

Article

Rural E-Customers' Preferences for Last Mile Delivery: Evidence from Poland

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Abstract: Residents of rural areas buy products in the e-commerce market that are delivered to their homes (home deliveries) or to collection points (out-of-home deliveries). This poses last mile delivery challenges, which are of increasing interest to researchers. While urban research is widespread, a smaller number of rural studies are noticeable. The study aims to assess the factors differentiating the inhabitants of rural areas as to the familiarity and use of various methods of delivery of products purchased via the Internet and the reasons for choosing the preferred delivery methods. The paper uses the simplified SLR method in the literature section and multivariate data analysis in the empirical section. It contributes to the existing research in the form of the analysis of rural e-customers' preferences for choosing a particular delivery method or parcel collection method when out-of-home delivery is conducted. It indirectly focuses on the environmental attitudes that may lead to the sustainable transition through reducing CO₂ emissions while last mile delivery is performed. Regardless of choosing price or convenience over sustainable behavior for Polish rural e-customers, their preferences in last mile deliveries are focused on more eco-friendly methods of delivery. Such behavior is a good beginning for a more sustainable transition towards energy saving in Polish rural areas.

Keywords: preferences; last mile delivery; e-customer; rural; e-commerce



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1. Introduction

There is an increased need for online purchases in the e-commerce market, especially in developing countries [1]. Such activity results in challenges in the field of last mile delivery, which can be understood as the last leg of a distribution process, where the order is delivered from the last distribution point to the recipient, regardless of the final location [2]. The subject literature and business practice distinguish home deliveries (directly to the home or place of work) and out-of-home deliveries (to collection points such as post offices, parcel lockers, kiosks, or shops) [3]. Increased levels of deliveries were not only visible during the COVID-19 pandemic lockdowns but are a constant tendency in the e-commerce market, resulting in increased congestion, air pollution, noise, and problems related to quality of life. However, a large difference in GHG emissions is visible when comparing cities and rural areas [4].

The subject literature has attracted increased attention regarding publications that directly fit the concept of last mile deliveries in the e-commerce market to cities [5–9]. Nonetheless, there are very few papers addressing the rural logistics perspective, which could be defined (based on the cities' perspective, presented by Kiba-Janiak et al. [8]) as planning, implementing, coordinating, and controlling processes in rural areas related to the last mile delivery of goods purchased online. The most recent research is focused on, e.g., sustainability and development [1,10]. However, there is a lack of research assessing rural e-customers' preferences in the field of sustainable last mile deliveries. The delivery of

products in rural areas is seen as more important than in urban areas [11], especially since it generates higher distribution costs, being one of the major obstacles to rural sustainability [12]. E-commerce is becoming more and more popular in rural areas [13] and is an opportunity for economic advancement for rural households [14].

Thus, the main aim of the paper is to assess the factors differentiating the inhabitants of rural areas as to the familiarity and use of various methods of delivery of products purchased via the Internet, and the reasons for choosing the preferred delivery methods, as well as the methods of picking up the parcels when out-of-home delivery is conducted. To address the main aim, the following research question was formulated: what factors determine rural e-customers' preferences in choosing a delivery method?

The paper contributes to the state-of-the-art in the form of the analysis of rural e-customers' preferences for choosing a particular delivery method or parcel collection method when out-of-home delivery is conducted. It indirectly focuses on the environmental attitudes that may lead to the sustainable transition through reducing CO₂ emissions while last mile delivery is performed.

The adopted research method consists of a literature review and multivariate data analysis of rural e-customers in Poland. The study differs from the previous ones due to the application of both a simplified systematic literature review (SLR) and multivariate data analysis. The paper is structured as follows: the next section presents the literature review of last mile delivery in rural areas; then, materials and methods are presented, and the statistical analysis is performed. The paper is summarized with a discussion of the analyzed field.

2. Literature Review

The literature gap in the field of last mile delivery in rural areas is a challenging issue that should be addressed via research. As highlighted in the Introduction section, assessing rural e-customers' preferences in choosing the method of delivery of products purchased via the Internet represents a research gap that should be addressed through literature and empirical analyses. As a result, in the literature review, the authors of the paper initially adopted the three-stage process of the simplified systematic literature review (SLR) method. Its goal is to identify papers that focus on last mile deliveries in the e-commerce market in rural areas with an orientation towards delivery method preferences. Adoption of the complex and full SLR procedure depends on the number of eligible papers obtained in the final step of the seminal studies. However, in the beginning, the quantitative analysis of the papers published in the Scopus database was performed according to the following inclusion criteria: "last mile delivery" AND "rural" in the title, abstract, and keywords that created the baseline sample. Obtained papers referred not only to social sciences but also to the natural sciences and medicine; thus, the following inclusion criteria were included to obtain synthesis sample: journal AND conference proceedings in the "source type"; Social Sciences, Business, Management and Accounting, Environmental Science, Decision Sciences, Economics, Econometrics, and Finance in the "subject area". The final step referred to qualitative analysis in the form of seminal studies of papers that fit the topic of last mile delivery in rural areas. The process of selecting papers in terms of their eligibility for analysis is visualized in Figure 1.

The qualitative analysis of papers allowed for the identification of the most common issues in the field of last mile delivery in rural areas based on the 9 identified papers in seminal studies (the baseline sample consists of 70 papers). It enabled the authors of the paper to conduct an in-depth investigation of the current research and challenges in the analyzed field. Such a sample resulted in the adoption of only the simplified SLR method and abandoning the full SLR procedure. Therefore, we excluded from the procedure the annual evolution of the number of papers and the identification of top journals that publish papers in the field. All 9 publications in the most frequently cited order are briefly characterized in Table 1. Papers appeared mostly in recent years, i.e., during the period when e-commerce started to be extremely popular and when the COVID-19 pandemic

occurred. A detailed analysis of the seminal studies was performed as a result of the general findings presented in Table 1. The discussion in the field of last mile delivery in rural areas can be divided into three separate fields: optimization models and vehicle routing, methods of delivery, and stakeholders' preferences.

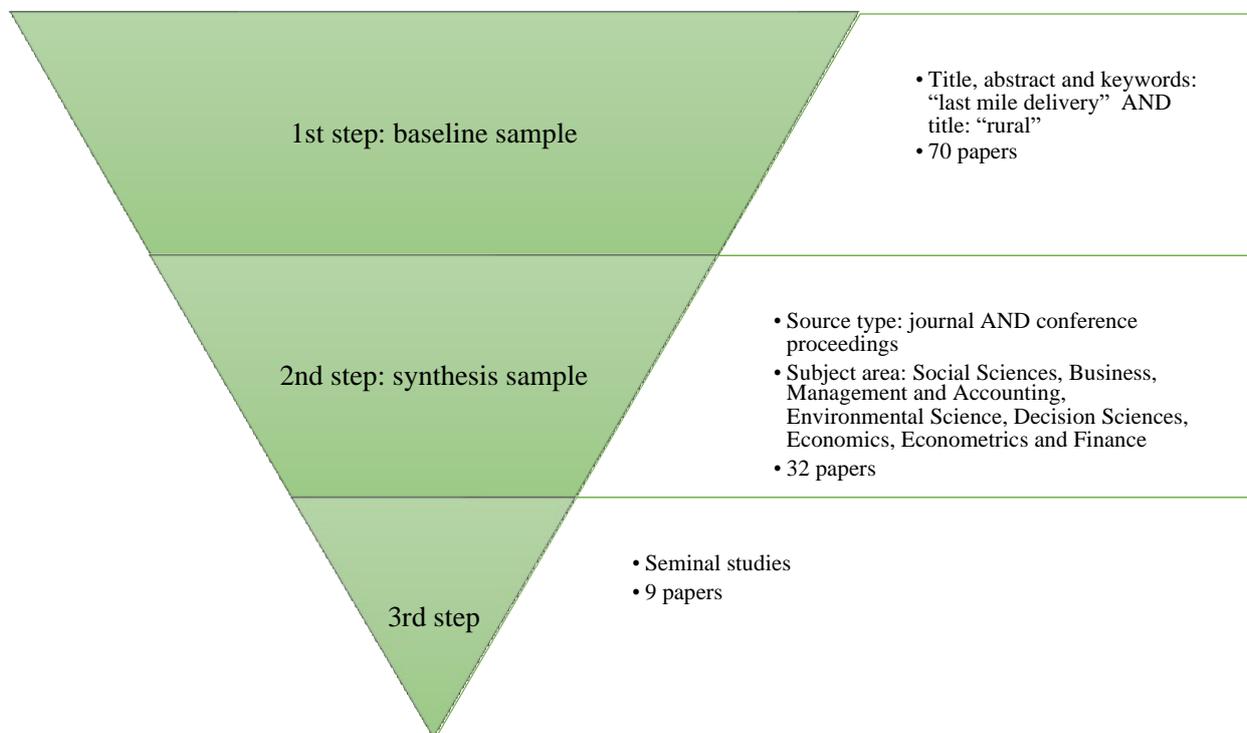


Figure 1. Procedure for systematic literature review from the Scopus database (own elaboration).

The optimization models and vehicle routing field of discussion consist of the two most citable papers [10,15]. This tendency is rather visible in the research field of last mile deliveries in general. The optimization started to focus on sustainable development issues, even though, as stated by Jiang et al. [10], rural last mile deliveries are inefficient and unsustainable. The authors diagnosed four factors affecting rural sustainability in the context of last mile deliveries, among which we can find the convenience of returning goods, the integrity of goods, the pickup of reserved goods, and delivery costs [10]. Considering the perspective of vehicle routing, the research of Yang, Dai, and Ma [15] proved that a long-term coalition in rural last mile deliveries would be beneficial for all participants, especially with the usage of intelligent logistics systems.

The second field of discussion refers to the methods of delivery with five identified papers [12,14,16–18]. Such a perspective is associated with the concept of sustainable last mile deliveries, which, in the city context, "concerns the planning, implementing, coordinating and controlling of processes on urbanized areas related to the last mile delivery of goods purchased online with the accompanying information, to reduce costs, reduce environmental degradation and increase road safety, obtained as a result of a compromise developed among the diverse preferences of stakeholders" [8]. However, it might be directly referred to rural areas. The methods of delivery can be divided into two separate forms: home deliveries, treated as less sustainable, and out-of-home deliveries, seen as pro-sustainable. Home deliveries are seen as preferable in rural areas due to the well-established logistics service providers. Such a method of delivery is more sustainable in rural areas than the use of collection points [16]. As stated by Mommens et al. [16], in the case of the rural area of Wallonia, there is a low density of collection points and, therefore, a high percentage of dedicated trips that results in higher external costs for consumers' transport. However, the research conducted by Seghezzi et al. [18] suggests that parcel lockers simply

lower delivery costs regardless of the location (urban or rural areas). The authors also proved that the benefits of parcel lockers are higher in rural areas, which is a result of the lower investment and annual costs. Nonetheless, there is a proposal to implement parcel lockers at secure centers in rural areas, even if such areas are under-served by logistics service providers. Gundu [17] assessed critical determinants of ICT acceptance among rural inhabitants in terms of parcel locker usage. Interestingly, the discussion on transport modes in rural areas is becoming a research topic among academicians through, e.g., discussion on how local logistics service providers, public transport, crowdsourcing, and multimodal transport could determine rural last mile deliveries [12]. The authors proved that implementing multimodal transport in supporting deliveries can effectively reduce distribution costs, especially when the number of orders is small. Accordingly, there is an opportunity for the crowdsourcing of last mile deliveries in rural areas [14].

Table 1. Papers on last mile delivery in rural areas in Scopus database (own elaboration).

Source	Title	Journal/Conference Proceedings	Publication Year	Number of Citations	Field of Discussion
[10]	Using the FAHP, ISM, and MICMAC approaches to study the sustainability influencing factors of the last mile delivery of rural e-commerce logistics	Sustainability	2019	16	Optimization models and vehicle routing
[15]	A cooperative rich vehicle routing problem in the last-mile logistics industry in rural areas	Transportation Research Part E: Logistics and Transportation Review	2020	14	Optimization models and vehicle routing
[13]	How to serve online consumers in rural markets: Evidence-based recommendations	Business Horizons	2020	11	Stakeholders' preferences
[16]	Delivery to homes or collection points? A sustainability analysis for urban, urbanized and rural areas in Belgium	Journal of Transport Geography	2021	8	Methods of delivery
[18]	Parcel lockers vs. home delivery: a model to compare last-mile delivery cost in urban and rural areas	International Journal of Physical Distribution and Logistics Management	2022	3	Methods of delivery
[17]	Smart Locker System Acceptance for Rural Last-Mile Delivery	2020 2nd International Multidisciplinary Information Technology and Engineering Conference	2020	2	Methods of delivery
[12]	An Investigation of Multimodal Transport for Last Mile Delivery in Rural Areas	Sustainability	2022	1	Methods of delivery
[19]	Construction and application of customer satisfaction model with the service quality of last-mile delivery in rural areas	WSEAS Transactions on Business and Economics	2021	0	Stakeholders' preferences
[14]	The construction of a crowdsourcing-based logistics network in rural China	PICMET 2019—Portland International Conference on Management of Engineering and Technology	2019	0	Methods of delivery

The last field of discussion refers to the stakeholders' preferences, with only two papers [13,19]. This area of research is far less analyzed than the city perspective [8,20,21]. Nonetheless, the role of e-customers in last mile deliveries has become an important link in management innovation [19]. A low density level, socioeconomics, and demographic dimensions impose challenges in last mile delivery; therefore, Sousa et al. [13] proposed a set of recommendations for e-retailers to serve rural markets efficiently, among which some referring to the last mile deliveries can be found:

- Delivery service level adoption through the availability of a few deliveries in the week;
- No same-day delivery option in orders;
- Support for parcel locker deliveries;
- Higher delivery fees for a specified group of orders that require personalized goods, small items, or short lead times;
- Usage of dynamic fees to increase route density and avoidance of flat-free subscription models;
- Outsourcing of last mile delivery;
- Support for flexible last mile delivery through partnerships with local entities, other e-retailers, longer delivery routes, and favoring milk runs;
- Support for e-customer-oriented order consolidation centers, and availability of facilities for individual order collection.

Different factors affect e-customer satisfaction regarding last mile delivery in rural areas, among which quality and customer-perceived value are the main factors. Moreover, assurance has the strongest indirect effect of quality on e-customer satisfaction, while intangibles have the weakest effect. Nonetheless, e-customer satisfaction influences customer loyalty [19]. The satisfaction might be improved by local governments and logistics service providers through the adoption of specific ideas, such as meeting rural e-customers' needs, reviving infrastructure construction, ensuring information safety, optimization of the delivery routes, and professionalization of deliveries [19].

The adopted simplified SLR method indicates that current research is focused mainly on optimization models and vehicle routing, methods of delivery, and stakeholders' preferences. Despite the existing research discussing the various methods of delivery available in rural areas, there is a lack of research assessing rural e-customers' preferences for choosing a particular delivery method, or parcel collection method when out-of-home delivery is conducted. This research gap is intended to be filled with the empirical research presented in the following sections.

3. Material

The research was carried out as part of a project by researchers from the Wrocław University of Economics and Business (Poland), Copenhagen Business School (Denmark), and a European research group, including educational and research institutions, aimed at examining attitudes towards online purchases among e-customers living in rural areas. They were asked about previous experiences with online purchases or—if the respondents had not yet bought products via the Internet—a hypothetical purchasing situation in which they, as an e-customer, bought any product online from a selected seller.

The research was conducted in April 2022 on a representative sample of 1071 adult Poles—inhabitants of rural areas. The inhabitants of the Lubuskie (2.3%), Opolskie and Podlaskie (3.1% each), Zachodniopomorskie (3.2%), and Warmińsko-Mazurskie (3.8%) provinces had the smallest share in the sample, while the largest share—over 10%—was represented by inhabitants of the Wielkopolskie (10.6%), Małopolskie (11.3%) and Mazowieckie (12.5%) provinces. The sample size distribution by age group, gender, and province is presented in Table 2. The proportions of inhabitants in different region, gender, and age groups directly correspond to the proportion of the population.

Table 2. Structure of the sample by age group, gender, and province of rural e-customers (own elaboration).

Province	18–24 Years		25–34 Years		35–44 Years		45–54 Years		55–64 Years		65 Years and More		Total		Σ
	M ¹	F ²	M ¹	F ²	M ¹	F ²									
Lower Silesia	3	2	5	5	7	7	5	6	7	5	5	8	32	33	65
Kujawy-Pomerania	3	3	5	5	6	6	5	5	5	5	5	6	29	30	59
Lublin	4	3	7	7	8	7	8	6	5	7	7	10	39	40	79
Lubuskie	1	1	2	2	3	3	2	2	2	2	2	3	12	13	25
Łódzkie	3	3	6	7	6	6	6	5	5	5	6	7	32	33	65
Małopolskie	6	6	12	11	12	12	10	11	10	9	10	12	60	61	121
Mazowieckie	6	6	13	11	14	13	12	11	11	10	11	16	67	67	134
Opolskie	1	1	3	3	3	3	3	3	3	3	3	4	16	17	33
Podkarpackie	4	4	11	8	9	8	7	7	7	7	7	10	45	44	89
Podlaskie	2	1	3	3	3	3	3	3	3	2	3	4	17	16	33
Pomeranian	3	3	6	6	6	5	4	7	5	4	4	4	28	29	57
Silesia	3	4	6	6	7	7	6	7	6	6	7	10	35	40	75
Świętokrzyskie	1	3	5	4	5	4	4	5	4	4	4	5	23	25	48
Warmińsko-mazurskie	2	2	4	4	4	4	3	3	4	3	3	5	20	21	41
Wielkopolskie	5	5	11	10	12	12	9	9	8	9	10	13	55	58	113
West Pomeranian	2	2	3	3	4	4	4	3	4	3	1	1	18	16	34
Total	49	49	102	95	109	104	91	93	89	84	88	118	528	543	1071
	98		197		213		184		173		206		1071		

¹ Male. ² Female.

In the survey of respondents' preferences towards choosing a delivery method, the following factors were analyzed, identifying those that were important for online purchases by residents of rural areas:

- Gender (528 men and 543 women), which means that in the group of rural residents surveyed, 49.3% were men and 50.7% were women.
- Age, which was considered in two approaches—age groups (18–24, 25–34, 35–44, 45–54, 55–64, 65 years and over) and age as a continuous variable (number)—which allowed us to identify the possible linear impact of age on e-customer behavior or certain border years for which changes occur in a discrete manner.
- The sample distribution in age groups was as follows: 18–24 years—9.2%, 25–34 years—18.4%, 35–44 years—19.9%, 45 to 54 years—17.2%, 55–64 years—16.2%, people aged 65 and more—19.2%.
- Education level, broken down into the following classes: lack of formal education (primary school—29), upper primary school (the Polish “gimnazjum”—16), high school (546), bachelor's degree (91), master's degree (267), professional title (51), engineer (51), a doctoral degree (9), other (11). More than half of the respondents were graduates of high schools.
- Number of persons in the rural household: 1 (91), 2 (293), 3 (246), 4 (249), 5 (120), 6 (48), 7 (17), 8 (6), 9 (2). The most numerous were two- (27.4%), three- (23.0%), and four-person households (23.3%).

- Population in the place of residence (number of indications): <500 (294), <1000 (263), <2000 (153), <3000 (95), <5000 (149), <20,000 (18). The answer “I do not know” (99) was eliminated from the analysis, which was treated as a lack of data. In total, 75% of the respondents lived in rural areas of up to 3000 inhabitants.
- The number of neighbors living within a radius of 150 m in the following classes: less than 7 (98), 7–10 (143), 11–20 (273), 21–99 (371), more than 100 (111). The answer “I do not know” was eliminated from the analysis, which was treated as a lack of data (75).

Variables characterizing behaviors related to online purchases were obtained from respondents’ answers to questions regarding the following (in brackets, the number of indications is given).

1. Delivery methods:

- home delivery: courier directly to home/work (known—986/used—934);
- home delivery: by post office directly to home/work (known—759/used—631);
- out-of-home delivery: pickup in a parcel locker (known—904/used—806);
- out-of-home delivery: pickup at the post office (known—683/used—435);
- out-of-home delivery: pick up in the store where the online purchase was made (click and collect) (known—498/used—266);
- out-of-home delivery: pickup at a kiosk/shop or another collection point (known—544/used—348);
- home delivery: free home delivery with free return option (known—554/used—338), including the separate option of home delivery and possible returns free of charge as a result of different motives for choosing delivery method among countries where the research is conducted.

2. Reason for choosing the preferred method of delivery (in each line in Table 3, there are highlighted the two most frequently indicated choice reasons).

3. The method of picking up the parcels when out-of-home delivery is conducted:

- on foot (185);
- by a private car (839);
- by bike (134);
- by public transport (83),
- other (motorcycle/scooter/company car—12).

Table 3. Reasons for the choice of the delivery method by rural e-customers (own elaboration).

Delivery Method ¹	Cheaper Delivery	Only Available Delivery	Speed of Delivery	More Reliable Delivery	More Convenient Delivery	Other Reason
Courier directly to home/work (HD)	102	143	274	169	508	33
By post office directly to home/work (HD)	114	154	118	133	324	51
Pickup in a parcel locker (OOH)	390	80	335	130	360	36
Pickup at the post office (OOH)	163	227	75	94	82	123
Pickup from the seller (click and collect) (OOH)	160	111	89	85	65	74
Pickup at a kiosk/shop or other pickup points (OOH)	165	137	86	64	106	78
Free home delivery with the possibility of free return (HD)	160	62	99	107	259	48

¹ HD means home delivery, OOH means out-of-home delivery. Dimmed cells in the table are the two most frequently indicated choice reasons for each delivery method.

4. Methods

The diagnostic survey method was applied in the research, while the survey questionnaire was used to implement the survey research technique. The primary data were collected using the standardized and structured computer-assisted interview (CAWI) method. The widely accepted statistical methods applied in the research results' analysis are indicated below.

Most answers have been coded as dummy variables, with the exception of the time to reach the pickup point when out-of-home delivery was conducted. In the analysis of different methods for delivery collection, only those respondents who declared familiarity with such a form have been taken into account. Thus, in tables with results, the total number of observations is not always the same.

Generally, alpha equal to 0.05 has been assumed as a basic significance level, but for the initial list of explanatory variables for regression models, also variables significant at 0.10 have been considered. The chi-squared test for independence has been used to analyze the relations between qualitative variables. In the case of many possible choices in the survey question, we tried to merge rows or columns in the contingency table, if the test for the original table was significant at 0.10.

To compare two groups with respect to the quantitative variable (two groups were usually formed by chosen/not chosen answer), the Student *t* test has been used, with separate variance estimation. The very large sample secures the robustness of this test against deviations from normality. To compare means from at least three groups, the one-way analysis of variance has been used. In case of general significance and high similarity of some means, classes have been merged and significance checked again.

Significance, direction, and power of relations between two quantitative variables have been evaluated by Pearson's coefficient of linear correlation. Regression models were built for significant variables—logistic regression for dummy explained variables and linear multiple regression for quantitative variables. In Tables S1–S4, as well as in further parts of the paper, we point out only statistically significant factors and relations.

5. Results

5.1. Familiarity with Delivery Methods

To answer the question of which factors determine familiarity with the methods of delivery among rural e-customers, the chi-squared test was used. No significant differences were found between women and men living in rural areas in terms of their knowledge of the methods of delivery. When assessing the familiarity with delivery methods and determining factors, further variants were considered.

The first method of delivery was a courier delivery directly to the home/workplace (the so-called home delivery). Surprisingly, the possibility of delivery by a courier is less well known among people up to 24 years old (less by more than 10 pp). The age of the respondents also had significant differentiation strength when treated as a continuous variable. The average age of people who knew about the delivery method by courier was almost 47 years, while, among people declaring ignorance of this method of delivery, this average was slightly lower than 39 years. An even greater difference was noted in the case of people who had secondary education or were without an education. Among them, only slightly more than two thirds knew about the possibility of using a courier to obtain purchased products via the Internet, while, among people with other forms of education, 92% knew about this method of delivery (see Table S1).

It is obvious that some potential factors may be correlated with each other, which is especially true for age, which, in the preliminary analyses, was considered both as a continuous variable and as a discrete variable by age group. Therefore, among the logistic regression models, we interpret only multifactorial models, which, in connection with the application of step-wise regression, select better variables from related (correlated) ones. Thus, the multifactorial regression model shows that for each year that the age difference increases (in the direction of "aging"), the likelihood of being familiar with the delivery by

courier method increases by 3.2%. This likelihood increases almost four-fold if the rural e-customer has an education other than only middle school, or even none (no education).

The second delivery method available to choose from in the survey was by post office directly to the home/workplace (treated as home delivery). As in the case of delivery by a courier, familiarity with this method of delivery was greater in people at least 25 years old. Women had slightly better knowledge of postal deliveries, but their superiority over men showed poor statistical significance ($p = 0.0761$). Those aged at least 25 years old had a two-times higher probability of knowing about this method of delivery as younger people. Each person in the rural household showed an increased likelihood of familiarity with direct postal delivery by 13.6%.

In the case of delivery to parcel lockers, as many as 84.4% of rural e-customers with at least secondary education declared that they knew about this method of delivery. Among people with a lower education level, this share was lower and reached 62.2%. Quite surprisingly, this variable did not enter the multifactorial model, which included only the number of people living in a 150-m radius from the respondent's place of residence. If this number of neighbors did not exceed 100, the likelihood of familiarity with parcel lockers was more than 60% higher than in the case of respondents for whom the number of neighbors was more than 100.

Pickup at the post office as an out-of-home delivery method of goods purchased via the Internet also depends on age and education level. Familiarity with this method was significantly lower in very young people, up to 24 years old, and in those who had only primary education. Both of these factors exist independently, because they were included in the multifactorial model of logistic regression. However, the impact of education level was stronger.

For pickup from the seller (click and collect) as an out-of-home method of delivery, the age and education level of rural e-customers are important and both of these variables also remained in the multifactorial model of logistic regression. However, the distribution of variants of these variables was slightly different from the earlier case. We observed less familiarity with click and collect delivery methods in very young people (up to 24 years old) and older people (65+). Rural e-customers among these age groups had a greater likelihood of knowing about this delivery method by more than 65% when eliminating the impact of education level. Respondents with at least an upper primary education level had an almost 2.5-times higher likelihood. In terms of familiarity with pickup at a kiosk/shop or other pickup point (out-of-home delivery), the results were very similar as to the factors differentiating the knowledge of this method of delivery to the case of click and collect points.

Finally, the number of neighbors is a variable that differentiated respondents when choosing free delivery as an alternative home delivery method. The result is interesting, because people living almost alone (the number of neighbors within a radius of 150 m being less than 7) or in a relatively densely populated place (over 20 neighbors) had a stronger likelihood of being familiar with this method of delivery.

5.2. Factors Differentiating the Choice of Delivery Method

The first part of the research goal was to assess whether rural e-customers know about the potential delivery methods for products purchased via the Internet and whether this knowledge is varied due to, among others, age, gender, education level, the number of people in the rural household, and the number of neighbors (see Table S1). The second part of the research goal was the identification of factors differentiating the choice of delivery method (see Table S2).

Groups of people who declared familiarity with a given method of delivery were evaluated, and only those relationships and dependencies that showed statistical significance were analyzed. Thus, in the case of two types of home delivery—courier delivery and postal delivery—none of the features (age, gender, education level, number of people in the rural household, number of neighbors) differed from the rural e-customers' responses.

In the case of parcel lockers, the variables differentiating the responses of respondents from rural areas at the level of statistical significance were found to be education level and the number of neighbors. More often, this delivery method was used by people with at least secondary education (80.6%) than people with a lower level of education (75.0%). When the number of neighbors was at least seven (within a radius of 150 m), 90% of respondents who had previously indicated familiarity with this delivery method used parcel lockers. Both of these variables were also included in the multidimensional logistics model. In this model, age was also treated as a continuous variable, with an indication that the older the person, the less likely they were to use a parcel locker.

Parcel collection at the post office was more often used by men (69%) than women (59%). The average number of people in the family that used this delivery method (3.35) was significantly higher than for people not using this form (3.11). The differential significance of both of these variables was confirmed by both the single- and multifactorial logistic regression models.

Only education had a differential impact on the use of the click and collect delivery method. This method was significantly more often used by people from rural areas with bachelor's, master's, or engineer's degrees (60.5%). Among people with another level of education (mainly lower), 47.6% of respondents used this delivery method. The logistic regression model showed that a person with a bachelor's, master's, or engineer's degree had almost a 70% greater probability of using the click and collect method. Accordingly, pickup at a kiosk, shop, or other collection point was more often used by men (68.3%) than women (59.6%).

An interesting observation concerns free home delivery with the possibility of free returns. Here, the only differentiating variable was found to be the number of people in the rural household. Each person in the family increased the likelihood of using this delivery method by 16%, provided that the existence of this form was known.

5.3. Reasons for Choosing a Delivery Method

The following subsection analyzes the reasons for choosing the preferred method of delivery (see Table S3). The "cheaper delivery" option as a reason for choosing direct courier delivery to home/work was indicated by rural e-customers with primary education (36%) more often than others (only 9.6%). Age was a differentiating factor for respondents regarding "cheaper delivery" selection in the case of postal delivery directly to the home or to a parcel locker. This reason was more often indicated by people up to 34 years old regarding postal delivery, and up to 44 years old regarding delivery to a parcel locker. Interestingly, in the logistic regression model, a better differentiating variable was age expressed as a continuous variable, with a general conclusion that older people less often chose postal delivery or a parcel locker. This is because, in the case of the click and collect method in the store where the goods were purchased, and also regarding free home delivery, these methods are cheaper than other methods. Regarding the collection of products in the kiosk/store or at another collection point, age appeared again as a differentiating variable in the multifactorial regression model, as well as two other factors. The "cheaper delivery" reason was indicated by people living in smaller villages (less than 1000 inhabitants), but having more neighbors (over 7) in the closest area (within a radius of up to 150 m).

No variable characterizing respondents from rural areas differentiated them in indicating the reason of "only available delivery method". In the one-dimensional analyses, the age and number of neighbors appeared as variables differentiating rural e-customers with poor statistical significance, but these variables did not enter the logistic regression models, where the strict principle of considering only significant variables at the level of 0.05 was applied.

The situation was completely different when indicating "speed of delivery" as the reason for choosing a given delivery method, and this applied to several methods. The "speed of delivery" by courier (home delivery) was less important for the elderly and for those who had up to seven neighbors within a 150-m radius. Nevertheless, this reason

for choosing a parcel locker was often indicated by people under 34 years old (53.2%) than by older ones (35.5%). “Speed of delivery” as a reason for picking up a parcel at the post office was more often indicated by women (13.1%) than men (8.7%). However, these numbers were so small that the gender variable was not included in the logistic regression model. The “speed of delivery” as a factor for picking up the parcel in the store where the purchase was made was more often indicated by middle-aged people (45–64), which was confirmed both in the chi-square independence test and in the multifactorial logistic regression models.

In the assessment of factors differentiating the choice of “more reliable delivery” as the reason for choosing a particular method of delivery, age was of significant importance in differentiating between home delivery by courier and collection at a post office or parcel locker, click and collect, as well as free home delivery with free returns. In the case of home delivery by courier, rural e-customers up to 45 years old more often indicated “reliability” as the reason for choosing this method of delivery. In terms of postal delivery, high reliability as a reason for the choice was emphasized by people from the age range of 55–64, and, slightly more often, due to “reliability”, this option was chosen by women, but this relationship was statistically insignificant. In terms of collecting products from a parcel locker, people up to the age of 64 were two-times more likely to indicate “reliability” as a reason for choosing this method than older people, and only age in this division remained important in the multifactorial logistic regression model. Accordingly, age did not appear as a differentiating factor for “reliability” as a reason to collect parcels at the post office, and this aspect was more often emphasized among men than women. The number of people in the household was also important—each person increased the likelihood of appreciating the “reliability” of this delivery method by approximately 16%. The “reliability” of picking up a parcel at a kiosk, shop, or other collection point was more often emphasized by people up to the age of 64. Finally, the “reliability” of free home delivery was more often appreciated by young people up to the age of 45.

“Convenience” is another important feature for the choice of home delivery by courier and was more often indicated by young people up to 34 years old or older—at least 55 years old. The second factor that significantly differentiated rural e-customers when choosing home delivery by a courier due to “convenience” was the education level. More than every second person with higher education, as compared to an upper primary school education, emphasized the “convenience” of this form, while, among the others, it was only emphasized by less than every third person. The “convenience” of picking up products from a parcel locker was more often emphasized by men and people with at least seven neighbors within a radius of 150 m (weak statistical significance). Moreover, interestingly, in the multifactorial logistic regression model, only this variable remained as significantly differentiating respondents. In the case of the click and collect method of delivery, “convenience” was chosen only by the inhabitants of smaller villages with up to 2000 inhabitants.

5.4. Collection Methods for Out-of-Home Delivery

When analyzing the methods of picking up parcels when out-of-home delivery is conducted (see Table S4), it should be pointed out that the choice of an on-foot method was differentiated by two variables, i.e., the population and the number of neighbors. This method is chosen by rural e-customers living in a village with a large population, but in rather compact buildings where the number of neighbors is at least 100 in a radius of 150 m.

These variables are also important when choosing the means of picking up a parcel when using one’s own car. Respondents from rural areas more often use this method of collection in smaller villages with up to 3000 inhabitants, with rather sparse buildings (up to 100 neighbors in a radius of 150 m). An education level higher than upper primary school is also important, which can simply mean a rural e-customer owning a car. The survey showed that the larger the household, the more often the parcels are picked up by car. Moreover, a bike is used more often by men in larger villages (over 3000 inhabitants) to pick up a parcel. Accordingly, public transport is more often used by young people

(up to 24 years old), who do not have a car, with an education level of at least upper primary school. In the multifactorial logistic regression model, age was expressed as a continuous variable—with each year of age (in terms of “aging”), the likelihood of using public transport decreases.

6. Discussion

The applied methods and techniques of data analysis allowed us to identify the factors differentiating the inhabitants of rural areas, their familiarity with and use of various methods of delivery of products purchased via the Internet, and the reasons for choosing a preferred delivery method, as well as the methods of collecting parcels in the case of out-of-home delivery. The most important conclusions resulting from the conducted research are given below.

Age is a variable that differentiates respondents from rural areas, because familiarity with a particular method of delivery is more often indicated by people over 24 years old (it is possible that younger participants in the e-commerce market are not so prevalent, or are “served” by parents/friends during online purchases), while, for people over 64 years old, the likelihood (regression models) of familiarity with modern delivery methods (other than home delivery) decreases with each year of age. This fits with the observation that out-of-home delivery methods promote social exclusion. Deliveries to parcel lockers require familiarity with ICT solutions through, e.g., mobile apps. As stated by T. Gundu [17], this might be challenging for rural e-customers, especially for Baby Boomers (born between 1946 and 1964), who are not “digital natives”. China’s rural society example shows that the co-evolution of ICT and rural e-customers is still in the development stage [22].

Public transport as a means to travel to a collection location for out-of-home delivery was indicated by young people from rural areas up to the age of 24. This is unsurprising—public transport is crucial for meeting rural society’s demands regarding work and education [23]. In turn, young people more often indicate the importance of a low delivery price: by courier (18–34 years), to a parcel locker (18–44 years), by click and collect (18–24 years), or through free home delivery (18–44 years). However, the older the person, the less important is a lower delivery price. Moreover, generational differences are also visible, because people aged 55+ trust the Polish Post, while people under the age of 45 value home delivery by couriers more.

Additionally, the higher the education level, the greater the knowledge of individual methods of delivery of ordered goods. A similar situation is noted in the case of using parcel lockers and click and collect points. People with primary education more often pointed to the low price (“cheaper delivery”) as the reason for their choice when home delivery by courier was performed or when pickup at the post office with the use of public transport was conducted.

Furthermore, gender does not significantly differentiate rural e-customers, besides the indicated exceptions in terms of familiarity with delivery methods (postal deliveries more often indicated by women) and their use (pickup at the post office and click and collect more often indicated by men), and the method of collecting a parcel in the case of out-of-home delivery (by bicycle more often indicated by men). Rural women more often point to the speed of delivery as an important aspect of picking up a parcel at the post office, and credibility when home delivery by the post office is performed. On the other hand, men consider delivery to the post office to be more reliable, and delivery to a parcel locker is considered more convenient.

If the number of people in the rural household exceeds three, they are more likely to be familiar with home deliveries by the post office, parcel collection through click and collect, and collection at a kiosk/shop or other pickup point. With each additional person in the household, the likelihood of familiarity with these methods increases (from 7.6% to 13.6%). When they are used, rural households with more than three people prefer to pick up a parcel at the post office or select free delivery with a free return option. Such

households also pick up parcels using a private car. Reasons for choosing a specific method of delivery for over three-person households are as follows:

- “Cheaper delivery” for three forms of delivery—parcel locker, click and collect, and free home delivery with free returns option;
- “Speed of delivery” for home delivery by courier;
- “Credibility” for parcel locker, pick up at the post office and the kiosk/shop, or other pickup point.

Rural e-customers are familiar with and more likely to use parcel lockers when they have a greater number of neighbors. People who have relatively few neighbors prefer to collect a parcel at a kiosk/shop or other pickup point because of the cheaper delivery, while the speed of delivery is important during courier home delivery. On the other hand, rural e-customers indicate a parcel locker as more convenient. This may mean that parcel lockers are located in denser and more accessible locations, according to the policies of parcel companies [24]. However, the installation of parcel lockers at secure centers in rural areas [17,18] might be a good solution for their wider acceptance, especially when there is a suggestion for retailers to increase their usage of parcel lockers as pickup points for deliveries [13]. Nonetheless, out-of-home delivery is more convenient for courier companies [3] but does not produce large amounts of returns, as is the case with home deliveries, which usually result in failed delivery attempts [25].

Collecting a parcel on foot when out-of-home delivery is conducted is chosen by respondents from more densely populated villages (over 100 neighbors within a radius of 150 m), and by car from areas with a smaller number of neighbors. The number of inhabitants in the village is an important factor in the case of the reasons for the choice:

- “cheaper delivery” when picking up a parcel at a kiosk/shop or other pickup point, which is preferred by the inhabitants of small villages (up to 1000 inhabitants);
- “more convenient” when choosing click and collect among inhabitants of villages with up to 2000 inhabitants.

When picking up parcels on foot during out-of-home delivery, parcels are collected more often by residents of villages with up to 2000 inhabitants, but when traveling by a private car, it is more common in residents of villages with up to 3000 inhabitants. Home deliveries are perceived as less sustainable, so increases in familiarity with this method correspond with the conclusion of Jiang et al. [10] that deliveries in rural areas are inefficient and unsustainable. A different assumption and conclusion were presented by Mommens et al. [16], who suggested pro-sustainable behavior when choosing home delivery in rural areas. However, such a conclusion was the result of a lower density of collection points, which aligns with the out-of-home delivery methods in the research area of Wallonia. In Poland, 16 m people out of 36 m have access to parcel lockers by 10-min walk, while 21 m people have access to other pickup points [26]. Nonetheless, the lower density of the population in rural areas suggests the necessity for the implementation of multimodal transport services [12] that could support both home and out-of-home deliveries.

It can be concluded that rural e-customers in Poland have pro-environmental attitudes. Regardless of choosing price or convenience over sustainable behavior, their preferences in last mile deliveries are focused on more eco-friendly methods of delivery. Such behavior is a good beginning for a more sustainable transition in Polish rural areas. The reduction of CO₂ emissions while last mile delivery is performed is a desirable direction for further improvements.

The research has its limitations. The results should be tested with various types of products that can be purchased via the Internet by rural e-customers, but also with analogical research provided by project partners. A cross-national examination of attitudes towards online purchases might bring more general conclusions on how last mile delivery is developed in rural areas in European Union countries. Additional analysis should focus on the factors that shift attitudes toward more sustainable behavior, as suggested by Kiba-Janiak et al. [8,10,16] for last mile deliveries in cities. As we can see from research presented

by Jiang et al. [10] and Mommens et al. [16], there is no consensus in understanding which delivery methods are pro-sustainable in rural areas. More in-depth research in the field, among various stakeholders, should bring valuable input into the discussion. Additionally, the level of pro-environmental attitudes among rural e-customers should be examined following the shippers' behaviors towards sustainable solutions. In further research, the authors would like to focus on how the behavior of rural e-customers has changed as a result of the COVID-19 pandemic, especially for the last mile delivery aspect, including the type of product, routing efficiency, and meeting of fulfillment timelines, which constitute key factors [27]. Therefore, the behavior of rural e-customers is an important field of research that might help to determine, as stated by Sułkowski et al. [28], the possibility of exploiting the customer experience potential.

Supplementary Materials: The following supporting information can be downloaded at: <https://www.mdpi.com/article/10.3390/en15228351/s1>, Table S1: Familiarity with the delivery method—factors differentiating the answers provided by rural e-customers (own elaboration). Table S2. The use of particular delivery methods—factors differentiating the answers provided by rural e-customers (own elaboration). Table S3. Reasons for choosing the preferred delivery method—factors differentiating the answers provided by rural e-customers (own elaboration). Table S4. Means of transport used to pick up the delivery during out-of-home delivery—factors differentiating the answers provided by rural e-customers (own elaboration).

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