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PROSUMER INVESTMENTS IN PHOTOVOLTAICS - ANALYSIS OF PROFITABILITY, MOTIVATION AND USER SATISFACTION

INWESTYCJE PROSUMENTÓW W FOTOWOLTAIKĘ – ANALIZA RENTOWNOŚCI, MOTYWACJI I SATYSFAKCJI UŻYTKOWNIKÓW

Abstract

Objectives: *The aim of the study was to examine the experiences of prosumers related to the use of micro photovoltaic (PV) installations in households in various regions of Poland.*

Material and methods: *The study focused on issues related to the profitability of investments, decision-making motivations, satisfaction levels, and perceptions of changes in the billing system (net-metering vs. net-billing). The study was conducted using a survey method on a sample of 203 PV system users.*

Results: *The results showed that economic benefits were the main decision-making factor, with over 80% of respondents rating the investment as profitable. The important level of satisfaction was due to the reduction in energy costs and the feeling of energy independence, while environmental motivations were of a complementary nature. Statistical analysis did not confirm a correlation between the location of the investment and its profitability assessment, which indicates a high degree of consistency in the experiences of prosumers across the country. At the same time, the change in the billing system from net metering to net billing was assessed negatively by most respondents due to the reduction in the expected profitability of the investment and the introduction of investment uncertainty.*

Conclusions: *It was concluded that photovoltaics is perceived by prosumers primarily as a tool for optimizing household finances, and that regulatory stability is a key condition for the further development of citizen energy in Poland.*

Keywords : *prosumers, photovoltaics, investment profitability, net-billing, user satisfaction, PV micro-installations.*

Streszczenie

Cel pracy: *Celem badań było zbadanie doświadczeń prosumentów związanych z użytkowaniem mikroinstalacji fotowoltaicznych (PV) w gospodarstwach domowych w różnych regionach Polski.*

Metodyka badań: *Przedmiotem badań były kwestie związane z opłacalnością inwestycji, motywacjami decyzyjnymi, poziomem satysfakcji oraz postrzeganiem zmian w systemie rozliczeń (net-metering vs net-billing). Badanie przeprowadzono metodą ankietową na próbie 203 użytkowników instalacji PV.*

Wyniki badań: *Wyniki wykazały, że głównym czynnikiem decyzyjnym były korzyści ekonomiczne, a ponad 80% respondentów oceniło inwestycję jako opłacalną. Wysoki poziom satysfakcji wynikał głównie z redukcji kosztów energii oraz poczucia niezależności energetycznej, natomiast motywacje ekologiczne miały charakter uzupełniający. Analiza statystyczna nie* *potwierdziła zależności między lokalizacją inwestycji a jej oceną opłacalności, co świadczy o dużej spójności doświadczeń prosumentów w skali kraju.*

Wnioski: *Zmiana systemu rozliczeń z netmeteringu na netbilling została przez większość badanych oceniona negatywnie ze względu na obniżenie przewidywanej rentowności inwestycji i wprowadzenie niepewności inwestycyjnej. W związku z tym stwierdzono, że fotowoltaika jest postrzegana przez prosumentów przede wszystkim jako narzędzie optymalizacji ekonomicznej gospodarstwa domowego, a stabilność regulacyjna stanowi kluczowy warunek dalszego rozwoju energetyki obywatelskiej w Polsce.*

Słowa kluczowe: *prosumenci, fotowoltaika, opłacalność inwestycji, net-billing, satysfakcja użytkowników, mikroinstalacje PV*

Introduction

Contemporary challenges related to environmental protection and climate change mitigation require a gradual shift away from conventional energy sources such as coal, oil, and natural gas (Ślusarczyk 2021, pp. 24-38). Their exploitation contributes to pollution emissions and the degradation of natural resources, and moreover, they are non-renewable raw materials whose availability is steadily declining. In this context, the development of renewable energy sources (RES) is not only an environmental necessity, but also a factor that strengthens energy security and economic competitiveness (Tora et al. 2022, pp. 111–118, Safa, 2013, pp. 11–12). The European Union's energy policy assumes a systematic increase in the share of RES in overall energy consumption. The International Renewable Energy Agency (IRENA) estimates that by 2050, this share could reach 85% globally. For the European Union, forecasts indicate an increase from 17% in 2015 to over 70% in 2050 (Kalinina et al., 2021, pp. 89–104). Currently, the European RES sector generates revenues of EUR 129 billion per year and employs over one million people. A similar dynamic can be observed in Poland, where the development of renewable energy sources is supported by a broad legal framework. The Polish Act on Renewable Energy Sources defines RES as non-fossil energy sources, including wind energy, solar radiation energy, aerothermal, geothermal and hydrothermal energy, hydropower, wave, current and tidal energy, ambient energy, as well as energy obtained from biomass, biogas, agricultural biogas, biomethane, bioliquids and renewable hydrogen (Act on Renewable Energy Sources, 2024). This broad catalogue of renewable sources provides the legal basis for the development of various RES technologies in Poland, although in recent years the most dynamic growth has been observed in photovoltaics. According to data from the Energy Regulatory Office (2025), the total installed capacity in renewable energy installations at the end of 2024 was 33.6 GW. Of this, 21.2 GW was accounted for by photovoltaic installations, and the number of micro-installations exceeded 1.5 million. The total capacity of these household installations reached 12.75 GW, which indicates a significant increase in public interest in this type of investment. A detailed analysis of the installed capacity in individual renewable energy sources is presented in Table 1.

Table 1. *Installed capacity of renewable energy sources in Poland*

Type of renewable energy source	Installed capacity [MW] in 2005–2024			
	2005	**2009**	**2014**	**2024**
Biogas power plants	31,972	70,888	188,549	306,3
Biomass power plants	189,790	252,490	1 008,245	969,6
Power plants generating energy from solar radiation, including microinstallations	-	0,001	21,004	21 157,0 12 749,9
Wind power plants	**83,280**	**724,657**	**3 833,832**	**10 139,5**
Hydroelectric power plants	852,495	945,210	977,007	980,8
Hybrid renewable energy sources and others	-	-	-	69,9
Total	**1 157,537**	**1 993,246**	**6 028,637**	**33 623,1**

Source: own study based on data from the Energy Regulatory Office, 2025.

Given Poland's geographical conditions and resource development potential, there has been an upward trend in energy production from renewable sources over the years (Poland's Energy Policy until 2040, Ministry of Climate and Environment, 2 March 2021).More than half of the power will come from zero-emission sources, and the implementation of these goals will be influenced by the introduction of photovoltaics and wind farms into the Polish power system, as well as the launch of a nuclear power plant (Oniszk-Popławska, et. al, pp. 104–108, Martinot, et al. 223–235).

Photovoltaics as a source of renewable energy

Photovoltaics are playing an increasingly important role in the energy transition, both globally and locally [Foit, 2013, pp. 84-92]. According to forecasts, by 2040, energy generated by photovoltaic systems will account for 20% of energy from renewable sources (Krzyż 2023, pp. 3-8). PV systems enable the conversion of solar radiation into electricity and, in the case of hybrid solutions, into thermal energy. In Poland, the most popular are installations that generate only electricity to meet the needs of households (Moro, 2013, pp. 125-130; Chmieliński, 2015 pp. 123-126). The increase in interest in PV micro-installations is due to several key factors. These include a drop in the prices of panels and components, an increase in their efficiency, technological progress, and the attractiveness of support programs such as My Electricity and tax relief. Equally important are growing environmental awareness and changing legal regulations that encourage investment in prosumer energy.

The climatic conditions in Poland are favourable for the development of photovoltaics. Annual sunshine ranges from 950 to 1250 kWh/m², with the most favourable conditions occurring in the central and eastern regions (Piech, 2015, pp. 78-80; Korasiak, 2017, pp. 123-127). Approximately 80% of the annual total radiation occurs between April and September (Sala, 2018, pp. 129-133), which allows for effective design.

The profitability of photovoltaic micro-installations depends on many interrelated factors, which can be divided into four groups: legal, technological, economic, and social (Worek et al., 2021, pp. 115–117).

Legal – these include applicable regulations resulting from energy and construction, law, and prosumer billing systems. The transition from net metering to net billing after 1 April 2022 has affected the way energy surpluses are billed and changed the profitability outlook for investments. Technological – these relate to the development of new generations of photovoltaic cells, their efficiency, durability, and availability. Examples include monocrystalline cells, thin-film cells (CdTe, CIGS), as well as modern dye and perovskite solutions (Kumar 2017, pp. 10-35). Economic – related to the costs of purchasing and installing the system, available forms of financing and current energy prices. According to Nowak, the cost of a micro-installation for an average household range from

PLN 30,000 to PLN 40,000, and the expected return on investment is 8–12 years (Nowak, 2023, pp. 582-615).Social – these include, among others, the level of environmental awareness, a sense of energy independence, the prestige of the investment and the impact on the household budget. Many users perceive photovoltaic installation as a step towards modernity and environmental responsibility.

Despite the introduction of the net billing system, which replaced the previous discount model, investments in PV micro-installations are still considered profitable – due to rising energy prices and the availability of subsidies. However, there is still a lack of in-depth analyses that would show the perspective of the users themselves and their experiences in different local conditions (Ciesielka 2021, pp.144–147).

Research methodology

The literature on the subject is dominated by technical, legal, and financial analyses of photovoltaic installations. Much less attention is paid to the subjective experiences of users – their motivations, assessment of the profitability of the investment, level of satisfaction or perception of regulatory changes. These issues remain particularly under-researched at the regional level. The aim of this study was to conduct a multi-faceted analysis of prosumer investments in PV micro-installations from the perspective of users from different regions of Poland. Five fundamental areas of analysis were considered: 1/. the level of perceived profitability of the investment, 2/. factors motivating the decision to install, 3/. the level of satisfaction with the use of the system, 4/. the impact of the change in the billing system (net-metering vs net-billing) and 5/. the diversity of responses depending on the place of residence (province).

The first three areas were formally verified using research hypotheses. The last two areas were treated as illustrative and supplementary, serving as a general assessment of the variation in responses depending on the region. Research hypotheses:

H1: The assessment of the profitability of investments in PV depends on the place of residence of the prosumer.

H2: Prosumers' motivations differentiate the expected return on investment in photovoltaic installation.

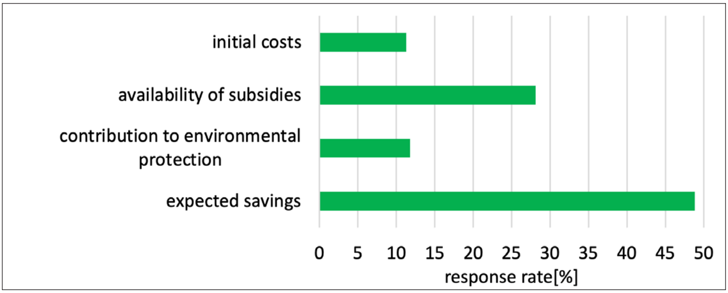
H3: The introduction of the net-billing system has lowered the subjective assessment of the profitability of investments in photovoltaic micro-installations.

The survey was conducted in the first quarter of 2025 among owners of single-family homes using photovoltaic installations. The sample was selected deliberately. A diagnostic survey method was used, employing an online questionnaire. The questions concerned investment motives, profitability assessment, satisfaction with use and opinions on changes in the prosumer billing system. The total number of completed and qualified questionnaires was 203. Other demographic data were not analyzed. The collected data were subjected to statistical analysis using descriptive analysis and multidimensional correspondence analysis. In the first stage, descriptive statistics (percentages, means, standard deviations) were used to present the structure of the respondents' answers. Then, to verify the research hypotheses, correspondence analysis was used to identify relationships between qualitative variables such as investment profitability assessment, prosumer motivations, expected payback period and installation location. The results of the analyses were illustrated graphically, showing the relationships between the categories of the variables studied.

Research results and discussion

The analysis of the survey results allowed for a detailed characterization of prosumers' investment experiences related to micro photovoltaic installations. Among the respondents, the dominant decision-making factor (approx. 49%) was savings on electricity bills. The second most important factor was the availability of subsidies for the installation, which was indicated as the main motive by approximately 30% of respondents. The least important decision-making factors, according to the respondents, were the initial costs of installation and the contribution to environmental protection (Fig. 1). This distribution of motivation confirms the dominance of economic considerations, which is also reflected in European literature. Research has shown that in households, the primary incentive for investing in PV is the reduction of energy costs, especially in systems that enable net metering (Georgarakis et al. 2021, pp. 5824–5834; Kumar 2017, pp. 45-67, Hansen and Percebois 2015, pp. 35-39) emphasize that an important factor increasing interest in prosumption is an appropriate support policy – subsidies and tax relief (Kalinina et al. 2017, pp. 100-104).

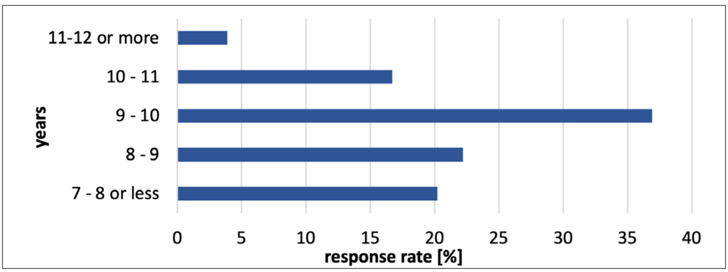
Fig. 1. *Main criteria for decisions to invest in photovoltaic micro-installations [%]*



Source: Own study based on research

The assessment of the payback period for a photovoltaic installation indicates a certain diversity of perception of this period among respondents. Most of the respondents (approximately 80%) estimated the payback period at 7-10 years. In contrast, approximately 20% of respondents estimated the payback period to be 10-12 years or more, which may indicate a slightly lower level of savings (Fig. 2). These data are consistent with the simulations presented by Moro and Korasiak, which indicate that in European conditions, the payback period is most often between 6 and 10 years, and the main factors shortening this period are the form of energy billing and the retail price of electricity (Moro 2013, pp. 129-130; Korasiak 2017, pp.126-127).

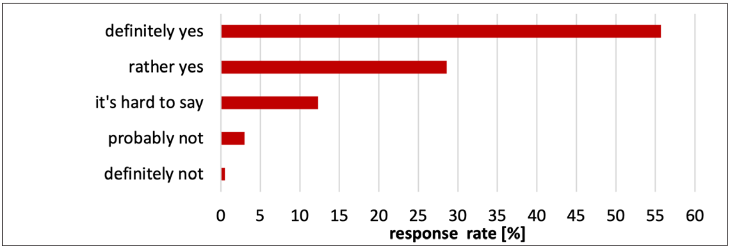
Fig. 2. *Estimated return on investment period [%]*



Source: Own study based on research

When asked about their overall assessment of the investment's profitability, as many as 84.3% of respondents said they considered it profitable, with 56% rating it as definitely profitable and approximately 29% as profitable (Fig. 3). Only 3.5% of respondents expressed a negative opinion, with only 0.5% rating the investment as definitely unprofitable. This level of approval for prosumer investments is confirmed by analyses researchers, who indicate that long-term financial benefits and energy independence have a strong influence on the positive perception of this form of energy supply (Piech, 2015, pp. 75-76; Sala, 2018, pp.130-131, Tora et al. 2022, pp. 111–118, Georgarakis et al., 2021, pp. 5824–5827).

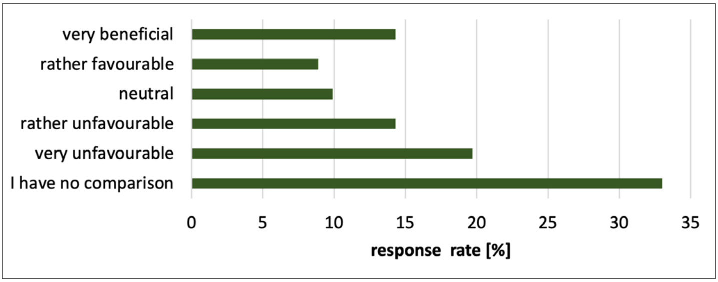
Fig. 3. *Assessment of the profitability of investments in PV [%]*



Source: Own study based on research

The change from net metering to net billing, although it affected only some of the respondents, was viewed negatively (Fig.4). Only about 23% of respondents assessed this change positively, and about 10% had a neutral opinion. As many as 34% assessed the new system negatively or very negatively, pointing to the opacity of the new rules, difficulties in forecasting savings and a reduction in the expected profitability of the investment. The loss of the possibility of direct energy balancing in a 1:1 ratio was perceived as particularly disadvantageous by those who had planned their investment under the previous regulations. These results are consistent with international analyses (Mielziuk et al., 2024, pp. 28–35) showed that the net-billing system introduces investment uncertainty and undermines confidence in the stability of energy policy, especially among households with low energy flexibility.

Fig. 4. *Assessment of the impact of the change in the billing system (net metering vs. net billing) [%]*



Source: Own study based on research

The results obtained in the study confirm the important role of the economic dimension of investment as the main decision-making factor and indicate an important level of acceptance and satisfaction with the use of PV micro-installations.

Statistical analysis

Analyses indicate that there is a relationship between the assessment of the profitability of investments in photovoltaic installations and their location. Among the profitability assessment categories, the response 'definitely yes' received the highest weight (0.557), which means that it was the most frequently selected option among respondents. The high mapping quality (0.998) for this category indicates that it fits very well with the factor structure. The responses 'definitely no' (0.978) and 'rather yes' (0.861) were also of high quality, indicating that these categories describe the direction of the differentiation of assessments well.

In the location category, it can be concluded that residents of rural areas and small towns (up to 100,000 inhabitants) were more likely to rate PV investment as profitable ('rather yes', 'definitely yes'), while respondents from large agglomerations (over 200,000 inhabitants) were more likely to express scepticism or a negative assessment of profitability. The high quality and inertia values for these categories confirm that location is an important factor in differentiating the perception of the economic benefits of investing in photovoltaics.

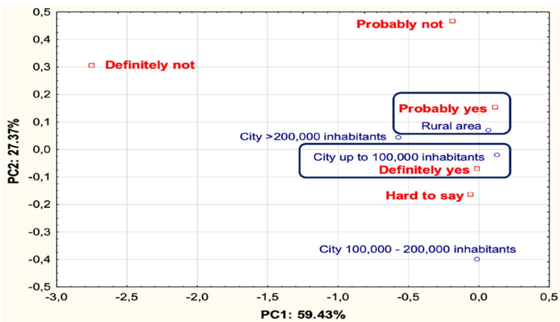
Table 2. *Column and row coordinates for the relationship: assessment of the profitability of investments in PV and installation locations*

Specification	Column coordinates and contribution to inertia				
	Dimension 1	Dimension 2	Mass	Quality	Relative
Definitely yes	-0,013	-0,070	0,557	0,998	0,039
Rather yes	0,116	0,153	0,286	0,861	0,170
Hard to say	-0,055	-0,164	0,123	0,732	0,070
Rather no	-0,185	0,466	0,030	0,572	0,182
Definitely no	-2,750	0,304	0,005	0,978	0,539
	Row coordinates and inertia contribution				
Rural area	0,068	0,070	0,581	0,733	0,105
Town with up to 100,000 inhabitants	0,130	-0,020	0,202	0,341	0,143
Town with 100,000-200,000 inhabitants	-0,013	-0,399	0,103	0,969	0,238
Town with over 200,000 inhabitants	-0,567	0,043	0,113	0,995	0,515

Source: Own study using Statistica 13.3 software.

The presented relationships between the assessment of the profitability of investments in photovoltaic (PV) installations and the place of residence of respondents(Fig. 5) indicate that the first two dimensions together explain 86.8% of the total inertia (Dimension 1 – 59.43%, Dimension 2 – 27.37%), which indicates high data mapping quality. The visible concentration of the 'rather yes' and 'definitely yes' categories near rural areas and towns with up to 100,000 inhabitants suggests that residents of smaller towns and rural areas are more likely to perceive investments in PV as profitable. It should therefore be noted that the statistical analysis showed significant correlations between the place of residence of respondents and their assessment of profitability, which confirms hypothesis H1.

Fig. 5. *Relationship between the assessment of the profitability of investments in photovoltaic installations and their location*



Source: Own study using Statistica 13.3 software.

An analysis the group of variables describing investment motivations, the categories related to economic motives received the highest scores: savings on bills: NET-m (0.340) and savings on bills: NET-b (0.281), (Table 3). Non-financial motives, such as energy independence and environmental impact, have a lower weight (from 0.054 to 0.123), but are distinguished by their high quality of representation. This is particularly true for 'energy independence: NET-b (0.991) and energy independence: NET-m (0.912).

Among the categories related to the expected return on investment (row coordinates), the highest weight was recorded for the 9-10 years range (0.370), which means that this was the most frequently declared expected return period. In turn, the categories 8-9 years (mass 0.222; quality 0.885) and 7-8 years or less (mass 0.202; quality 0.636) reflect groups of respondents who expect a shorter time to recoup their investment. Longer payback periods, such as 10–11 years' (weight 0.167; quality 0.779) and 11–12 years or more (weight 0.039; quality 0.469), are characterised by lower quality, which suggests less consistency of these categories in the dependency structure. Verification of hypothesis H2 confirmed the assumed relationship. A statistically significant relationship was found between the declared investment motive and the expected payback period for PV installation costs.

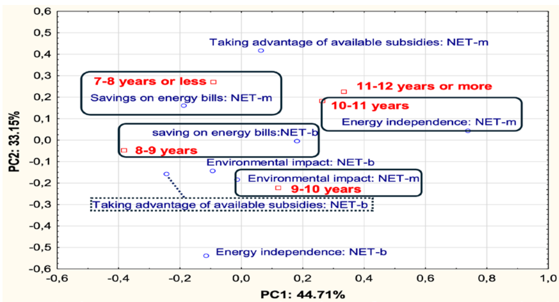
Table 3. *Category coordinates and contribution to inertia in the correspondence analysis between prosumers' motivations and the expected return on investment period*

Specification	Column coordinates and contribution to inertia				
	Dimension 1	Dimension 2	Mass	Quality	Relative inertia
	0,183	-0,005	0,281	0,794	0,095
savings on bills: NET-b	-0,187	0,160	0,340	0,954	0,173
savings on bills: NET-m	-0,093	-0,144	0,108	0,280	0,092
environmental impact: NET-b	-0,012	-0,186	0,059	0,226	0,073
environmental impact: NET-m	-0,242	-0,158	0,049	0,863	0,038
use of subsidies: NET-b	0,066	0,415	0,039	0,570	0,098
use of subsidies: NET-m	-0,114	-0,540	0,069	0,991	0,170
energy independence: NET-b	0,738	0,041	0,054	0,912	0,261
energy independence: NET-m	Row coordinates and inertia contribution				
7–8 years old or younger	-0,089	0,270	0,202	0,636	0,206
9–10 years old	0,122	-0,225	0,370	0,931	0,208
8–9 years old	-0,382	-0,048	0,222	0,885	0,299
10–11 years old	0,265	0,180	0,167	0,779	0,177
11–12 years old or older	0,336	0,223	0,039	0,469	0,110

Source: Own study using Statistica 13.3 software.

The relationship between the dominant investment motives of prosumers and the expected return on investment (Figure 6) can be considered representative. This is confirmed by the fact that the first two dimensions together explain 77.86% of the total inertia (Dimension 1 – 44.71%, Dimension 2 – 33.15%). Two characteristic profiles of respondents can be distinguished. The first one includes the category 8–9 years and the motive 'savings on bills: NET-m, which means that prosumers motivated by the desire to reduce energy costs most often expect a return on investment in the range of 8–9 years. The second profile, covering the categories 7–8 years or less and taking advantage of subsidies: NET-m, indicates a group of respondents who expect a shorter payback period and at the same time take advantage of available forms of financial support. Another group of respondents are those located on the right side of the map, near the categories 11-12 years or more and energy independence: NET-m. This means that prosumers driven by the need for energy independence are willing to accept a longer payback period for their investments.

Fig. 6. *Relationship between prosumers' motivations and the expected return on investment period*



Source: Own study using Statistica 13.3 software.

The values of the column coordinate weights (Table 4) indicate that the categories 'definitely yes' (0.557) and 'rather yes' (0.286) have the largest share in the data structure, which means that the majority of respondents positively assess the profitability of investments in PV despite the change in the settlement system. Both categories are characterised by high mapping quality (0.949 and 0.397, respectively). An extremely high mapping quality (0.997) was obtained for the 'difficult to say' category, which means that neutral or ambiguous opinions have a significant impact on the structure of dependencies. On the other hand, the responses ‘rather not’ (0.871) and ‘definitely not’ (0.559) are characterised by low weight but a significant contribution to inertia. Overall, the results confirm that extreme and ambiguous attitudes are distinguished by the highest quality of representation, which most significantly differentiates the perception of the impact of the change in the settlement system on the assessment of the profitability of investments in photovoltaics.

The largest weight among the categories assessing the change in the billing system is characterised are people who have not previously used the net metering system. The categories ‘very unfavourable’ (0.197) and ‘very favourable’ (0.143) also scored highly, although their mapping quality is low (0.130 and 0.774), which indicates a poor fit with the factor structure. On the other hand, the highest mapping quality was achieved by the categories ‘neutral’ (0.996) and ‘no comparison’ (0.965), indicating that these groups of respondents are best represented in the model and best describe the structure of dependencies.

Table 4. *Column and row coordinates for the relationship between the change from net metering to net billing and the assessment of the profitability of investments in PV*

Specification	Column coordinates and inertia contribution				
	Dimension 1	Dimension 2	Weight	Quality	Relative inertia
Definitely yes	0,008	0,159	0,557	0,949	0,109
Rather yes	0,059	-0,043	0,286	0,397	0,028
Hard to say	-0,450	-0,433	0,123	0,997	0,352
Rather no	0,919	-0,588	0,030	0,871	0,295
Definitely no	1,450	-1,118	0,005	0,559	0,216
	Row coordinates and inertia contribution				
Very favourable	0,081	0,188	0,143	0,774	0,056
Neutral	-0,564	-0,425	0,099	0,996	0,361
Rather favourable	0,304	-0,246	0,089	0,583	0,170
Rather unfavourable	0,359	-0,260	0,143	0,802	0,256
I have no comparison	-0,079	0,222	0,330	0,965	0,139
Very unfavourable	-0,041	0,003	0,197	0,130	0,0185

Source: Own study using Statistica 13.3 software.

The relationship between the assessment of the impact of the change in the prosumer settlement system and the perceived profitability of investments in photovoltaic installations indicates a concentration of the categories ‘difficult to say’ and ‘neutral’, which suggests that some of the respondents were unable to clearly assess the effects of the change in the system. This may be due, for example, to the short period of validity of the new rules or regulatory ambiguities.

The subsequent concentration of the 'definitely yes' and 'very beneficial' categories indicates that positive assessments of profitability correlate with the belief in the beneficial impact of the net-metering system. These results confirm hypothesis H3. The introduction of the net-billing system contributed to a deterioration in the subjective assessment of the profitability of investments, and the perception of the changes clearly differs between users who previously used net metering and new prosumers.

Conclusions

The results of the research and analyses confirmed the dominant role of economic motivation in the decision-making process. Respondents were primarily motivated by the desire to reduce their electricity bills and the possibility of taking advantage of available forms of financial support. Other factors, such as energy independence or environmental beliefs, were complementary and less frequently appeared as dominant determinants of investment decisions.

Most respondents positively assessed the profitability of PV micro-installations. The important level of financial satisfaction was confirmed by both the declared savings on bills and the positive subjective assessments of the overall profitability of the investment. However, it should be noted that the statistical analysis showed significant correlations between the respondents' place of residence and their assessment of profitability, which confirms hypothesis H1.

Verification of hypothesis H2 confirmed the assumed relationship. A statistically significant relationship was found between the declared investment motive and the expected payback period for PV installations. This means that even among people who are mainly guided by economic considerations, there is a uniform strategy for calculating profitability in terms of time. It can be assumed that the investment decision is based on a strict calculation of the return on investment over a specific number of years.

With regard to hypothesis H3, respondents who installed their systems during the period when the new net-billing system was in force expressed a significantly lower level of satisfaction with the energy billing rules.

The main reason for the negative assessments was the loss of the possibility of billing energy surpluses at a 1:1 ratio, which was available in the net-metering system. The new billing system introduces a value model in which surplus energy sold to the grid is priced lower than energy purchased from the grid, which significantly reduces the expected profitability of the investment. The results of the study therefore allow us to accept hypothesis H3 as confirmed – the change in the billing system had a negative impact on the perception of the profitability of photovoltaic investments.

In summary, the results indicate a high degree of consistency in the experiences of PV system users, regardless of region or socio-demographic variables.

This indicates that the prosumer model, guided by economic rationality and focused on obtaining benefits in the form of lower household operating costs, has become established in Poland. At the same time, a risk factor has been identified in the form of regulatory instability – in particular, changes to the prosumer settlement system – which may lead to a decline in confidence in support mechanisms and a reduction in the propensity to invest in the future.

A relevant direction for further research is the incorporation of safety-related determinants of rooftop PV investments into the analytical framework. Future studies should examine whether issues such as fire safety, roof load-bearing capacity, installation quality and maintenance conditions affect prosumers' investment decisions.

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