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ENVIRONMENTAL DETERMINATION OF BANKS INVESTMENT LENDING IN THE EU

Serhii Savluk
D.Sc. in Economics, Associate Professor of Department of the Banking, State University of Trade and Economics, Kyiv, Ukraine;
ORCID: 0000-0002-4709-6607

Natalia Shulga
D.Sc. in Economics, Professor of the Department of Banking, State University of Trade and Economics, Kyiv, Ukraine;
ORCID: 0000-0002-2010-5884

Liliia Zherdetska
D.Sc. in Economics, Professor of the Department of Banking, Odesa National Economic University, Odesa, Ukraine;
e-mail: lzherdetska@gmail.com
ORCID: 0000-0001-5398-868X
(Corresponding author)

Yulian Serazhym
PhD in Economics, Associate Professor of the Department of Banking, State University of Trade and Economics, Kyiv, Ukraine;
ORCID: 0000-0002-2295-7095

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ABSTRACT

The European Union (EU) has taken a clear strategy to decarbonize and reduce greenhouse gas emissions. A significant role in solving this important problem is the financial support for the modernization of the economy, where the key role is investment loans that banks provide to the economy. The literature overview does not give the answer to how banks impact reducing greenhouse emissions. That is why, there is a necessity to conduct research on identifying the impact of investment lending on reducing greenhouse gas emissions.

The article focuses on identifying the impact of investment lending by banks on reducing greenhouse gas emissions based on empirical analyses of available statistical data.

A hypothesis of a correlation between the volume of greenhouse gas emissions of companies and investment loans of banks was put forward and empirically tested. It has been proven that with an increase in the share of investment loans in the total volume of loans to the non-financial sector in France, the volume of greenhouse gas emissions significantly decreases, which allows to conclude the environmental orientation of investment loans of French banks. In Poland between the specified indicators for the entire period of the study, there is no significant correlation was found, but for the period 2001-2014, there was a significant inverse relationship.

Empirical analysis shows that investment bank lending affects the reduction of greenhouse gas emissions, which is proven by the example of France and Poland in 2001-2014. Changes in trends in 2015-2018 can be explained by the increase in CO2 emissions by road transport and the action of other factors. In particular, in countries that have made the transition from an administrative to a market economy, the environmental aspect of investment lending is less followed, as they focus on the commercialization of the economy.

Keywords: greenhouse gases, banks, investment loans, ecology, green economy, social responsibility, corporate governance

JEL Classification: G21, G24

INTRODUCTION

The international community is concerned about the deterioration of the ecological situation. The governments of the countries that have joined the Paris Climate Agreement, their central banks, international and national financial institutions, companies and households reacted to this metamorphosis. Over the past 32 years (1990-2022), the EU member states achieved significant progress in improving ecology thanks to the reduction of greenhouse gas emissions by 31%. This became possible thanks to the accumulation of significant financial resources, which were invested in preserving a clean environment. Among the sources of financial support for ecological production, a significant role belongs to loans that banks provide to enterprises.

In the evolving landscape of the EU banking sector, the environmental context is undergoing profound transformations. As regulatory frameworks tighten and societal expectations shift towards sustainability, the influence of environmental determinants on investment lending practices becomes increasingly significant. This dynamic interplay between environmental determinants and banking activities is not merely a matter of compliance but a strategic imperative shaping the future of investment business.

The relevance of understanding how environmental conditions impact banks' investment lending cannot be overstated. With the EU's commitment to ambitious climate goals and sustainable development, financial institutions are tasked with aligning their lending portfolios with broader environmental objectives. The pressures to integrate environmental, social, and governance (ESG) criteria into investment decisions are mounting, driven by both regulatory mandates and market expectations. Consequently, banks must navigate a complex landscape where environmental considerations are not just supplementary but central to their lending strategies.

Given the rapid evolution of environmental regulations and the increasing focus on sustainable finance, further research is essential to fully grasp the implications for banks' lending behaviours. Investigating these environmental determinants will not only contribute to academic knowledge but also offer practical insights for policymakers, financial institutions, and stakeholders aiming to foster a more sustainable and resilient financial system. The insights gained from this study could inform strategies that enhance the alignment of investment lending with environmental sustainability goals, thereby supporting the EU's broader environmental and economic objectives.

LITERATURE REVIEW

In recent years, there has been a growing scientific interest in researching the issues of assessing environmental performance, social responsibility and corporate governance (ESG) in the banking business. In this context, it is worth mentioning the article by Bătae et al. (2021), in which an analysis of the relationships between ten dimensions of environmental, social and managerial components and the financial activity of banks was carried out. Based on the results of the study, the authors concluded a positive relationship between the reduction of greenhouse gas emissions and the financial indicators of the companies; banks have an interest in ecologically oriented products and services, as well as digitization of processes.

In view of modern realities, a study dedicated to identifying the relationship between ESG indicators and bank risks is important. Di Tommaso & Thornton (2020) argue that high ESG scores are associated with a slight reduction in banks' risk; there is a positive indirect relationship between ESG indicators and the market value of banks. The article by Galletta, S. & Mazzù, S. (2023) discusses the need to integrate into the risk management system not only social and management risks but also risks related to the climate and the environment.

Today, regulators, economic agents and households pay considerable attention to financial literacy. In view of the above, it is advisable to consider the publication by Todorov, L. et al. (2023), in which the authors proved that financial literacy is related to carbon emissions in a complex non-linear manner. In developed countries, financial literacy has led to a reduction in the carbon footprint and has had a positive impact on environmental protection.

A study by Zheng et al. (2023) emphasizes the existence of a two-way integration relationship between ESG indicators and corporate green innovations. ESG indicators change simultaneously with indicators in the field of green inventions for clean industries, at the same time, there is only a long-term relationship between these indicators for industries that pollute the environment.

Iyke-Ofoedu M., Nwonye N., Abner I., Ezaki H. & Ubani O. (2023) find that both the carbon footprint of bank loans and fossil fuel subsidies significantly contribute to Tunisia's ecological footprint. Moreover, the impact in the case of an increase in the carbon footprint of bank loans on the growth of the ecological footprint is bigger than in the case of a decrease in indicators.

It is worthwhile to pay attention to the research by Takahashi & Shino (2023) on the impact of greenhouse gas emissions on lending to Japanese companies. The scientists concluded that banks consider significant greenhouse gas emissions from borrowers to be associated with higher risks of banks losing such loans in the long term.

The issue of ESG risks of EU banks is extremely important in the context of the regulation of their capital, which is carried out by the European Banking Authority (EBA). EU banks will soon be required to take ESG factors into account when assessing the creditworthiness of their borrowers. In addition, the EBA envisages including environmental risk in the stress testing program and developing risk metrics for accounting in capital and reporting to supervisory authorities. It seems that the introduction of such a step on the part of the EBA will slow down the process of bank environmental lending in EU countries (Costa, 2023). Central and commercial banks have not remained aloof from the process of supporting sustainable development. A set of measures is implemented that will contribute to the formation of an ecologically clean economy through the implementation of an effective mechanism for its financing (Shulga & Savluk, 2024).

The impact of environmental, social and governance practices on bank lending in EU countries is revealed in the article by Shabir et al. (2024), where it is stated that environmental and managerial components influence lending more strongly

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than social ones. The relationship between bank loan losses and ESG indicators is highlighted in the work of Bruno et al. (2024). The study of the impact of ESG assessments on non-performing loans of European banks, whose shares are listed on the stock exchange, allowed the authors to claim that if the consideration of ESG indicators can increase the value and stability of the bank, then, on the other hand, the negative effect of such consideration can directly arise as a result of losses on loans.

Despite the presence of a lot of studies related to the economic aspects of the greening of companies and banks, the question remains unsolved: what role does bank credit play in the greening of EU countries? Unfortunately, neither existing publications nor statistical datasets allow us to directly find an answer to this question, which led to the need to conduct this research.

As has been mentioned above, despite the growing importance of this issue, research on how investment lending determinants specifically influence the environment within the EU remains underexplored. Existing studies often focus broadly on financial performance or regulatory impacts, leaving a gap in our understanding of how environmental determinants directly shape banks' investment decisions.

AIMS AND OBJECTIVES

This study seeks to bridge that gap by providing an empirical analysis of how investment lending practices in the EU influence environmental indicators. In particular, the research's contribution to reducing this gap will be determining the role of bank investment lending in reducing greenhouse emissions.

The aim of the article is to investigate the impact of banks' investment lending to the real sector of the economy on greenhouse gas emissions.

Achieving the goal of the research involves setting and solving the following tasks:

- finding an information base for analysis;
- substantiation of quantitative indicators (variables);
- determination of the temporal and geographical aspects of the study; substantiation of research methods.

According to the results of the analysis of the information base based on the specified methods, conclusions will be drawn regarding the impact of bank investment lending on greenhouse gas emissions.

It should be noted that statistical arrays of data do not allow us to find answers to this question directly. It is necessary to improve the architecture of statistical bases. Here we will focus on the process of conducting an empirical analysis of how the banking system of individual EU member states contributed or did not contribute to the reduction of greenhouse gas emissions in these countries.

METHODS

To achieve the goal of the article - to investigate the impact of banks' credit activity on greenhouse gas emissions, the hypothesis was put forward that investment loans of banks in the real sector of the economy have an environmental component, and borrowers use them also to reduce greenhouse gas emissions. When formulating the hypothesis, the authors assumed that banks` investment loans should most contribute to the ecological modernization of production, as opposed to loans for current needs, which are mainly aimed at financial support of already operating businesses.

In order to test the hypothesis, we have separated the most valid data about commercial banks' investment lending on EU member states central banks` websites and data on the dynamics of greenhouse gas emissions in these countries. Some countries were chosen that achieved the best results in reducing greenhouse gas emissions, and have different degrees and histories of market economy development. In view of the availability of the necessary data, this study was conducted on the cases of:

1. France, which is one of the most economically developed countries in Europe and reduce greenhouse gas emissions by the end of 2022 compared to 1990 by 26.3%.
2. Poland, which, since 1990, has undergone a transition period from an administrative to a market economy and, accordingly, had specific features of economic development.

The cases of Sweden and Romania, which achieved the best results in reducing greenhouse gas emissions among the EU member states, were also studied, however, the available statistical data do not provide an opportunity to fully verify the author's hypothesis.

In particular, statistical data on the indicator of investment loans of banks to the corporate sector of Sweden and Romania are not available either on the ECB website or on the English-language versions of the websites of the countries' central banks (Sveriges riksbank and Banca Naţională a României).

In order to refute or confirm the formulated hypothesis, a standard correlation analysis was conducted (1) between the rate of growth/decrease in investment loans of banks and the rate of decrease in greenhouse gas emissions; (2) between the share of investment loans in bank loans portfolios and greenhouse gas emissions in the respective country. In addition, a non-linear regression was also carried out between the share of investment loans in their total volume and greenhouse gas emissions using a set of different Excel functions based on the coefficient of determination R.

RESULTS

The case of France

Eurostat greenhouse gas emissions statistics for the period 1992-2022 and annual volumes of loans, including investment, of the French banks, published by the Bank of France were used to conduct the research. On this basis, the trends of changes in indicators of greenhouse gas emissions, growth/decrease in the volume of investment loans to the non-financial sector and the share of investment loans in the total amount of loans of French banks are built (Figure 1).

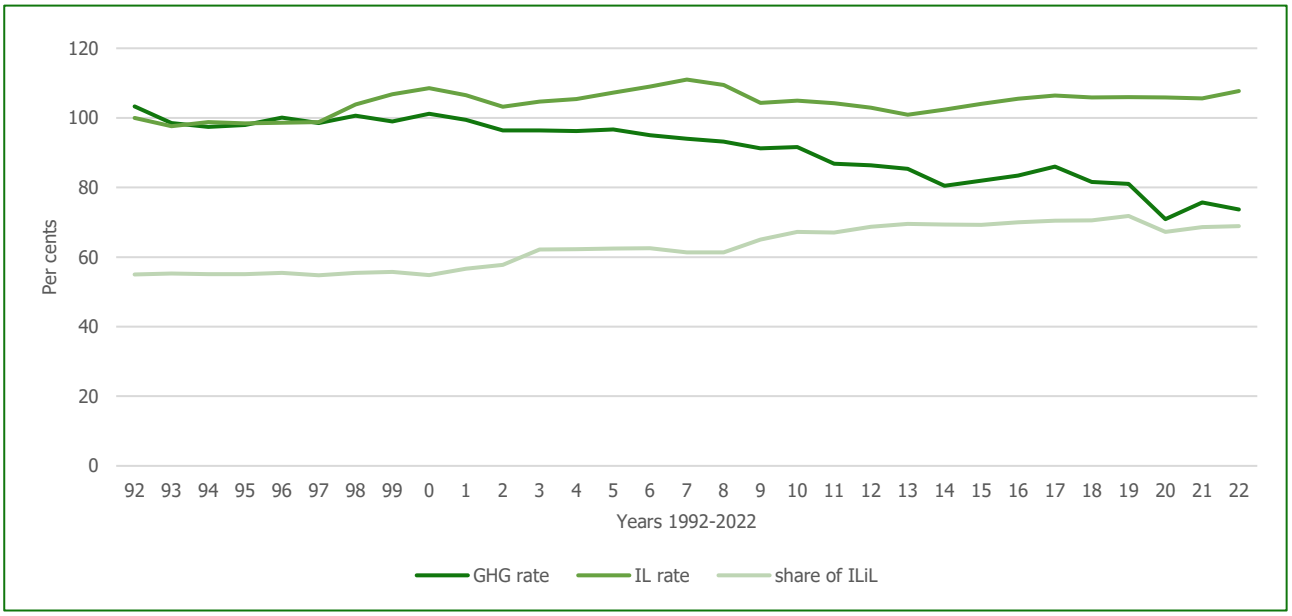

Figure 1. The dynamics of greenhouse gas emissions (GHG rate), investment loans to the non-financial sector (IL rate), and the share of investment loans in the total amount of loans (share of ILiL) of French banks for 1992-2022. Note: for 1990, and 1991, there are no data on loans. *(Source: compiled from: Eurostat. Netgreenhousegas emissions (2024), Banque de France (2024) Statistic. Investment loans granted to domestic non-financial corporations; Loans granted to domestic non-financial corporations, stock)*

The data of Figure 1 shows that with the reduction of greenhouse gas emissions, there is a relatively stable annual volume of investment loans, while their share in the total amount of lending during the period under study is growing. Based on the results of the correlation analysis between the rate of growth/decrease in investment loans of French banks and the rate of decrease in greenhouse gas emissions, it was calculated that the correlation coefficient (r) is 0.21-0.26. This indicates a practical lack of connection between these indicators. At the same time, a high level of linear correlation between the dynamics of greenhouse gas emissions and the share of investment loans of French banks in the total volume of their loans was revealed (Table 1).

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Table 1. Coefficients of linear correlation (r) between the dynamics of investment loans (IL), their share in loans to the non-financial sector (ILiL) and the dynamics of greenhouse gas (GHG) emissions in France for 1992-2022. *(Source: compiled according to the data of Figure 1)*

Correlation pairs	No time shift	With a lag of 1 year	With a lag of 2 years
IL and GHG	-0.20865	-0.20693	-0.26301
ILiL and GHG	-0.86931	-0.90601	-0.91754

The data in Table 1 serve as a basis for the conclusion - with an increase in the share of investment loans in the total volume of loans to the non-financial sector in France, the volume of greenhouse gas emissions significantly decreases. This is especially true with a lag of 2 years between data on ILiL and GHG. In addition, in the case of extracting data for "Covid" and the beginning of the war between russia and Ukraine in 2020-2022, the correlation reached a high level of -0.93.

Fisher's F-test with confidence levels of 0.05 and 0.01 was used to test the reliability of this model. With 2 factors, the actual level of Fisher's F -test was 98.5. With 28 data, it should be at least 19.45 at a confidentiality level of 0.05 and 99.46 at a confidentiality level of 0.01. The obtained results fully satisfy the requirements of 5% error and almost meet the requirements of 1% error. This allows us to assume that in years of economic growth when the structure of credits is in favour of the investment component, it has a particularly significant effect on greenhouse gas emissions. Investment loans of French banks have a significant environmental component, which contributes to the improvement of borrowers' environmental standards. In the years of recession (for example, 2020-2022), the share of investment loans in the total volume decreases or does not increase, as a result of which the driver of reducing gas emissions becomes a decrease in production volumes in such periods.

The study of the non-linear regression between the share of investment loans in their total amount and greenhouse gas emissions made it possible to outline that the most significant coefficient of determination R^2 is in the exponential function for the period 1992-2020 with a lag of 1 year (Figure 2).

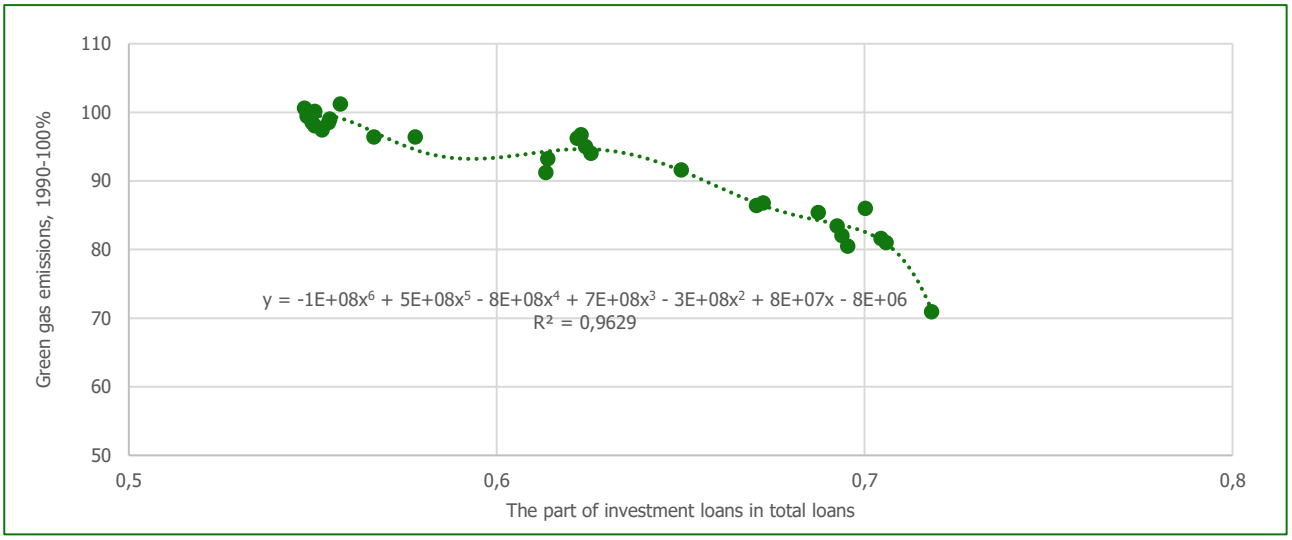

Figure 2. The relationship between the reduction of greenhouse gas emissions and the share of investment loans in the total amount of French bank loans, calculated for 1992-2020 with a lag of 1 year. *(Source: compiled according to the data of Figure 1)*

With such configuration, the coefficient of determination R^2 almost approaches the maximum level of 1, which gives reason to assert the existence of a significant relationship between the dynamics of the share of investment loans in their total volume to non-financial companies and the volume of greenhouse gas emissions. Therefore, it can be concluded that investment loans in France over the last three decades had a significant environmental component.

Cases of Poland and other countries

The verification of the regularity of the relationship between the share of investment loans in their total volume and greenhouse gas emissions was also carried out on the cases of Poland on the basis of statistical data of the Central Bank of Poland - Narodowy Bank Polski. Dynamics of the share of investment loans of Polish financial institutions in the total volume of their credits and greenhouse gas emissions (1990 = 100%) from 2001 to 2022 is in Figure 3.

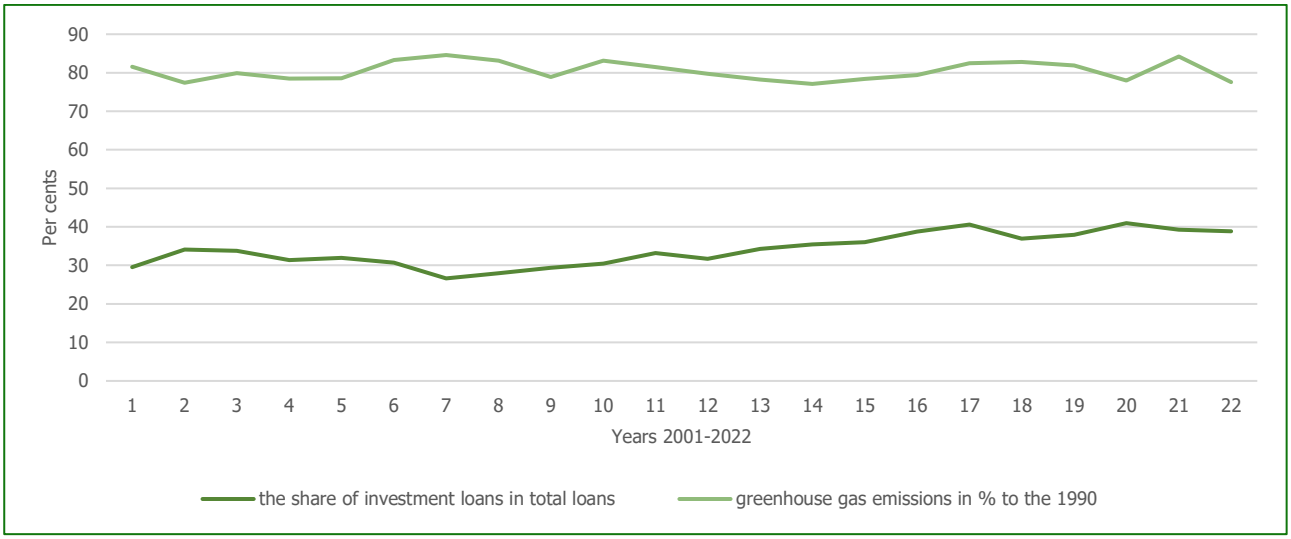

Figure 3. Dynamics of the share of investment loans of Polish financial institutions and greenhouse gas emissions (1990 =100%) from 2001 to 2022. Note: data from table MFIs loans to non-financial corporations – stocks in PLN million (page MIF _ K _ P, column 9 - investment loans and col. 18 loans in total). The data are available since March 2002 (accepted as of January 1, 2002) on a monthly basis. *(Source: compiled from Eurostat (2024) Net greenhouse gas emissions, NBP (2024) Statistics)*

Visually, Figure 3 shows that the share of investment loans grew slowly, but did not exceed 40% of all loans. At the same time, the volume of gas emissions was within the 70-80% corridor and did not change significantly during this period. The lack of connection between these factors is confirmed by the low correlation coefficients: -0.25 without period shift, 0.02 with a lag of 1 year, and -0.04 with a lag of 2 years. It does not significantly increase the correlation between the removal of "covid" years. However, when determining the correlation between these variables for the period 2001-2014, a rather significant inverse relationship was obtained. The correlation coefficient was -0.75. Probably, the reason was the rapid growth of CO2 emissions by road transport from 37.9 million tons in 2014 to 59.7 million tons in 2019. This is slightly more than in France, where the level of CO2 emissions by motor vehicles was relatively stable at the level of 45-46 million tons (Eurostat (2024), CO2 emission). In Poland, also during this period, the factor of decreasing the ratio of investments in environmental protection from 0.8% of GDP in 2015 to 0.4% in 2016 and subsequent years affected negatively (Eurostat (2024). Environmental protection investments of total economy).

Certain provisions of this article are debatable because they are based on assumptions that cannot be proven due to the lack of necessary statistical information. In particular, we are talking about Sweden and Romania - the leaders in the reduction of greenhouse gas emissions in the EU (by almost 73% during 1990-2022).

Only according to the available statistical data for Romania, it was possible to find out that the share of long-term (more than 1 year) bank loans to the corporate sector of the country was at a high level in recent years. By the beginning of 2022, it was 76.7% of total loans (calculated by: Banca Naţională a României (2024). Loans to non-financial corporations). At the same time, the share of loans of Romanian banks to the corporate sector in the total volume of their loans (incl. households and others) decreased somewhat from 49.2% at the end of 2007 to 45.7% at the end of 2021 (Banca Naţională a României (2024), Loans and Deposits by County) but still remains at a high level. Based on the above, it can be assumed that the channel of bank investment lending to the economy of Romania was an important tool for its greening.

In Sweden, there is a tendency to decrease the share of loans to the corporate sector in the total volume of bank loans. If as of January 1, 2004, it was 43.3%, then as of January 1, 2024, it decreased to 34.4%. On the other hand, the share of consumer loans increased from 49.6 % to 57.1% over 20 years (calculated by: Sveriges Riksbank (2024). This indicates that Swedish banks kept the credit policy vector for the development of consumer lending. However, this does not mean that they have not invested enough in the economy as a whole and its environmentalization, in particular. This could also happen through the purchase of securities, the orientation of the population to the consumption of products manufactured using "green" technologies, and other channels.

DISCUSSION

Despite the significant interest of scientists in ESG banking issues, the results of this study contain a significant contribution to the development of this issue in the context of investment lending. Bătae et al. (2021) prove the presence of a positive

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relationship between the reduction of greenhouse gas emissions and the company's financial performance. Todorov L., Aleksandrova A., and Ismailov T. (2023) argue that financial literacy is related to carbon emissions in a complex non-linear manner. Scholars Takahashi and Shino (2023) concluded for Japan that banks consider significant greenhouse gas emissions from borrowers as an additional credit risk factor. The example of Tunisia (Iyke-Ofoedu M., Nwonye N., Abner I., Ezeaku H. & Ubani, O., 2023) shows an asymmetric relationship between the carbon footprint of bank loans, fossil fuel subsidies and environmental footprint.

However, due to the complexity of the topic and its relative novelty, there are still gaps in the field of sustainable banking. In contrast to existing studies, the authors proposed a hypothesis of the impact of investment bank lending on greenhouse gas emissions. This connection is due to the fact that bank investment loans promote ecological innovations in production, as opposed to current loans. The hypothesis is proved on the example of France, but certain aspects require additional explanation.

In particular, the influence of the consumer lending factor on the purchase of ecological products, including those produced by own producers, on reducing the level of greenhouse gas emissions requires a separate study.

The authors also put forward the thesis that most EU member states do not have a single strategy for financing the greening of the economy, as evidenced by data on investments from all sources for environmental protection relative to their GDP. Different countries during certain years made significant investments aimed at protecting the environment, in which bank loans probably also played a significant role. The formulated thesis is debatable and may be the subject of further scientific research.

An additional explanation is needed for the phenomenon when in France in the period 2015-2019 there was an increase in greenhouse gas emissions (even with the increase in the share of investment credits) and only from the year 2020 onwards, emissions began to decrease (Figure 2). Moreover, this trend is typical for EU countries as a whole, when greenhouse gas emissions in the EU as a whole increased from 75.1% to the level of 1990 in 2014 to 77% in 2018, and in 2017 amounted to 78.7%, but no significant GDP growth was observed.

The Eurostat portal has statistics on investments in environmental protection, issuance of green bonds and a number of other indicators related to ecology. However, this information is incomplete, not always up-to-date and does not reveal exactly the environmental factor of investment and credit activity in general and in banking in particular. In our opinion, it is necessary to distinguish what share of loans is directed to the improvement of environmental protection (reduction of greenhouse gas emissions, waste processing, etc.) and improvement of social standards (creation of jobs, labour protection, etc.). This helps create an array of valid and universal socio-ecology finance datasets and will focus investors on improving the socio-ecology standards of their lending activity.

CONCLUSIONS

According to the results of the study, it was revealed that during 1990-2022 EU member states, including France and Poland, significantly reduced greenhouse gas emissions. On the other hand, during the years 2015-2018, an increase in greenhouse gas emissions was observed in France and Poland, which can probably be associated with an increase in road transport.

Empirical analysis allows us to claim that investment bank lending to the real sector of the economy affects the reduction of greenhouse gas emissions, which is proven by the example of France. On the other hand, in Poland, this trend was not statistically confirmed during the entire period of the study. This can be explained by the different levels of implementation of the environmental component in the investment lending mechanism in the studied countries, as well as by the action of other factors. In particular, in countries that have made the transition from an administrative to a market economy, the environmental aspect of investment lending is less followed, as it was focused on the commercialization of the economy. However, the phenomenon of Romania, where, in our opinion, bank lending to the corporate sector played a significant role in the greening of the economy, requires further research.

The statistics of the ecology aspect of investments in the economy should have further development on a standardized basis.

In view of the obtained results, it was determined that such issues as (1) the mechanism of the influence of bank consumer lending on the consumption of ecological products and (2) the development of a methodology for evaluating the strategy of financing the economy greening within the EU countries require additional research.

ADDITIONAL INFORMATION

AUTHOR CONTRIBUTIONS

All authors have contributed equally.

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CONFLICT OF INTEREST

The Authors declare that there is no conflict of interest.

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Савлук С., Шульга Н., Жердецька Л., Серажим Ю.

ЕКОЛОГІЧНА ДЕТЕРМІНАНТА БАНКІВСЬКОГО ІНВЕСТИЦІЙНОГО КРЕДИТУВАННЯ В ЄС

Європейський Союз (ЄС) прийняв чітку стратегію декарбонізації та скорочення викидів парникових газів. Значну роль у розв'язанні цієї важливої проблеми відіграє фінансова підтримка модернізації економіки, де ключове значення мають інвестиційні кредити, які банки надають економіці. Огляд літератури не дає відповіді, як банки впливають на скорочення викидів парникових газів. Тому існує необхідність проведення досліджень щодо виявлення впливу інвестиційного кредитування на скорочення викидів парникових газів.

Стаття фокусується на виявленні впливу інвестиційного кредитування банків на зменшення викидів парникових газів на основі емпіричного аналізу наявних статистичних даних.

Висунуто та емпірично перевірено гіпотезу щодо кореляційної залежності між обсягами викидів парникових газів унаслідок отримання компаніями інвестиційних кредитів банків та їх часткою в сукупному розмірі кредитів. Доведено, що зі збільшенням частки інвестиційних кредитів у загальному обсязі кредитів нефінансовому сектору Франції суттєво зменшується обсяг викидів парникових газів, що дозволяє зробити висновок про екологічну спрямованість інвестиційних кредитів французьких банків. У Польщі між указаними показниками за весь період дослідження вірогідного кореляційного зв'язку не виявлено, але для періоду 2001-2014 рр. спостерігався вірогідний обернений зв'язок.

Емпіричний аналіз показує, що інвестиційне кредитування банків упливає на скорочення викидів парникових газів: це підтверджено на прикладі Франції та Польщі у 2001-2014 роках. Зміни тенденцій у 2015-2018 роках можна пояснити збільшенням викидів CO2 автомобільним транспортом та дією інших факторів. Зокрема, у країнах, які здійснили перехід від адміністративної до ринкової економіки, екологічному аспектові інвестиційного кредитування приділяють менше уваги, оскільки вони зосереджені на комерціалізації економіки.

Ключові слова: парникові гази, банки, інвестиційні кредити, екологія, зелена економіка, соціальна відповідальність, корпоративне управління

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