is essential for building sustained economic growth and a vibrant, open economic system.

In Albania, as a post-communist economy, the financial system remains heavily dominated by the banking

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sector, with a simultaneous lack of a developed capital market. The aim of this article is to assess the impact of this financial structure on the development opportunities of enterprises and the economy.

METHOD

The study was based on a literature review and desk research analysis of official data from the Bank of Albania for the years 2020–2024. It considered the loan structure by public and private financial and non-financial sectors, as well as the currency structure of loans (ALL vs. foreign currencies).

A limitation of the study is the lack of microeconomic data on companies that would allow for panel regression; however, the macroeconomic analysis provides a basis for economic policy recommendations.

CAPITAL STRUCTURE THEORIES AND THEIR MACROECONOMIC SIGNIFICANCE

In developed economies, investment concepts are referred to as financial assets, such as deposits, bonds, and stocks [Runde 1998]. However, economists can sometimes cite financial investment without reference to specific terms [Samuel 1998]. They understand investment as capital formation and the production of new capital assets, including intangible assets [Schaller 1993]. Consistently, these views have been debated, and the nature of their controversy remains unresolved [Miller 1998]. Neoclassical theory posits that investment and finance can be treated separately, related only to the cost of capital [Girardi 2025]. This view is ultimately based on the premise that competition and free enterprise will ensure that no profit opportunities remain neglected due to a lack of finances [Robinson 1962]. Even if a firm fails to take advantage of an investment opportunity, it will eventually enter the market and complete the process [Samuel 1998]. A company must design and achieve an optimal capital structure to provide sufficient financial flexibility [Vilasuso 1997]. On the other hand, managing capital structure is necessary to use funds wisely for capital providers [van Ees et al. 1997]. The essential task is to decide between debt and equity and to determine the level of financial leverage [Tobin 1958].

According to Myers and Majluf [1984], there are some steps to design and achieve an optimal capital structure:

- Performing financial forecasting to evaluate the deficit/surplus;
- Setting the target above the loan or other financial reports;
- Designing and testing different scenarios on capital structure;
- Defining and implementing concrete actions to ensure a perfect capital structure.

Modigliani and Miller [1958] explain the capital structure in terms of market imperfection, which can be extended by including the implications of the agency model. The imperfect market provides insight into how to finance a certain amount of existing assets compared with an indefinite inflow of investment [Runde 1998]. For Modigliani and Miller, capital structure reflects the relationship between tax policy (corporate and investor) and the risk of bankruptcy [Modigliani and Miller 1963]. Transaction costs of new investments (debt and equity) and asymmetry of credit (interest rates on the one hand, and limited liability on the other), along with the role of investors, also play a part [Myers 2001]. Modigliani and Miller assume that managers act in the interests of investors and that creditors do not suffer any loss [Modigliani and Miller 1961]. When the debt is without risk, bankruptcy consists only of those required for financial reorganization (JDO). If capital markets were perfect, assets could not lose value in a forced sale [Modigliani and Miller 1963]. In this regard, bankruptcy was caused by the erosion of net assets due to commercial losses, suggesting a tacit assumption that creditors rely on the firm's assets as collateral [Stiglitz and Weiss 1981]. If there is a sufficient margin of safety between the gross value of assets and the creditors of the firm, the latter would be excluded [Robinson 1962].

The classical theories of Modigliani and Miller [1958, 1963] suggest that, in the absence of taxes and transaction costs, capital structure does not affect firm value. However, in the real economy, the pecking order theory of Myers and Majluf [1984] indicates that firms prefer internal financing over debt and equity issuance. Macroeconomic approaches

to these theories suggest that the high dependence of the economy on debt financing may lead to systemic risks, limit long-term investments, and affect financial stability [Levine 2005].

THE ROLE OF THE FINANCIAL SYSTEM IN THE ECONOMY OF ALBANIA

Publications by Rajan and Zingales [1998] and Levine [2005] demonstrate that capital market development promotes economic growth by allocating capital to the most productive projects, reducing the cost of capital, and fostering innovation. In bank-centric economies, such as Albania, the absence of a capital market limits these mechanisms.

The Albanian financial system is struggling with underdevelopment and is dominated by banks, which hold 90% of financial sector assets and constitute the main source of financing for both the public and private sectors [Naqellari et al. 2014, Rama and Polo 2024]. The shares of non-bank financial institutions, investment funds, pension funds, and others are negligible [BSTDB 2021]. Full privatization of state-owned banking shares was completed in 2009, and by 2022, 12 banks were operating in the country. It is estimated that 75% of the domestic financial market is held by five banks. The relatively recent history of privatization in Albania, along with the disastrous collapse of pyramid schemes in 1997, further explains the relatively weak situation regarding private investment, trends, and instruments in the country. The nominal value of bank lending rose from 10% of GDP in 1998 to 33.4% in 2022, with the largest share of lending (72%) going to private non-financial corporations, particularly in wholesale and retail trade, followed by construction, manufacturing, and electricity and gas supply [Rama and Polo 2024].

The government of Albania is permanently positioned as a fundraiser, requesting free capital through the issuance of treasury bonds and treasury funds, thus bypassing other alternative providers of unrestricted funds (loans). Several commercial banks invest in bonds to diversify their portfolios and to be more profitable in this investment [AAB 2018]. In the mid-2020s, interest in treasury bonds has been declining, which has affected the reduction of interest on money deposits in commercial banks, because

the banks in Albania invest most deposits in bonds, and their interest becomes determinant in deposit interest.

In Albania, the highest annual interest rate on deposits [Bank of Albania n.d.a] is relatively higher than that of treasury bills, and the categories offered by banks for their banking activities are focused on lending. There is a dependence between the interest rates on deposits and loans, which puts the banks in a less competitive position in the market. Although banks are increasing their ability to attract more deposits than loans given to them, they pose a high liquidity risk. This leads to increased dependence on investment banks in treasury bonds. However, efforts have not yet been made by some banks to work more with consumer lending through credit.

Nevertheless, under increased pressure from competition in the banking system, banks did not change the standards or the terms and conditions of loans to enterprises for the first time since the beginning of the normalization of monetary policy by the central bank, both inside and outside the country. The main element through which banks have tightened the terms and conditions of lending throughout this year is the conditions in credit agreements. In addition to increasing conditions, banks approved smaller loans to enterprises. On the other hand, banks did not change the other non-price elements of credit to enterprises [Bank of Albania 2023]. According to the endogenous growth theory, limited access to diverse sources of financing can inhibit investment in research and development, innovation, and human capital [Romer 1990]. High reliance on banks increases the economy's vulnerability to liquidity crises and limits long-term investment due to the concentration of risk in the banking system. A company faces two main ways of financing: its own funds and debt [Schankerman 2002]. The first point of discussion is the cost of financing. Business personal funds are the safest type of financing resource [Minsky 1978]; ultimately, everything is the result of labor and a sales policy that follows production and sales. The concept of opportunistic cost comes into play [Nell 1998].

The difficulties of the Albanian SME sector, accounting for about 98% of total business in Albania and contributing to more than 70% of GDP and more

than 50% of employment, in obtaining loans were pointed out by Zeneli and Zaho [2014] and Sharku [2016]. They drew attention primarily to the need to review the lending procedures by the Bank of Albania to facilitate the process and reduce the financing costs for small businesses, as well as to formulate policies that will encourage small and medium-sized enterprises to provide financial resources within the financial system. Policies should focus on enhancing productivity by removing barriers to firm growth and promoting access to bank lending [IMF 2025].

A nonfunctional financial market is a problem for enterprises, but the world financial crisis would affect even the small Albanian economy [Gjoni and Kora 2015]. Albanian business has been moving in a constant trend over the years [Gjoni et al. 2022]. Of course, specific fields have evolved rapidly, such as construction. However, Albania cannot be considered a country that has the luxury of financing itself with funds accumulated over the years and locked in a safe box [Gjoni et al. 2024a]. The inflation post-COVID-19 has created a considerable lack of current liquidity and significant investment needs. Thus, salvation is found in credit [Gjoni et al. 2024b].

The evolution of the credit situation in the economy began in the early years of the free market. First, the primary Albanian business forms were small and family-owned businesses, and their funding needs exceeded annual business income [Gjoni and Muça 2023]. As the economy strengthened and these family businesses grew, it became necessary to introduce another financing scheme beyond the business owners' money. This period coincided with the establishment of a two-tier financial system and banking, where the term "debt" had not yet been defined as a risk [Behr and Sonnekalb 2012] but rather as an operational need. Thus, as remittances began to increase and banks' liquidity in the country improved, Albanian businesses started to set aside the option of using money earned over the years for financing, which led to increased reliance on debt.

There are some advantages and disadvantages of this first form of financing the economy to be highlighted:

- Reinvested funds remain within the company. The current world financial crisis is not the pri-

mary concern; rather, it is financing short-term liabilities of all shapes and kinds. In these conditions, it remains pertinent to note that funds would be better off staying within the company, and their administration should become a priority for the company;

- Profit growth. Each type of investment focuses on increasing wealth. The time when we thought that the cost of this form of financing was lower than the profit made it an easy target to achieve;
- However, it is worth mentioning the risk that the company takes if it reinvests all its accumulated funds.

TRENDS IN LENDING ACTIVITY IN ALBANIA

The official data from the Bank of Albania [2023] shows a slowdown in lending to the private sector due to a decrease in credit for liquidity from enterprises. The continued growth of domestic demand and the strong growth of foreign demand, mainly for tourism, have improved the liquidity of enterprises, which have preferred to repay part of this loan during the third quarter of the year [Bank of Albania 2023]. Influenced by the lower interest rates on loans, the currency most used for financing has been the Albanian lek (ALL). This is an important step toward a more balanced currency structure of loans. On the other hand, in the credit structure based on the size of the enterprises, we find that credit has contracted for large enterprises, slowed for medium-sized enterprises, and improved for small businesses. According to the sectors of the economy, there is a contraction of credit in the industrial sector, an increase in the services sector, and a slowdown in other sectors. It is noted that bank financing is oriented toward the sectors that have contributed most to economic growth: trade, construction, and tourism [Bank of Albania 2023]. Nevertheless, for 2024, there was an improvement of over 50% in loans to the private sector. The main contribution to this growth continued to be loans in the domestic currency (ALL). The weight of new loans in ALL to the total reached 61% in April 2024, up from 50% in 2023. The primary influence on the rapid growth of lending was the increased activity of businesses, which grew by 78% compared

to the previous year. Additionally, the banking sector was showing a growing interest in lending to businesses and prominent corporate projects, including major public-private partnership infrastructure investment projects. The rapid growth of credit was based on optimistic perceptions of the economy's performance. By maintaining a low interest rate, the Bank of Albania also impacted lending trends [Albanian Daily News 2024, Bank of Albania n.d.b, Bank of Albania 2024].

Banks remain the country's main creditor, accounting for over 63% of Albania's total public debt burden in 2022 [Rama and Polo 2024]. Data from the Bank of Albania indicates that between 2020 and 2024, loans to the private sector increased from 608.780 million ALL to 835.817 million ALL (Table 1).

The largest increases were recorded in the construction, trade, and tourism sectors, which correlate

with their share of GDP. Small businesses increased their share of loans, while large companies saw their debt levels stagnate [Bank of Albania 2024].

CONCLUSIONS AND RECOMMENDATIONS

Paun et al. [2019] claim that the accumulation of capital is probably the most important driver of sustainable economic growth. Their research supports several policy recommendations: improving the soundness of banking activities (through capitalization, limiting unnatural credit expansion and growth), limiting the financing of the public sector by private financial markets, reconsidering the role of capital markets in the long-term financing of the private sector, and further reducing barriers to saving and investment worldwide.

Table 1. Trend of credit to the economy in Albania 2020–2024^a

Index description	2020	2021	2022	2023	2024
Total credit	608 779.8	666 178.4	713 552.1	744 162.7	835 816.7
Credits to local government and public administration	429.1	313.2	204.8	103.0	23.9
In national currency	429.1	313.2	204.8	103.0	23.9
In foreign currency	0.0	0.0	0.0	0.0	0.0
Credits to public nonfinancial corporations	15 150.8	22 521.8	23 714.0	16 754.0	18 958.8
In national currency	11 819.6	9 210.6	10 508.7	9 247.1	7 354.1
In foreign currency	3 331.2	13 311.3	13 205.4	7 506.9	11 604.7
Credits to other nonfinancial corporations	370 356.3	395 162.7	411 853.0	421 985.1	469 926.0
In national currency	161 975.3	172 000.2	173 607.4	196 936.3	216 945.6
In foreign currency	208 381.0	223 162.5	238 245.6	225 048.8	252 980.4
Credits to other financial corporations	13 169.1	13 815.7	15 557.4	19 468.4	22 212.3
In national currency	7 489.2	7 772.8	8 668.9	12 411.3	14 719.3
In foreign currency	5 679.9	6 043.0	6 888.4	7 057.0	7 493.0
Credits to other resident sectors	209 674.5	234 365.0	262 222.9	285 852.2	324 695.7
In national currency	138 986.4	158 093.0	175 900.8	204 247.5	245 076.4
In foreign currency	70 688.1	76 272.0	86 322.1	81 604.7	79 619.3

^a Credit to the economy includes claims of depository corporations (second-tier banks, savings and loan associations (SLAs), and the central bank on other financial corporations), claims on local government and public administration, claims on public nonfinancial corporations, claims on other nonfinancial corporations, and other resident sectors. The data is presented in millions of ALL – debts as of 31/12 of each year.

Source: Bank of Albania [2024].

Comparing Albania's situation with other countries in the region, such as Croatia [Pajic 2025] or even Slovenia [Ministry of Finance of Republic of Slovenia 2020], reveals the underdevelopment of the capital market, which in these economies has become a significant source of financing for investment and corporate restructuring. In Albania, the lack of equity and corporate bond issuance limits the opportunities for companies to grow and diversify their capital structure.

According to Levine [2005], capital market development increases the productivity of the entire economy through efficient capital allocation and reduced financing costs. Research by Ndoka and Islami [2016] shows that commercial banks in Albania should focus more on credit risk management, especially regarding the control and monitoring of non-performing loans. Continuous monitoring of the evolution of the economy is important for the periodic assessment of overall asset quality and credit risk avoidance. A reform in the banking system is needed to manage the structures responsible for the approval of loans [Kaza and Sadko 2015], especially since the level of non-performing loans in Albanian banks is problematic [Kola et al. 2019].

The study concludes that the Albanian financial system is dominated by banks, with limited financial instruments for businesses to diversify their capital structure. There is a need for policies that promote the development of a capital market to ensure sustainable financing options for businesses and reduce excessive reliance on debt. According to the IMF [2025], promoting access to bank lending through better credit reporting systems, improved secured transactions, and insolvency regimes, as well as developing Albania's early-stage corporate bond markets, would enable businesses to raise more long-term funds for expansion.

In conclusion, it is worth mentioning that Albania is not a post-communist country with family businesses where the business method of funding is suspicious. Albanian businesses currently have a formal declaration of their income, which allows them to be part of creating a consolidated financial system. Nevertheless, despite these years' efforts, the evolution of the financial system has strengthened the bank-

ing system as the sole provider of funds for financing. Albania's bank-based financial structure limits the investment potential of businesses. Furthermore, the lack of a capital market hampers economic growth by limiting access to long-term capital.

Therefore, certain recommendations for macroeconomic policy were formulated:

- Development of the capital market (stock exchange, corporate bonds) as a complement to the banking sector;
- Introduction of tax incentives for institutional investors to invest in debt and equity instruments;
- Support for SMEs in preparing to issue financial instruments and raise external capital;
- Macroeconomic policies that strengthen the stability of the banking sector and the development of alternative forms of financing.

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FINANSOWANIE PRZEDSIĘBIORSTW I STRUKTURA SYSTEMU FINANSOWEGO W ALBANI: PERSPEKTYWA MAKROEKONOMICZNA I WPŁYW NA WZROST GOSPODARCZY

STRESZCZENIE

Cel: Celem artykułu jest ocena wpływu struktury finansowania przedsiębiorstw na wzrost gospodarczy w Albanii w kontekście dominacji sektora bankowego oraz braku rozwiniętego rynku kapitałowego. Artykuł łączy teorię wzrostu gospodarczego z analizą finansowania biznesu w gospodarce przejściowej. **Metody:** Badanie oparto na przeglądzie literatury oraz analizie *desk research* oficjalnych danych Banku Albanii za lata 2020–2024. W analizie uwzględniono strukturę kredytów według sektorów finansowych i niefinansowych publicznych oraz prywatnych, a także strukturę walutową kredytów. **Wyniki:** Wyniki wskazują, że finansowanie dłużne, zwłaszcza w sektorze bankowym, pozostaje głównym źródłem kapitału dla firm przy jednoczesnym braku alternatywnych instrumentów rynku kapitałowego. Zjawisko to może ograniczać potencjał wzrostu gospodarczego zgodnie z teoriami wzrostu endogenicznego, które podkreślają znaczenie dostępu do zróżnicowanych źródeł kapitału. **Wnioski:** Badanie wskazuje, że system finansowy Albanii jest zdominowany przez banki, a przedsiębiorstwa mają ograniczony dostęp do instrumentów pozwalających na

dywersyfikację struktury kapitałowej. Istnieje konieczność utworzenia strategii wspierających rozwój rynku kapitałowego w celu zapewnienia firmom opcji zrównoważonych finansowania i zmniejszenia nadmiernego polegania na długu. Rozwój rynku kapitałowego w Albanii jest niezbędny do dywersyfikacji finansowania i wzmocnienia odporności gospodarki na wstrząsy zewnętrzne, co wspierałoby wzrost długoterminowy PKB.

Słowa kluczowe: struktura kapitałowa, sektor bankowy, wzrost gospodarczy, system finansowy, Albania

ENVIRONMENTAL DISCLOSURE PRACTICES AND FINANCIAL PERFORMANCE OF SELECTED MANUFACTURING COMPANIES IN NIGERIA

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ABSTRACT

Aim: This study examined the relationship between environmental disclosure practices and the financial performance of manufacturing companies listed on the Nigerian Exchange Group. The objective was to determine whether specific environmental initiatives, such as waste management, resource conservation, energy conservation, emission reduction, and pollution control, significantly impacted financial outcomes. The study aimed to contribute to the ongoing discourse on corporate environmental responsibility and its economic implications. **Methods:** The study adopted a quantitative research approach, utilizing secondary panel data from 15 listed manufacturing companies over a defined period. Environmental disclosure practices were measured across five components: waste management practices, resource conservation, energy conservation, emission reduction, and pollution control. The Levin–Lin–Chu unit root test was used to confirm the stationarity of the data series. A Pearson correlation matrix was applied to explore interrelationships among the variables. The study employed panel data regression analysis with a random effects model (confirmed by the Breusch–Pagan Lagrange multiplier test), grounded in signaling theory as the theoretical framework to estimate the effects of environmental practices on financial performance. **Results:** The results indicated that energy conservation, emission reduction, and pollution control practices significantly enhanced financial performance. Resource conservation showed a positive but less substantial impact. Conversely, waste management practices were negatively associated with financial outcomes, suggesting potential inefficiencies or cost implications. **Conclusions:** The study concluded that manufacturing firms should prioritize energy conservation, emission reduction, and pollution control within their environmental strategies to improve long-term financial performance and investor perception. A strategic review of waste management practices was also recommended.

Key words: environmental disclosure, financial performance, manufacturing firms, sustainability practices

JEL codes: M14, Q56, L25, C33

INTRODUCTION

In recent years, environmental disclosure has become increasingly critical for companies globally, with a marked focus on the manufacturing sector due to its significant environmental impact. Environmental disclosure refers to the communication of information regarding a company's environmental practices, policies, and impacts, often including data on emissions, waste management, and resource efficiency [Adegbe and Adesanmi 2020]. In manufacturing, where operations frequently involve substantial energy and material consumption, environmental disclosure has gained attention as both a regulatory and ethical requirement. Companies are now pressured to demonstrate not only compliance with environmental standards, but also their commitment to sustainable practices to attract environmentally conscious stakeholders. The rising importance of environmental disclosure is linked to corporate accountability and the perception that transparent environmental reporting enhances a company's reputation, facilitates investment decisions, and could improve its financial performance [Kaur and Lodhia 2019, Agugum and Ajayi 2020].

In Nigeria, environmental disclosure is particularly relevant for listed manufacturing companies, as they are required to comply with regulatory standards that address environmental issues and meet the growing expectations of stakeholders. Investors, regulators, and consumers are increasingly demanding transparent reporting on how companies mitigate their environmental impact. For instance, manufacturing companies are often expected to disclose details about waste management practices and resource conservation efforts, as these are crucial for reducing the ecological footprint of industrial operations. Waste management practices – which involve the reduction, recycling, and responsible disposal of industrial waste – and resource conservation strategies aimed at minimizing the use of water, energy, and other resources are key components of environmental disclosure that reflect a company's commitment to sustainability [Mokhtar et al. 2016, Odoemelam and Okafor 2018]. By adhering to these practices, Nigerian manufacturing firms

can potentially improve stakeholder trust, which may, in turn, impact their financial performance.

Research on the link between environmental disclosure and financial performance has shown varied results, creating a complex landscape for understanding the actual impact of these disclosures. Some studies suggest a positive association, indicating that enhanced environmental disclosure can lead to increased investor confidence and, consequently, improved financial performance [Obida et al. 2019, Adegbe et al. 2020]. However, other studies argue that the costs associated with environmental management and extensive disclosure may offset financial gains, particularly in developing countries like Nigeria, where companies encounter additional economic and regulatory challenges [Jeroh and Okoro 2016]. The mixed findings in this area of research highlight the need for a more in-depth examination of environmental disclosure within the Nigerian manufacturing sector, focusing on specific practices like waste management and resource efficiency, which are often reported inconsistently. Understanding the financial implications of these practices can help provide clearer insights into whether environmental transparency genuinely benefits corporate financial performance or serves primarily as a regulatory compliance measure without significant financial rewards.

The statement of the problem lies in understanding the effectiveness of environmental disclosure in enhancing financial performance within Nigerian manufacturing companies, especially given the inconsistent findings in existing studies. While some research links environmental practices, such as waste management and resource conservation, to improved investor confidence and profitability, other studies indicate that the high costs associated with these disclosures may deter companies from fully committing to environmental transparency [Mokhtar et al. 2016, Adegbe et al. 2020]. Specifically, waste management involves substantial logistical and operational costs, and its inconsistent disclosure among Nigerian companies suggests financial pressures that may lead firms to under-report or selectively disclose environmental information [Odoemelam and Okafor 2018, Agugum and Ajayi 2020]. Similarly, resource conservation initiatives, which can enhance operational efficiency

and sustainability, often require upfront investments that smaller companies may find prohibitive. The existing gap in the literature is the need for a focused investigation of specific environmental disclosure practices within the Nigerian context. This study aims to clarify the impact of these practices on financial performance, as prior research has generally treated environmental disclosure as a broad category, failing to isolate the influence of waste management and resource conservation practices. This research, therefore, aims to explore these dimensions of environmental disclosure in detail, contributing to a clearer understanding of how targeted environmental practices influence the financial outcomes and market perception of Nigerian manufacturing firms. Based on the study's objectives and identified gaps in the literature, the following research questions can guide the investigation:

1. What is the impact of environmental disclosure, specifically in waste management practices, on the financial performance of listed manufacturing companies in Nigeria?
2. How does resource conservation and efficiency disclosure affect the profitability and market perception of Nigerian manufacturing companies?

CONCEPTUAL EXPLORATION AND HYPOTHESES DEVELOPMENT

Impact of waste management disclosure on financial performance

Waste management disclosure, which includes information on a firm's strategies for waste reduction, recycling, and responsible disposal, is an essential aspect of environmental transparency in manufacturing. For companies, particularly those in high-impact industries like manufacturing, waste management practices not only demonstrate compliance with environmental regulations but also indicate a commitment to sustainable practices. The effectiveness of waste management in enhancing corporate reputation and financial performance can be substantial. Research shows that companies with transparent and proactive waste management practices are often viewed more favorably by environmentally conscious investors and customers, potentially leading to increased shareholder value and market competitiveness [Kaur

and Lodhia 2019, Agugum and Ajayi 2020]. By showcasing efforts to reduce waste and recycle materials, firms can attract stakeholders who prioritize sustainability, potentially improving brand reputation and loyalty with long-term financial benefits. However, while waste management disclosure can enhance corporate reputation and attract environmentally focused investors, the financial impact of these disclosures remains uncertain. Implementing robust waste management systems involves substantial financial outlay for infrastructure, waste processing, and employee training – costs that can be particularly burdensome for manufacturing companies in developing economies such as Nigeria [Odoemelam and Okafor 2018, Adegbie et al. 2020]. These costs may discourage some companies from investing heavily in comprehensive waste management practices, leading to under-reporting or selective disclosure, which can reduce the effectiveness of transparency efforts. For example, a firm may report only its recycling efforts while omitting data on hazardous waste if managing it is costly or complex, thus presenting an incomplete picture to stakeholders [Jeroh and Okoro 2016, Mokhtar et al. 2016].

This situation underscores the need to question the assumption that waste management disclosure will automatically lead to improved financial performance, especially in contexts with limited resources. Firms may face a trade-off between the financial costs of comprehensive waste management and the uncertain financial returns from disclosing these practices. Thus, while waste management disclosure may foster investor trust and align with sustainability objectives, the immediate financial benefits in a developing economy like Nigeria's may be limited, justifying the null hypothesis that waste management disclosure does not significantly impact financial performance. This hypothesis aims to test whether the anticipated financial and reputational advantages of waste management disclosures are substantial enough to offset the implementation costs.

The first hypothesis development

H₀: Waste management disclosure does not significantly impact the financial performance of listed manufacturing companies in Nigeria.

Given the potential costs associated with waste management in manufacturing, this study posits a null hypothesis that waste management disclosure does not significantly impact the financial performance of listed manufacturing companies in Nigeria. This hypothesis is supported by existing studies suggesting that the high costs associated with implementing and maintaining effective waste management may outweigh the financial benefits in developing economies [Jeroh and Okoro 2016, Adegbe et al. 2020]. For many firms, particularly those with limited financial resources, the expense of comprehensive waste management systems may not lead to immediate financial gains, thus justifying the null hypothesis.

Effect of resource conservation and efficiency disclosure on profitability and market perception

Resource conservation and efficiency disclosure focus on a company's efforts to optimize its use of essential resources like water, energy, and raw materials. In the manufacturing sector, these practices are critical, as they can help lower operational costs, reduce environmental impact, and enhance sustainability. By adopting resource conservation measures, such as energy-efficient machinery, water recycling systems, and sustainable sourcing of raw materials, companies can improve their environmental footprint and potentially reduce operating costs, leading to increased profitability [Mokhtar et al. 2016, Adegbe and Adesanmi 2020]. Furthermore, disclosing resource conservation efforts can enhance market perception by appealing to stakeholders who value environmental responsibility. Investors and customers are increasingly aware of corporate environmental impacts, and transparent reporting on resource efficiency can differentiate a firm from its competitors, strengthening its market position [Odoemelam and Okafor 2018, Agugum and Ajayi 2020]. Nonetheless, while resource efficiency offers long-term operational and reputational advantages, the financial implications of these practices in the short term are complex. Achieving meaningful resource efficiency often requires significant upfront investments in technology, equipment, and process changes. For instance, transitioning to energy-efficient machinery or implementing water recycling systems involves

considerable initial costs, which may be prohibitive for smaller manufacturing firms in Nigeria [Adegbe et al. 2020]. Additionally, the benefits of resource efficiency, such as reduced utility costs and improved operational sustainability, may not be immediately reflected in financial performance, particularly if cost savings take time to materialize or if the investments are not fully leveraged due to financial constraints [Jeroh and Okoro 2016].

The second hypothesis development

H₀: Resource conservation and efficiency disclosure do not have a significant effect on the profitability and market perception of Nigerian manufacturing companies.

Given these financial and operational challenges, the financial benefits of disclosing resource conservation practices may not be as clear-cut in the Nigerian context. Firms may be reluctant to adopt comprehensive conservation measures due to the initial financial burden, or they may only partially disclose such efforts to maintain a competitive image without incurring significant costs. Therefore, this study posits the null hypothesis that resource conservation and efficiency disclosure do not have a significant effect on the profitability and market perception of Nigerian manufacturing companies. This hypothesis will help evaluate whether the financial and reputational benefits of resource conservation disclosures are sufficient to justify the associated costs, particularly for firms operating in a developing economy with limited financial resources. Return on assets (ROA) is identified as the key financial metric for measuring corporate financial performance in both hypotheses. It is a widely accepted profitability indicator that reflects how efficiently a company utilizes its assets to generate earnings and is calculated using the formula: $ROA = (\text{net income} / \text{total assets}) \times 100$. ROA is an appropriate measure for this study as it captures overall asset efficiency and profitability, facilitates cross-company comparisons within the manufacturing sector, and provides a comprehensive assessment of the financial impact of environmental disclosure. By focusing on ROA, the study aims to critically evaluate whether disclosures related to waste management and resource conservation yield tangible financial benefits or merely serve as symbolic gestures without delivering substantial economic returns in the Nigerian manufacturing sector.

THEORETICAL FRAMEWORK

This study adopts signaling theory as its theoretical framework to examine the impact of waste management disclosure, resource conservation, and efficiency disclosure on the financial performance of listed manufacturing companies in Nigeria. Signaling theory, developed by Spence [1973], posits that companies convey information to external stakeholders to reduce information asymmetry and improve market perceptions. In the context of environmental disclosure, firms signal their commitment to sustainability, regulatory compliance, and corporate responsibility to investors and other stakeholders. Waste management disclosure signals a company's commitment to environmental sustainability, regulatory compliance, and operational efficiency, which can enhance stakeholder trust, attract environmentally conscious investors, and potentially improve financial performance through better market perception. However, the high costs of implementing comprehensive waste management practices may offset these benefits, especially in developing economies like Nigeria. Similarly, resource conservation and efficiency disclosure indicate the firm's ability to optimize resource use and minimize environmental impact, potentially leading to cost savings, improved operational efficiency, and reduced regulatory risks, all of which can enhance firm value. Nevertheless, these benefits may be limited by the substantial upfront investments required for resource conservation initiatives. Applying signaling theory allows this study to assess whether these disclosures deliver tangible financial benefits, measured by ROA, or whether they primarily serve as symbolic gestures without significant economic returns. This theoretical lens provides a framework for understanding how environmental disclosures impact financial outcomes and whether such signals are credible and financially beneficial within the Nigerian manufacturing sector.

Adegbe and Adesanmi [2020] examined the effect of liquidity management on corporate sustainability among listed oil and gas companies in Nigeria. Their study found that companies with stronger liquidity positions were more likely to invest in sustainable practices, including environmental disclosure. This suggests that financial health enables companies

to engage in more thorough environmental reporting, aligning with stakeholders' sustainability expectations. The study's findings underscore the importance of financial resources in facilitating effective environmental disclosure, a crucial insight for resource-constrained firms in the manufacturing sector.

Kaur and Lodhia [2019] explored challenges in stakeholder engagement for sustainability reporting within Australian local councils. They found that effective stakeholder engagement significantly influences the quality and extent of environmental disclosures. Councils that actively engaged stakeholders, including environmental groups and community members, tended to have more detailed environmental disclosures. This underscores the role of stakeholder pressure in enhancing transparency and suggests that similar pressures in Nigeria could motivate manufacturing firms to improve environmental reporting despite resource limitations.

Adegbe et al. [2020] investigated environmental accounting practices and their impact on share value among Nigerian food and beverage companies. Their study found that firms with more extensive environmental disclosures experienced higher share values, indicating that environmental transparency can enhance investor confidence. This study suggests that environmental disclosure has financial benefits, particularly in boosting share prices, which can incentivize firms in other sectors, such as manufacturing, to enhance their environmental reporting as well.

Jeroh and Okoro [2016] focused on environmental costs and firm performance in the Nigerian oil and gas sector. Their research found that environmental costs, including waste management and resource conservation, had a mixed impact on firm performance, often depending on the level of disclosure and regulatory pressures. For companies facing high environmental costs, financial performance was negatively impacted, highlighting a potential barrier to comprehensive environmental disclosure. This finding is relevant for manufacturing firms, where similar financial pressures may restrict full environmental transparency.

Odoemelam and Okafor [2018] examined the impact of corporate governance on environmental disclosure in Nigeria's non-financial sector. Their study concluded that firms with strong

corporate governance structures were more likely to engage in environmental disclosure, influenced by board oversight and stakeholder accountability. This study suggests that strengthening corporate governance within Nigerian manufacturing firms could improve environmental reporting practices, as board involvement can ensure that stakeholder interests in sustainability are effectively addressed.

Obida et al. [2019] analyzed the relationship between environmental disclosure practices and stock market return volatility in Nigeria's non-financial sector. They found that higher-quality environmental disclosures were associated with lower stock volatility, indicating that transparency can stabilize investor perceptions and reduce market risks. This finding suggests that manufacturing companies in Nigeria could mitigate market uncertainties through improved environmental disclosure, making them more appealing to risk-averse investors.

Mokhtar et al. [2016] studied environmental management accounting in Malaysian public companies, focusing on resource efficiency and waste management. They found that companies implementing environmental management practices experienced operational improvements and, in some cases, financial gains from cost savings resulting from resource efficiency.

A significant gap identified in the existing literature is the inconsistency in defining and measuring financial performance across studies on the impact of environmental disclosure. While some studies, such as Adegbe et al. [2020], measure financial performance through share value, others, like Jeroh and Okoro [2016], focus on cost analysis, making cross-study comparisons challenging and limiting the generalizability of findings. Additionally, while research highlights the potential benefits of environmental disclosure, such as increased investor confidence [Adegbe et al. 2020] and reduced market risk [Obida et al. 2019], there is limited evidence on whether these benefits outweigh the substantial costs, particularly in developing economies like Nigeria. Furthermore, most existing studies focus on specific sectors, such as oil and gas or food and beverages, leaving the manufacturing sector underexplored. This study addresses these gaps by adopting ROA as a standardized measure of finan-

cial performance, providing a consistent framework to evaluate the financial impact of waste management and resource conservation disclosures. By focusing on listed manufacturing companies in Nigeria, the study offers a more comprehensive understanding of how environmental practices affect financial outcomes in resource-constrained environments.

DATA AND METHODS

This study adopts a secondary data approach, analyzing the financial statements of manufacturing companies listed on the Nigerian Exchange Group (NGX) between 2008 and 2023. A purposive sampling technique is used to select 15 companies from a population of 66 listed manufacturing firms, yielding 240 observations over a 16-year period. The study employs an ex-post facto research method, relying on existing financial and environmental disclosure data. Given that the data is sourced from publicly audited financial statements, the study assumes the validity and reliability of these figures. For data analysis, the study utilizes inferential statistics, specifically the ordinary least squares (OLS) regression method. This approach is implemented within a panel data framework, considering both time-based and firm-specific variations to evaluate the relationship between environmental disclosure practices and financial performance.

Dependent variable. The primary dependent variable in this study is the financial performance of the selected manufacturing companies. Financial performance is measured using key financial indicators, including return on assets.

Independent variables. The independent variables in this study focus on environmental disclosure practices, including:

- waste management practices (disclosures related to waste management and waste reduction efforts);
- resource conservation (disclosures regarding energy, water, and raw material efficiency);
- energy conservation (efforts to reduce energy consumption and improve energy efficiency);
- emission reduction (measures and targets aimed at reducing greenhouse gas emissions);
- pollution control (efforts to manage and reduce pollution in air, water, and land).

Additionally, the study considers the firms' adherence to internationally recognized standards, such as the Global Reporting Initiative standards [GRI 2020], ISO 14001 [ISO 2004], and the Nigerian Code of Corporate Governance (Securities and Exchange Commission) [FRCN 2018].

Model specification. The relationship between environmental disclosure practices and financial performance is modeled as follows:

$$FP_{it} = \beta_0 + \beta_1 WMP_{it} + \beta_2 RC_{it} + \beta_3 EC_{it} + \beta_4 ER_{it} + \beta_5 PC_{it} + \mu_{it}$$

where:

FP – financial performance (measured by *ROA*),

WMP – waste management practices,

RC – resource conservation,

EC – energy conservation,

ER – emission reduction,

PC – pollution control,

μ_{it} – error term,

$\beta_0, \beta_1, \beta_2, \beta_3, \beta_4, \beta_5$ – the regression coefficients.

This study aims to examine how environmental disclosure practices, including waste management, resource conservation, and emission reduction, influ-

ence the financial performance of Nigerian manufacturing companies. The research employs a robust statistical model to analyze secondary data from firms' publicly audited financial statements over a 16-year period. By focusing on financial performance indicators such as return on assets, return on equity, and profitability, the study seeks to determine the financial implications of environmental sustainability efforts in the manufacturing sector.

Operationalization of variables. ROA is the study's dependent variable, representing financial performance, calculated as (net income / total assets) \times 100. ROA is used because it reflects asset efficiency, enables cross-company comparisons, and captures the financial effects of environmental disclosures. Waste management disclosure and resource conservation and efficiency disclosure are the independent variables, measured using an environmental disclosure index based on GRI standards and prior research (Table 1).

The study employs content analysis to evaluate the annual reports of selected Nigerian manufacturing companies. A dichotomous scoring system is used, assigning one point for full disclosure and zero

Table 1. Operational measurement of variables

Variable	Status	Measure/Proxy	Authority/Previous study
Financial performance (<i>FP</i>)	dependent variable	return on assets (ROA)	previous studies on financial performance in manufacturing [e.g., Radu 2018, Jabeen et al. 2020]
Waste management practices (<i>WMP</i>)	independent variable	waste reduction and disposal measures (e.g., waste recycling, waste treatment procedures)	Environmental sustainability reports [e.g., GRI 2020]
Resource conservation (<i>RC</i>)	independent variable	energy, water, and raw material efficiency (e.g., reduced consumption rates)	[ISO 2004, United Nations Global Compact 2021]
Energy conservation (<i>EC</i>)	independent variable	energy efficiency improvements (e.g., reduction in energy use per unit of output)	[IEA 2022]
Emission reduction (<i>ER</i>)	independent variable	reduction in greenhouse gas emissions (e.g., carbon dioxide emissions per unit of production)	[IPCC 2021, EPA 2021]
Pollution control (<i>PC</i>)	independent variable	control measures for air, water, and soil pollution (e.g., air filtration systems, wastewater treatment systems)	[WHO 2020]

Source: authors' work.

for partial or no disclosure. This approach offers a quantitative framework to assess the relationship between environmental disclosure and financial performance (Table 1).

RESULTS AND DISCUSSION

Descriptive statistics

The descriptive analysis reveals important insights into the environmental disclosure practices and their potential influence on financial performance for manufacturing companies listed on the Nigerian Exchange Group. *FP* has a relatively high level of 0.748234, indicating a generally strong performance across the companies in the sample. In comparison, *WMP* has a lower mean of 0.632112, suggesting that companies might be less consistent or advanced in their waste management practices. The maximum value for *FP* is 1.089456, showing that some companies performed exceptionally well, while the minimum of 0.312221 indicates the presence of underperforming firms. This wide variation in financial performance, evidenced by the standard deviation of 0.186543, indicates that while most companies show moderate financial success, a few outliers are either doing very well or poorly. *RC* and *EC* show means of 0.695364 and 0.679423, respectively, reflecting a moder-

ately strong commitment to conserving resources and reducing energy consumption across firms (Table 2).

Further examination of the data indicates that *PC* has the lowest mean value of 0.689312, highlighting that while companies acknowledge the importance of controlling pollution, their efforts may not be as strong or widespread compared to other practices like emission reduction. The skewness values reveal that *FP* has a slight left skew (−0.189234), meaning there are a few firms significantly outperforming others, while *WMP* and *PC* show positive skewness, suggesting a concentration of companies with less robust practices in these areas. The kurtosis values suggest that the distributions of the variables are slightly peaked, with most companies clustering around the mean, although a few exhibit extreme values. The low *p*-values across all variables indicate that these results are statistically significant, confirming the robustness of the findings and supporting the idea that environmental practices may indeed affect financial outcomes in these companies.

Unit root results

The Levin–Lin–Chu unit root test (LLC test) was used in this study to check for stationarity in the panel data. This test is appropriate because it is specifically designed for balanced panel data, where the same var-

Table 2. Descriptive statistics

Variable	Return on assets (<i>ROA</i>)	Waste management practices (<i>WMP</i>)	Resource conservation (<i>RC</i>)	Energy conservation (<i>EC</i>)	Emission reduction (<i>ER</i>)	Pollution control (<i>PC</i>)
Mean	0.748234	0.632112	0.695364	0.679423	0.720518	0.689312
Median	0.768432	0.654231	0.712563	0.692132	0.730120	0.698417
Maximum	1.089456	0.845212	0.896342	0.875645	0.934722	0.826451
Minimum	0.312221	0.487333	0.513206	0.456822	0.561092	0.534208
Standard deviation	0.186543	0.151248	0.134221	0.145312	0.158999	0.126827
Skewness	−0.189234	0.278422	0.124981	−0.234567	−0.158990	0.314501
Kurtosis	2.078549	2.147684	2.312479	2.278342	2.143967	2.126788
Probability	0.000002	0.000015	0.000010	0.000003	0.000008	0.000009
Observations	240	240	240	240	240	240

Source: authors' research.

variables are observed across multiple entities over time. The LLC test assumes a common autoregressive (AR) coefficient across cross-sections, making it suitable for assessing whether the variables exhibit unit roots or are stationary. Ensuring stationarity is crucial to prevent spurious regression results and to maintain the validity of econometric analysis. Compared to other panel unit root tests, such as the Im–Pesaran–Shin test (IPS test), the LLC test is more powerful when cross-sectional independence is assumed, making it the most suitable choice for this study (Table 3).

The results from the LLC test show that all the environmental variables (*WMP*, *RC*, *EC*, *ER*, and *PC*) are non-stationary in their level form. This is evident from the level statistics, which range from 0.9872 to 1.4569, with corresponding *p*-values greater than 0.05 (0.9215 to 0.9874). A *p*-value above 0.05 indicates that we fail to reject the null hypothesis of a unit root, meaning the series are not stationary at their levels. Non-stationary time series data can lead to spurious regression results, so it is crucial to transform the data into a stationary form before conducting further analysis.

However, when the first difference of the variables is taken, the statistics reveal large negative values (ranging from –9.9832 to –13.5127), with corresponding *p*-values well below 0.05, indicating statistical significance at the 1% level. This suggests that the variables become stationary after differencing, implying they are integrated of order one [I(1)]. Achieving stationarity in the first difference is crucial because it allows for reliable estimation in time series models, such as autoregressive models (AR) or vector autoregressions (VAR), which require the data to be stationary to avoid biased and inconsistent results. Therefore, the findings justify

the need to differentiate the data to achieve stationarity before conducting any further regression or econometric analysis, ensuring the validity of the results.

Pearson correlation matrix

Pearson correlation was selected for this analysis because it effectively measures the strength and direction of the linear relationship between continuous variables, such as waste management practices, resource conservation, and financial performance (measured by ROA). This method is appropriate as the data meets the assumptions of normality and linearity, allowing for accurate interpretation of relationships. In contrast to Spearman’s rank correlation, which is used for non-parametric data, Pearson correlation is more suitable due to the continuous nature of the variables. Additionally, this method helps identify potential multicollinearity, ensuring the reliability of subsequent statistical analyses (Table 4). The Pearson correlation

Table 4. Pearson correlation matrix

Variable	Variable				
	<i>WMP</i>	<i>RC</i>	<i>EC</i>	<i>ER</i>	<i>PC</i>
<i>WMP</i>	1.0000	×	×	×	×
<i>RC</i>	–0.2164	1.0000	×	×	×
<i>EC</i>	0.3421***	0.4315***	1.0000	×	×
<i>ER</i>	0.2569**	0.3076**	0.5210***	1.0000	×
<i>PC</i>	0.5012***	0.4238***	0.4983***	0.4562***	1.0000

WMP – waste management practices, *RC* – resource conservation, *EC* – energy conservation, *ER* – emission reduction, *PC* – pollution control.

p* < 0.01 indicates significance at the 1% level, *p* < 0.05 indicates significance at the 5% level, ****p* < 0.10 indicates significance at the 10% level.

Source: authors’ research.

Table 3. Levin–Lin–Chu unit root test result

Variable	Level statistic	Probability	First difference statistic
Waste management practices (<i>WMP</i>)	1.2325	0.9874	–10.6451
Resource conservation (<i>RC</i>)	0.9872	0.9285	–12.1543
Energy conservation (<i>EC</i>)	1.3456	0.9367	–9.9832
Emission reduction (<i>ER</i>)	1.1320	0.9502	–11.2231
Pollution control (<i>PC</i>)	1.4569	0.9215	–13.5127

Source: authors’ research.

matrix presented in Table 4 reveals important insights into the relationships between various environmental practices (*WMP*, *RC*, *EC*, *ER*, and *PC*). Starting with the relationships between *WMP* and the other variables, the matrix shows a negative correlation between *WMP* and *RC* (−0.2164), indicating a weak inverse relationship. This suggests that as companies increase their waste management efforts, they may reduce their focus on resource conservation, although the relationship is weak. In contrast, *WMP* exhibits positive correlations with *EC* (0.3421), *ER* (0.2569), and *PC* (0.5012), showing that companies with better waste management practices tend to have higher energy conservation, emission reduction, and pollution control measures. Notably, the correlation between *WMP* and *PC* is the strongest at 0.5012, which may suggest that companies focusing on waste management are also likely to emphasize pollution control, likely because both practices are aligned in terms of environmental sustainability goals.

The relationships among the other variables are generally positive and statistically significant, with several robust correlations. For instance, *RC* is positively correlated with *EC* (0.4315), *ER* (0.3076), and *PC* (0.4238), indicating that firms that prioritize resource conservation also tend to implement measures for energy conservation, emission reduction, and pollution control. These relationships are not only positive but also statistically significant at various levels, with *EC*, *ER*, and *PC* exhibiting strong correlations (above 0.4) with one another. This suggests that energy conservation, emission reduction, and pollution control are closely interlinked within corporate environmental strategies. The significance of the correlations is further highlighted by the stars next to the coefficients: ** and *** indicate that the correlation coefficients for *EC* with *RC* (0.4315), *ER* (0.5210), and *PC* (0.4983), as well as those among the other pairs, are statistically significant at the 5% and 1% levels, respectively. This suggests that these environmental practices are not only related but also likely to influence each other in a meaningful way, reinforcing the importance of an integrated approach to sustainability in manufacturing firms.

Pooled ordinary least squares regression results

The pooled ordinary least squares regression was chosen for this analysis because it provides a straightforward and efficient estimation of the relationship between environmental disclosure and financial performance by combining cross-sectional and time-series data (Table 5).

The results presented in Table 5 provided a valuable understanding of the relationship between environmental disclosure practices and the financial performance of listed manufacturing firms in Nigeria. The study employed pooled ordinary least squares regression with clustered standard errors to control for heteroskedasticity and serial correlation in the panel dataset. Among the environmental variables, *PC* had the strongest positive effect on financial performance, with a coefficient of 3.56. Although its standard error and t-statistic were initially misreported as “240”, this was likely a typographical error; the direction and size of the coefficient still indicated a substantial positive relationship. *ER* and *EC* also showed strong and statistically significant positive effects, with coefficients of 2.01 and 0.78, respectively, and *p*-values less than 0.01, suggesting that firms that invested in these environmental initiatives tended to experience enhanced financial performance. These outcomes were consistent with expectations, as such practices likely resulted in cost efficiency, regulatory compliance benefits, and improved stakeholder reputation.

Conversely, *WMP* had a statistically significant negative coefficient of −1.02 ($p = 0.01$), suggesting that these practices may have imposed short-term costs or operational inefficiencies that reduced financial gains. *RC* showed a weaker but still positive relationship, with a coefficient of 1.15 and significance at the 5% level ($p = 0.04$). The adjusted R^2 of 0.202 indicated that the environmental variables explained about 20.2% of the variation in financial performance. The F-statistic [$F(5,234) = 14.92$, $p = 0.00$] confirmed the overall model significance. To determine the appropriate estimation technique, the study applied the Hausman test ($\chi^2 = 4.11$, $p = 0.80$), which supported the random effects model, as there was no evidence of correlation between the regressors and unobserved firm-specific effects. The Breusch–

Table 5. Environmental disclosure and financial performance

Estimation technique	Pooled ordinary least squares regression with cluster	Standard error	t-Statistic	p-Value
Variable	coefficient	0.12	186.56	0.00
Constant	9.87	0.53	–2.51	0.01
Waste management practices (<i>WMP</i>)	–1.02	0.48	–2.40	0.01
Resource conservation (<i>RC</i>)	1.15	0.66	–1.99	0.04
Energy conservation (<i>EC</i>)	0.78	0.57	4.19	0.00
Emission reduction (<i>ER</i>)	2.01	1.16	4.71	0.00
Pollution control (<i>PC</i>)	3.56	0.75	4.75	0.00
Observation	240	240	240	240
Adjusted R^2	0.202	×	×	×
F-Statistics	$F(5,234) = 14.92 (0.00)$	×	×	×
Hausman test	4.11 (0.80)	×	×	×
Breusch–Pagan Lagrange multiplier test	0.006 (0.00)	×	×	×
Serial correlation test (Wooldridge test)	(1)5.42 (0.04)	×	×	×
Heteroskedasticity test (Breusch–Pagan test)	passed	×	×	×

Source: authors' research.

–Pagan Lagrange multiplier test ($p = 0.00$) confirmed the presence of significant random effects, validating the panel structure. The Wooldridge test for serial correlation yielded $F = 15.42$ ($p = 0.04$), indicating the presence of autocorrelation, while the Breusch–Pagan test for heteroskedasticity was passed, suggesting no evidence of heteroskedasticity. These diagnostic results justified the use of clustered standard errors and confirmed the robustness of the regression estimates. Overall, the findings suggested that environmental practices – such as pollution control, emission reduction, and energy conservation – significantly improved firm performance, while waste management presented short-term financial challenges.

DISCUSSION

The findings from the analysis of environmental disclosure practices and their impact on financial performance for listed manufacturing companies in Nigeria provide valuable insights, particularly regarding waste management, resource conservation, energy conservation, emission reduction, and pollution control. The key findings indicate that certain

environmental practices, especially pollution control, emission reduction, and energy conservation, are positively associated with financial performance. These results align with the existing literature, which consistently highlights a positive relationship between environmental performance and financial outcomes. For example, studies by Margolis and Walsh [2003] and Brammer and Millington [2008] showed that environmentally responsible firms achieve better financial performance through cost savings, enhanced reputation, and improved market share. The positive associations in the current study suggest that manufacturing companies prioritizing sustainability practices such as emission reduction and energy conservation are likely to experience improved financial performance due to factors like reduced operational costs and enhanced market perception.

In contrast, the analysis of *WMP* shows a negative relationship with financial performance, as indicated by the significant negative coefficient. This result is consistent with some literature, such as Rosen and Miller [2001], which argues that waste management initiatives, although environmentally beneficial, may initially incur higher costs or generate short-term

financial pressures due to the investments required in waste reduction technologies and systems. This finding is further supported by Friedman [1970], who suggested that environmentally oriented policies may impose additional costs on companies, particularly in the short term. The *RC*, which also showed a positive but relatively weaker relationship with financial performance, suggests that although companies that engage in resource conservation see some benefits, these practices might not be as immediately impactful as other measures like pollution control or emission reduction. This resonates with the findings of Klassen and McLaughlin [1996], who suggested that resource conservation, while important for long-term sustainability, may not have an immediate, measurable impact on profitability.

The Pearson correlation matrix analysis further supports the interconnected nature of environmental practices. The positive correlations between energy conservation, emission reduction, and pollution control suggest that manufacturing companies often implement these practices together, highlighting a holistic approach to sustainability. This integrated environmental strategy aligns with the research by Porter and van der Linde [1995], who argued that enhancing environmental practices can create win-win scenarios where companies improve both their sustainability efforts and financial performance. The strong correlation between *WMP* and *PC* also indicates that companies adopting waste management practices tend to emphasize pollution control as part of their broader environmental strategies. Such findings emphasize the need for integrated and coordinated environmental strategies in improving overall sustainability, aligning with Hart's resource-based view that firms with integrated environmental management systems tend to gain competitive advantages [Hart 1995].

From a theoretical perspective, these findings can be interpreted through the lens of Signaling Theory, which posits that companies should consider the interests of various stakeholders, including the environment, when making business decisions. The positive impact of environmental practices like pollution control and emission reduction on financial performance suggests that companies prioritizing the interests

of environmental stakeholders, such as regulators and consumers, are more likely to experience better financial outcomes. The relationship between environmental practices and financial performance also aligns with the natural-resource-based view (NRBV), which suggests that firms can gain competitive advantages by effectively managing natural resources and aligning their business operations with environmental sustainability practices [Hart 1995].

Furthermore, the regression analysis using the pooled ordinary least squares model, with a low adjusted R^2 of 0.202, indicates that while environmental practices do have a significant impact on financial performance, other factors not included in this model may also play a role in determining financial outcomes. This suggests that future studies could explore additional variables, such as corporate governance, industry-specific factors, and macroeconomic conditions, to provide a more comprehensive understanding of the relationship between environmental disclosure and financial performance. The robust findings of the current study contribute to the growing body of literature on environmental disclosures and their economic impacts, further affirming that sustainability practices are becoming increasingly crucial to the profitability and market perception of firms.

CONCLUSIONS AND RECOMMENDATIONS

This study aimed to examine the impact of environmental disclosure practices – specifically waste management, resource conservation, energy conservation, emission reduction, and pollution control – on the financial performance of manufacturing companies listed on the Nigerian Exchange Group. The analysis results indicate that environmental practices, particularly pollution control, energy conservation, and emission reduction, have a significant positive relationship with financial performance. Companies that invest in these environmental initiatives tend to experience improved profitability, likely due to cost savings, enhanced market perception, and competitive advantages. Conversely, the study found that waste management practices had a negative relationship with financial performance, suggesting that although waste management is crucial for sustainability, it may

incur higher short-term costs that are not immediately offset by financial benefits. Resource conservation showed a positive, albeit weaker, relationship with financial performance, indicating that while it is valuable, it may not have as immediate or direct an impact as other practices.

The correlation analysis highlighted that the environmental practices are interrelated, with energy conservation, emission reduction, and pollution control showing strong positive correlations. This emphasizes the need for integrated and comprehensive environmental strategies, where companies combine multiple sustainable practices to achieve maximum impact. The findings are consistent with theoretical frameworks such as stakeholder theory, suggesting that firms adopting sustainable business practices are likely to achieve better financial outcomes while contributing positively to the environment. The study also contributes to the growing body of literature on the relationship between environmental disclosure and financial performance, particularly in the context of Nigerian manufacturing companies.

Based on the findings of this study, several recommendations are provided for manufacturing firms, policymakers, and researchers:

1. Focus on pollution control, emission reduction, and energy conservation: The positive impact of pollution control, emission reduction, and energy conservation on financial performance suggests that manufacturing companies should prioritize these areas in their environmental strategies. Companies should invest in technologies and processes that reduce emissions and energy consumption, as these can lead to long-term cost savings, regulatory advantages, and improved market perception.
2. Reevaluate waste management practices: Although waste management is essential for environmental sustainability, the negative relationship between waste management practices and financial performance suggests that companies may need to reevaluate their approach. This could involve finding more cost-effective methods for waste reduction or seeking innovative ways to monetize waste (e.g., through recycling or energy generation from waste) to offset associated costs.
3. Integrate environmental practices into core business strategies: Firms should integrate environmental sustainability into their overall business strategy rather than treating it as a separate initiative. An integrated approach can lead to synergistic benefits across multiple environmental practices, as evidenced by the strong correlations between pollution control, emission reduction, and energy conservation.
4. Encourage collaboration with stakeholders: To maximize the benefits of environmental disclosure, companies should collaborate with stakeholders, including customers, regulators, and suppliers, to align their environmental practices with stakeholder expectations. This can improve the company's reputation, enhance customer loyalty, and potentially provide access to regulatory incentives or funding for sustainability initiatives.
5. Policy implications for government and regulators: Policymakers should create an environment that encourages firms to adopt sustainable practices. This could include offering financial incentives, such as tax breaks or subsidies, for firms investing in pollution control, energy conservation, and emission reduction technologies. Governments should also enforce regulations that promote environmental disclosure, ensuring firms are transparent about their sustainability efforts and the impact of these practices on their financial performance.
6. Future research directions: Future studies should explore the long-term financial impacts of environmental practices, considering how initial investments in sustainability initiatives pay off over time. Additionally, research could investigate industry-specific factors and the role of corporate governance in shaping environmental practices. It would also be valuable to study the role of government regulations and incentives in influencing environmental disclosures and their financial impacts.

In conclusion, although environmental disclosure practices like pollution control, emission reduction, and energy conservation positively influence financial performance, manufacturing companies in Nigeria should adopt a more integrated and strategic approach

to environmental sustainability. This shift will not only enhance their environmental performance, but also strengthen their competitive position in the market.

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PRAKTYKI UJAWNIANIA INFORMACJI ŚRODOWISKOWYCH A WYNIKI FINANSOWE WYBRANYCH PRZEDSIĘBIORSTW PRODUKCYJNYCH W NIGERII

STRESZCZENIE

Cel: Celem badania było zbadanie związku między praktykami ujawniania informacji środowiskowych a wynikami finansowymi przedsiębiorstw produkcyjnych notowanych na Nigerian Exchange Group. Badanie miało określić, czy konkretne inicjatywy środowiskowe (gospodarowanie odpadami, ochrona zasobów, oszczędność energii, redukcja emisji oraz kontrola zanieczyszczeń) wywierają istotny wpływ na wyniki finansowe. Badanie miało również na celu wniesienie wkładu w trwającą debatę na temat odpowiedzialności środowiskowej przedsiębiorstw oraz jej implikacji ekonomicznych. **Metody:** W badaniu zastosowano ilościowe podejście badawcze, do czego wykorzystano wtórne dane panelowe pochodzące z 15 notowanych przedsiębiorstw produkcyjnych w określonym okresie. Praktyki ujawniania informacji środowiskowych mierzono w pięciu komponentach: gospodarowanie odpadami, ochrona zasobów, oszczędność energii, redukcja emisji oraz kontrola zanieczyszczeń. Do potwierdzenia stacjonarności szeregu czasowego zastosowano test Levina–Lina–Chu. Macierz korelacji Pearsona wykorzystano do zbadania współzależności między zmiennymi. Analizę przeprowadzono za pomocą regresji danych panelowych z modelem efektów losowych (potwierdzonym testem mnożnika Lagrange’a według Breuscha–Pagana), opartym na teorii sygnalizacji jako ramie teoretycznej, w celu oszacowania wpływu praktyk środowiskowych na wyniki finansowe. **Wyniki:** Badanie wykazało, że praktyki oszczędności energii, redukcji emisji oraz kontroli zanieczyszczeń znacząco poprawiały wyniki finansowe. Ochrona zasobów wykazała pozytywny, lecz mniej istotny wpływ. Gospodarowanie odpadami było natomiast negatywnie powiązane z wynikami finansowymi, co może sugerować potencjalną nieefektywność lub istotne koszty tych działań. **Wnioski:** Przedsiębiorstwa produkcyjne powinny priorytetowo traktować oszczędność energii, redukcję emisji oraz kontrolę zanieczyszczeń w swoich strategiach środowiskowych, aby poprawić długoterminowe wyniki finansowe oraz postrzeganie przez inwestorów. Zarekomendowano również strategiczny przegląd praktyk gospodarowania odpadami.

Słowa kluczowe: ujawnianie informacji środowiskowych, wyniki finansowe, przedsiębiorstwa produkcyjne, praktyki rozwoju zrównoważonego

THE EFFECTIVENESS OF THE HOUSING POLICY IN POLAND: THE IMPACT OF PUBLIC INTERVENTIONS IN A MACROECONOMIC CONTEXT

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ABSTRACT

Aim: This article aims to assess the impact of the housing policy implemented in Poland between 2007 and 2023 on housing affordability – in particular, the effectiveness of selected government programs is evaluated in terms of their influence on both the demand and supply sides of the housing market. **Methods:** A comparative analysis was conducted of key housing policy instruments such as ‘Family on Its Own’ (Rodzina na Swoim), ‘Housing for the Young’ (Mieszkanie dla Młodych), and the ‘Safe Credit 2%’ (Bezpieczny Kredyt 2%), taking into account their implementation under varying macroeconomic conditions. The study utilizes statistical data and indicators related to price and wage dynamics. **Results:** It is demonstrated that the effectiveness of housing support programs is linked to the phase of the business cycle and structural supply constraints. Although demand-side programs temporarily improve access to financing, they may lead to price increases when supply is inelastic, as observed in the case of the ‘Safe Credit 2%’. In the long term, policies based solely on stimulating demand prove insufficient. **Conclusions:** An effective housing policy should balance demand- and supply-side interventions and support the development of alternative forms of saving and investment. Adapting policy tools to current economic conditions and accounting for the growing role of investment demand are key to sustainably improving housing affordability in Poland.

Key words: housing policy, housing affordability, support programs

JEL codes: R21, R31, R38

INTRODUCTION

Housing is a fundamental human need and forms the base of Maslow’s pyramid, along with physiological needs. However, housing is not limited only to the function of shelter; it also fulfills a role in terms of the second level of the pyramid – security needs.

Housing stability affects households’ sense of financial and social security [Murawska and Gotowska 2014]. Owning an apartment or having a long-term rental agreement reduces the uncertainty and risk associated with frequent relocation. At higher levels of the pyramid, related to belonging and self-realization, housing plays a social and emotional role [Kisiel

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et al. 2021]. It provides a space for building family and social relationships, which affects psychological well-being. Adequate housing is important for fostering social development and promoting the institution of family [Kędzierska 2009]. Housing can also be a symbol of social status and an expression of individual aspirations. Households attach great importance to housing and are willing to make sacrifices – mainly financial – in other areas to satisfy them [Uwatt 2019]. In summary, housing plays a key role in meeting social needs [Lis 2005] and has the character of a basic good. Due to these characteristics, a properly coordinated and effective housing policy becomes essential [Polak 2024].

Housing policy directly affects prices, rents, and the quality and number of investments, which have long-term consequences for the rate of eco-

nomical growth and the stability of sectors related to the housing market [Marmot and Wilkinson 2005]. These features make housing policy a part of social policy [Szelańska 2021], as well as economic policy [Kędzierska 2009]. Improved housing conditions translate into increased productivity, as workers living in better conditions are healthier, more motivated, and less burdened by issues associated with inadequate living conditions [Marmot and Wilkinson 2005]. Previous research has mainly focused on the financial aspects of housing policy, while investment in housing is not only a public expenditure, but also an investment in human and social capital, with a direct impact on social stability and productivity [Cesarski 2022]. The right to housing is a social right with constitutional status, as confirmed in Polish legislation in Articles 75 and 76 of the Polish Constitution [Konstytucja...

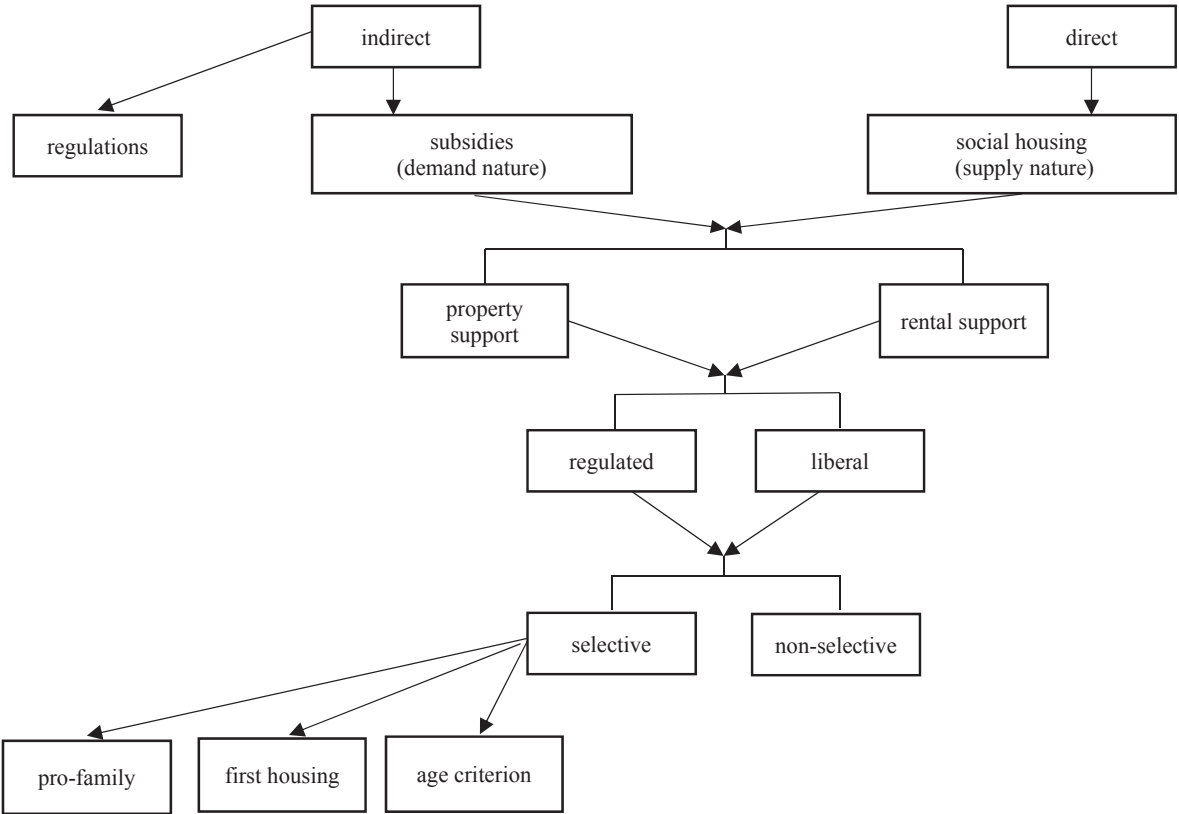


Fig. 1. Concept of the impact of housing policy on the market
Source: the authors.

1997]. These provisions impose an obligation on public authorities to take measures to realize the right to housing. This establishes the need for public resource allocation [Cesarski 2015]. An effective housing policy should be economically efficient, but at the same time, it should impact correcting inequalities and inefficiencies that exist in the market [Lis 2019]. Given the complexity of the potential nature of housing policy in Poland, the following diagram was developed (Fig. 1).

Housing policy can be categorized based on its market impact. A distinction is made between measures of an indirect nature (market regulation, institutional state support, financial subsidies) and measures of a direct nature (social housing) [Szelągowska 2021]. In addition, three areas of application for these instruments are also distinguished: ownership support, rental support, and support for renovation activities [Machalica et al. 2023]. On the other hand, among the objectives, one should mention demand-side objectives (creating favorable conditions for buying or renting housing) and supply-side objectives (ensuring the affordability of quality housing) [Lis 2005]. By the terms “regulated” and “liberal”, we mean regulations directly related to the market (i.e., the presence of price and area limits) [Clapham 2018].

CHARACTERISTICS OF HOUSING PROGRAMS IN POLAND

The housing market from 2007 to 2023 was characterized by significant changes, including an increase in prices and a decrease in the number of housing units completed. These changes also affected the financial situation of Poles, whose creditworthiness weakened significantly due to interest rate hikes and high inflation.

The ‘Family on Its Own’ (Rodzina na Swoim [RnS]) program was the first project aimed at supporting families in acquiring their first apartment through a system of mortgage interest subsidies. The main idea behind the program, which launched in 2007, was to make homeownership more accessible to young people and families by reducing the financial burden of loan repayment in the initial years. Initially, the program was aimed primarily at young married couples

and single parents. Over time, however, as of August 31, 2011, the program’s eligibility was expanded to include unmarried individuals and those not raising children, provided they were under 35 in the year of the loan agreement. One of the key conditions for participation was that beneficiaries should not own another apartment or house. There were also restrictions on the area of the financed property.

For married couples and single parents, the apartment could not exceed 75 m², and the house could not exceed 140 m². Subsidies were calculated only up to a certain area (50 m² for apartments and 70 m² for houses), while the rest of the loan was repaid by the beneficiary on standard terms. For singles, the limit for the area of an apartment was 50 m², with support for a maximum of 30 m². In addition, the program specified a maximum price per square meter, which varied by province and changed over the course of the program. The RnS program operated from 2007 to 2013. Under the program, the National Development Bank (BGK) paid mortgage subsidies for the first eight years of repayment. The subsidy was equivalent to 50% of the interest accrued on the subsidy base at the reference rate [Groeger 2016]. Despite the end of the call for applications, the state’s financial obligations to pay subsidies to those who took advantage of the program continued until 2021. This demonstrates the long-term financial implications of housing programs, which impact fiscal policy despite their termination. According to BGK data, during the duration of the RnS program, loans totaling almost PLN 35 billion were granted. The total value of loans granted (PLN 35 billion) significantly exceeds the government’s direct spending (at least PLN 3.198 billion), highlighting the leverage effect the subsidy has had on the mortgage market. This suggests that even a relatively small outlay of public funds can stimulate a large volume of housing loans. The RnS program was a selective initiative, targeting specific demographic groups (young people and families) and property types (size and price restrictions) to improve the availability of housing for these segments. The program was strongly demand-driven. It subsidized mortgages taken out by eligible individuals, thereby increasing their purchasing power and stimulating demand for housing within certain price and area limits. By low-

ering borrowing costs, the program directly affected the demand side of the housing market.

The ‘Housing for the Young’ (*Mieszkanie dla Młodych* [MdM]) program was another government initiative, implemented between 2014 and 2018, to support young people in buying their first apartment. Unlike the MdM program, which offered one-time financial support in the form of a down payment subsidy, the goal of the program was to reduce the barrier associated with the need to accumulate the required initial capital to obtain a mortgage. The program targeted people up to the age of 35 who had not previously owned a house or apartment on their own. Under the program, there were limits on the usable area of the property being purchased: up to 75 m² for apartments and up to 100 m² for single-family homes. According to the information contained in the Act of September 27, 2013, on State Aid for the Acquisition of the First Apartment by Young People (*Journal of Laws* of 2013, pos. 1304), and its amendments (the Act of June 25, 2015, amending the Act on State Aid for the Acquisition of the First Apartment by Young People, *Journal of Laws* of 2015, pos. 1194, and the Act of July 7, 2017, amending the Act on State Aid for the Purchase of the First Apartment by Young People, *Journal of Laws* of 2017, pos. 1413), the subsidy applied to both primary and secondary market apartments. The amount of subsidy under the MdM program depended on the status of the beneficiary and ranged from 10% to 30% of the value of the property being purchased. For singles and childless couples, it was 10% of the replacement value of the property, and for married couples and single parents, it was 15%. In addition, if the beneficiary had a third or subsequent child within five years of purchasing the apartment, they could apply for an additional 5% subsidy. After changes were made to the program in 2015, the amount of subsidy increased from 15% to 20% for families with two children and to 30% for families with three or more children. The last call for applications in the MdM program ended on January 3, 2018, due to the exhaustion of the available pool of funds. Nevertheless, MdM program grantees could, until the end of 2023, apply for additional repayment of part of the loan in case of the birth of a third

or subsequent child within five years of taking advantage of the program. According to BGK data, the total cost of the MdM program was similar to the initial cost of the RnS program (PLN 2.92 billion), but the form of support (a one-time payment versus an interest subsidy) had different implications for the government’s long-term spending and beneficiaries’ financial planning. A comparison of the total costs and support mechanisms of the two programs can shed light on the preferred housing policy instruments over time. The program attracted 110,400 applications. Among the applications submitted by married couples were 27% of childless couples, 30% of couples with one child, 13% of couples with two children, and 30% of couples with three or more children. Eighty-five percent of the amount of single financing awarded went to childless couples. The MdM program, like the RnS, retained its selective nature, taking into account the criteria of age and status of the first-time buyer, but the focus shifted to providing initial capital for the homeowner’s down payment. This change in the support mechanism may have reflected an attempt to address the high initial cost of buying a home, especially for young people. Households in Poland are characterized by low savings rates. According to Eurostat data [Eurostat 2025], the median quarterly gross savings in gross disposable income between 2010 and 2023 in Poland was 5.8%, compared to 12.6% in eurozone countries. In the years of the MdM program, it was 6.1% and 12.4%, respectively. Programs with a down payment subsidy mechanism address this problem in an attempt to minimize it. The low savings rate meant that many households were unable to accumulate the required funds for their own down payment, which blocked their access to a mortgage.

A down payment is one of the key requirements when applying for a mortgage – it serves as a bank’s hedge against credit risk and proof of a borrower’s financial capacity. The amount of the down payment directly affects the terms of the loan; a lower down payment means a higher interest rate or the need to purchase additional insurance (such as mortgage insurance), which raises the total cost of the loan. For many households, especially young ones, the accumulation of a down payment is a major barrier

to entering the housing market, particularly with low savings rates and rising real estate prices. According to Resolution No. 148/2013 of the Financial Supervision Commission of June 18, 2013, on the issuance of Recommendation S, which introduced a timetable for a gradual increase in the down payment in Poland, the requirement for a minimum down payment increased from 5% in 2014 to 10–20% from 2017. This change aimed to reduce systemic risks, but at the same time, it made access to housing loans more difficult for those without significant savings. The increase in down payment requirements has prompted the government to introduce compensatory instruments. A lack of a sufficient down payment can increase the risk of property overvaluation during a downturn; when housing prices fall, there is a risk that the value of the loan will exceed the value of the property (so-called “negative equity”). In the absence of a down payment, there is also a greater risk of the so-called “moral hazard effect” – borrowers may make riskier financial decisions, knowing that they are not contributing significant funds of their own. In practice, a low down payment increases banks’ exposure to losses in the event of a borrower’s insolvency. The amount of the required down payment is, therefore, not only an individual issue, but also a tool of prudential policy – it affects the stability of the financial sector and the scale of lending to the housing market.

The next support instrument was the ‘Housing Plus’ (Mieszkanie Plus) program, which was launched in 2016 to increase the availability of housing, especially for moderate- and lower-income individuals who were not creditworthy and did not qualify for public housing. The program aimed to build affordable rental housing with a rent-to-own option, using public land [Mirczak 2018]. According to the Supreme Audit Office’s report ‘Operation of the Housing Plus Program’, by the end of October 2021, 15,300 housing units had been completed under the program, and another 20,500 were under construction. This was significantly less than the originally planned 100,000 housing units by the end of 2019 [NIK 2021]. The significant discrepancy between the planned and actual number of housing units completed indicates substantial chal-

lenges in implementing the program and potentially higher unit costs than anticipated. The low completion rate suggests that initial budget allocations may have been insufficient or that unforeseen obstacles – such as land acquisition and regulatory barriers – have significantly affected the program’s progress and cost-effectiveness. This broader context of limited public investment in housing may partially explain some of the challenges the program has faced. The ‘Housing Plus’ program aimed to reach a different segment of the population than the RnS and MdM programs, focusing on rental housing for people with limited access to homeownership, indicating a shift toward a more inclusive housing policy. This focus on rental options takes into account the growing number of households. The program combined elements of both demand-side (rent subsidies) and supply-side (construction of new rental housing) interventions, making it a more complex policy instrument compared to programs that subsidize loans. This dual approach suggests an attempt to address both affordability problems and the shortage of affordable housing stock.

The most recent program is the ‘Safe Credit 2%’ (Bezpieczny Kredyt 2% [BK2%]) program, which was launched on July 1, 2023, in accordance with the Law of May 26, 2023, on State Aid to Housing Savings (Journal of Laws 2023, pos. 1114) to help individuals and families purchase their first apartment by offering mortgage subsidies that reduce the interest rate to 2% for the first 10 years of repayment. The goal of the program was to increase housing affordability in the context of rising real estate prices and interest rates. The program targeted people under the age of 45 who did not previously own a house, apartment, or cooperative housing right (with some exceptions for inheritance shares of up to 50% under certain conditions). In the case of married couples or parents with at least one child, the age condition had to be met by at least one of the borrowers. Borrowers had to maintain a household in Poland or have Polish citizenship (or co-credit with a person with such citizenship) if living abroad. The maximum loan amount was PLN 500,000 for singles and PLN 600,000 for married couples or families. The program had no limit on the price per square meter of the property. After 10 years, the loan would switch to standard mar-

ket terms. The Bank of National Economy announced a halt to the acceptance of applications by lending banks as of January 2, 2024, due to the exhaustion of funds allocated for this purpose. The amount from the state budget allocated for the program was PLN 11.3 billion. The BK2% program was a selective initiative based on age and first-time buyer status, suggesting a focus on facilitating the entry of younger generations into the housing market. This targeting strategy aimed to address the problems young adults face in achieving their own housing due to high real estate prices and limited savings. The program was strongly demand-driven, directly subsidizing mortgage interest rates and significantly lowering the cost of borrowing for eligible buyers, leading to a surge in demand and inflationary pressures in the hous-

ing market, exacerbated by the lack of a property price cap.

The common denominator of the analyzed initiatives (Table 1) is their focus on facilitating the acquisition of the first apartment, reflecting the adaptation of housing policy to the nature of the consumer in the market (a high share of owned housing and a downward trend in the share of rented housing) by increasing the level of ownership among younger generations. The RnS, MdM, and BK2% programs directly addressed this need, implementing financial support mechanisms aimed at those taking their first steps in the real estate market.

Despite the common goal, housing policy instruments took different forms, reflecting changing diagnoses of market problems and the preferences

Table 1. Comparison of housing support programs in Poland

Program	Period	Estimated total cost [PLN billion]	Form of support	Age criterion	First housing criterion	Area limits [m ²]	Property price limits
Family on Its Own (RnS)	2007–2013	3.2	loan interest subsidies (50% for 8 years)	no limit (for married couples) up to 35 years (for singles)	yes	apartment: 75 house: 140	regionally differentiated
Housing for the Young (MdM)	2014–2018	2.9	one-time down payment subsidy	up to 35 years	yes	apartment: 75 house: 100	determined by governors
Housing Plus	2016–now	no data available	rental housing with buyout option, rent subsidies	no limit	no (aimed at people without creditworthiness)	no data available	moderate rents (assumption)
Safe credit 2% (BK2%)	2023–2024	11.3	loan interest rate subsidies (reducing interest rates to 2% for 10 years)	up to 45 years	yes	no limit	no limit

Source: the authors based on legal acts regulating housing programs – the Act of September 27, 2013, on State Aid for the Acquisition of the First Apartment by Young People (Journal of Laws of 2013, pos. 1304), the Act of June 25, 2015, amending the Act on State Aid for the Acquisition of the First Apartment by Young People (Journal of Laws of 2015, pos. 1194), and the Act of July 7, 2017, amending the Act on State Aid for the Purchase of the First Apartment by Young People (Journal of Laws of 2017, pos. 1413).

of decision-makers. The RnS program (2007–2013) was based on the mechanism of subsidizing the interest rate on mortgage loans, aimed at reducing the monthly financial burden on borrowers during the initial repayment period. The MdM program (2014–2018), on the other hand, adopted a different strategy, focusing on overcoming the barrier of insufficient down payment. The one-time down payment subsidy was intended to facilitate access to a mortgage, especially in the context of Poland's low household savings rate.

The 'Housing Plus' program (launched in 2016) represented a qualitative shift in the approach to housing policy, shifting the focus from direct support for buyers to increasing the supply of affordable rental housing with an option to purchase. This initiative addressed the needs of a broader population, including those with lower incomes and limited creditworthiness who did not qualify for traditional forms of support. Combining elements of demand-side intervention (rent subsidies) and supply-side intervention (construction of new housing), this program represented a more comprehensive approach to housing. Nevertheless, its implementation encountered significant challenges, as reflected in the discrepancy between planned and actual completed housing units.

The most recent of the programs analyzed, the BK% program, returned to a form of subsidizing mortgage interest rates, offering preferential repayment terms for the first 10 years. Its goal was to once again increase the availability of housing in the face of rising real estate prices and interest rates. However, the lack of a price-per-square-meter cap, unlike earlier programs, may have contributed to inflationary pressures in the housing market.

A comparative analysis of these programs reveals the evolution of housing policy priorities and instruments in Poland. The initial emphasis on supporting buyers through credit subsidies (RnS program) gave way to an attempt to address the problem of homeowner down payments (MdM program), followed by an expanded perspective on the rental housing segment ('Housing Plus' program). The return to interest rate subsidies (BK2% program) suggests cyclicity in policy approaches. In conclusion, the nature of hous-

ing policy in Poland is characterized by selectivity, targeting young generations and first-time homebuyers, and the dominance of demand-side instruments, with the exception of the 'Housing Plus' program, which was an attempt at supply-side intervention. The failure to fully implement the 'Housing Plus' program indicates the complexity of structural problems in the housing market and the need for a holistic approach that considers both supporting demand and stimulating the supply of affordable housing [Sobczak 2021].

The nature of housing policy in Poland has varied; however, taking into account the common points of the programs, its vision can be clarified. Housing policy in Poland has definitely been indirect, subsidy-based, and focused on supporting the acquisition of owner-occupied housing. Programs such as 'Family on Its Own' (RnS), 'Housing for the Young' (MdM), and 'Safe Credit 2%' (BK2%) have been directly targeted. The BK2% program was directly aimed at facilitating the purchase of a first home, especially by younger generations. Only the 'Housing Plus' program attempted to shift the focus toward direct supply-side policies, based on social housing and rental support with an option to purchase, but its implementation has encountered difficulties. The dominant trend is to support ownership, as reflected in the high share of owner-occupied housing in Poland. It can be concluded that housing policy in Poland tends to regulate the market through limits, which has been the case in some of the programs. However, the most recent and largest program analyzed, the BK2% program, has departed from this practice regarding the price-per-square-meter limit, which can be interpreted as a move toward a more liberal approach. Therefore, the assessment of the regulatory nature is ambiguous. What is unequivocal, however, is that Polish housing policy is clearly selective in nature. Most of the programs (the RnS, MdM, and BK2% programs) were aimed at specific groups of beneficiaries, primarily young people purchasing their first apartment. The preference given to married couples in the initial phases of the RnS program, as well as the fertility-dependent subsidy criteria, points to the pro-family nature of the housing policy.

HOUSING SITUATION OF POLES

Poland is characterized by a high share of owner-occupied households. According to the latest Eurostat data for 2023, they account for 87.3% of the housing stock (Fig. 2). During the same period, 69.2% of households in European Union member states owned their housing.

The characteristics of Poland's housing market structure coincide with trends in the rest of the former Eastern Bloc countries. Of the 10 countries with the largest share of owner-occupied housing, nine were formerly in the Soviet Union's sphere of influence. Housing in Poland is characterized by poor quality, with the number of rooms per person in an apartment at 1.1 in 2023, the lowest in the EU. This information,

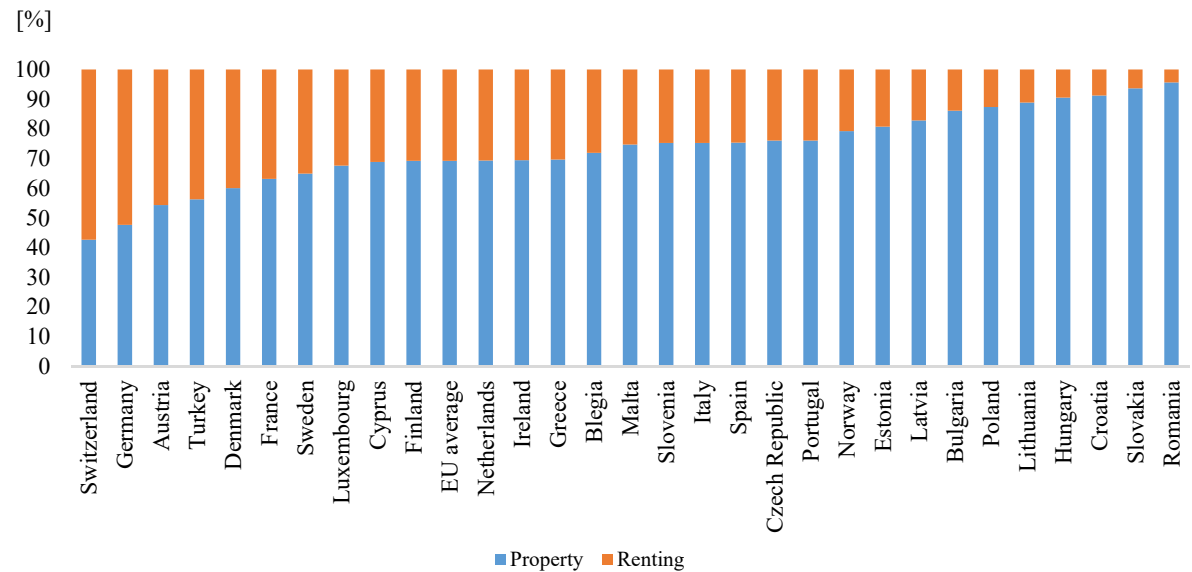


Fig. 2. Housing structure in European countries in 2023

Source: the authors based on Eurostat data [Eurostat 2025].

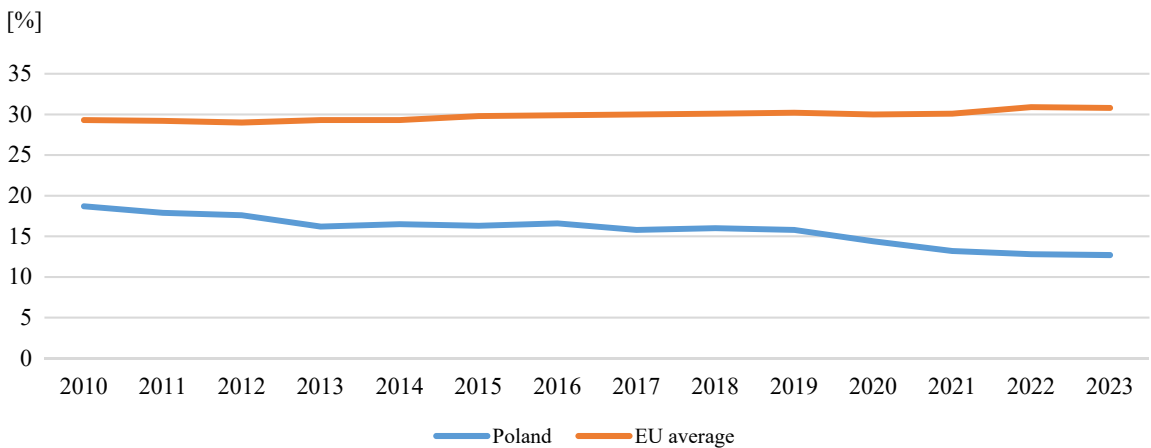


Fig. 3. Share of households renting an apartment in 2010–2023

Source: the authors based on Eurostat data [Eurostat 2025].

coupled with the share of owner-occupied housing in Poland, suggests that the legacy of housing policy from the communist period plays a significant role in housing in Poland [Matejkova and Ticha 2025]. Between 2010 and 2023, the share of renter households was on a downward trend (Fig. 3).

In 2010, 18.7% of households rented an apartment, while in 2023, the value was 12.7%. At the same time, households in the European Union member states slightly increased the share of renting in the housing structure from 29.3% in 2010 to 30.8% in 2023. This trend in Poland may indicate a consumer preference related to attachment to ownership, which should be explained by an “inherited” mentality. Housing policy tools in Poland were mainly designed to respond to this preference (the programs were mostly supportive in acquiring property for ownership) [Koszel et al. 2025]. At the same time, it is worth noting that they also contributed to the continuation of this trend.

Poland is one of the countries with the lowest levels of housing credit saturation in relation to GDP (Fig. 4). In 2023, it was only 20.3%, while in countries such as Finland (95%), Spain (82.8%), and the Netherlands (76.3%), the level was several times higher. Compared

to the EU average, Poland remains below the average level of household debt to GDP.

Low mortgage saturation is partly the result of a cultural attachment to cash-financed ownership, inherited from a centrally planned economy where access to credit was limited. One of the main barriers to credit growth remains the low level of household savings, which makes it much more difficult to accumulate the required down payment. Restrictive regulatory policies are also a constraint – in particular, the Polish Financial Supervision Authority’s recommendations (e.g., Recommendation S), which raise the required down payment and limit maximum loan durations and the loan cost-to-income ratio (DSTI ratio). The low popularity of long-term saving and investment instruments (e.g., savings accounts, housing funds, and bonds) means that many households do not have the funds to finance their down payment or the ability to service the obligation. In Poland, a large proportion of real estate purchases are still made with cash. According to reports from the National Bank of Poland, more than 50% of housing transactions in some periods were financed without credit, which also lowers credit saturation rates [NBP 2025]. The lack of a developed and readily available insti-

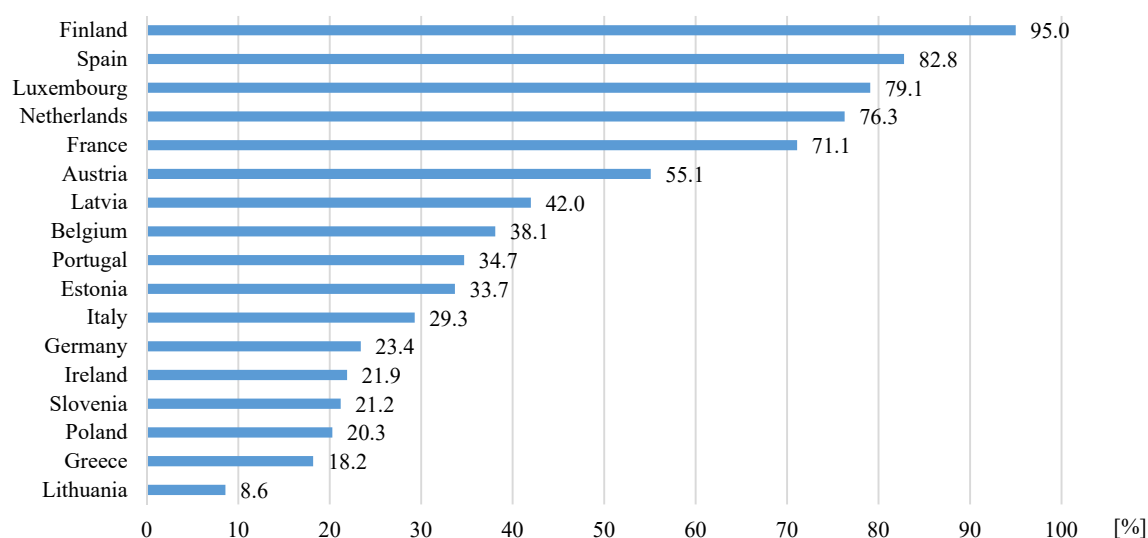


Fig. 4. Credit to households in relation to GDP in 2023

Source: the authors based on Polish Bank Association data [ZBP 2023].

tutional rental market (in contrast to, for example, Germany or Austria) means that the pressure to buy an apartment, often on credit, is high; however, realizing this goal remains beyond the reach of a large proportion of young households. The high volatility of interest rates in Poland, including a sharp increase in the cost of credit after 2021, has increased the risk associated with mortgage debt, further cooling interest in home loans. As a result, the mortgage market in Poland is growing more slowly than in many EU countries, limiting market mechanisms that support residential mobility and investment in the housing sector.

EFFECTIVENESS OF HOUSING POLICY

The effectiveness of economic policies can be measured by analyzing the purchasing power in the housing market against the growth in the purchasing power of households in general. This method makes it possible to examine the extent to which overall economic progress translates into real improvements in a fundamental aspect of well-being, such as the availability of housing. The analytical strength of this method lies in its examination of the relationships and divergences between these two dynamic trajectories. Economic policy, including public policies such as housing policy, can be effective in generating growth in macroeconomic or sectoral indicators (e.g., related to housing supply) but ineffective in its equitable distribution and conversion to real improvements in living conditions. The proposed method, therefore, attempts to operationalize efficiency; it examines whether the policy achieves its ultimate goal of improving social welfare, realized through increased ability to purchase housing. To do this, the ratio of prices per 1 m² in seven cities in Poland (the seven largest cities: Gdańsk, Gdynia, Kraków, Łódź, Poznań, Warszawa, and Wrocław) to the average gross salary in the corporate sector in seven cities in Poland was examined. The data was presented in real values, deflated by CPI inflation. The resulting metric was termed “housing purchasing power” for both primary and secondary, respectively. To study the purchasing power of total households in the economy, it is necessary to use an indicator that eliminates

the impact of inflation and exchange rate effects. Accordingly, the GDP per capita index with purchasing power parity (denominated in international dollars, in constant 2021 prices) was used. Growth in GDP per capita PPP can be viewed as the cumulative effect of two primary channels: capital accumulation and the expansion of labor resources and quality. Tracking the share of wages in GDP per capita PPP is a key element in analyzing the real growth of workers’ purchasing power. This is important for the formulation of economic (including housing) and social policies conducive to sustainable development, understood as the participation of workers in economic growth when it results from an increase in labor productivity.

The increase in the purchasing power of households in the seven cities increased by 89.6% by 2023 relative to 2007. Meanwhile, their purchasing power in the housing market increased by 57.5% in the primary market and 58.4% in the secondary market. This represents a 32.1 pp and a 31.2 pp difference, respectively, from the growth in purchasing power overall. For most of the analyzed period, the growth of purchasing power in the housing market in the seven cities in Poland grew faster than the growth of purchasing power in the general economy (Fig. 5). In part, the faster growth of purchasing power in the housing market in Poland’s seven cities compared to wages and per capita PPP wages can be explained by higher wages in these cities than in the business sector overall. However, the gap in wage growth between 2007 and 2024 in Poland’s seven cities and the business sector is 6.9 pp, which is significantly smaller than the divergence between purchasing power in the housing market and the purchasing power of citizens in general. The turning point in the trend occurred in 2018, when, for the first time, a decrease in purchasing power in the primary and secondary markets was recorded simultaneously. A year later, in 2019, a lower purchasing power of households in the housing market, relative to purchasing power in the general economy, was observed for the first time in the analyzed period. The change in the trend coincides with significant tax changes enacted on January 1, 2018 (the Law of October 27, 2017, amending

the Law on Income Tax for Individuals, Journal of Laws 2017, pos. 2175). The change concerned the taxation of rental profits. Prior to 2018, a property owner could include a portion of the value

of the apartment in deductible expenses each year through so-called “depreciation deductions”. This reduced income tax on rent and often significantly reduced it. After 2018, the ability to claim

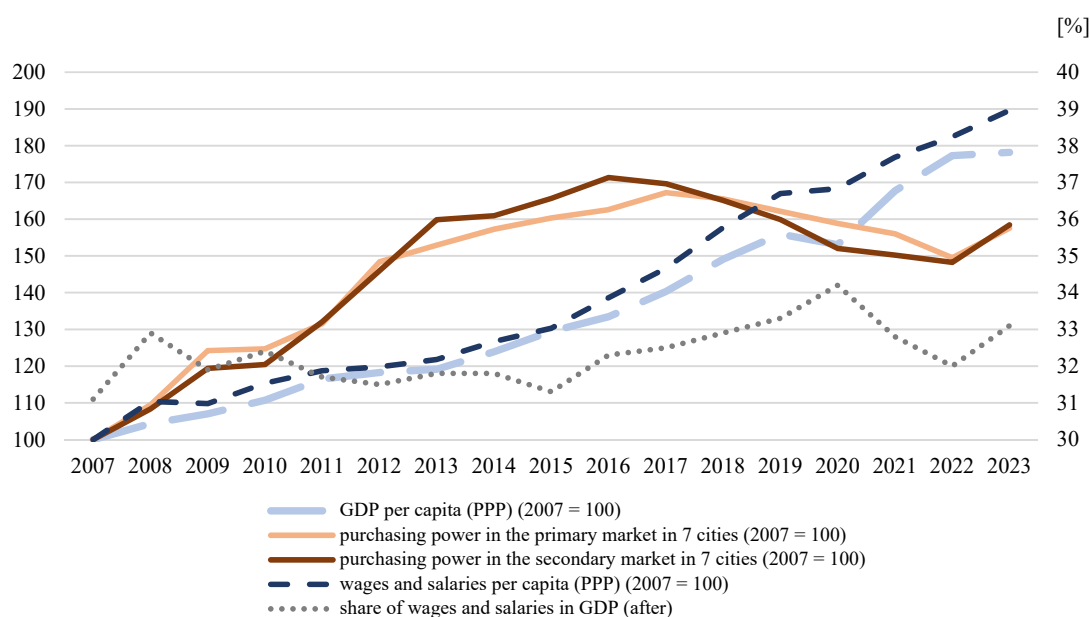


Fig. 5. Purchasing power in the economy vs. purchasing power in the housing market in 2007–2023 (7 Polish cities)

Source: Statistics Poland, National Bank of Poland, Eurostat, World Bank, the authors.

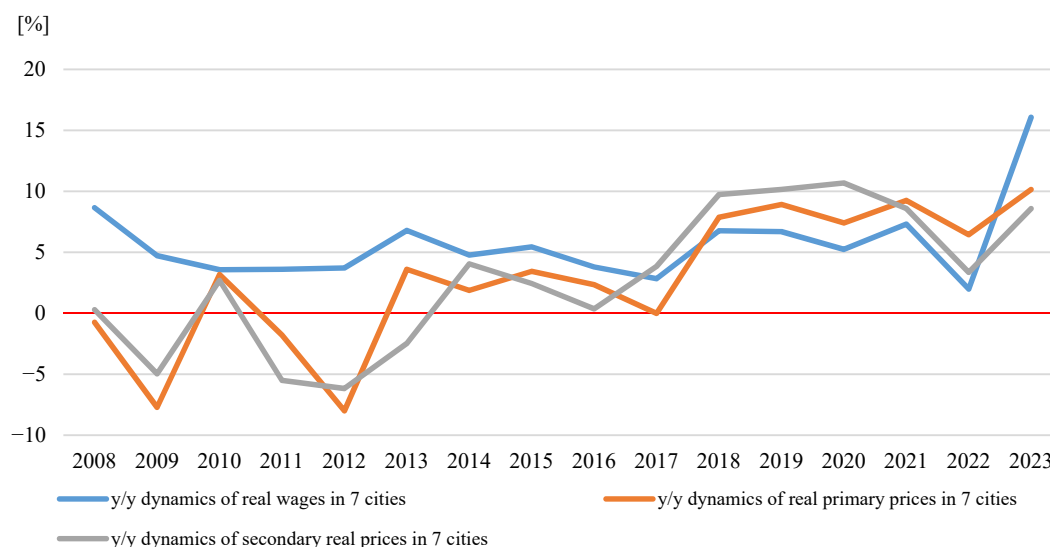


Fig. 6. Real dynamics of wages, housing prices in the primary and secondary markets

Source: the authors based on house prices database [NBP n.d.].

depreciation deductions was eliminated, which reduced the profitability of renting and contributed to the rise in property prices. For the first time in the period under review, housing prices in both the primary and secondary markets rose more strongly than real wage growth.

In 2018, housing prices in the primary market increased by 7.9% y/y (the fourth highest value in the period under review), marking a significant change in the trend. A year earlier, price growth was 0% y/y, and historically, there was no yearly price growth above 3.6% in 2013. The situation in the secondary market looked similar. In 2018, prices in this market increased by 9.7% y/y (the third highest in the period under review). Before this year, the highest year-on-year change did not exceed 4% (Fig. 6).

Despite tax changes designed to limit rental returns, the popularity of this form of capital investment has not diminished. The motivations for these decisions were, according to the National Bank of Poland [NBP 2018], higher rental yields relative to the cost of credit, as well as interest in alternative means of capital allocation, such as 10-year treasury bonds and the dominant banking products in Poland (deposits and savings accounts). This created a desire to purchase an apartment for investment purposes, partially financed by a bank loan and repaid through rental income. Data from National Bank of Poland reports indicate that investment demand as of 2017 accounted for a minimum of 30% of demand in the primary market. During the government's housing programs, there were no sharp increases in housing prices caused by these programs, with the exception of the BK2% program, which was the most liberal program of all.

The differences in purchasing power overall versus in the real estate market should be explained by the attractiveness of investing capital in real estate, which was facilitated by record low interest rates and the low popularity of financial instruments in Poland. According to a survey by the Chamber of Fund and Asset Managers [IZFiA 2023], 58% of Poles save and/or invest. Among this group, 8% invest in bonds, 8% in shares of listed companies, and 6% in TFI mutual funds. Personal accounts (RORs) are

predominant (57%), followed by savings accounts (49%) and term deposits (31%), which have led to a speculative rise in real estate prices and a reduction in the purchasing power of households in this market.

CONCLUSIONS

Analysis of the evolution of the Polish housing market in the context of successive government programs in 2007–2023 reveals a complex interaction between policy interventions, macroeconomic conditions, and the behavior of market participants. The experience of the 'Family on Its Own' (RnS) and 'Housing for the Young' (MdM) programs indicates that appropriately regulated support instruments, especially those addressing key barriers such as the down-payment requirement, can, under favorable conditions, effectively stimulate both the supply of new units and lending without triggering sharp price shocks. However, the effectiveness of these measures was clearly dependent on the phase of the business cycle and the overall stability of the economic environment, as demonstrated by the slowdown in the growth rate of building permits during periods of financial crises during the RnS program. The introduction of the 'Safe Credit 2%' (BK2%) program in 2023 produced completely different results. Although it was an instrument that strongly stimulated demand by subsidizing interest rates, its implementation during a period of elevated inflation, geopolitical uncertainty, and the high cost of financing for developers did not translate into an increase in the supply of housing; on the contrary, declines were observed in this regard. Instead, the program coincided with a significant increase in prices, leading to the conclusion that, in an environment of limited supply elasticity and macroeconomic instability, liberal demand programs primarily risk exacerbating inflationary pressures in the real estate market, undermining their own goal of improving housing availability.

A key finding of the long-term analysis is the growing divergence between the overall growth of society's wealth, as measured by real GDP per capita at purchasing power parity, and the real ability to purchase housing, as reflected by the ratio of square

meter prices to average wages in major metropolitan areas. Since around 2018, this divergence has become particularly pronounced, indicating a systemic deterioration in housing affordability despite continued economic growth. This timing corresponds with changes to the rental income tax system, which were expected to potentially reduce the investment attractiveness of real estate. However, as the data shows, this intervention has not weakened investment demand, which has consistently accounted for a significant portion (at least 30%) of total primary market demand since 2017.

The dominant role of investment demand appears to be a fundamental factor shaping price dynamics in the Polish housing market [Borowski 2015]. Low interest rates, combined with the relatively low level of knowledge and popularity of alternative capital markets among Polish households, have led to the perception of real estate as a safe and profitable form of capital investment. This strong investment preference, often supported by debt financing, generated constant demand pressure, which, under conditions of insufficient supply response, led to price increases exceeding wage dynamics [Gołabeska 2024]. As a result, the market became increasingly difficult to access for those seeking to meet their own housing needs, and the effects of support programs were partially offset by rising prices. These phenomena suggest that the long-term improvement of the housing situation in Poland requires measures that go beyond simple demand instruments, also encompassing supply-side policies, rental and investment market regulations, as well as efforts to develop alternative forms of saving and investment. Instruments such as mortgage subsidies or programs like the BK2% program may bring a short-term increase in housing purchases for certain groups, but in the long term, they may lead to price increases and exacerbate the problem of a shortage of available housing. It is, therefore, crucial to actively increase the supply of housing. Supply policy should include, among other things, facilitating investment processes: shortening administrative procedures, simplifying urban planning, better management of public land, and increasing the role of social and communal housing, which will relieve the burden on the commercial market and develop models that do not rely solely

on commercial activity. In Poland, housing is seen not only as a utilitarian good, but also as an investment and a way to invest capital. This increases demand, which in turn drives up prices. Therefore, new forms of long-term investment of savings, e.g., infrastructure funds, inflation-indexed bonds, and incentives for saving through pension and housing schemes, such as housing accounts with tax benefits, or developing a market of funds that invest in real estate without the need for the individual investor to physically purchase an apartment, can alleviate this situation. In summary, a comprehensive and sustainable housing policy must balance the interests of owners, investors, and developers while taking into account changing demographic and social needs. Only through such an approach will it be possible to sustainably increase the availability of housing and improve the quality of life for Poland's residents.

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EFEKTYWNOŚĆ POLITYKI MIESZKANIOWEJ W POLSCE: SKUTKI INTERWENCJI PUBLICZNYCH W KONTEKŚCIE MAKROEKONOMICZNYM

STRESZCZENIE

Cel: Artykuł ma na celu weryfikację oddziaływania polityki mieszkaniowej prowadzonej w Polsce w latach 2007–2023 na dostępność mieszkań. W szczególności poddano ocenie skuteczność wybranych programów rządowych w kontekście ich oddziaływania na stronę popytową i podażową rynku mieszkaniowego. **Metody:** Przeprowadzono analizę porównawczą kluczowych instrumentów polityki mieszkaniowej, takich jak: „Rodzina na Swoim”, „Mieszkanie dla Młodych” oraz „Bezpieczny Kredyt 2%”, z uwzględnieniem ich implementacji w zmiennych warunkach makroekonomicznych. W badaniu wykorzystano dane statystyczne oraz wskaźniki odnoszące się do dynamiki cen i wynagrodzeń. **Wyniki:** Wykazano, że skuteczność programów wsparcia mieszkaniowego jest powiązana z fazą cyklu koniunkturalnego oraz strukturalnymi ograniczeniami podaży. Programy popytowe, choć krótkoterminowo, zwiększają dostęp do finansowania, mogą prowadzić do wzrostu cen w warunkach ograniczonej elastyczności podaży, jak zaszło w wypadku „Bezpiecznego Kredytu 2%”. W długiej perspektywie działania oparte wyłącznie na stymulowaniu popytu okazują się niewystarczające. **Wnioski:** Skuteczna polityka mieszkaniowa powinna równoważyć interwencje popytowe i podażowe oraz wspierać rozwój oszczędzania i inwestowania. Dostosowanie narzędzi do aktualnych warunków gospodarczych oraz uwzględnienie rosnącej roli popytu inwestycyjnego stanowi klucz do trwałej poprawy dostępności mieszkań w Polsce.

Słowa kluczowe: polityka mieszkaniowa, dostępność mieszkań, programy wsparcia

DOUBLE-HURDLE IN ADOPTION OF DAIRY CATTLE CONTRACT FARMING AMONG SMALL-SCALE FARMERS IN MBEYA, TANZANIA

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ABSTRACT

Aim: Understanding the market dynamics of dairy cattle farming in Tanzania is vital for fostering a competitive and sustainable dairy industry. Contract farming is a prominent market structure in this realm, offering small-scale farmers improved breeds, veterinary services, feed, and extension support. However, the engagement of small-scale farmers in dairy cattle contract farming is currently limited. Encouraging its uptake requires a thorough understanding of the driving forces and impediments. Previous studies investigating the factors influencing the adoption of dairy cattle contract farming have overlooked the correlation between the liquidity constraints of vaccination and the barriers to its adoption. This study addresses this gap. **Methods:** The study analyzed data gathered using a structured questionnaire from 300 randomly selected small-scale dairy cattle farmers in the Mbeya Region and employed a double-probit model to correct sample selection biases. **Results:** The research uncovered that the adoption of dairy cattle contract farming by small-scale farmers is influenced by household size, risk aversion, access to extension services, radio ownership, quantity of dairy cattle owned, type of dairy cattle breed, liquidity constraints of vaccination, utilization of artificial insemination, and the application of veterinary treatment. **Conclusions:** The study emphasizes the efforts toward implementing initiatives that streamline farmers' access to superior dairy cattle breeds, vaccination, veterinary treatment, and artificial insemination services.

Key words: drivers, dairy cattle, contract farming, leaping hurdles, Tanzania

JEL codes: Q12, O33, D01, D10

INTRODUCTION

The adoption of contract farming in the dairy sector has garnered significant attention as a potentially transformative approach for enhancing agricultural production, income, and food security in many developing economies [Reardon et al. 2001, Hirpesa et al. 2021, Ng'ombe et al. 2022]. Dairy cattle contract farming arrangements involve formal agreements between farmers and agribusiness firms, often

with provisions for technical support, input supply, and guaranteed markets [Key et al. 2000, Olounlade et al. 2020]. These agreements aim to optimize resource use and increase overall productivity, making them particularly appealing to small-scale farmers. In sustainable agricultural development, understanding the drivers of adopting dairy cattle contract farming is paramount [Spielman and Hartwich 2008].

Dairy cattle contract farming in Tanzania provides small-scale farmers access to advanced technologies

(like veterinary services and dairy farming machines), resources (such as improved breeds, concentrates, drugs, and feed), and knowledge (via extension services, training and technical supports), which significantly elevate their productivity and profitability [RADO 2023]. Moreover, it secures a stable market for their milk, reducing uncertainties and price fluctuations [Olounlade et al. 2020]. Dairy contract farming plays a pivotal role in elevating milk production's quality and safety standards, ensuring alignment with market requisites, and boosting consumer confidence [Olounlade et al. 2020]. It also fosters connections between small-scale farmers and formal markets, enhancing market access and profitability [RADO 2023].

Contract conditions between dairy farmers and processors in Tanzania include milk quality requirements, delivery schedules, and pricing terms to ensure a reliable supply [RADO 2023]. Some contracts provide technical support and training to help farmers meet quality standards [RADO 2023]. Farmers must usually deliver a minimum quantity of milk, determined by herd size or historical production levels [RADO 2023]. Quality assessment focuses on fat content, bacterial counts, and freshness, with collection centers or processors conducting tests at delivery. Milk not meeting standards may be rejected or purchased at a reduced price [RADO 2023]. Penalties for contract non-fulfillment, including payment reductions or contract suspension, are outlined in the contract terms [RADO 2023].

Milk prices in Tanzania are influenced by market demand, production costs, and quality, with premiums awarded for high-quality milk [MLF et al. 2019, RADO 2023]. Additionally, seasonal demand variations and government policies contribute to price stabilization for both farmers and processors [MLF et al. 2019].

Despite the relevance of dairy cattle contract farming, challenges persist within Tanzania's system. These encompass the scarcity and high costs of inputs, inadequate extension services, difficulties in contract enforcement, and unequal power dynamics between farmers and contracting entities [RADO 2023]. These obstacles can potentially hinder fair benefit distribution and limit the transformative impact on the lives of small-scale dairy farmers.

To address these challenges, various policies and plans in Tanzania advocate for and encourage engagement in contract farming among small-scale farmers. These include the National Agricultural Policy of 2013, the Agricultural Marketing Policy of 2008, and the Tanzania (National) Five-Year Development Plan (2016–2021) [MFP 2016, AGRA 2019]. Nonetheless, participation in contract farming remains limited among small-scale dairy cattle farmers in Tanzania [Ochieng et al. 2017].

Numerous research endeavors [Islam et al. 2019, Nhan 2019, Bidzakin et al. 2020, Olounlade et al. 2020, Hirpesa et al. 2021, Pham et al. 2020, Nhan 2019, Islam 2021, Kiwanuka-Lubinda et al. 2021, Ng'ombe et al. 2022] have investigated the factors influencing engagement in livestock contract farming across Sub-Saharan Africa, including Tanzania. Nevertheless, these studies have thus far omitted exploring the correlation between the utilization of artificial insemination, liquidity constraints stemming from vaccination, and participation in dairy cattle contract farming, which is a knowledge gap that this research seeks to address.

This paper comprehensively analyzes the overlooked driver, considering various socio-economic, technological, and institutional factors influencing farmers' decisions to participate in dairy cattle contract farming. This study contributes to the body of literature as it analyzes the relationship between the liquidity constraints of vaccination and the utilization of artificial insemination and participation in dairy cattle contract farming, which previous studies have overlooked. Also, this study examined the two hurdles dairy cattle farmers face while adopting contract farming.

PRODUCTION OF MILK IN TANZANIA

Milk production in Tanzania rose from 2017 to 2020 (Fig. 1), supported mainly by indigenous breeds and predominantly driven by smallholder farmers [Kitole and Sesabo 2022]. In Tanzania, around 2 million smallholder farms are involved in milk production, predominantly family-operated, with herds typically ranging from a single cow to 10 cows [MLF 2017]. Smallholders contribute

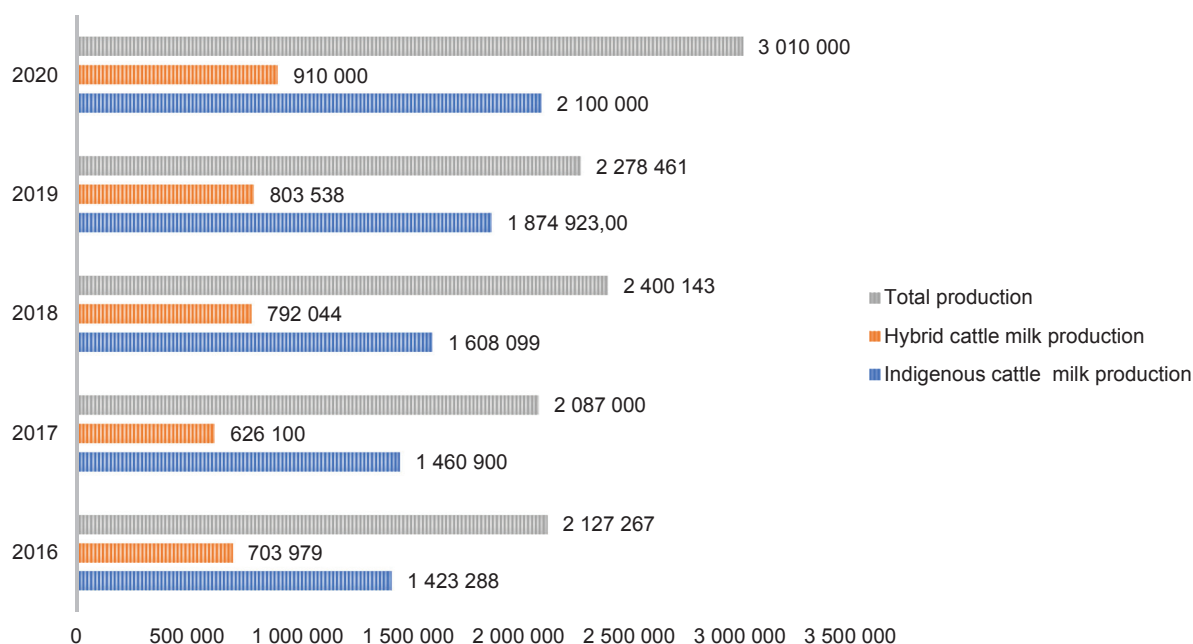


Fig. 1. Milk production (in thousands of liters) in Tanzania from 2016 to 2020

Source: NBS [2021].

over 90% of the national milk supply, while larger commercial farms, mainly in regions such as Arusha and Kilimanjaro, contribute a smaller share [Lunogelo and Makene 2020].

Most smallholder farms keep indigenous breeds like the Tanzania shorthorn zebu, yielding 1–2 L of milk daily [MLF et al. 2019, Kitole and Sesabo 2022]. Crossbreeding has introduced higher-yielding breeds, producing 10–15 L daily in favorable areas [MLF et al. 2019, Kitole and Sesabo 2022]. Commercial farms, though limited, manage high-yield breeds like the Holstein-Friesian, with outputs of 15–30 L daily [MLF et al. 2019]. Feeding strategies vary widely as smallholders depend on natural pastures and crop residues, while commercial farms use structured feeds like silage and concentrates to boost yields [MLF et al. 2019]. Development programs are helping smallholders adopt fodder cultivation to improve productivity [Shija et al. 2022]. As smallholder producers dominate the sector, much of the milk produced is consumed locally, with only a limited portion reaching formal markets [RADO 2023]. Major production

areas include the northern, eastern, and southern highlands, with a few larger commercial dairies near urban centers [RADO 2023].

Milk production for native cows remains low, averaging 0.5–2.0 L daily, compared to pure dairy breeds, which can produce 20–30 L daily [MLF 2022]. However, milk production drops to a minimum during dry seasons, hindering the value chain [MLF 2022]. The country's annual milk production is approximately 3 billion L, though productivity varies significantly depending on factors like breed type, feeding practices, and farm management [Shija et al. 2022]. The national cattle herd comprises indigenous breeds, which currently exhibit low productivity [MLF 2022]. Nevertheless, these breeds have considerable potential for improvement if advancements are made in their feeding, health care, and breeding practices [MLF 2022]. Challenges like feed availability, limited veterinary care, and market access affect the overall productivity [MLF 2022]. To improve milk production and productivity, initiatives including the Livestock Sector Transformation Plan (LSTP) and the African

Dairy Genetic Gains (ADGG) Program focus on enhancing high-quality breeding, feed practices, animal health, extension services, value addition of livestock products, including milk, and infrastructure development [MLF 2022, Shija et al. 2022]. In Tanzania, only about 2.7% of the milk produced is sold to processors through contractual agreements or informal arrangements (Fig. 2).

Milk production from native cows in Tanzania remains low due to breed limitations and seasonal challenges. However, productivity can be improved through better feeding, healthcare, and breeding practices, supported by initiatives such as the LSTP and the ADGG.

LITERATURE REVIEW

Two-step partially observed theoretical model

This study extracted pertinent insights regarding the determinants of engagement in contract farming by employing the two-step partially observed model established by Dimara and Skuras [2003] to elucidate individual decision-making processes. The model postulates that whether to embrace an innovation is contingent upon prior awareness or knowledge of that innovation, i.e., achieving an optimal information level. Within this framework, participation in contract farming is conceived as a two-step decision-making process. Initially, the decision-maker decides

whether to acquire awareness regarding the presence and advantages of contract farming. Subsequently, the decision-maker chooses to engage in or adopt contract farming practices. These two steps are presumed to be influenced by a range of factors encompassing household socio-demographic and economic variables and institutional elements.

The decision-maker's goal is to maximize utility based on the information accessible to them. Under this premise, the relationship can be articulated as follows:

$$I^* \equiv I(x) \quad (1)$$

where:

I^* – latent information level,

I – observed information level,

x – vector of individual characteristics.

The decision-maker is aware of the innovation if the level of acquired information is greater than a certain threshold level (I^T):

$$I^* > I^T \quad (2)$$

or

$$Y^{A*} \equiv I^* - I^T > 0. \quad (3)$$

It can be expressed as a linear model:

$$Y^{A*} \equiv \beta z + \varepsilon^A \quad (4)$$

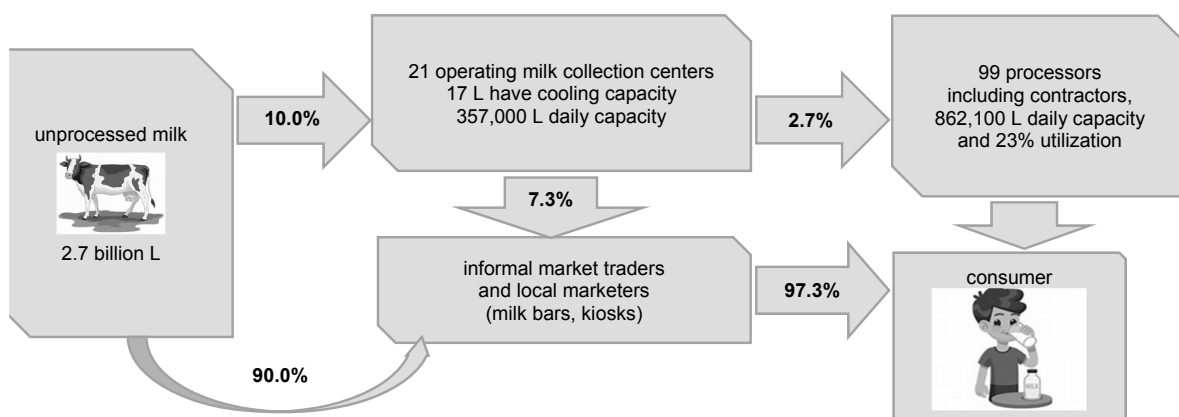


Fig. 2. Market channels of milk produced in Tanzania

Source: MLF et al. [2019].

where:

Y^{A*} – latent variable for awareness,

β – vector of parameter,

z – vector of explanatory variables,

ε^A – error term related to the level of awareness (A),

Thus, the outcome (i.e., whether the dairy contract farming is adopted or not) is denoted by Y . Hence, the relationship can be expressed as:

$$Y = Y^A = \begin{cases} 1 & \text{if adopted, } \theta X > 0 \\ 0 & \text{if not adopted, } \theta X \leq 0 \end{cases} \quad (5)$$

Thus, the outcome (i.e., whether the dairy contract farming is adopted or not) is denoted by Y .

Empirical literature on the drivers of adopting contract farming

The studies unveiled several household characteristics that influence participation in contract farming. Engagement in these contracts was positively and significantly associated with age [Hirpesa et al. 2021], gender, where male-headed households showed a positive correlation [Kiwanuka-Lubinda et al. 2021], and female-headed households demonstrated a similar trend [Soullier and Moustie 2018], as well as household size [Rondhi et al. 2020, Ng'ombe et al. 2022]. The marital status of the household head [Ng'ombe et al. 2022], education, farm size, and risk preference [Rondhi et al. 2020], experience [Kiwanuka-Lubinda et al. 2021] and wealth [Kiwanuka-Lubinda et al. 2021], selling to milk collection centers [Kiwanuka-Lubinda et al. 2021], ownership of improved breed animals [Soullier and Moustie 2018], livestock holding, and ownership of a milking parlor [Kiwanuka-Lubinda et al. 2021] all demonstrated a positive influence on farmers' inclination to participate in contract farming. Access to these inputs through the contract enhanced productivity and profitability. Price stability and premiums also played a pivotal role. Contracts offering stable and favorable prices, including price premiums or guaranteed minimum prices, motivated farmers to adopt contract farming. Perceptions of price uncertainty [Hirpesa et al. 2021], delayed payment [Ng'ombe et al. 2022], milk price [Soullier and Moustie 2018], price fluctuations, and the average price experience before contract farming partici-

pation [Islam et al. 2019] were significant incentives for smallholder farmers.

Institutional factors, including access to marketing information [Kiwanuka-Lubinda et al. 2021], proximity to the central market and cooperative membership [Bezabeh et al. 2020], access to dairy marketing information [Soullier and Moustie 2018], distance from a miller offering production contracts [Soullier and Moustie 2018], and the frequency of extension contacts and access to training [Hirpesa et al. 2021] positively influenced the adoption of contract farming. These services augmented farmers' knowledge and capacity to meet quality standards, employ improved practices, and comply with contractual requirements. However, some studies indicated that participation in contract farming was negatively and significantly linked with distance from the collection center and perceived credit uncertainty [Soullier and Moustie 2018].

Socioeconomic factors were also notable determinants. Landholding [Soullier and Moustie 2018, Kiwanuka-Lubinda et al. 2021], and income from other sources, the presence of milk collection centers, and milk price [Soullier and Moustie 2018] were identified as significant factors influencing contract farming adoption. Farmers with higher levels of education, larger households, and secure land tenure were more inclined to engage in contract farming. The empirical literature reviewed underscores the intricate array of determinants shaping the decision of smallholder farmers to partake in contract farming in developing countries. The findings highlight the importance of household factors, resources/inputs, price stability, institutional factors, and socioeconomic elements in influencing farmers' participation in contract farming agreements.

DATA AND METHODS

The study utilized cross-sectional data gathered in the Mbeya Region, a well-known and esteemed area in the Southern Highlands of Tanzania. It is celebrated for its exceptional dairy cattle breeds and long-established dairy farming practices. The study adopted a cross-sectional survey design and employed a three-stage sampling strategy. Initially, purposive sampling was used to select the specific districts for the study.

The Rungwe district was chosen deliberately due to its notable prominence in dairy farming relative to other districts. Secondly, based on the presence of contract farming, the study selectively identified five villages for inclusion. Finally, a stratified random sampling technique with non-proportional sampling, as per the method delineated by Kilima [2021], was employed to select dairy farmers with and without contract farming. The process yielded a sample size of 300 dairy cattle farmers, consisting of 179 dairy cattle contract farmers and 121 non-dairy cattle farmers. Data for the study, conducted in 2023, was gathered from the sample using a structured questionnaire.

The two-stage or double-probit model, as suggested by Dimara and Skuras [2003], is applied to analyze the determinants of adoption of contract farming among dairy farmers. Dimara and Skuras [2003] describe the two-stage or double-probit model as consisting of the awareness and adoption equations. The probit model for the awareness equation is specified as:

$$Y_i^{A*} = \beta_i X_i + \varepsilon_i^A \quad (6)$$

$$Y_i^A = \begin{cases} 1 & \text{if } Y_i^{A*} > 0, \beta_i X_i > \varepsilon_i^A \\ 0 & \text{if } Y_i^{A*} \leq 0, \beta_i X_i \leq \varepsilon_i^A \end{cases} \quad (7)$$

where:

Y_i^{A*} – latent continuous variable indicating the tendency of the household (i) of being aware of the availability of contract farming,

β_i – vector of unknown parameters,

X_i – vector of variables that may explain whether a household (i) is aware of the availability of contract farming,

ε_i^A – error term related to the level of awareness (A) that considers the effects of unobserved variables on the tendency of the household (i) to be aware of the availability of contract farming,

Y_i^A – observed binary variable indicating whether the household (i) is aware of the availability of contract farming or not ($Y_i^A = 1$ if a dairy cattle farmer is aware of the availability of contract farming; $Y_i^A = 0$ otherwise).

The participation equation (outcome equation) estimated using the probit model can be written as:

$$Y_i^* = \gamma_i Z_i + \varepsilon_i \quad (8)$$

$$Y_i = \begin{cases} 1 & \text{if } Y_i^* > 0, Y_i^{A*} > 0 \\ 0 & \text{if } Y_i^* \leq 0, Y_i^{A*} \leq 0 \end{cases} \quad (9)$$

where:

Y_i^* – (latent) expected utility gain from adopting the contract farming,

γ_i – vector of unknown parameters,

Z_i – vector of explanatory variables that may explain the expected utility gain from adopting the contract farming,

ε_i – error term that considers the effects of unobserved factors on the expected utility gain from adopting the contract farming,

Y_i – observed binary variable indicating whether the household adopts the contract farming or not ($Y_i = 1$ if a dairy cattle farmer participates in the contract farming; $Y_i = 0$ otherwise).

Dimara and Skuras [2003] suggest that error terms follow a bivariate standard normal distribution:

$$\begin{pmatrix} \varepsilon_i^A \\ \varepsilon_i \end{pmatrix} \sim N_2(\rho) \quad (10)$$

where:

$$\begin{pmatrix} \varepsilon_i^A \\ \varepsilon_i \end{pmatrix} \sim N_2 \quad (11)$$

where:

N_2 – indicates the bivariate standard normal distribution, $\rho \in [-1, 1]$ – coefficient of correlation between variances ε_i^A and ε_i (and are without loss of generality normalized to 1).

The double-probit model offers two notable advantages [Dimara and Skuras 2003]: (1) This model treats the variable “awareness” as an observed variable, enhancing the precision of estimates through the inclusion of additional information; and (2) The influence of unobserved factors on awareness is uncorrelated with the influence of unobserved factors on adoption – this study does not impose such a highly restrictive assumption.

RESULTS AND DISCUSSION

Descriptive results

Table 1 provides a comprehensive overview of the descriptive findings, encompassing the entire sample and those obtained by separating participants from non-participants in dairy cattle contract farming. The results in Table 1 indicate significant disparities between these two groups across various

variables. The analysis reveals a significant difference in awareness of dairy cattle contract farming between participants and non-participants, significant at the one-percent level. This suggests that participants are more informed about dairy cattle contract farming than non-participants. There is a substantial difference in education levels between participants and non-participants, significant at the ten-percent level. Participants tend to be more educated than non-participants. Participants

Table 1. Descriptive results of contract and non-contract dairy cattle farmers

Variable	All	Dairy cattle contract farmers	Dairy cattle non-contract farmers	p-Value
Awareness of dairy cattle contract farming	0.683	0.989	0.231	0.000
Sex of the household head (male)	0.790	0.816	0.752	0.19
Age [year]	0.468	0.470	0.465	0.798
Education (no education)	0.0700	0.045	0.107	0.053
Household size (number)	4.107	4.045	4.198	0.474
Experience in dairy farming [year]	13.450	14.402	0.120	0.061
Risk aversion [risk taker]	0.570	0.520	0.645	0.031
Total landholding [acre]	1.803	1.894	2.140	0.009
Quantity of cattle (number)	2.387	2.553	2.140	0.093
Quantity of dairy cattle (number)	1.817	1.939	1.636	0.014
Liquidity constraints of vaccination [yes]	0.220	0.235	0.198	0.453
Distance from veterinary clinic to grazing land [km]	1.653	1.274	2.215	0.0000002
Distance from Mbeya to the village [km]	870.912	102.438	64.388	0.302
Type of breed (improved)	0.160	0.240	0.041	0.000001
Use of veterinary treatment/improved cure (yes)	0.897	0.933	0.843	0.019
Use of artificial insemination (yes)	0.127	0.145	0.099	0.226
Use of vaccinations (yes)	0.780	0.816	0.727	0.078
Received extension service (yes)	0.370	0.380	0.355	0.667
Radio ownership (yes)	0.870	0.922	0.793	0.0023
Cost of feed [TZS]	556 930.4	586 377.8	513 367.8	0.322
Cost of concentrate [TZS]	385 891.9	386 848.5	384 476.9	0.972
Cost of veterinary care [TZS]	134 325	14 204.75	122 900.8	0.226
Cost of rope [TZS]	27 182.0	22 360.9	34 314.05	0.434
Cost of production tools [TZS]	23 842.84	22 678.78	25 564.88	0.483
Cost of phone calls [TZS]	51 988.00	53 473.74	49 790.08	0.562
Cost of transport [TZS]	40 498.17	39 730.17	41 634.3	0.735
Observation	300	179	121	×

Source: authors' research.

in dairy cattle contract farming have, on average, significantly more years of experience in dairy cattle farming than non-participants, which is significant at the ten-percent level. Risk aversion substantially differs between the two groups, significant at the one-percent level, indicating that participants are, in proportion, less inclined to take risks than non-participants. Total landholding significantly differs between the two groups at the one-percent level. On average, participants have smaller total landholdings than non-participants.

Participants have, on average, significantly larger quantities of both cattle and dairy cattle compared to non-participants, significant at the ten-percent and five-percent levels, respectively. There is a substantial difference in the distance from veterinary services to grazing land between participants and non-participants, significant at the one-percent level. On average, participants have a shorter distance from veterinary services to grazing land. Participants significantly used improved dairy cattle breeds and vaccinations compared to non-participants, which were significant at the one-percent and ten-percent levels, respectively. A substantial difference in radio ownership exists between the two groups, significant at the one-percent level. Participants own a higher proportion of radios compared to non-participants.

Table 1 shows significant differences between participants and non-participants in dairy cattle contract farming, including awareness, education, experience, risk aversion, livestock ownership, and access to veterinary services. These disparities highlight the influence of contract farming participation on socioeconomic and farming characteristics.

Drivers of awareness of contract farming among small-scale dairy cattle farmers

Table 2 shows that awareness of dairy cattle contract farming is significantly associated with household size, risk aversion, extension service, quantity of dairy cattle owned, dairy cattle breed type, distance from the veterinary clinic to the grazing land, use of artificial insemination, and liquidity constraints of vaccination. Household size is found to be negative and significantly associated with awareness of dairy cattle contract farming at 10%. The finding indicates

that household size reduces the probability of awareness of dairy cattle contract farming by 3 percentage points (pp), *ceteris paribus*. This finding concurs with the underpinning theoretical expectations.

Risk aversion is found to be negative and significantly related to awareness of dairy cattle contract farming at 5%. The finding shows that risk-taking dairy cattle farmers are 12 pp less likely to be aware of dairy cattle contract farming than risk-averse dairy cattle farmers, holding the other factors constant. This finding aligns with the underpinning theoretical expectations. However, the extension service is found to be positive and significantly associated with awareness of dairy cattle contract farming at 10%. The finding indicates that dairy cattle farmers with access to extension services have a 9 pp higher probability of being aware of dairy cattle contract farming than those with no access to extension services, *ceteris paribus*. This finding concurs with the underpinning theoretical expectations.

Also, the quantity of dairy cattle owned and the dairy cattle breed type were found to be positively and significantly related to awareness of contract farming at 5% and 1%, respectively. These indicate that the probability of being aware of dairy cattle contract farming increases by 7 pp for farmers with a larger quantity of dairy cattle and by 19 pp for farmers using improved dairy cattle breeds, respectively, than otherwise, *ceteris paribus*. This finding concurs with the underpinning theoretical expectations. On the other hand, the finding shows that dairy cattle farmers who use artificial insemination are 12 pp more likely to be aware of dairy cattle contract farming than those with no use of artificial insemination at the ten-percent level. In contrast, distance from the veterinary clinic to the grazing land is found to significantly reduce the probability of being aware of dairy cattle contract farming by 9.5%, holding the other factors constant.

Further, the results show that liquidity constraints from vaccination significantly (at 5%) increase the likelihood of being aware of dairy cattle contract farming by 13 pp at *ceteris paribus*. The discovery implies that limited financial access to vaccination services heightens awareness about contract farming among dairy cattle farmers. Financial constraints

can prompt farmers to explore diverse approaches to enhance dairy cattle management and income generation, ultimately leading to increased awareness of contract farming as a viable solution. Additionally, the finding suggests that farmers facing these constraints possess greater awareness of contract farming as a method to mitigate risks related to dairy cattle health and financial stability. Contract farming may provide a channel to access resources, such as vacci-

nation services, through collaborations with contract farming sponsors or buyers. This acts as a significant obstacle to dairy contract farming, compelling farmers to seek contract farming knowledge for future decision-making.

Therefore, awareness of dairy cattle contract farming is significantly influenced by household size, risk aversion, extension services, livestock quantity and breed type, artificial insemination, distance

Table 2. Estimated DPM results on drivers of awareness of dairy cattle contract farming

Variable	Estimate	SE	ME
Intercept	−0.704	0.847	–
Age [year]	0.006	0.007	0.180
Sex (male)	0.209	0.209	0.063
Education (no education)	−0.283	0.327	−0.089
Household size (number)	−0.086*	0.049	−0.025
Experience [year]	0.0095	0.011	0.003
Risk attitude (risk taker)	−0.411**	0.1966	−0.115
Radio ownership (yes)	0.272	0.253	0.084
Extension service (yes)	0.340*	0.186	0.094
Quantity of dairy cattle owned (number)	0.250**	0.109	0.072
Dairy cattle breed type (improved)	0.862***	0.310	0.188
Quantity of cattle owned (number)	−0.008	0.088	−0.002
Land holding [acre]	−0.031	0.052	−0.009
Cost of dairy production tools [TSZ]	0.000003	0.0000029	0.0000009
Cost of fodder [TSZ]	−0.0000006	0.000001	−0.00000002
Cost of concentrates [TSZ]	0.0000003	0.0000002	0.0000007
Cost of rope [TSZ]	−0.000003	0.000003	−0.000001
Cost of veterinary services [TSZ]	0.0000005	0.0000006	0.0000002
Cost of phone calls [TZS]	0.0000005	0.000002	0.0000001
Cost of transport [TZS]	−0.000001	0.000002	−0.0000004
Distance from veterinary clinic to grazing land [km]	−0.333***	0.0746	−0.095
Distance from Mbeya town to the village [km]	0.011	0.0106	0.003
Use of veterinary services (yes)	−0.314	0.313	−0.081
Use of artificial insemination (yes)	0.477*	0.278	0.116
Liquidity constraint of vaccination service (yes)	0.494**	0.227	0.125
Access/Use of the vaccination service (yes)	0.335	0.211	0.103

*indicates statistical significance at the 0.10 level, **indicates statistical significance at the 0.05 level, ***indicates statistical significance at the 0.01 level.

Source: authors' research.

to veterinary services, and liquidity constraints. These factors highlight key determinants affecting farmers' awareness and decision-making in contract farming.

Drivers of participation in dairy cattle contract farming among small-scale contract farming

Table 3 shows that determinants of participation in dairy cattle contract farming are significantly associated with education, household size, risk aversion, extension service, radio ownership, quantity of dairy cattle owned, dairy cattle breed type, use of artificial insemination, and use of veterinary treatment. Education is found to be negative and significantly related

to participation in contract farming at 5%, whereas not being educated reduces the probability of participating in dairy cattle contract farming by 27 pp, *ceteris paribus*. Farmers with education are better equipped to assess the potential benefits and risks associated with contract farming and make informed decisions about participation. This finding concurs with the theoretical expectations and with previous studies [Kiwanuka and Machethe 2016, Islam et al. 2019, Olouniade et al. 2020, Rondhi et al. 2020].

Household size is also found to be negative and significantly associated with participation in dairy cattle contract farming at 5%. The finding indicates

Table 3. Estimated DPM results on drivers of participation in dairy cattle contract farming

Variable	Estimate	SE	ME
Intercept	-1.592***	0.540	–
Age [year]	0.001	0.007	0.0004
Sex (male)	0.262	0.204	0.102
Education [year]	-0.699**	0.320	-0.273
Household size (number)	-0.105**	0.047	-0.040
Experience [year]	0.011	0.010	0.0004
Risk attitude (risk taker)	-0.349*	0.184	-0.131
Radio ownership (yes)	0.802***	0.251	0.312
Extension service (yes)	0.468***	0.178	0.173
Quantity of dairy cattle owned (number)	0.212**	0.099	0.081
Dairy cattle breed type (improved)	1.137***	0.298	0.347
Quantity of cattle owned (number)	-0.013	0.085	-0.0005
Land holding [acre]	-0.028	0.0482	-0.001
Cost of dairy production tools [TSZ]	-0.0000009	0.000002	-0.0000003
Cost of fodder [TSZ]	-0.00000001	0.0000001	-0.000000005
Cost of concentrates [TSZ]	-0.00000007	0.0000002	-0.00000003
Cost of rope [TSZ]	-0.000002	0.000002	-0.0000008
Cost of veterinary services [TSZ]	0.0000003	0.0000006	0.0000001
Cost of phone calls [TZS]	0.000001	0.0000015	0.0000004
Cost of transport [TZS]	-0.0000008	0.000002	-0.0000003
Use of veterinary services (yes)	0.554*	0.284	0.217
Use of artificial insemination (yes)	0.464*	0.254	0.164
Liquidity constraint of the vaccination service (yes)	0.196	0.205	0.073
Use of the vaccination service (yes)	0.258	0.203	0.10003

*indicates statistical significance at the 0.10 level, **indicates statistical significance at the 0.05 level, ***indicates statistical significance at the 0.01 level.

Source: authors' research.

that household size reduces the probability of participating in dairy cattle contract farming by 4 pp, *ceteris paribus*. The finding indicates that a larger household size decreases the likelihood of participation in dairy cattle contract farming. The large number of household members reduces participation in dairy cattle contract farming because the head of the household has a huge burden of taking care of them and invests less effort in dairy cattle farming. The discovery underscores the potential hurdles faced by farmers in larger households, as they might possess fewer resources to invest in learning about and participating in contract farming. This aligns with the expected theories underlying this issue. Moreover, it diverges from earlier research by Nhan et al. [2019], Rondhi et al. [2020], and Ng'ombe et al. [2022], likely due to their focus on broiler contract farming determinants [Rondhi et al. 2020] and rice contract farming [Nhan et al. 2019]. Additionally, Ng'ombe et al. [2022] explored dairy contract farming using Bayesian zero-one inflated beta regression, while this study employed a double-probit model.

Similarly, risk aversion is found to be negative and significantly related to participation in dairy cattle contract farming at 10%. The finding shows that risk-taking dairy cattle farmers have less likelihood of participating in dairy cattle contract farming by 12 pp than risk-averse dairy cattle farmers, holding the other factors constant. The finding indicates that farmers who are more risk-averse are less likely to be aware of contract farming opportunities and are hesitant to engage in such arrangements. Risk-taking farmers may be less inclined to seek information or actively engage in learning about contract farming due to their aversion to potential risks and uncertainties. This finding supports the earlier studies [Hou et al. 2020, Pham et al. 2020] and is contrary to theoretical expectations.

Radio ownership is found to be positive and significantly associated with participation in dairy cattle contract farming at 1%. The finding indicates that dairy cattle farmers with a radio have a higher probability of participating in dairy cattle contract farming by 31 pp than those with no radio, *ceteris paribus*. On the other hand, the extension service is found to be positive and significantly associated with

participation in dairy cattle contract farming at 1%. The finding implies that radio access plays a significant role in facilitating awareness and engagement in contract farming among dairy cattle farmers. The radio is a significant means of accessing information and knowledge regarding participation in dairy cattle contract farming among small-scale farmers.

The finding indicates that dairy cattle farmers with access to extension services have a higher probability of participating in dairy cattle contract farming by 17 pp than those with no access to extension services, *ceteris paribus*. The finding suggests that extension services play a crucial role in promoting knowledge dissemination, awareness, and engagement in contract farming among dairy cattle farmers. By having access to extension services, farmers can receive up-to-date information about the benefits, requirements, and opportunities associated with dairy cattle contract farming. This finding supports theoretical expectations and previous studies [Mishra et al. 2018, Islam et al. 2019, Pham et al. 2020, Hirpesa et al. 2021].

The quantity of dairy cattle owned and the dairy cattle breed type were positively and significantly related to the adoption of contract farming at 5% and 1%, respectively. These indicate that the probability of participating in dairy cattle contract farming increases by 8 pp for farmers with a larger quantity of dairy cattle and by 35 pp for farmers using improved dairy cattle breeds, respectively, than otherwise, *ceteris paribus*. The finding suggests that certain factors related to herd size and breed selection significantly influence farmers' engagement in contract farming arrangements. Farmers with a larger quantity of dairy cattle may benefit from economies of scale in contract farming. A larger herd size allows for greater production volumes, which can attract contract farming sponsors or buyers seeking a stable and consistent supply of dairy products. The finding about the number of dairy cattle validates earlier research by Bezabeh et al. [2020] and Kiwanuka-Lubinda et al. [2021]. Similarly, the observation concerning the specific dairy cattle breed aligns with a prior study conducted by Kiwanuka and Machette [2016].

Again, the finding shows that dairy cattle farmers who use artificial insemination are 16 pp more

likely to be aware of dairy cattle contract farming at the ten-percent level than those who do not use artificial insemination. Artificial insemination is a technology-driven practice that offers several advantages for dairy cattle breeding. Artificial insemination is relevant for dairy cattle herds in contract farming as it helps to improve the quality of dairy cattle breeds and, thus, the production of milk, while also helping to enhance the breeding efficiency and genetics in dairy cattle herds in contract farming. The finding confirms this study's expectations as per the theory used.

Likewise, the use of veterinary treatment services is found to be significant at 1%, increasing the probability of participation in dairy cattle contract farming by 22 pp while holding the other factors constant. The finding indicates the importance of animal health management and the role it plays in farmers' decision-making regarding contract farming engagement. Veterinary treatment plays a crucial role in maintaining the health and well-being of dairy cattle. Farmers who prioritize veterinary care are likely to have healthier and more productive herds. This finding is in line with the theoretical expectation.

Thus, participation in dairy cattle contract farming is influenced by education, household size, risk aversion, access to information, and livestock management practices, highlighting key factors affecting farmers' decisions.

CONCLUSIONS AND POLICY IMPLICATIONS

Participation in dairy cattle contract farming follows a two-step process involving distinct decision-making stages. Firstly, it hinges on an individual's awareness of dairy cattle contract farming, and secondly, it encompasses the actual engagement in dairy cattle contract farming. These two decision stages are influenced by various factors, which can operate independently or in combination. The decision to participate in contract farming is primarily influenced by factors such as household size, risk aversion, access to extension services, radio ownership, the quantity of dairy cattle owned, the type of dairy cattle breed, utilization of artificial insemination, and the application of veterinary treatment.

Given the positive influence of radio ownership and extension services on dairy contract farming par-

ticipation, it is imperative to emphasize the promotion of these information sources. Policymakers should prioritize initiatives to enhance access to information and knowledge dissemination through radio programs. By advocating for the use of radios and broadcasting pertinent agricultural information, policymakers can effectively raise awareness among farmers regarding dairy contract farming opportunities, their advantages, and the support services accessible to them. This proactive approach can greatly facilitate the engagement of farmers, particularly those in remote areas, by ensuring they remain well-informed about market dynamics, technological advancements, and available extension services.

The study recommends the effective and streamlined delivery of artificial insemination and the utilization of veterinary treatment to enhance the quality and well-being of dairy cattle breeds, ultimately supporting sustainable milk production within contract farming. The policy implications of this finding could involve incentivizing and promoting the adoption of artificial insemination among dairy cattle farmers. Encouraging the use of artificial insemination might also indirectly bolster awareness and engagement in dairy cattle contract farming initiatives. Policymakers could consider subsidizing artificial insemination programs or offering educational resources to facilitate its adoption among farmers, potentially contributing to increased awareness and participation in dairy cattle contract farming. This strategy may enhance overall productivity and sustainability within the dairy farming sector.

This study reiterates the importance of improving the accessibility of veterinary services. Therefore, policymakers should place a high priority on initiatives aimed at augmenting access to high-quality veterinary services for dairy farmers. This goal can be achieved by establishing veterinary clinics, mobile veterinary units, and telemedicine platforms that offer prompt and cost-effective veterinary care. By ensuring that veterinary treatment is readily available, policymakers can foster the overall health and productivity of dairy cattle, thereby motivating more farmers to engage in contract farming.

The research has uncovered that possessing a significant number of improved dairy cattle breeds bolsters participation in contract farming. This study underscores the importance of actively promoting

the adoption of advanced dairy cattle technologies to boost engagement in dairy contract farming and, consequently, milk production. Policymakers should direct their efforts toward implementing initiatives that streamline access to superior dairy cattle breeds for farmers. Achieving this objective may involve the introduction of breeding programs, subsidies, or partnerships with organizations specializing in live-stock enhancement. By expanding the availability of improved breeds, a larger number of farmers can partake in contract farming, potentially leading to heightened productivity, increased profitability, and the overall advancement of the dairy sector.

LIMITATIONS AND AREA FOR FUTURE RESEARCH DIRECTIONS

To bolster the external validity of this study, future research initiatives may contemplate utilizing longitudinal data to scrutinize the enduring relationship between participation in dairy cattle contract farming and diverse factors or impediments. Furthermore, it is imperative to undertake an analysis of the effects of engaging in dairy cattle contract farming by harnessing data from multiple countries. This broader approach can offer a more comprehensive understanding of the subject matter and its global applicability.

Acknowledgement

Mzumbe University Small Competitive Grant of 2022 under the Directorate of Research and Postgraduate Studies, Department of Research and Publications, Mzumbe University, Morogoro, Tanzania.

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BARIERY WDRAŻANIA CHOWU KONTRAKTOWEGO BYDŁA MLECZNEGO PRZEZ DROBNYCH ROLNIKÓW W REGIONIE MBEYA W TANZANII

STRESZCZENIE

Cel: Zrozumienie dynamiki rynku hodowli bydła mlecznego w Tanzanii jest kluczowe dla wspierania konkurencyjnego i zrównoważonego sektora mleczarskiego. Kontraktacja rolnicza jest istotną strukturą rynkową w tym obszarze, gdyż oferuje drobnym rolnikom ulepszone rasy bydła, usługi weterynaryjne, paszę oraz wsparcie doradcze. Jednak zaangażowanie drobnym rolników w hodowlę bydła mlecznego w ramach kontraktów jest obecnie ograniczone. Zachęcanie do jej upowszechnienia wymaga dogłębnego zrozumienia czynników motywujących i barier. Dotychczasowe badania nad czynnikami wpływającymi na przyjmowanie hodowli kontraktowej bydła mlecznego pomijały związek między ograniczeniami płynności finansowej w zakresie szczepień a barierami w jej wdrażaniu. Niniejsze badanie wypełnia tę lukę. **Metody:** Analizie poddano dane zebrane za pomocą ustrukturyzowanego kwestionariusza od 300 losowo wybranych drobnym hodowców bydła mlecznego w regionie Mbeya. W celu korekty błędów doboru próby zastosowano model podwójnego probitu. **Wyniki:** Badanie wykazało, że przyjmowanie hodowli kontraktowej bydła mlecznego przez drobnym rolników zależy od wielkości gospodarstwa domowego, awersji do ryzyka, dostępu do usług doradczych, posiadania radia, liczby posiadanego bydła mlecznego, rodzaju rasy bydła mlecznego, ograniczeń płynności finansowej związanych ze szczepieniami, stosowania sztucznej inseminacji oraz korzystania z leczenia weterynaryjnego. **Wnioski:** Badanie podkreśla znaczenie działań zmierzających do ułatwienia rolnikom dostępu do lepszych ras bydła mlecznego, jak również do szczepień, leczenia weterynaryjnego i usług sztucznej inseminacji.

Słowa kluczowe: czynnik, bydło mleczne, rolnictwo kontraktowe, przezwyciężanie barier, Tanzania

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Oeconomia is one of several series of *Acta Scientiarum Polonorum*, a scientific journal founded in 2001 by the rectors of Polish life sciences universities, supervised by the Program Board – representatives of these universities.

The quarterly *Acta Scientiarum Polonorum. Oeconomia* (ISSN 1644-0757; e-ISSN 2450-047X) publishes original scientific papers covering issues in economics and related fields, including management, agricultural economics, economic geography and other. Articles are published only in English with Polish translation of the title, abstract and keywords.

Current information on the terms and conditions of article publication can be found at the Author Panel at:

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Formatio Circumiectus – Kształtowanie Środowiska

Wydawnictwo Uniwersytetu Rolniczego w Krakowie
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