MASTER'S THESIS

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MSc in Supply Chain Management

Gödöllő, Hungary
2024

Hungarian University of Agriculture and Life Sciences
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UNLOCKING THE POTENTIAL OF PARCEL LOCKER ADOPTION IN PHILIPPINE E-COMMERCE: A STATED CHOICE EXPERIMENT ON LAST-MILE DELIVERY OPTIONS

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Gödöllő, Hungary
2024

ABSTRACT

The exponential growth of e-commerce in the Philippines, catalyzed by the COVID-19 pandemic, has placed unprecedented demands on logistics service providers to deliver efficiently and reduce face-to-face interactions during the national health crisis. In response, parcel lockers have emerged as an innovative logistics solution. These secure, automated storage units are located in accessible areas such as shopping centers, residential complexes, and public spaces, offering a convenient and flexible alternative for 24/7 package collection without direct human contact.

Despite its potential, the adoption of parcel lockers in the Philippines has been slow, with the majority of Filipinos unaware of this delivery option. Major online marketplaces like Lazada and Shopee do not offer parcel locker delivery, further limiting its visibility and use. This study aims to identify the factors influencing Filipino consumers' delivery method preferences, employing a stated choice experiment to evaluate preferences for home delivery, parcel lockers, and collection points across varied attributes such as location, distance, payment method, and shipping fee.

The findings reveal that less convenient locations, greater distances, and higher costs significantly deter the selection of certain delivery methods. However, when parcel lockers are presented under optimal conditions—strategically located, with simplified payment methods and at no cost—their market share increases dramatically to 56.2%. This surge underscores a strong consumer preference for parcel lockers when perceived barriers are minimized, suggesting substantial potential for their wider adoption in the Philippines. This research provides essential insights for logistics service providers and policymakers to develop strategies that enhance the attractiveness and utilization of parcel lockers among Filipino e-commerce consumers.

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1. Introduction

After the COVID-19 pandemic, the Philippine e-commerce sector experienced a dramatic growth, with the adoption rate of e-commerce increasing from a pre-pandemic rate of 2% to 76% in the first six months of 2020 (Capistrano, Gomez and Isleta, 2023). Based on the latest report by Statista (2023), the market size of the Philippine e-commerce industry reached $15 billion in 2022 and it is projected to expand to around $60 billion by 2030. This surge is underpinned by an increasing e-commerce penetration rate, which stood at 40.9% in 2022 and is expected to climb to 48.6% by 2027. Moreover, the gross merchandise value of the internet economy was approximately $22 billion in 2022, with forecasts predicting a surge to around $150 billion by 2030, indicating a thriving digital market (Statista, 2023). Further bolstering this growth is the high internet and mobile penetration, with 73 million active online users and a 74.1% smartphone household penetration rate as of 2021. This digital engagement is accompanied by a significant shift towards digital payments, with e-money users increasing more than fourfold from 2019 to 2021 (US International Trade Administration, 2024).

Amidst this backdrop of e-commerce success, a critical challenge emerges in the form of accommodating the growing demands of last-mile delivery. As the e-commerce sector expands, so too does the necessity for efficient and reliable delivery systems that can keep pace with increased consumer expectations for speed and convenience. The last mile, the final step in the delivery process from the distribution center to the consumer's doorstep, becomes increasingly pivotal. This stage is notorious for being the most complex and cost-intensive part of the logistics chain. Last-mile delivery, as defined by various scholars, refers to the last segment in the delivery process where goods are transported from a transportation hub to the final delivery destination, typically the consumer's home or a collection point (Corejova et al., 2022; Kiba-Janiak et al., 2021; Lai et al., 2022; Van Duin et al., 2020). This phase is critical as it often presents logistical challenges that can affect the speed, efficiency, and quality of delivery services.

Notably, the last mile can consume over 70% of the energy in the entire distribution channel due to frequent stops, low drop sizes, and inefficient vehicle usage (Milewski & Milewska, 2021). Likewise, the inefficiencies associated with last-mile delivery, particularly in urban settings, include high costs, environmental impact due to increased vehicle emissions, and the complexities of navigating urban congestion (Kiba-Janiak et al., 2021; Loan et al.,

2022). These challenges are compounded by the growing volume of e-commerce, which exacerbates traffic congestion and pollution, making this segment of the logistics chain costly and complex.

To address the challenges of the last mile, several innovative solutions have been proposed and implemented globally. These include the use of collection-and-delivery points (CDPs) and parcel lockers, which offer a secure and convenient means for consumers to collect their packages, thereby reducing the need for direct delivery to doorsteps and the associated logistical burdens (Lai *et al.*, 2022). Other solutions focus on sustainability and efficiency, such as the development of urban consolidation centers that allow for the use of greener transport modes, and the implementation of IT solutions like dynamic routing software to optimize delivery routes (Van Duin et al., 2020). Additionally, crowdshipping, and the engagement of multiple stakeholders including government bodies and transport companies, have been identified as cooperative approaches to solving last-mile challenges (Kiba-Janiak *et al.*, 2021). In more advanced economies, the use of drones is also being promoted to reduce delivery times and improve the overall customer experience (Koncová, Kremeňová and Fabuš, 2022).

Among the innovative solutions being implemented to address the last-mile problem, parcel locker is one that has been recently introduced in the Philippines. Currently, the parcel locker market in the Philippines is served by three main providers: MBOX Smart Lockers Corp., QUBE 24/7 Smart Technology Corporation, and PopBox PH. QUBE began operations in March 2021, followed by MBOX in October of the same year. The most recent entrant, PopBox PH, started its operations in February 2023. These services have strategically positioned their parcel lockers in accessible public locations such as malls, supermarkets, and residential buildings, including condominiums and dormitories. Distinctively, PopBox PH has chosen to locate its lockers exclusively at key transport hubs, particularly within major rail transport stations such as the LRT and MRT, facilitating convenient pickups for daily commuters.

Research from various global contexts has consistently shown that the implementation of parcel lockers offers a promising solution to many of the challenges associated with last-mile deliveries. For instance, studies by Iannaccone, Marcucci and Gatta (2021) and Da Silva, De Magalhães and Medrado (2019) highlight that critical factors such as proximity to home/work, accessibility, and cost reduction significantly sway consumer preferences towards the adoption

of parcel lockers. Specifically, Iannaccone's work emphasizes the importance of location convenience and 24/7 accessibility as key determinants influencing consumer choice for parcel lockers. Similarly, Da Silva et al. found that reducing freight costs and ensuring convenient pick-up locations can lead to a significant preference for using parcel lockers over traditional delivery methods. This aligns with consumer trends in the Philippines, where the convenience of e-commerce is highly valued but often hindered by traditional logistical inefficiencies.

In Europe and other developed markets, where parcel locker systems are well-established, consumer adoption patterns provide valuable insights into the operational benefits and cost efficiencies these systems offer (Molin, Kosicki and Van Duin, 2022). However, these studies also expose a critical gap: most existing research does not account for the unique socioeconomic and infrastructural challenges present in emerging markets like the Philippines. Unlike in European countries, the logistics infrastructure in the Philippines is less developed, and the concept of parcel lockers is relatively new. The Philippines presents a unique logistical landscape characterized by significant geographical fragmentation and urban congestion, which may influence consumer preferences and the practicality of different last-mile delivery solutions, particularly parcel lockers. The demographic and consumer behavior in the Philippines is also distinct, with a high level of mobile penetration yet characterized by a significant number of unbanked individuals. This requires a tailored approach to understand how these factors influence the willingness to adopt new innovative solutions such as parcel lockers. This aspect has rarely been covered in existing literature but could be crucial in a market where traditional payment methods still predominate.

The unique market dynamics in the Philippines distinctly shape the adoption landscape of parcel locker service, as evidenced by its limited mainstream integration three years after its introduction. Despite the potential efficiency benefits, this delivery method remains relatively unknown among the general population. Moreover, leading online marketplaces such as Lazada and Shopee have not yet incorporated parcel lockers into their logistics frameworks, limiting access for a significant segment of e-commerce consumers. Consequently, the adoption of parcel lockers is still in its early stages, with a general lack of awareness and understanding of their acceptance or use within the local context. For this reason, this study aims to bridge this knowledge gap by investigating the adoption of parcel lockers as a preferred last-mile delivery option through a stated choice experiment.

While existing studies provide a strong foundation, they predominantly focus on markets where consumer behavior and logistical frameworks differ significantly from those in the Philippines. Hence, the research by Iannaccone, Marcucci and Gatta (2021), Da Silva, De Magalhães and Medrado (2019), Molin, Kosicki and van Duin (2022), and Merkert, Bliemer and Fayyaz, (2022) on determining consumer preferences for parcel delivery using stated choice experiments can be adapted and expanded to explore how similar factors play out in the Philippine setting, where the e-commerce landscape is rapidly evolving against a backdrop of unique challenges.

The stated choice experiment aims to assess consumer preferences for home delivery, parcel locker, and collection points. It explores the influence of specific delivery attributes such as location, distance, payment method, and shipping fee on consumer's choice of parcel delivery. Furthermore, this paper also investigates the impact of individual sociodemographic such as age, sex, educational attainment, work status, and monthly income on consumer preference for last-mile delivery. Thus, the following hypotheses are proposed:

Hypotheses related to alternative-specific variables (location, distance, payment method, and shipping fee):

- **H1:** *Less convenient locations lower the perceived utility of delivery methods.*
- **H2:** *Location has a significant impact on the choice of delivery method.*
- **H3:** *Less distance increases the utility of delivery method alternatives.*
- **H4:** *Distance has a significant impact on the choice of delivery method.*
- **H5:** *More advanced payment options decrease the perceived utility of delivery methods.*
- **H6:** *Payment method has a significant impact on the choice of delivery method.*
- **H7:** *High shipping fees decrease the perceived utility of delivery methods.*
- **H8:** *Shipping fee has a significant impact on the choice of delivery method.*

Hypotheses related to case-specific variables (sociodemographic characteristics)

- **H9:** *Younger consumers are more likely to adopt parcel lockers due to their greater familiarity and comfort with technology-based solutions.*
- **H10:** *Age has a significant impact on parcel locker preference.*
- **H11:** *Male consumers are more likely to choose parcel lockers as a delivery method.*
- **H12:** *Sex has a significant impact on parcel locker preference.*

- ***H13:** Higher educational attainment is positively correlated with the acceptance of parcel lockers.*
- ***H14:** Educational attainment has a significant impact on parcel locker preference.*
- ***H15:** Employed individuals are more likely to prefer parcel lockers due to the convenience they offer in managing deliveries around busy schedules.*
- ***H16:** Work status has a significant impact on parcel locker preference.*
- ***H17:** Individuals with higher monthly incomes are more likely to use parcel lockers.*
- ***H18:** Monthly income has a significant impact on parcel locker preference.*
- ***H19:** Consumers with previous experience using parcel lockers are more likely to prefer them in the future.*
- ***H20:** Previous usage of parcel locker has a significant impact on parcel locker preference.*
- ***H21:** Consumers who have seen or heard about parcel lockers before are more likely to use them again.*
- ***H22:** Awareness about parcel locker has a significant impact on parcel locker preference.*

This research aims to uncover the key factors influencing consumer choices of last-mile delivery methods by testing these specific hypotheses. The data collected from this stated choice experiment will be analyzed using a panel-based mixed logit model, with statistical procedures carried out in Stata. Beyond adding to the existing body of knowledge in logistics and consumer behavior, the findings will provide actionable insights that can help local businesses and policymakers improve e-commerce logistics efficiency and customer satisfaction in the Philippines.

The paper is structured as follows: Section 2 presents a focused and comprehensive literature review on parcel locker acceptance and adoption. Section 3 describes the methodological approach, discusses the data sampling process, and details the analyses used. The results are thoroughly explored in Section 4, while Section 5 provides a conclusion that encapsulates the study's findings and implications.

2. Literature review

Parcel lockers are automated delivery systems designed to enhance the efficiency and security of package deliveries. According to Schnieder and West (2020), parcel lockers are a form of Collection and Delivery Point (CDP) where customers can pick up their parcels at their convenience, without the need for human interaction. Carotenuto et al. (2022) expand on this by noting that these units are strategically placed in accessible locations to facilitate easy access, making them a crucial part of solutions aimed at optimizing last-mile delivery. Additionally, J. H. R. Van Duin et al. (2020) highlight that parcel lockers are typically integrated into public or semi-public spaces, offering a secure and accessible option for parcel collection.

The innovativeness of parcel lockers provides a lot of advantages for both customers and logistics service providers. For instance, parcel lockers significantly decrease the occurrence of failed deliveries as recipients can collect their parcels at a time that suits them, avoiding the need to be at home or coordinate with couriers (Schnieder and West, 2020). Likewise, these units are placed in strategic locations to facilitate easy access, reducing travel distance for delivery vehicles, which lowers fuel costs and improves logistics efficiency. They offer increased security by minimizing the risk of parcel theft, a common issue with unattended home deliveries, and provide 24/7 availability, adding a layer of convenience not available with traditional home delivery services (Hideyama, Phung-Duc and Okada, 2019). Parcel lockers help optimize urban space by providing delivery solutions that do not require large-scale infrastructure changes and reduce CO_2 emissions due to fewer delivery routes and lower fuel consumption (Carotenuto *et al.*, 2018). Additionally, they support returns and address challenges, facilitating easier return processes and eliminating the need to find customer addresses, which can be time-consuming for couriers. The centralized delivery points of parcel lockers increase delivery efficiency, particularly by reducing the number of stops delivery vehicles must make and are found to be particularly advantageous in rural areas where the costs of home deliveries are generally higher due to greater distances between delivery points (Seghezzi, Siragusa and Mangiaracina, 2022).

Despite their benefits, parcel lockers require significant upfront investment for installation and ongoing maintenance which can be costly. They occupy fixed space 24/7, which can be a significant drawback in densely populated or space-constrained areas, and might require consumers to travel to locker locations, which could offset some environmental benefits.

Carotenuto et al. (2022) also noted that the fixed capacity of lockers might lead to availability issues during high demand periods such as holidays, potentially leading to delays or accessibility issues for consumers. In regions where cash on delivery is common, the lack of personal interaction can be a disadvantage, and if not strategically placed, some users may find lockers inconveniently located, potentially increasing their reliance on motorized transport to access these facilities. Moreover, in areas with lower e-commerce penetration, there's a risk that parcel lockers may not be utilized to their full capacity, potentially leading to inefficiencies and underutilized investments.

Nonetheless, parcel lockers are increasingly recognized as a viable solution to many challenges associated with traditional home delivery, particularly in congested urban areas. They streamline last-mile logistics, enhance operational efficiency, and offer a more sustainable option for urban deliveries by alleviating the burdens of home delivery. The utility of parcel lockers is underscored by their ability to adapt to different geographic contexts, providing substantial benefits in both urban and rural settings due to their ability to manage delivery dynamics effectively. This makes them a robust solution for e-commerce and courier companies looking to improve service reliability and customer satisfaction (Hideyama, Phung-Duc and Okada, 2019). However, their effectiveness greatly depends on strategic placement, adequate infrastructure investment, and consumer acceptance. For this reason, it is essential to understand what factors or attributes can influence the general public's acceptance and adoption of parcel lockers. There are many existing literatures that focus on this particular topic and the methodologies employed by the authors are varied.

2.1. Mixed-Methods Consumer Research

Mixed methods consumer research combines quantitative and qualitative approaches to garner a comprehensive understanding of consumer preferences and behaviors. This approach is evident in studies that explore various aspects of parcel locker adoption and usage, providing valuable insights that are applicable to diverse market conditions.

For instance, Lemanowicz and Sitarska (2022) utilized an online survey methodology to explore consumer preferences regarding e-commerce delivery methods, gathering data from 302 respondents. This approach is highly efficient, allowing for broad geographic coverage at

a lower cost and providing the capability for robust statistical analysis using tools like Pearson's χ^2 tests and Mann-Whitney U tests. The result of the study which highlights the significance of delivery price and flexibility in e-commerce is consistent with existing literatures. However, the method they used may suffer from self-selection bias and lacks the depth that qualitative interviews provide. It also assumes that all respondents have sufficient internet access and digital literacy, which may not hold true across all demographic groups. As such, it may not be the best fit for studying parcel locker preference in the Philippines due to the potential lack of representativeness and depth needed to fully understand the factors influencing locker adoption.

Meanwhile, Nahry and Farhan Vilardi (2019) employed a mixed-method approach in Jakarta, Indonesia, using two sequential online surveys that incorporated the Analytic Hierarchy Process (AHP) to assess consumer preferences on parcel lockers versus direct delivery. This methodology allows for a structured evaluation of consumer priorities and changes in perceptions after receiving detailed information about delivery methods. The outcome of their research underscores a consensus among consumers about the efficiency and convenience of parcel lockers, particularly in terms of cost and timesaving. However, the preference could vary significantly based on individual experiences with different delivery methods, as well as factors like the accessibility of locker locations and the reliability of the delivery service. While their methodology provided comprehensive data collection and quantitative rigor, the complexity of AHP may not have been straightforward for all participants and could have introduced difficulties in understanding and evaluating the factors without adequate explanation. Additionally, the study's focus on an urban, relatively tech-savvy population in Jakarta might be too limiting if to be applied in the diverse demographic and geographic landscapes of the Philippines. As such, adapting this methodology may not ensure effective results.

In the study of Kedia, Kusumastuti and Nicholson (2017), they explored consumer perceptions of Collection and Delivery Points through focus groups in Christchurch, New Zealand. This qualitative methodology provides deep insights into consumer behaviors and preferences, benefiting from the rich, detailed data that focus groups can offer. Participants in a group setting can express their views more freely and build upon others' ideas, which leads to a more nuanced understanding of attitudes toward new logistic solutions like parcel lockers. Nevertheless, the findings from such a qualitative case study may not be broadly applicable, particularly in a culturally and logistically distinct setting like the Philippines. The dynamics of focus groups might also lead to conformity or the dominance of more vocal participants, which

could skew the data. Moreover, organizing and conducting focus groups is resource-intensive and may not be feasible for large-scale studies across the Philippines.

Another mixed-methods consumer research was conducted by Asdecker (2021). He organized 37 semi-structured interviews to understand consumer acceptance of alternative delivery places, including parcel lockers. This method is highly effective in capturing detailed contextual factors that influence consumer decisions, providing depth of insight through flexible questioning that allows interviewers to delve deeper into consumer responses. However, this approach's generalizability is limited due to the small sample size and the qualitative nature of the data. Conducting and analyzing such interviews is also time-consuming and requires significant resources. The differences in cultural attitudes towards technology and e-commerce between Germany and the Philippines could further complicate the direct application of these findings, necessitating a tailored approach that considers local consumer behavior and infrastructure readiness.

Lastly, Lemke, Iwan and Korczak (2016) assessed the usability of parcel lockers through a comprehensive online survey of registered users of InPost's service in Poland. The survey, which included both open and closed-ended questions, provided detailed quantitative data and allowed for broad demographic coverage. This method's structured nature ensures data reproducibility and comparative analysis, making it valuable for statistical generalizations about consumer preferences. However, the methodology might lack the qualitative depth to fully explore the reasons behind consumer preferences and could suffer from self-selection bias. The findings, focused on a Polish urban context with specific consumer familiarity and online shopping behaviors, may not translate effectively to the Philippine context, where different urban densities, consumer familiarity with online shopping, and logistical challenges prevail.

2.2. Application of Theoretical Models on Technology or Innovation Acceptance

In the realm of technology and innovation acceptance, the literature explores a range of methodologies applied across various studies to understand consumer preferences and behaviors towards new technologies like parcel lockers.

As an example, Yuen et al. (2018) employed Innovation Diffusion Theory (IDT) to examine consumer intentions to use self-collection services in Singapore. Their survey-based design incorporated variables like relative advantage and observability, analyzed through hierarchical regression to ascertain their impact on consumer intentions. The study's research result aligns with existing literature that highlights the importance of relative advantage and compatibility in influencing technology adoption, suggesting a consensus that these factors are critical across different contexts and technologies. However, the findings on complexity and observability's non-significant impact on intention might contrast with other studies that have found these factors to be influential in technology adoption scenarios. While the study's comprehensive innovation evaluation offers a clear statistical representation of variable influences, its geographic limitation to Singapore and reliance on visible or trialable innovations make it less applicable to the Philippines. The low visibility of parcel lockers in the Philippines could significantly hinder the effectiveness of IDT in this context, as the theory assumes a level of user engagement and visibility.

On the other hand, An et al. (2022) utilized Protection Motivation Theory (PMT) and the Technology Acceptance Model (TAM) to explore U.S. consumers' adoption decisions regarding parcel locker services, using Structural Equation Modeling (SEM) for analysis. Based on the findings of their study, there is a consensus in the literature regarding the significance of trust and perceived ease of use in technology adoption. The study also offers a nuanced perspective by integrating PMT and TAM, suggesting a stronger role for technological efficacy over protection motivation, which may provoke further discussion and research in the field. Overall, this study's robust approach in examining interrelationships between various constructs is commendable. However, the cultural and contextual differences between the U.S. and the Philippines might limit the direct applicability of these findings to the Philippine market, where technological familiarity and acceptance dynamics differ.

Another interesting research is the integration of Resource Matching Theory, Innovation Diffusion Theory, and the Theory of Planned Behavior to assess Thai consumers' intentions using smart lockers (Tsai and Tiwasing, 2021). The use of Partial Least Squares Structural Equation Modeling (PLS-SEM) allowed for an intricate analysis of consumer behavior drivers. The result of this study agrees with existing research in highlighting the importance of technology acceptance factors but provides new insights by applying a multi-theory perspective in the Thai context. There is also a consensus on the significance of factors like convenience

and reliability, which aligns with global trends in technology adoption, although the specific emphases and interrelations might vary by context. Nonetheless, the specificity to Thai consumer behavior and the complex nature of the SEM could complicate the interpretation of results when considering application to the diverse and variably urbanized areas of the Philippines.

Furthermore, the research of Thongkam, Lohatepanont and Pornchaiwiseskul (2021) which focused on Bangkok to study factors influencing the use of automated parcel lockers combining TAM with variables like trialability is another relevant literature. The research findings from this literature are consistent with previous studies regarding the influence of perceived ease of use and usefulness on technology adoption. However, the lack of significant impact of perceived control and technology anxiety on intention to use APL provides a contrasting perspective to some existing literature, suggesting that these factors may vary in importance across different technologies and contexts. While their comprehensive framework and detailed quantitative analysis via SEM provide nuanced insights, the assumption of user familiarity and visibility of technology in Bangkok poses a significant challenge when considering the Philippine context, where such assumptions cannot be made.

In summary, while these methodologies offer valuable understanding into consumer behavior in contexts where parcel lockers are more established, their application to the Philippines requires additional consideration of local conditions, including initial awareness-building and understanding of the unique consumer landscape in the region.

2.3. Stated Choice Experiments

A stated choice experiments is a research methodology extensively used across various disciplines to gauge consumer preferences and decision-making processes under hypothetical scenarios. This technique is particularly effective at drawing out consumer preferences by presenting respondents with a set of alternative options, each defined by a series of attributes, from which they must choose (Fessler *et al.*, 2022). Originally developed to empirically test economic theories, notably the theory of indifference curves, stated choice experiments have evolved significantly and are now applied widely in fields such as transportation, healthcare, marketing, and environmental economics (Bliemer and Rose, 2014). The design of stated

choice experiments involves meticulous planning to ensure the scenarios are realistic and relevant. This includes decisions about the labelling, the number of tasks, and the attributes included in each task. Respondents are asked to make choices based on these set of alternatives, which distinguishes this methodology from others that query past behaviors or attitudes (Polydoropoulou *et al.*, 2022).

Stated choice experiments are highly flexible, allowing researchers to test a wide range of scenarios and attributes. This flexibility is crucial for exploring products or services that do not yet exist in the market. This type of methodology provides detailed insights into consumer preferences and the trade-offs they are willing to make, offering a quantitative measure of the relative importance of different attributes (Caspersen and Navrud, 2021). This methodology is invaluable for designing or modifying services and for informing policy and business strategies. However, stated choice experiments have limitations. The hypothetical nature of the scenarios can lead to biases, as responses may not always reflect actual behavior (Caspersen, Navrud and Bengtsson, 2022). The design and interpretation of stated choice experiments require significant expertise, and both the data collection and analysis processes are resource intensive. These factors can complicate the application of stated choice experiments and may lead to oversimplification of complex real-world decision-making processes.

Additionally, analytical methods used in stated choice experiments are crucial for interpreting the data gathered from these surveys. These methods typically revolve around discrete choice modeling, a statistical technique used to predict choices between two or more discrete alternatives. Two of primary analytical techniques employed in stated choice experiments are the multinomial logit (MNL) model and the mixed logit model. The MNL model is one of the most used analytical methods in stated choice experiments. It is based on random utility theory, which posits that the utility of each choice alternative for an individual is composed of an observable component and a random component. The model estimates the probability that a particular choice will be selected over other alternatives, based on the attributes of the choices and potentially other individual-specific variables.

The MNL model is straightforward in interpretation and implementation. Its simplicity makes it widely accessible and applicable in various fields. However, one significant limitation is the independence of irrelevant alternatives (IIA) assumption, which implies that the relative

odds of choosing between any two alternatives are unaffected by other available alternatives (StataCorp., 2023). This can be unrealistic in scenarios where choices are closely related.

In contrast, the mixed logit model expands upon the MNL model by incorporating randomized fluctuations in taste, unconstrained substitution patterns, and temporal correlations in unobserved variables. This flexibility makes the mixed logit model more robust and realistic for analyzing stated choice data. It can accommodate complex preference structures and heterogeneity across individuals, reflecting more nuanced consumer behaviors (Chen *et al.*, 2024). It also allows for the specification that certain parameters such as the sensitivity to cost or time vary among individuals. Although, the model is computationally more intensive than simpler models like the MNL. Its complexity requires careful specification and interpretation, which can demand more expertise and computational resources.

For the purpose of this study, the methodology will only focus on MNL and mixed logit models. Each analytical method offers distinct advantages and is suited to different types of research questions and data structures. These methods collectively enable researchers to extract valuable insights from stated choice experiments, informing both academic research and practical decision-making in real-world applications.

Stated choice experiments are increasingly utilized to understand consumer preferences for various last-mile delivery options, including the potential use of parcel lockers as a sustainable alternative to traditional delivery methods. As such, to understand the effectiveness of stated choice experiments in estimating the consumer preferences for last mile delivery, it is essential to consult the existing literatures.

Molin, Kosicki and van Duin (2022) conducted a detailed study in the Netherlands to explore consumer preferences among different delivery options: home delivery, service point delivery, and parcel locker delivery. They employed a stated choice experiment where participants were presented with scenarios varying in delivery price, time slots, and distance to pick-up points. This data was analyzed using a mixed multinomial logit model, which allowed the researchers to capture the trade-offs consumers make between different attributes of delivery methods. The analysis showed all varied attributes significantly impacted utility, and preferences varied with personal characteristics. Notably, even a small price increase for HD significantly decreased its selection, suggesting consumers' sensitivity to price changes. An

expanded locker network, coupled with price adjustments, showed potential to shift consumer preferences significantly toward PL use. For this research, the methodology used is particularly adaptable and may offer valuable insights into how variations in delivery attributes could influence the adoption of parcel lockers among Filipino consumers.

Another relevant literature is the research of Da Silva, De Magalhães and Medrado (2019) which analyzed consumer preferences for pick-up sites in Brazil as an alternative to home delivery. Their methodology also relied on a stated preference survey combined with discrete choice modeling. This study's flexibility allowed for the exploration of consumer responses to hypothetical changes in service attributes, providing a robust framework for quantitative analysis. Interestingly, the study found that a significant majority (92%) of respondents would prefer the pick-up site option in scenarios offering a reduction in both freight cost and delivery time, especially when the pick-up site is conveniently located on their daily route. Similar to the first study, it could directly inform policy and strategic decisions in the Philippines by identifying key preferences such as cost and location that might influence consumer choice towards parcel lockers.

On the other hand, a study conducted by Iannaccone, Marcucci and Gatta (2021) focused on the preferences of young consumers in Rome, using stated preference surveys analyzed through multinomial logit models. This study provided valuable insights into how different attributes such as cost and location impact consumer choices and forecasted market demand for parcel lockers. Specifically, the analysis showed that distance from home or work and 24/7 accessibility emerged as critical determinants of parcel locker choice. Financial incentives and environmental certifications also influenced preferences, though to a lesser extent. The strengths of this study lie in its applicability to hypothetical scenarios and detailed insight into preferences, which are crucial for strategic decision-making. The methodology's adaptability makes it suitable for exploring how parcel locker services could be tailored to fit the Philippine market, particularly among younger demographics.

Lastly, Collins (2015) employed a more complex model, the random parameter error components logit (RPECL), to study the environmental implications of delivery options in Sydney, Australia. This method allowed for a nuanced understanding of how behavioral factors influence delivery choices, integrating these choices into everyday travel patterns. In fact, the result of the study found that consumer preferences for collection points can be significantly

influenced by the integration of pickups into existing travel patterns, which aligns with existing literature suggesting that convenience and reduced travel are critical in consumer choice of delivery methods. These findings support the notion that providing more convenient and environmentally friendly options could shift consumer behavior towards more sustainable practices. The depth of analysis provided by this methodology could guide effective environmental strategies in parcel delivery, relevant to enhancing sustainable logistics solutions in urban areas like those in the Philippines.

Each of these studies contributes valuable insights into the factors driving consumer preferences for last-mile delivery options, emphasizing the utility of stated choice experiments in capturing detailed consumer preferences across different contexts. For the Philippine context, where traditional delivery methods dominate and new technologies like parcel lockers are not yet widespread, stated choice experiments provide a valuable methodological approach to explore and understand potential consumer adoption and preference structures. The flexibility to simulate various hypothetical scenarios will allow the assessment of consumer preferences in the absence of real-world usage data. This can be instrumental in identifying which features of parcel locker services—such as location, distance, payment method, and shipping fee—are most likely to influence adoption and preference. This method provides predictive insights that are crucial for tailoring interventions to fit consumer preferences and for supporting strategic decisions regarding the implementation and promotion of parcel lockers in the Philippines.

3. Methodology

A stated choice experiment was conducted to understand the preferences and potential adoption of parcel lockers for last-mile delivery among Filipino online consumers. This section describes the design of the experiment, the data collection, and the data analysis methods.

3.1. Design of Stated Choice Experiment

The survey was created and designed online using a web application called SurveyEngine. This software is an online survey instrument suitable for academic-grade market research methods like discrete choice experiments, best-worst scaling, and conjoint analysis among others (SurveyEngine GmbH, 2024). It is used extensively by academicians and researchers in the fields of transportation, health, and environment.

In the stated choice experiment, respondents must imagine that they have purchased a medium-sized product online and they need to choose a delivery method. Additional scenario settings like good weather and product dimensions were also explained to respondents. Afterwards, they were presented nine (9) scenarios or choice sets that each describes three alternatives: door-to-door delivery, parcel lockers, and service points.

Each alternative is given four (4) varying attributes. For the selection of attributes, the existing literature was consulted. The main attributes identified are location, distance, payment method, and shipping fee. The specifications of attribute levels were then defined using real-world information.

- **Location.** This attribute was selected based on the parcel locker study conducted by Iannaccone, Marcucci and Gatta (2021) in which they specified two groups of location: (1) shopping center and supermarket and (2) gas station and metro station. For this study, however, an expanded attribute levels were introduced. Five levels or five groups of locations were presented to respondents: (1) home, (2) transportation stations (LRT/MRT, bus stations, integrated terminal exchange stations), (3) residential sites (condominiums, apartment complexes, executive villages, subdivisions), (4) service sites (schools, gyms, banks, post offices, pawnshops), and (5) shopping places (malls, supermarkets, convenience stores). Several constraints were applied in the survey

settings to make the scenario realistic. First, the home location is only applicable for door-to-door delivery alternative. Second, transport stations, residential sites, service sites, and shopping places are all available for parcel locker alternative. Lastly, only the service sites and shopping places are valid locations for collection points.

- **Distance.** Several discrete choice experiments on last-mile delivery have included distance as an important attribute for delivery methods (Molin, Kosicki and van Duin, 2022; Da Silva, De Magalhães and Medrado, 2019; Iannaccone, Marcucci and Gatta, 2021; Chen et al., 2024). There were five levels of distance provided to respondents: (1) no travel required, (2) 500 meters (about 6 minutes' walk), (3) 750 meters (about 9 minutes' walk), (4) 1000 meters (about 12 minutes' walk), and (5) 1250 meters (about 15 minutes' walk). Again, some constraints were applied. For door-to-door delivery, the distance is 0, which means no travel required. For parcel locker, first four levels were assigned, including the no travel required because the parcel locker may be in an area along the respondents' route to work or school. And lastly, for collection point, levels 2 to 5 were assigned.

- **Payment Method.** This attribute was not adopted from any of the existing literature. Instead, this was included in the experiment to reflect a unique characteristic of the e-commerce environment in the Philippines. For Filipinos online consumers, the most predominant choice of payment method is cash-on-delivery. Additionally, based on the 2021 Philippine Central Bank's Financial Inclusion Survey, 44% or 34.3 million of Filipino adults are unbanked (De Gantès, Gerson and Romano, 2023). This means that 4 out of 10 adults do not own any type of formal financial account. As such, typical payment methods offered to parcel locker users in Europe and other countries around the world may not be usable for Filipinos. As such, four levels of payment methods were introduced. These are: (1) cash, (2) online payment, (3) swipe or insert debit/credit card, and (4) contactless payment. All four levels of payment methods were applied to parcel locker and collection point alternatives while only cash and online payment were applied to door-to-door delivery.

- **Shipping Fee.** The cost of delivery was also identified as a key attribute in several choice experiments published by researchers. To reflect a realistic costing for delivery, the current online marketplace and parcel locker providers were reviewed. For the cost of door-to-door delivery and collection point, Lazada and Shopee applications were used. It was determined that when customers choose collection point, Lazada and Shopee do not charge any amount, hence, it is always ₱0. On the other hand, for door-

to-door delivery, the price ranges from ₱38 to ₱50. However, this only applies to orders from a single vendor. As customers order from multiple vendors, an additional ₱38 to ₱50 shipping fee is charged for each order. Lastly, for parcel lockers, service providers do not charge any amount as long as the customer picks up the parcel within a certain time period, typically from 16 hours to 24 hours after the order is delivered in the locker. If the customer picks up the parcel outside the free stay hours, an overstaying fee is applied. A total of eight levels of shipping fee was applied in the experiment, with specific applications for each alternative as shown in Table 1.

Table 1: Alternatives, Attributes, and Attribute Levels
(Source: Own work)

ATTRIBUTE	ALTERNATIVE	ATTRIBUTE LEVELS			
Location	Home delivery	Home			
	Parcel locker	Transport stations	Residential sites	Service sites	Shopping places
	Collection point	Service sites	Shopping places		
Accessibility	Home delivery	No travel required			
	Parcel locker	No travel required	500 meters (about 6 minutes' walk)	750 meters (about 9 minutes' walk)	1000 meters (about 12 minutes' walk)
	Collection point	500 meters (about 6 minutes' walk)	750 meters (about 9 minutes' walk)	1000 meters (about 12 minutes' walk)	1250 meters (about 15 minutes' walk)
Payment method	Home delivery	Cash	Online payment		
	Parcel locker	Cash	Online payment	Swipe or insert debit/credit card	Contactless payment
	Collection point	Cash	Online payment	Swipe or insert	Contactless payment

ATTRIBUTE	ALTERNATIVE	ATTRIBUTE LEVELS			
				debit/credit card	
Shipping fee	Home delivery	₱38	₱76	₱114	₱152
	Parcel locker	₱0	₱6	₱24	₱42
	Collection point	₱0			

An efficient experimental design was generated using the statistical software Ngene. Unlike orthogonal and orthogonal factorial designs, an efficient experimental is generated by simulating choices based on the probability of selection derived from the model, providing the best overall balance between design size and efficiency without limitations on attribute structure or levels (ChoiceMetrics, 2018). This approach allows the design to specifically target the most informative responses about the parameters, which is crucial when parameters are affected by random variations. For mixed logit models, which allow for random preference variations, efficient designs are particularly suitable. They accommodate the random parameter distribution, tailoring the experiment design to capture the essential data needed for accurate parameter estimation.

Based on the combinations of varying attribute levels of the four attributes, the Ngene software utilized Pseudo-random Monte Carlo simulation and Modified Latin Hypercube Sampling to generate 36 choice sets that are optimally distributed across the attribute levels. This generation process ensures that all potential variations are adequately represented. As mentioned earlier, several constraints were applied on attribute level combinations to ensure realism and to avoid dominant alternatives which could potentially bias parameter estimates (Bliemer and Rose, 2014).

The experimental design was then subdivided into four blocks with 9 choice sets each. Every respondent was randomly assigned to one of the four blocks and therefore responded to 9 choice sets. The subdivision of the situations of choice in blocks had the objective of making the survey more compact and attractive, keeping the focus of the respondents in the answers. In this type of sample design, instead of the number of situations being given by each level of each attribute, only the main effects of the combinations are captured (Louviere, Hensher and Swait, 2000). An example of a choice set is presented in Figure 1.

Figure 1. Example of a choice set presented to participants.

(Source: Own work)

3.2. Data collection

The survey was distributed online, posted in social media, groups, pages, and Messenger. This resulted in 289 respondents who attempted the survey, of which 110 completed the survey. Table 2 presents the socio-demographic characteristics of the sample.

Table 2. Descriptive statistics of respondents in the sample.

Source: (Own work)

SOCIO-DEMOGRAPHICS	CATEGORY	N=110	PERCENT
Age	Below 18 years old	0	0%
	18 - 24 years old	10	9.1%
	25 - 34 years old	42	38.2%
	35 - 44 years old	20	18.2%
	45 - 54 years old	6	5.5%
	55- 64 years old	16	14.5%
	65 and over	16	14.5%
Gender	Male	52	47.3%
	Female	58	52.7%
Education	Tertiary - Doctoral Level	3	2.7%
	Tertiary - Graduate Level	73	66.4%
	Tertiary - Undergraduate Level	30	27.3%
	Vocational	2	1.8%
	Secondary	2	1.8%
	Primary	0	0%
Work status	Full-time	61	55.5%
	Part-time	20	18.2%
	Not working / student / retired	29	26.4%
Monthly income	Less than ₱9,100	17	15.5%
	Between ₱9,100 to ₱18,200	24	21.8%
	Between ₱18,200 to ₱36,400	30	27.3%
	Between ₱36,400 to ₱63,700	18	16.4%
	Between ₱63,700 to ₱109,200	12	10.9%
	Between ₱109,200 to ₱182,000	6	5.5%
	At least ₱182,000 and up	3	2.7%
Seen or heard of PL	Yes	71	64.5%
	No	39	35.5%
Used PL before	Yes	37	33.6%
	No	73	66.4%
Used CP before	Yes	65	59.1%
	No	45	40.9%

The sample presents a near-even split between female (52.7%) and male (47.3%) respondents. It is noteworthy that individuals with higher education, particularly those with graduate-level tertiary qualifications, are substantially overrepresented, accounting for 66.4% of the sample, in comparison to those with vocational or secondary education who are markedly underrepresented. Moreover, the age distribution is skewed towards young and middle-aged adults, with those between 25 to 44 years of age comprising over half of the respondents. The age brackets below 18 and the senior groups 45 and above are less represented within the

sample. Additionally, there's a diverse range of income levels, with a significant number of participants earning between ₱18200 to ₱36400 monthly.

In the sample, a majority of respondents are familiar with parcel lockers (PL), with 64.5% having seen or heard about them, indicating a significant level of awareness. However, prior usage of PL is less common, with only 33.6% of the sample having actually used them before. This suggests that while parcel lockers are within the public's knowledge, their adoption as a service is not as widespread.

On the other hand, collection points (CP) have a higher usage rate, with nearly 60% (59.1%) of the participants reporting having used them, pointing towards a greater acceptance or possibly longer-standing familiarity with this mode of parcel collection. The discrepancy between the high awareness of parcel lockers and the lower actual usage rate compared to collection points could reflect different stages of adoption or preference for traditional collection methods.

3.3. Data analysis

The responses from SurveyEngine were processed, cleaned, and uploaded to Stata for model estimation and analysis (StataCorp., 2023). For comparative purposes, a multinomial logit model (MNL) was initially estimated. This served as a baseline model, which assumes independence from irrelevant alternatives (IIA) and homogeneity of preferences across individuals. The MNL model's estimates were used to verify the necessity to move to a more advanced model.

To account for repeated choices by the same individual and account for preferences that vary randomly across individuals, a panel-based mixed logit model was chosen as the primary analytical tool. This model allows the capture of preference heterogeneity and relaxation of IIA assumption, making it more flexible than the MNL model. Meanwhile, the panel nature of the data came from respondents making multiple choices across different scenarios. In short, the panel-based mixed logit choice model was used as it can handle the randomness in the preferences across individuals and accommodate the variation in attribute levels across alternatives.

In a panel-based mixed logit choice model, the actual or final formula incorporates both fixed and random coefficients to reflect how individuals make choices between different alternatives over time. The utility that individual i derives from choosing alternative a at time t, U_{iat}, typically combines observed variables, fixed parameters, and random parameters.

The general formula for the utility is:

$$U_{iat} = X_{iat}\beta_i + W_{iat}\alpha + Z_{it}\delta_a + \varepsilon_{iat}$$

Where:

- X_{iat} is a vector of alternative-specific variables (that may vary over time or scenario and individuals).

- β_i is a vector of random coefficients (that vary over individuals but not over alternatives, capturing preference heterogeneity).

- W_{iat} is a vector of alternative-specific variables with fixed coefficients.

- α is a vector of fixed coefficients associated with W_{iat}.

- Z_{it} is a vector of individual-specific or case-specific variables.

- δ_a is a vector of alternative-specific coefficients associated with Z_{it}.

- ε_{iat} is a random error term.

In discrete choice modelling, especially when dealing with a panel structure, the concept of "time" might be abstract, which means it might not represent actual time but different conditions or scenarios under which choices are made. For this study, instead of actual time, each respondent has a unique set of scenarios or t that are not repeated within the same panel unit.

For this study, the following utility functions were applied:

$$U_{i,HomeDelivery,t} = \beta_{loc}\cdot loc_{iat} + \beta_{dis}\cdot dis_{iat} + \beta_{pay}\cdot pay_{iat} + \beta_{fee}\cdot fee_{iat} + \varepsilon_{iat}$$

$$U_{i,ParcelLocker,t} = \beta_{age} \cdot \boldsymbol{age}_{iat} + \beta_{sex} \cdot \boldsymbol{sex}_{iat} + \beta_{educ} \cdot \boldsymbol{educ}_{iat} + \beta_{work} \cdot \boldsymbol{work}_{iat}$$

$$+ \beta_{income} \cdot \boldsymbol{income}_{iat} \quad + \beta_{par\_use} \cdot \boldsymbol{par\_use}_{iat} + \beta_{par\_seen} \cdot \boldsymbol{par\_seen}_{iat} + \beta_{cp\_use}$$

$$\cdot \boldsymbol{cp\_use}_{iat} + \varepsilon_{iat}$$

$$U_{i,CollectionPoint,t} = \beta_{age} \cdot \boldsymbol{age}_{iat} + \beta_{sex} \cdot \boldsymbol{sex}_{iat} + \beta_{educ} \cdot \boldsymbol{educ}_{iat} + \beta_{work} \cdot \boldsymbol{work}_{iat}$$

$$+ \beta_{income} \cdot \boldsymbol{income}_{iat} + \beta_{par\_use} \cdot \boldsymbol{par\_use}_{iat} + \beta_{par\_seen} \cdot \boldsymbol{par\_seen}_{iat} + \beta_{cp\_use}$$

$$\cdot \boldsymbol{cp\_use}_{iat} + \varepsilon_{iat}$$

In these utility functions:
- loc, dis, pay, and fee represent the variables for the home delivery alternative.
- age, sex, educ, work, income, par_use, par_seen, and cp_use are variables that are potentially common across alternatives but may have different effects (coefficients) for parcel locker and collection point.

Next, to calculate the choice probabilities for each alternative, the formula for panel-based mixed logit is applied. The probability that individual i chooses alternative a at time t, conditional on the random coefficient vector $\boldsymbol{\beta_i}$, is:

$$P_{iat}(\boldsymbol{\beta_i}) = \frac{e^{U_{iat}}}{\sum_{j=1}^{A} e^{U_{ijt}}}$$

Where:
- $\boldsymbol{\beta_i}$: These are the random coefficients specific to individual i, which capture individual-specific preferences and allow for heterogeneity in the choice model.
- $e^{U_{iat}}$: The exponential function of the utility $\boldsymbol{U_{iat}}$ ensures that the probability is positive and non-linearly related to the utility. The exponential function is commonly used in choice models due to the logit's closed-form and the convenient property that the error term follows a Gumbel distribution.
- $\boldsymbol{U_{iat}}$: The utility that individual i derives from choosing alternative a at time t. It is a function of the observed characteristics and parameters of the model.

- $\sum_{j=1}^{A} e^{Uijt}$: This is the sum of the exponentiated utilities of all *A* alternatives available to the individual at time *t*. It acts as a normalizing constant that ensures that the probabilities across all choices sum to 1.

- *j* : An index for the alternatives, which runs from 1 to *A*.

The model estimation was conducted using maximum simulated likelihood (MSL) to ensure convergence and stable parameter estimates. Its rationale is to simulate and approximate choice probability by drawing multi-dimensional random numbers from a postulated probability distribution of β and taking the mean value (Chen *et al.*, 2024). For a panel data set with *N* individuals, the log-transformed simulated likelihood function (*LL*) is:

$$LL = \sum_{i=1}^{N} log\,(L_i)$$

where L_i is the simulated likelihood for the *i*-th individual, calculated as the product of probabilities of the choices made by the individual across all time periods:

$$L_i = \prod_{t=1}^{T} \prod_{a=1}^{A} (P_{iat})_{diat}$$

The final panel-based mixed logit model was obtained by maximizing the simulated log-likelihood function using 250 Halton draws. The number of draws was determined by constantly increasing the number of draws until the parameters became stable. The resulting parameter values from this model are presented in Table 3 and discussed in the next section.

4. Results and Discussion

4.1. Model estimation

Each of the 110 respondents made choices in each 9 scenarios, making a total of 990 cases. Since there are 3 alternatives for every case, a total of 2,970 observations were gathered. Of these choices, 43% were made for a home delivery alternative, 23.5% for a parcel locker alternative, and 33.5% for a collection point alternative. The model estimations from these observations were analyzed using Stata.

Comparing different statistical models is crucial in analyzing decision-making behavior, particularly in choice modeling where the nuances of individual and group choices are examined (Chen *et al.*, 2024). Hence, the data collected was estimated using both the MNL and the panel-based mixed logit model. This comparison provided additional insights due to the distinct approaches and assumptions of both models. The MNL model, for instance, operates under the Independence of Irrelevant Alternatives (IIA), implying that the choice between two options is not influenced by other available options (Lee, Yoo and Song, 2016). In contrast, the mixed logit model allows for variability in individual preferences and acknowledges unobserved factors affecting choices, thus providing a more flexible framework for understanding decision dynamics (StataCorp., 2023).

Each model has its advantages depending on the complexity of the data and the specificity of the analysis required. Mixed logit models are particularly valuable for recognizing preference heterogeneity among individuals and better capturing substitution patterns between similar choices, aspects that MNL models might overlook due to their assumption of uniform preferences across individuals (Crabbe and Vandebroek, 2012). While MNL models are simpler and faster to estimate, mixed logit models, though computationally heavier, offer a more detailed and potentially more accurate reflection of real-world choice processes. Hence, this comparison aided in selecting a model that best fits the data.

Table 3 presents the parameter estimates of the MNL (model 1) and mixed logit model (model 2). First, looking at the final log-likelihood, the MNL recorded -1002.7777 while the

mixed logit model has -706.81924. Considering that a higher (less negative) log-likelihood indicates a better fit to the observed data, the result means that there is an improvement in the model fit of the mixed logit as compared with the MNL. Additionally, comparing the Wald chi-square statistics of the models provided more insight into their relative fit and effectiveness in explaining the variation in the data based on the predictors used. Wald Chi-square Test evaluates the overall significance of the model (Yaylali, Çelik and Dilek, 2016). A significant chi-square statistic indicates that at least one of the coefficients significantly contributes to explaining the dependent variable, thus validating the inclusion of the predictors in the model . Based on the results of the model estimations, the Wald chi-square of the MNL model is 62.36 while the mixed logit model is 74.39. This means that the mixed logit model with the higher Wald chi-square value provides a better fit to the data compared to the MNL model.

The result of the final log-likelihood and Wald chi-square test implies that the mixed logit model, with its additional complexity and ability to account for random variations in preferences (random coefficients), is capturing more of the nuances in the data than the simpler MNL model. Therefore, only the findings based mainly upon the parameter estimates of the mixed logit model are discussed hereafter.

Table 3. Parameter estimates of two discrete choice models.

Source: (Own work)

	Model 1: Multinomial Logit Model			Model 2: Panel Mixed Logit Model		
Parameter	**Coefficient**	**z-test**	**p-value**	**Coefficient**	**z-test**	**p-value**
Alternative- specific variables (attributes)						
Location	0.030209	0.46	0.649	-0.4309882	-2.64	0.008**
Distance	-0.082354	-1.63	0.102	-0.2020596	-1.96	0.05*
Payment Method	0.0326851	0.91	0.362	0.0544767	0.92	0.356
Shipping Fee	-0.1344744	-4.67	0.000***	-0.2834129	-4.21	0.000***
Home Delivery (HD)	(base alternative)			(base alternative)		
Parcel Locker (PL)						
Age (PL)	-0.2018833	-1.43	0.152	-0.4428633	-1.98	0.048*
Sex (PL)	0.4576585	1.21	0.225	0.4336554	0.74	0.462
Education (PL)	0.1627183	0.55	0.582	-0.1794149	-0.57	0.566
Work status (PL)	0.1900534	0.76	0.447	0.9115343	2.41	0.016*

	Model 1: Multinomial Logit Model			Model 2: Panel Mixed Logit Model		
Parameter	**Coefficient**	**z-test**	**p-value**	**Coefficient**	**z-test**	**p-value**
Income (PL)	-0.0035077	0.03	0.980	-0.028581	0.15	0.884
Used PL	-0.8077206	-1.5	0.134	-1.749282	-1.8	0.072
Heard or seen PL	-0.4340301	-1.03	0.304	-0.305315	-0.47	0.635
Collection Point (CP)						
Age (CP)	-0.2856455	-2.12	0.034*	-0.5949091	-2.33	0.02*
Sex (CP)	0.4476118	1.07	0.284*	0.1737325	0.26	0.797
Education (CP)	-0.1011643	-0.34	0.732	-0.6117455	-1.69	0.092
Work status (CP)	0.357469	1.38	0.167	1.11756	2.57	0.01*
Income (CP)	0.2225827	1.51	0.132	0.5061852	2.21	0.027*
Used CP	-0.8389858	-1.88	0.06	-1.124266	-1.43	0.151
Model fit						
N	110			110		
Observations	2970			2970		
Final Log-likelihood	-1002.7777			-706.81924		
Wald chi^2	62.36			74.39		
Prob > chi^2	0.0000***			0.0000***		

Significance: p<0.001(***); p<0.01(**); p<0.05(*).

To better explain the results, the dependent and independent variables should be distinguished. First, the dependent variable is the choice of alternative (home delivery, parcel locker, and collection point). On the other hand, the independent variables are grouped into two: the alternative-specific variables and case-specific variables. The alternative-specific variables are the attributes of the alternatives which are location, distance, payment method, and shipping fee. Meanwhile, the case-specific variables are those that are constant within case such as age, sex, educational attainment, work status, monthly income, previous usage of parcel locker, seen or heard parcel locker, and previous usage of collection point.

Additionally, it is critical to describe the general interpretation of the values included in the models. One of the important elements to interpret is the coefficient. Larger coefficients (in absolute value) generally indicate a greater impact of that attribute on the probability of choosing an alternative. On the other hand, the sign of the coefficient (+/-) indicates the direction of the impact (positive coefficients increase the probability, while negative coefficients decrease it). In each case, there is also a z-value which measures the number of

standard errors the coefficient is away from zero. A z-value with a large absolute value, typically greater than 1.96 or less than -1.96, indicates statistical significance at the 5% level, and this is usually accompanied by a p-value less than 0.05. The p-value indicates whether the relationship is statistically significant. Generally, a p-value less than 0.05 is considered significant.

4.2. Effects of alternative-specific variables on the choice of delivery method

In examining the relationship between the explanatory variables and the choice of home delivery, the negative coefficient for the location variable at -0.439882 implies that less desirable locations reduce the likelihood of choosing a delivery method. The z-value of -2.64 and the p-value of 0.008 suggest this variable's negative impact is both statistically significant and likely to be a real effect. **Therefore, both H1 and H2 are accepted.**

A similar interpretation applies to the distance variable, where its negative coefficient of -0.2020596 suggests that increased distance negatively affects the choice of delivery method. The corresponding z-value of -1.96 and p-value of 0.050 is only marginally significant, marking it a variable that could potentially influence consumer behavior, albeit with less certainty than location. **Therefore, both H3 and H4 are accepted.**

Meanwhile, the payment method, with its coefficient of 0.0544767 suggests a positive relationship with the utility for delivery methods, but with a p-value of 0.356, it is not statistically significant, so it cannot be confidently confirmed that the payment method has a reliable impact on the choice. This indicates that changes in the payment method are not associated with a consistent change in the probability of choosing any delivery method over other options, or the effect is too small to be detected with the given sample size. Also, as opposed to the hypothesis mentioned in the first section, the result indicates that more advanced payment options increase the likelihood of choosing a delivery method. **Therefore, both H5 and H6 are rejected.**

Lastly, the shipping fee variable presents a more definitive case. Its coefficient of -0.2834129 is significantly negative (z-value of -4.21 and p-value of 0.000), signaling a strong aversion to increased delivery fees when choosing a delivery method. This statistically

significant result emphasizes the importance of cost considerations in the consumer decision-making process. **Therefore, both H7 and H8 are accepted.**

4.3. Base alternative

Home delivery is indicated as the base alternative. The coefficients for the other alternatives are interpreted relative to this base case (Molin, Kosicki and van Duin, 2022). In discrete choice models, the base alternative is usually chosen for convenience, interpretability, or because it represents the most common or default choice among the options available. Moreover, the choice of base alternative might also be constrained by modelling considerations. Since most respondents in the dataset chose home delivery and have rarely used parcel lockers, making parcel lockers the base alternative would have led to less stable estimates because the "rare" choice becomes the reference category. Hence, home delivery was chosen as the base alternative. This way, the effects of variables on parcel lockers are analysed in terms of a shift away from the norm or from the home delivery alternative.

For the base alternative, coefficients are not estimated because it serves as the point of comparison for the effects of the variables on the probability of choosing other alternatives. The lack of coefficient and other statistical values for does not mean that the utility of the base alternative is zero. The home delivery is just the constant against which other utilities are measured. Its effects are captured in the constants of the other alternatives, wherein the model represents the utility of the base alternative when all other attributes are at their reference levels.

4.4. Effect of case-specific variables on parcel locker choice relative to home delivery

The coefficient for the age variable is -0.4428633, suggesting a negative relationship with the likelihood of choosing parcel lockers over home delivery. The negative sign indicates that as age increases, the preference for using parcel lockers decreases, which might be attributed to older individuals' familiarity and comfort with more traditional delivery methods. The effect, while subtle, is marginally significant, with a z-value of -1.98 and a p-value of 0.048,

indicating a borderline significant influence on choice behavior. **Therefore, both H9 and H10 are accepted.**

The analysis shows a coefficient of 0.4336554 for sex variable, which would suggest a positive effect, meaning that females are slightly more inclined towards using parcel lockers. However, the p-value of 0.462 reveals that this effect is not statistically significant, suggesting no substantial differences in preferences for parcel lockers between genders within the data sample. **Therefore, both H11 and H12 are rejected.**

The coefficient for education is -0.1794149, also indicating a negative influence on the selection of parcel lockers, meaning that people with less educational attainment have more preference for traditional delivery methods. However, the statistical insignificance of this relationship (p-value of 0.566) suggests that educational level does not play a crucial role in determining whether an individual prefers parcel lockers or home delivery. **Therefore, H13 is accepted while H14 is rejected.**

With a coefficient of 0.9115343, work status shows a significant positive impact on the choice of parcel lockers. The positive coefficient implies that individuals who are not employed are more likely to choose parcel lockers, potentially due to the convenience, flexibility, and cost considerations. The significance of this relationship is confirmed by a p-value of 0.014, indicating strong evidence that employment status influences delivery method preferences. **Therefore, H15 is rejected while H16 is accepted.**

The income variable, with a coefficient of -0.0258431 and a p-value of 0.886, shows that income has a negative and non-significant effect on the likelihood of choosing parcel lockers over home delivery. This suggests that income levels do not substantially affect the decision to use parcel lockers. **Therefore, both H17 and H18 are rejected.**

Interestingly, the coefficient for past parcel locker usage is -1.749282, indicating a strong negative effect on choosing parcel lockers if the individual has used them before. Despite the strong negative coefficient, the p-value of 0.072 places this effect just outside the usual thresholds for statistical significance, suggesting that while there is a trend where previous users might be less likely to use parcel lockers again, this trend does not meet the strict criteria for statistical significance at the 5% level. **Therefore, both H19 and H20 are rejected.**

Lastly, the coefficient for 'seen or heard about parcel locker' is -0.3505315 with a p-value of 0.635. This result indicates that increased visibility or awareness of parcel lockers does not significantly influence the likelihood of their selection. **Therefore, both H21 and H2 are rejected.**

These results explain the factors influencing the choice between home delivery and using parcel lockers. While some variables like age and employment status show a statistically significant relationship with delivery method preference, others like sex, education, income, and parcel locker visibility do not exhibit a strong enough impact to be considered decisive under typical statistical criteria.

4.5. Effect of case-specific variables on collection point choice relative to home delivery

The analysis shows a coefficient of -0.5949091 for age, indicating a negative relationship with the likelihood of choosing collection points over home delivery. This negative coefficient suggests that older individuals are less inclined to opt for collection points, possibly due to the inconvenience associated with such options. The statistical significance of this finding is underscored by a p-value of 0.020, confirming that age is a considerable factor in this preference.

With a coefficient of 0.1737325, the variable sex appears to have a positive but very weak association with the preference for collection points. However, the high p-value of 0.797 indicates that this effect is not statistically significant, implying that there is no substantial evidence to suggest differing preferences between genders for using collection points as a delivery method.

The education level has a negative coefficient of -0.6117455, which might suggest that individuals with higher education levels are less likely to choose collection points. Nevertheless, the relationship is not statistically significant, with a p-value of 0.092, indicating that while there is a trend, it does not reach the conventional levels of statistical confidence to assert a strong influence of education on this choice.

The variable 'work' shows a significant positive coefficient of 1.11756. This indicates that individuals who do not work are more likely to use collection points, potentially due to having more flexible time to manage pickups. The significance of this effect is validated by a p-value of 0.01, suggesting that employment status plays a crucial role in the decision to opt for collection points over home delivery.

Income exhibits a positive coefficient of 0.5061852, which is also statistically significant (p-value of 0.027). This suggests that individuals with higher incomes are more inclined to choose collection points. The significant coefficient indicates that higher income levels might correlate with a preference for the convenience and flexibility that collection points can offer.

The coefficient for previous collection point usage is -0.1175299, which points to a slight negative impact of prior usage on the likelihood of choosing collection points again. However, the p-value of 0.663 indicates that this relationship is not statistically significant. This lack of significance suggests that previous experiences at collection points do not strongly deter or encourage future use.

The results from this analysis underscore the complexity of factors influencing the choice of collection point over home delivery. While some variables such as age, work status, and income show significant effects, others like sex and previous usage do not exhibit a statistically significant impact. This highlights the importance of considering a broad range of factors when designing and promoting collection point services to cater effectively to diverse consumer preferences.

4.6. Post-estimation analysis using *margins*

After fitting a choice model, Stata recommends the use of margins, a command that allows the execution of detailed postestimation analysis (StataCorp., 2023). This includes calculating adjusted predictions and marginal effects. It can also be used to assess the effect of changing one or more predictor variables on the outcome while holding other variables at their means or specified values (AlKheder, 2023). For this reason, three of the identified significant

variables were estimated. The tables of predicted margins are attached to Appendix section.

Based on Figure 2, there is a clear trend that as income increases, the probability of selecting parcel lockers decreases. The margins are presented for seven different income levels, starting from the lowest income category (1) to the highest (7).

- For the lowest income level (1), the probability of choosing a parcel locker is the highest at approximately 29.3%.
- As income rises to level 2, this probability decreases slightly to around 26.4%.
- This downward trend continues steadily, with level 3 at 23.4%, level 4 at approximately 20.4%, level 5 at 17.4%, and level 6 at 14.6%.
- Finally, at the highest income level (7), the probability drops to about 11.9%.

The consistent decrease in the probability with increasing income is statistically significant across all income levels, as indicated by the z-values and the very small p-values (essentially 0.000). This implies that the relationship between income and the probability of using parcel lockers is a strong, consistent pattern present in the data.

Figure 2. Probability estimates on parcel locker choice based on monthly income.
Source: (Own work)
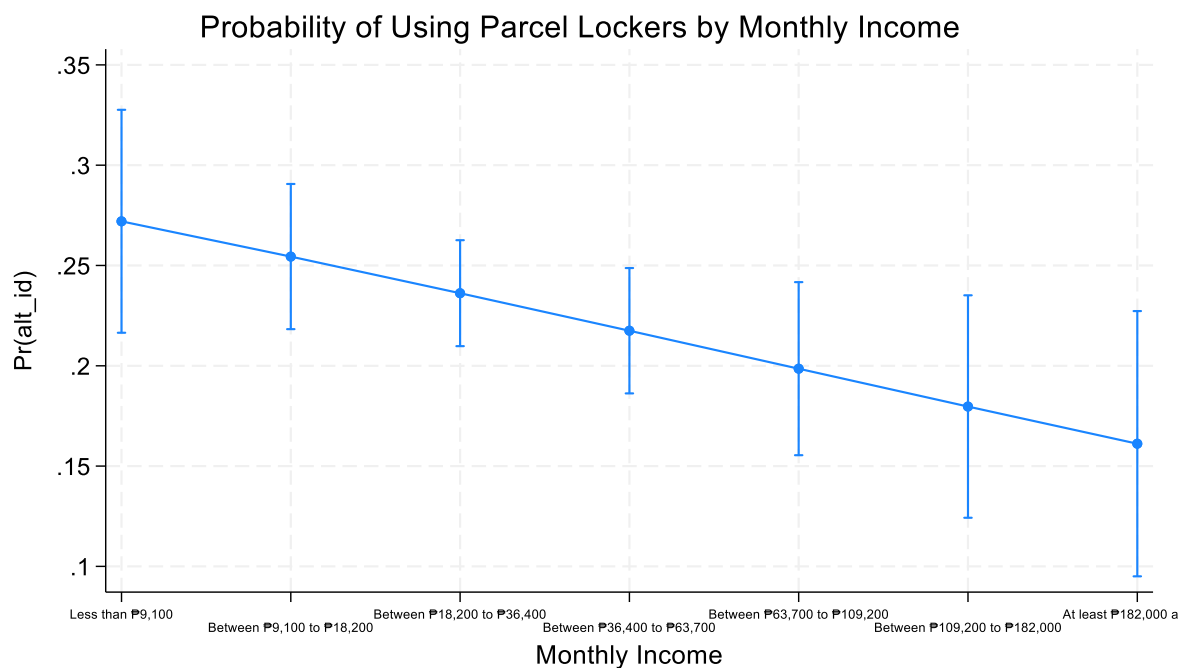
The graph illustrates this relationship visually, displaying a downward-sloping line as

income rises, with error bars representing the 95% confidence intervals for each predicted probability. The widening of the confidence intervals at higher income levels suggests greater variability in the preference for parcel lockers among individuals with higher incomes, which could be due to a variety of unobserved factors. This result can be due to several reasons. Lower-income individuals may favor parcel lockers due to their cost-effectiveness, the non-requirement for being present for delivery, or due to residing in multi-unit dwellings where home delivery may be less secure. On the other hand, higher-income individuals may have more secure options for home delivery or may value the convenience of home delivery more highly.

Figure 3. Probability estimates on the choice of delivery method based on age.

Source: (Own work)
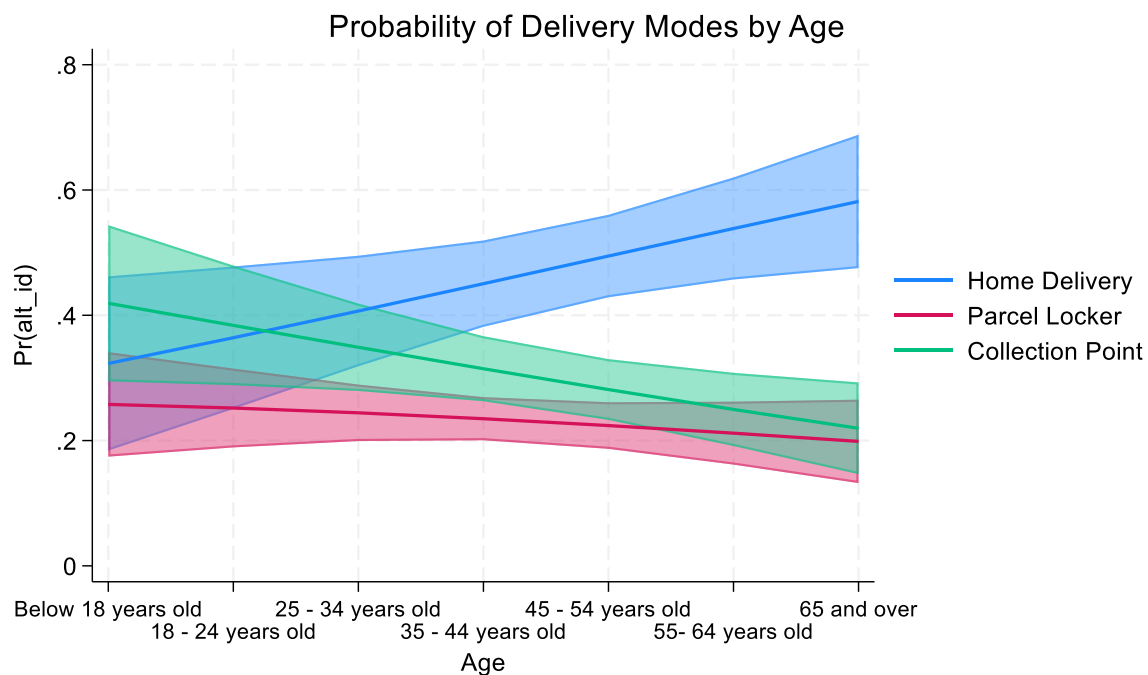
Subsequently, Figure 3 provides a discernible pattern showing how age influences the probability of selecting different delivery modes. The margins are outlined for seven distinct age groups, ranging from the youngest (1) to the oldest (7).

- For the youngest age group (1), the likelihood of opting for home delivery is lowest at approximately 32.36%, while the use of parcel lockers starts at a probability of around 24.43%, and collection points are chosen with a probability of about 39.44%.

- As we move to age group 2, the probability of selecting home delivery increases to around 36.41%, parcel locker preference decreases slightly to about 25.19%, and collection points dip to a probability of 38.39%.

- This trend continues with each advancing age group. By age group 3, home delivery preference rises to 40.68%, parcel lockers drop to 24.42%, and collection points inch upward to 39.83%. In age groups 4 and 5, we see a more pronounced preference for home delivery at approximately 45.79% and 49.45%, respectively. Simultaneously, the preference for parcel lockers decreases to about 22.39% and 21.12%, and collection points fluctuate slightly at 40.57% and 28.15%.

- For the older individuals in age group 6, the trend holds with home delivery increasing to 55.82%, parcel locker preference decreasing to 21.82%, and collection points dropping to 24.97%.

- Finally, in the oldest age group (7), the preference for home delivery peaks at about 58.17%, while the likelihood of choosing parcel lockers decreases further to 20.19%, and collection points are at a low of 21.95%.

The probabilities are statistically significant across all age groups for each delivery mode, as indicated by the z-values and p-values (essentially 0.000). This indicates that the relationship between age and the probability of choosing a particular delivery mode is strong and consistent throughout the data.

The graph visually illustrates these relationships with lines for each delivery mode that show the trends in probabilities across age groups. Home delivery preference increases with age, depicted by an ascending line, while the parcel locker line slopes downward, indicating a decline in preference as age rises. Collection points show a less clear-cut trend, with a line that exhibits slight fluctuations but generally suggests a slight increase in preference with age. These patterns may be attributed to various factors such as convenience, accessibility, and security considerations, which tend to differ across age groups. Younger individuals might find parcel lockers and collection points more aligned with their tech-savvy and flexible lifestyle, while older groups might prioritize the convenience and directness of home delivery.

Lastly, as can be seen in Figure 4, there is an observable trend indicating how work status affects the probability of choosing different delivery modes. The data covers three categories of work status: full-time, part-time, and not working/student/retired.

- For those employed full-time (work status 1), the likelihood of opting for home delivery is the highest at approximately 52.15%, while the use of parcel lockers is chosen with a probability of about 21.08%, and collection points are at around 26.83%.

- Moving to individuals working part-time (work status 2), there is a decrease in the probability of selecting home delivery to around 43.30%. Conversely, the preference for parcel lockers increases slightly to approximately 24.17%, and collection points are selected with a probability of about 32.56%.

- Among those not working, which includes students and retirees (work status 3), the trend shows a further decrease in the probability of choosing home delivery at about 34.75%. The likelihood of using parcel lockers does not significantly change, remaining close to 26.78%, while the preference for collection points shows a slight increase to 34.86%.

Figure 4. Probability estimates on the choice of delivery method based on work status.
Source: (Own work)
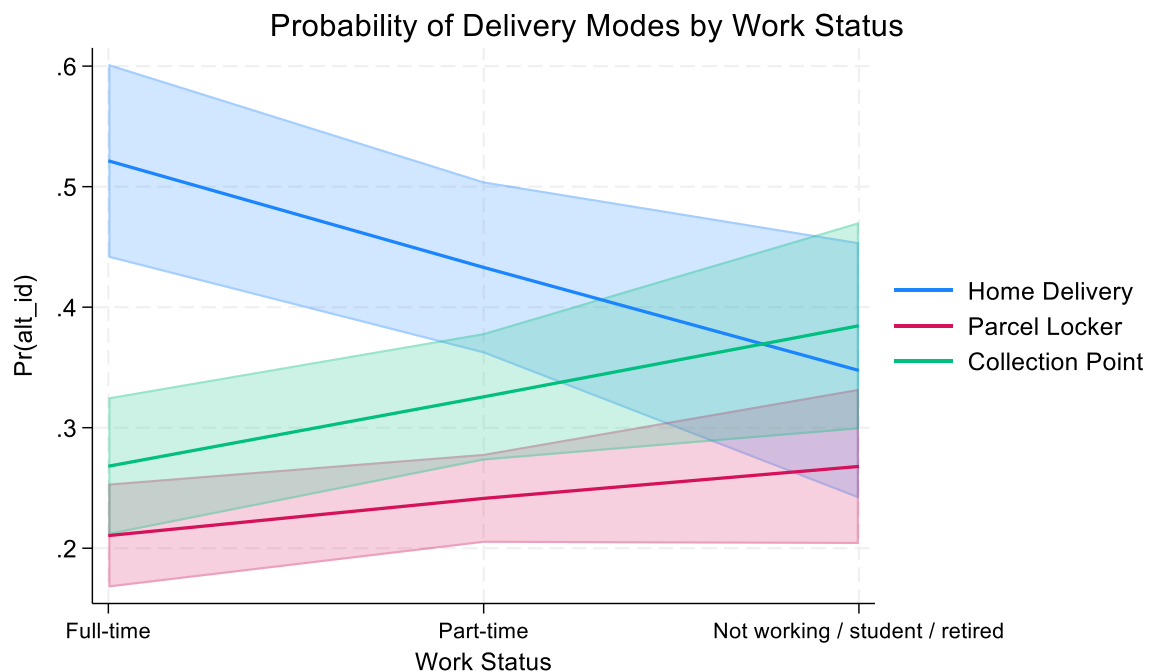
The consistent variation in probabilities across work statuses is statistically significant, as indicated by the p-values (0.000) and high z-values. This suggests that work status is a strong determinant of delivery mode preference.

In the graph, the relationships are visually depicted with different lines for each delivery mode, showing a downward trend for home delivery as work engagement decreases, while parcel locker and collection point preferences tend to increase or remain stable. The shaded areas representing the 95% confidence intervals suggest some uncertainty in these predictions, particularly for those not in full-time employment, which could be due to a range of unobserved factors.

The observed patterns might be due to several reasons. Full-time workers may prefer home delivery due to convenience and the ability to receive packages outside working hours. In contrast, those with more flexible schedules, like part-time workers or those not working, may be more open to using parcel lockers and collection points due to the potential for daytime availability to pick up deliveries, or a preference for the exercise or outing associated with retrieving packages.

Overall, the margins command provided an innovative way to interpret the effects of predictors in choice models in a more understandable format, shifting from coefficients to differences in probabilities or other measures directly interpretable in the context of the model's application.

4.7. Market share simulation

In this section, market share simulations based on expected choice probabilities in the model are shown and explained. The implemented simulations show what happens to market shares of home delivery, parcel locker, and collection point under different location, distance, payment method, and shipping fee attributes.

For each consumer, the choice probabilities are predicted for the three alternatives in each of the five scenarios. The averages across all these predicted probabilities are presented in Table 4, which are interpreted as the market shares of the delivery options under each scenario. Since current market shares of the three delivery alternatives are not available, the predicted market shares only reflect stated market shares as observed in the sample. The results are derived from changing specific variables and observing the resulting preferences among consumers, which reflect the sensitivity of consumers to these attributes.

Table 4. Predicted shares of delivery methods under 5 scenarios

Source: (Own work)

Attributes	Base scenario	Online/Card payment only	Max cost	Max distance	Under best PL, worst HD & CP attributes
HD Location	Home	Home	Home	Home	Home
PL Location	Residential s.	Residential s.	Residential s.	Residential s.	Residential s.
CP Location	Service site	Service site	Service site	Service site	Service site
HD Distance	No travel	No travel	No travel	No travel	No travel
PL Distance	No travel	No travel	No travel	1000 meters	No travel
CP Distance	500 meters	500 meters	500 meters	1250 meters	1250 meters
HD Payment M.	Cash	Online p.	Cash	Cash	Cash
PL Payment M.	Cash	Swipe card	Cash	Cash	Swipe card
CP Payment M.	Cash	Swipe card	Cash	Cash	Online p.
HD Price	₱38	₱38	₱38	₱38	₱152
PL Price	₱0	₱0	₱42	₱0	₱0
CP Price	₱0	₱0	₱0	₱0	₱0
HD market share	43%	35.3%	40.7%	46.5%	27.%
PL market share	23.5%	45.2%	21.9%	25.7%	56.2%
CP market share	33.5%	19.4%	37.5%	27.8%	16.3%

The base scenario serves as the benchmark for comparison. All attributes are set at their base levels, providing a snapshot of current consumer preferences without any modifications to service attributes. In this scenario, home delivery captures a market share of 43%, parcel lockers 23.5%, and collection points 33.5%. These figures suggest a relatively balanced preference among the different delivery methods under typical conditions.

The second scenario limits the payment method to online/card payments for the three alternatives while keeping all the other factors constant. Based on the result, a notable shift in consumer preferences is observed. The market share for home delivery decreases to 35.3%, indicating that some consumers may prefer traditional cash payments for home deliveries. Conversely, parcel locker sees an increase to 45.2%, suggesting that users of parcel lockers find online or card payments more aligned with the convenience and modernity of this delivery

method. Collection point's share decreases to 19.4%, possibly due to less preference for card payments when collecting from service sites.

In this third scenario, the cost of home delivery and parcel locker is increased to the maximum. Surprisingly, home delivery's market share increases to 40.7%. This counterintuitive result may suggest that consumers value the direct-to-home convenience that home delivery offers, sufficiently to outweigh the high cost. Alternatively, this might indicate low price sensitivity among certain segments of home delivery users. Meanwhile, parcel locker's share drops significantly to 21.9%, and collection point increases to 37.5%, likely due to consumers seeking the most cost-effective options.

For the fourth scenario, distance is maximized for parcel locker to 1000 meters and collection point to 1250 meters, testing the impact of less convenient locations. Home delivery's market share increases dramatically to 46.5%, underscoring the critical role of proximity and convenience in delivery choice. The decline in parcel locker's share to 25.7% and collection point to 27.8% further validates that increased travel distance for pickup significantly deters users, reinforcing the importance of accessibility in choosing these options.

The last scenario provides parcel locker with the most favorable conditions while disadvantaging home delivery and collection point. Here, parcel locker's market share soars to 56.2%, highlighting that optimal conditions for parcel lockers can significantly attract consumers. In contrast, home delivery's share plummets to 27.0%, and collection point's to 16.3%. This stark shift demonstrates that enhancing the attractiveness of parcel lockers—through better location, easier payment methods, and zero cost—can divert a substantial number of consumers from traditional home delivery and collection points.

The simulation results indicate how sensitive consumers are to changes in specific attributes of delivery methods. This information can be critical for logistics companies, policymakers, or retail businesses looking to enhance service offerings or competitive positioning. However, it is important to note that these shares are based on stated preferences within the sample collected in this study and does not reflect actual market shares. For real-world application, the findings would need to be validated against actual market data.

4.8. Ranking of Attributes

Unrelated to the model estimation results, an analysis of additional survey questions was also performed. In particular, the ranking of attributes made by respondents was analysed. As shown in Figure 5, respondents placed the strongest importance on the distance involved in receiving their delivery. This would imply that respondents value proximity or convenience significantly when choosing a delivery method. The second and third most important attributes for the respondents are shipping fee and location, respectively. For location, the respondents have given more preference for residential sites and transport stations, which may be seen as locations where people are not oftentimes compelled to walk additional distance to pick up their parcels. Meanwhile, the lowest score for the payment method indicates that while payment options are a factor in the decision-making process, they are not as critical as distance, shipping fee, or location. This might suggest that respondents are relatively flexible regarding payment methods or that most payment options currently meet their needs.

Figure 5. Composite ranking of attributes based on perceived importance.

Source: (Own work)
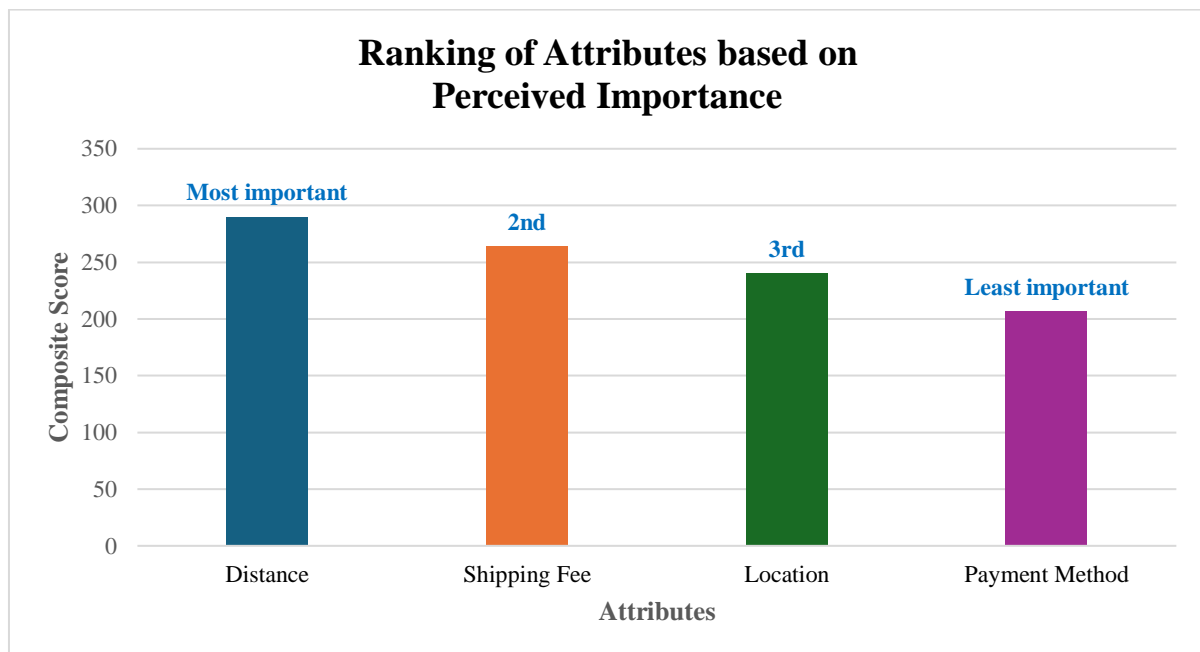
For service providers, these insights would suggest that strategies should prioritize minimizing the distance customers need to travel to receive their parcels, which could include increasing the number of parcel lockers or collection points or optimizing delivery routes for

speed and efficiency. Moreover, marketing communications might be more effective if they highlight the accessibility and convenience of pickup locations or the efficiency of the delivery process in terms of minimizing travel time or distance for the customer.

5. Conclusions and Recommendations

This paper explored the preferences of Filipino consumers regarding last-mile delivery options, with a specific focus on the adoption of parcel lockers. Conducted three years after parcel lockers were first introduced in the Philippines, this study aimed to understand the critical factors that influence consumer choices in a market where this delivery method remains largely unknown. Through a stated choice experiment involving 110 respondents, we utilized a panel-based mixed logit model to analyze consumer preferences, revealing nuanced insights into the attributes that most significantly impact delivery method selection.

The findings highlight that factors such as location, distance, and shipping fee play significant roles in influencing consumer preferences for last-mile delivery options. Particularly, we found that less convenient locations, longer distances, and higher costs significantly reduce the likelihood of selection of certain delivery methods. On the other hand, the type of payment method, though not a statistically significant influencer, was shown to positively impact consumer preferences towards certain delivery methods. Interestingly, unlike the general assumption that Filipinos prefer cash transactions, the result showed that the most favored option among the respondents is bank card payment. Moreover, several sociodemographic factors were also shown to have statistically significant impact on the choice of delivery options. The analysis of the effects of age and work status on the preference for using parcel lockers over home delivery reveals distinct trends. On one hand, the results indicate that as individuals age, their likelihood of choosing parcel lockers decreases. This trend might be due to older individuals' greater comfort with traditional delivery methods and less familiarity with newer technologies such as parcel lockers. Conversely, the analysis on the impact of work status suggests that individuals who are not employed, retired, or studying are more likely to opt for parcel lockers, likely valuing the convenience and flexibility they offer, which can be particularly appealing for those with variable schedules or lower income from not being employed.

Most importantly, the results from the scenario analysis is highly relevant to the overall goal of the research which is to understand the potential of wider parcel locker adoption in the Philippines. The findings from the scenario analysis underscore the substantial potential for parcel locker adoption in the Philippines, especially under conditions that optimize their appeal compared to traditional delivery methods. When parcel lockers are presented with favorable

conditions such as strategic location choices, simplified payment methods, and free usage, their market share increases dramatically to 56.2%. This notable rise indicates a strong consumer preference for parcel lockers when perceived barriers are minimized or eliminated. This result highlights the critical factors that could drive the adoption of parcel lockers in the Philippines. By addressing key consumer concerns and enhancing the attractiveness of parcel lockers, stakeholders can catalyze a shift towards more innovative and potentially more efficient last-mile delivery solutions. This strategy not only promises to improve consumer satisfaction but also aligns with broader goals of reducing logistical bottlenecks and enhancing the sustainability of urban delivery systems. Overall, the results from this study are crucial for multiple stakeholders, including businesses and policymakers, as they provide a clear indication of the strategies that could enhance the effectiveness and customer acceptance of parcel lockers and other innovative last mile delivery solutions in the Philippines.

However, this study has some limitations. The relatively small and non-representative sample size, predominantly consisting of highly educated young adults, suggests the findings might not be generalizable across the entire population. This limitation underscores the need for further research involving a larger and more diverse sample to validate these findings. Additionally, future research could explore other influential attributes, such as environmental factors, which were not included in this study but could provide deeper insights into consumer preferences and behaviors.

In conclusion, the stated choice experiment methodology used in this research has proven to be a robust approach for assessing consumer preferences in an emerging market like the Philippines. By providing valuable insights into how various attributes influence the choice of delivery methods, this study not only adds to the existing body of knowledge but also offers practical guidance for optimizing last-mile delivery services in the Philippines. As the e-commerce landscape continues to evolve, it is imperative that further research is conducted to explore the full potential of parcel lockers and other innovative delivery solutions in meeting the dynamic needs of Filipino consumers.

6. Summary

The exponential growth of e-commerce in the Philippines, catalyzed by the COVID-19 pandemic, has placed unprecedented demands on logistics service providers to deliver efficiently and reduce face-to-face interactions during the national health crisis. In response, parcel lockers have emerged as an innovative logistics solution. These secure, automated storage units are located in accessible areas such as shopping centers, residential complexes, and public spaces, offering a convenient and flexible alternative for 24/7 package collection without direct human contact.

Despite their potential, the adoption of parcel lockers in the Philippines has been slow, with the majority of Filipinos unaware of this delivery option. Major online marketplaces like Lazada and Shopee currently do not offer parcel locker delivery, further limiting its visibility and use. This study aims to identify the factors influencing Filipino consumers' delivery method preferences, employing a stated choice experiment to evaluate preferences for home delivery, parcel lockers, and collection points across varied attributes such as location, distance, payment method, and shipping fee.

The findings reveal that less convenient locations, greater distances, and higher costs significantly deter the selection of certain delivery methods. However, when parcel lockers are presented under optimal conditions—strategically located, with simplified payment methods and at no cost—their market share increases dramatically to 56.2%. This surge underscores a strong consumer preference for parcel lockers when perceived barriers are minimized, suggesting substantial potential for their wider adoption in the Philippines. This research provides essential insights for logistics service providers and policymakers to develop strategies that enhance the attractiveness and utilization of parcel lockers among Filipino e-commerce consumers.

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Attachments:

1ˢᵗ attachment: Survey Questionnaire

Welcome and thank you for participating in this survey!

I am currently working to complete my master's thesis, entitled **"Unlocking the Potential of Parcel Locker Adoption in Philippine E-commerce: A Stated Choice Experiment on Preferred Last-Mile Delivery Option."** This research is a critical requirement for my master's degree in supply chain management.

Your insights are crucial to this study, which aims to understand the preferences and potential adoption of parcel lockers for last-mile delivery among Filipino online consumers. Through this stated choice experiment, we aim to gather your preferences under various delivery scenarios to better assess the viability and appeal of parcel lockers in the Philippines. Your responses will play a key role in shaping the future of efficient and sustainable delivery solutions in the country.

All information gathered in this survey will be kept confidential. No individual will be identified in any publication of results. The survey will only take approximately 10 minutes to complete, and I am grateful for your valuable input and time. Thank you for being an awesome part of my academic journey!

Image of a parcel locker.

SURVEY SCENARIO

Imagine purchasing a medium-sized item/s online and you need to choose your preferred delivery method.

There are three (3) choices: door-to-door delivery, parcel lockers, and service points.

The **door-to-door delivery**, which means delivering your parcel directly to your home or work address, is the most common delivery method.

On the other hand, **parcel locker** is a new type of delivery option in the Philippines. It is a secure, self-service kiosk where recipients can pick up their packages at their convenience. These lockers are typically found in accessible locations such as shopping centers, residential buildings, transport hubs, or public spaces. Currently, there are three companies providing parcel locker services. These are MBOX Smart Lockers Corp., QUBE Smart Technology Corporation, and PopBox PH.

Lastly, a **collection or service point** is a delivery option that allows you to pick up your orders in your chosen location. You can pick up your orders in designated locations like malls, logistics centers or hubs, *M Lhuillier* branches, or other service points.

You will be given **10 scenarios** with varying conditions related to **location, payment method, method of receiving, and price.**

For the price, please note the rates below.

Door-to-door delivery shipping fee:
- ₱38 for purchases from 1 seller.
- ₱76 for purchases from 2 sellers.
- ₱114 for purchases from 3 sellers.
- ₱152 for purchases from 4 sellers.

Parcel locker shipping fee:
- FREE delivery if picked up within 16 hours.
- Additional fee for every 4 hours of overstaying. For example, there is a ₱6 overstaying fee if a medium-sized packaged is picked up 24 hours after delivery; ₱24 if picked up after 48 hours; and ₱42 if picked up after 72 hours.

Collection point shipping fee:
- FREE delivery. Parcel can be picked up within 7 days after delivery.

Now, considering the random attributes that will be given per scenario, **which delivery option would you choose?** Please click the "next" button at the bottom right of the screen.

Below are the 36 scenarios or choice sets generated by Ngene, a software tool used for generating experimental designs for stated choice surveys/experiments. These 36 scenarios have been grouped into 4, so respondents will only have to answer 9 scenarios each time.

	HOME DELIVERY				PARCEL LOCKER				COLLECTION POINT			
Choice Set	Loc	Dis	Pay	Fee	Loc	Dis	Pay	Fee	Loc	Dis	Pay	Fee
1	Home	No travel required	Cash	₱114	Shopping places	750 meters (about 9 minutes' walk)	Contactless payment	₱42	Service sites	500 meters (about 6 minutes' walk)	Contactless payment	₱0
2	Home	No travel required	Cash	₱114	Service sites	500 meters (about 6 minutes' walk)	Online payment	₱24	Shopping places	1000 meters (about 12 minutes' walk)	Contactless payment	₱0
3	Home	No travel required	Online payment	₱152	Residential sites	No travel required	Swipe or insert debit/credit card	₱24	Service sites	500 meters (about 6 minutes' walk)	Online payment	₱0
4	Home	No travel required	Cash	₱38	Service sites	750 meters (about 9 minutes' walk)	Contactless payment	₱6	Service sites	750 meters (about 9 minutes' walk)	Cash	₱0
5	Home	No travel required	Online payment	₱114	Shopping places	No travel required	Online payment	₱6	Service sites	1000 meters (about 12 minutes' walk)	Swipe or insert debit/credit card	₱0
6	Home	No travel required	Online payment	₱152	Transport stations	No travel required	Online payment	₱0	Service sites	750 meters (about 9 minutes' walk)	Cash	₱0
7	Home	No travel required	Cash	₱38	Shopping places	1000 meters (about 12 minutes' walk)	Online payment	₱42	Shopping places	1250 meters (about 15 minutes' walk)	Online payment	₱0
8	Home	No travel required	Cash	₱114	Service sites	750 meters (about 9 minutes' walk)	Cash	₱0	Service sites	1250 meters (about 15 minutes' walk)	Swipe or insert debit/credit card	₱0
9	Home	No travel required	Online payment	₱38	Service sites	No travel required	Swipe or insert debit/credit card	₱0	Shopping places	1000 meters (about 12 minutes' walk)	Cash	₱0
10	Home	No travel required	Online payment	₱152	Shopping places	500 meters (about 6 minutes' walk)	Cash	₱0	Shopping places	750 meters (about 9 minutes' walk)	Contactless payment	₱0

11	Home	No travel required	Online payment	₱152	Service sites	750 meters (about 9 minutes' walk)	Online payment	₱24	Shopping places	500 meters (about 6 minutes' walk)	Swipe or insert debit/credit card	₱0
12	Home	No travel required	Cash	₱38	Transport stations	No travel required	Swipe or insert debit/credit card	₱42	Shopping places	750 meters (about 9 minutes' walk)	Swipe or insert debit/credit card	₱0
13	Home	No travel required	Online payment	₱76	Service sites	500 meters (about 6 minutes' walk)	Swipe or insert debit/credit card	₱24	Service sites	1250 meters (about 15 minutes' walk)	Cash	₱0
14	Home	No travel required	Cash	₱38	Transport stations	No travel required	Contactless payment	₱24	Service sites	1000 meters (about 12 minutes' walk)	Online payment	₱0
15	Home	No travel required	Online payment	₱114	Shopping places	1000 meters (about 12 minutes' walk)	Contactless payment	₱24	Shopping places	1000 meters (about 12 minutes' walk)	Cash	₱0
16	Home	No travel required	Online payment	₱38	Shopping places	750 meters (about 9 minutes' walk)	Swipe or insert debit/credit card	₱6	Shopping places	500 meters (about 6 minutes' walk)	Contactless payment	₱0
17	Home	No travel required	Online payment	₱76	Shopping places	750 meters (about 9 minutes' walk)	Cash	₱42	Shopping places	1000 meters (about 12 minutes' walk)	Online payment	₱0
18	Home	No travel required	Cash	₱152	Shopping places	750 meters (about 9 minutes' walk)	Swipe or insert debit/credit card	₱0	Service sites	1000 meters (about 12 minutes' walk)	Swipe or insert debit/credit card	₱0
19	Home	No travel required	Online payment	₱114	Transport stations	No travel required	Cash	₱6	Shopping places	500 meters (about 6 minutes' walk)	Online payment	₱0
20	Home	No travel required	Online payment	₱76	Shopping places	500 meters (about 6 minutes' walk)	Contactless payment	₱0	Shopping places	750 meters (about 9 minutes' walk)	Swipe or insert debit/credit card	₱0
21	Home	No travel required	Cash	₱76	Shopping places	500 meters (about 6 minutes' walk)	Online payment	₱42	Service sites	500 meters (about 6 minutes' walk)	Cash	₱0
22	Home	No travel required	Cash	₱114	Service sites	500 meters (about 6 minutes' walk)	Contactless payment	₱6	Shopping places	1250 meters (about 15 minutes' walk)	Online payment	₱0

23	Home	No travel required	Cash	₱76	Residential sites	No travel required	Contactless payment	₱6	Shopping places	1000 meters (about 12 minutes' walk)	Swipe or insert debit/credit card	₱0
24	Home	No travel required	Online payment	₱76	Service sites	1000 meters (about 12 minutes' walk)	Online payment	₱6	Service sites	750 meters (about 9 minutes' walk)	Contactless payment	₱0
25	Home	No travel required	Cash	₱76	Shopping places	No travel required	Cash	₱24	Shopping places	1250 meters (about 15 minutes' walk)	Contactless payment	₱0
26	Home	No travel required	Cash	₱114	Residential sites	No travel required	Cash	₱42	Shopping places	750 meters (about 9 minutes' walk)	Cash	₱0
27	Home	No travel required	Cash	₱152	Service sites	1000 meters (about 12 minutes' walk)	Cash	₱6	Service sites	1000 meters (about 12 minutes' walk)	Contactless payment	₱0
28	Home	No travel required	Online payment	₱38	Residential sites	No travel required	Online payment	₱0	Service sites	1250 meters (about 15 minutes' walk)	Contactless payment	₱0
29	Home	No travel required	Online payment	₱114	Service sites	1000 meters (about 12 minutes' walk)	Swipe or insert debit/credit card	₱42	Service sites	750 meters (about 9 minutes' walk)	Online payment	₱0
30	Home	No travel required	Online payment	₱38	Service sites	500 meters (about 6 minutes' walk)	Cash	₱42	Service sites	500 meters (about 6 minutes' walk)	Swipe or insert debit/credit card	₱0
31	Home	No travel required	Cash	₱152	Shopping places	No travel required	Contactless payment	₱0	Service sites	500 meters (about 6 minutes' walk)	Online payment	₱0
32	Home	No travel required	Online payment	₱38	Shopping places	1000 meters (about 12 minutes' walk)	Cash	₱24	Service sites	1250 meters (about 15 minutes' walk)	Swipe or insert debit/credit card	₱0
33	Home	No travel required	Cash	₱76	Service sites	No travel required	Online payment	₱24	Service sites	750 meters (about 9 minutes' walk)	Online payment	₱0
34	Home	No travel required	Cash	₱152	Shopping places	500 meters (about 6 minutes' walk)	Swipe or insert debit/credit card	₱6	Shopping places	1250 meters (about 15 minutes' walk)	Cash	₱0

35	Home	No travel required	Online payment	₱152	Service sites	No travel required	Contactless payment	₱42	Shopping places	1250 meters (about 15 minutes' walk)	Contactless payment	₱0
36	Home	No travel required	Cash	₱76	Service sites	1000 meters (about 12 minutes' walk)	Swipe or insert debit/credit card	₱0	Shopping places	500 meters (about 6 minutes' walk)	Cash	₱0

DEMOGRAPHICS

1. Age:
- Below 18 years old
- 18 - 24 years old
- 25 - 34 years old
- 35 - 44 years old
- 45 - 54 years old
- 55- 64 years old
- 65 and over

2. Sex:
- Male
- Female

3. City / Province of Residence

4. Educational Attainment
- Tertiary - Doctoral Level
- Tertiary - Graduate Level
- Tertiary - Undergraduate Level
- Vocational
- Secondary
- Primary

5. Work status
- Full-time
- Part-time
- Not working / student / retired

6. Monthly Income Level
- Less than ₱9,100
- Between ₱9,100 to ₱18,200
- Between ₱18,200 to ₱36,400
- Between ₱36,400 to ₱63,700
- Between ₱63,700 to ₱109,200
- Between ₱109,200 to ₱182,000
- At least ₱182,000 and up

2nd attachment: Coding of Variables

VARIABLE CODE	VARIABLE LABEL NAME
case_id	Unique Respondent ID matching to the covariate data
scen_id	The Scenario number, starting from 1, from the absolute order the scenario was specified in the survey.
alt_id	Alternatives (1=Home delivery, 2=parcel locker, 3=collection point)
choice	Choice (0=not chosen, 1=chosen)
ALTERNATIVE-SPECIFIC VARIABLES	
loc	Location (1=Receive at home, 2=Pick up at transport stations (railways like LRT/MRT, bus stations), 3=Pick up at residential sites (condo, subdivisions), 4=Pick up at service sites (school, gym, bank, post office, gasoline stations, 5=Pick up at shopping places (malls, supermarkets, convenience stores))
dis	Distance (1=No additional travel required, 2=Distance to the nearest pick-up location is 500 meters (about 6 minutes' walk), 3=Distance to the nearest pick-up location is 750 meters (about 9 minutes' walk), 4=Distance to the nearest pick-up location is 1000 meters (about 12 minutes' walk), 5=Distance to the nearest pick-up location is 1250 meters (about 15 minutes' walk))
pay	Payment method (1=Pay cash, 2=Online payment, 3=Swipe or insert debit/credit card, 4=Contactless payment (Apple Pay, Google Pay))
fee	Shipping fee (1=₱0, 2=₱6, 3=₱24, 4=₱38, 5=₱42, 6=₱76, 7=₱114, 8=₱152)
CASE-SPECIFIC VARIABLES	
par_use	Previous usage of parcel locker (1=Yes, 2=No)
par_seen	Seen or heard about parcel locker (1=Yes, 2=No)
cp_use	Previous usage of collection point (1=Yes, 2=No)
rank_loc	Rank of location based on importance (1=Most important, 2=2nd, 3=3rd, 4=Least important)
rank_dis	Rank of distance based on importance (1=Most important, 2=2nd, 3=3rd, 4=Least important)

rank_pay	Rank of payment method based on importance (1=Most important, 2=2nd, 3=3rd, 4=Least important)
rank_fee	Rank of shipping fee based on importance (1=Most important, 2=2nd, 3=3rd, 4=Least important)
age	Age (1=Below 18 years old, 2=18 - 24 years old, 3=25 - 34 years old, 4=35 - 44 years old, 5=45 - 54 years old, 6=55- 64 years old, 7=65 and over)
sex	Sex (1=Male, 2=Female)
educ	Educational attainment (1=Tertiary - Doctoral Level, 2=Tertiary - Graduate Level, 3=Tertiary - Undergraduate Level, 4=Vocational, 5=Secondary, 6=Primary)
work	Work status (1=Full-time, 2=Part-time, 3=Not working / student / retired)
income	Monthly Income (1=Less than ₱9,100, 2=Between ₱9,100 to ₱18,200, 3=Between ₱18,200 to ₱36,400, 4=Between ₱36,400 to ₱63,700, 5=Between ₱63,700 to ₱109,200, 6=Between ₱109,200 to ₱182,000, 7=At least ₱182,000 and up)

3rd attachment: Stata Tables

```
. cmxtmixlogit choice, random(loc dis pay fee) casevars(age sex educ work income par_use par_seen
> cp_use) intpoints(250)

Fitting fixed parameter model:

Fitting full model:

Iteration 0:   Log simulated-likelihood = -758.35795  (not concave)
Iteration 1:   Log simulated-likelihood = -723.44782  (not concave)
Iteration 2:   Log simulated-likelihood = -712.90266  (not concave)
Iteration 3:   Log simulated-likelihood = -712.77821
Iteration 4:   Log simulated-likelihood = -709.45136
Iteration 5:   Log simulated-likelihood = -707.60884  (not concave)
Iteration 6:   Log simulated-likelihood = -707.52748  (not concave)
Iteration 7:   Log simulated-likelihood = -707.49421  (not concave)
Iteration 8:   Log simulated-likelihood = -707.46766  (not concave)
Iteration 9:   Log simulated-likelihood = -707.44311  (not concave)
Iteration 10:  Log simulated-likelihood = -707.40267  (not concave)
Iteration 11:  Log simulated-likelihood = -707.36679  (not concave)
Iteration 12:  Log simulated-likelihood = -707.23313
Iteration 13:  Log simulated-likelihood = -707.13514
Iteration 14:  Log simulated-likelihood = -706.82659
Iteration 15:  Log simulated-likelihood = -706.81924
Iteration 16:  Log simulated-likelihood = -706.81924
```

Mixed logit choice model	Number of obs =	2,970
	Number of cases =	990
Panel variable: case_id	Number of panels =	110
Time variable: scen_id	Cases per panel: min =	9
	avg =	9.0
	max =	9
Alternatives variable: alt_id	Alts per case: min =	3
	avg =	3.0
	max =	3
Integration sequence: Hammersley		
Integration points: 250	Wald chi2(20) =	74.39
Log simulated-likelihood = -706.81924	Prob > chi2 =	0.0000

choice	Coefficient	Std. err.	z	P>|z|	[95% conf. interval]	
alt_id						
loc	-.4309882	.1632313	-2.64	0.008	-.7509156	-.1110607
dis	-.2020596	.103247	-1.96	0.050	-.4044199	.0003008
pay	.0544767	.0589964	0.92	0.356	-.0611542	.1701076
fee	-.2834129	.0672703	-4.21	0.000	-.4152603	-.1515654
/Normal						
sd(loc)	1.094395	.128568			.8693125	1.377755
sd(dis)	.635018	.1097043			.4526206	.8909181
sd(pay)	.1782221	.1087763			.0538813	.5895017
sd(fee)	.3866053	.0711354			.2695545	.5544839
Home_Delivery	(base alternative)					
Parcel_Locker						
age	-.4428633	.223621	-1.98	0.048	-.8811524	-.0045741
sex	.4336554	.5891687	0.74	0.462	-.7210941	1.588405
educ	-.1794149	.3124609	-0.57	0.566	-.791827	.4329972
work	.9115343	.3775893	2.41	0.016	.1714728	1.651596
income	.028581	.1954599	0.15	0.884	-.3545134	.4116754
par_use	-1.749282	.9709208	-1.80	0.072	-3.652252	.1536881
par_seen	-.305315	.6438933	-0.47	0.635	-1.567323	.9566927
cp_use	.1151779	.6638372	0.17	0.862	-1.185919	1.416275
_cons	3.048874	2.368096	1.29	0.198	-1.59251	7.690257
Collection_Point						
age	-.5949091	.2556764	-2.33	0.020	-1.096026	-.0937926
sex	.1737325	.6770392	0.26	0.797	-1.15324	1.500705
educ	-.6117455	.3625422	-1.69	0.092	-1.322315	.0988243
work	1.11756	.4348617	2.57	0.010	.2652468	1.969874
income	.5061852	.2293728	2.21	0.027	.0566228	.9557476
par_use	-2.201899	1.115747	-1.97	0.048	-4.388724	-.0150738
par_seen	.5953521	.7649303	0.78	0.436	-.9038837	2.094588
cp_use	-1.124266	.7835449	-1.43	0.151	-2.659986	.4114535
_cons	4.444038	2.738765	1.62	0.105	-.9238421	9.811918

```
. margins, at(income = (1 2 3 4 5 6 7)) outcome (2)

Predictive margins                              Number of obs = 2,970
Model VCE: OIM

Expression: Pr(alt_id), predict()
Outcome:    Parcel Locker

1._at: income = 1

2._at: income = 2

3._at: income = 3

4._at: income = 4

5._at: income = 5

6._at: income = 6

7._at: income = 7
```

	Margin	Delta-method std. err.	z	P>|z|	[95% conf. interval]	
_at						
1	.2926996	.0352956	8.29	0.000	.2235215	.3618777
2	.2644461	.0236565	11.18	0.000	.2180803	.3108119
3	.2344854	.0175548	13.36	0.000	.2000786	.2688922
4	.2039537	.0189556	10.76	0.000	.1668015	.241106
5	.1740263	.0239241	7.27	0.000	.1271359	.2209166
6	.1457615	.0286072	5.10	0.000	.0896924	.2018307
7	.11998	.0316757	3.79	0.000	.0578967	.1820632

```
. margins, at(work = (1 2 3)) outcome (1 2 3)

Predictive margins                              Number of obs = 2,970
Model VCE: OIM

Expression: Pr(alt_id), predict()

1._at: work = 1

2._at: work = 2

3._at: work = 3
```

	Margin	Delta-method std. err.	z	P>|z|	[95% conf. interval]	
_outcome#_at						
Home Delivery#1	.5214833	.0410207	12.71	0.000	.4410841	.6018825
Home Delivery#2	.4330062	.0364254	11.89	0.000	.3616136	.5043987
Home Delivery#3	.3475147	.0542734	6.40	0.000	.2411408	.4538886
Parcel Locker#1	.2104856	.0220018	9.57	0.000	.1673628	.2536083
Parcel Locker#2	.2413713	.0188245	12.82	0.000	.204476	.2782666
Parcel Locker#3	.2678771	.0328546	8.15	0.000	.2034833	.332271
Collection Point#1	.2680311	.0291198	9.20	0.000	.2109574	.3251049
Collection Point#2	.3256225	.0269705	12.07	0.000	.2727613	.3784838
Collection Point#3	.3846082	.0438771	8.77	0.000	.2986106	.4706058

```
. margins, at(age = (1 2 3 4 5 6 7)) outcome (1 2 3)

Predictive margins                                    Number of obs = 2,970
Model VCE: OIM

Expression: Pr(alt_id), predict()

1._at: age = 1

2._at: age = 2

3._at: age = 3

4._at: age = 4

5._at: age = 5

6._at: age = 6

7._at: age = 7
```

	Margin	Delta-method std. err.	z	P>|z|	[95% conf. interval]	
_outcome#_at						
Home Delivery#1	.3230629	.0709242	4.56	0.000	.184054	.4620718
Home Delivery#2	.3641465	.0580041	6.28	0.000	.2504605	.4778325
Home Delivery#3	.4067907	.045027	9.03	0.000	.3185394	.495042
Home Delivery#4	.4504544	.0351683	12.81	0.000	.3815257	.519383
Home Delivery#5	.4945598	.0335742	14.73	0.000	.4287556	.560364
Home Delivery#6	.5385209	.0415441	12.96	0.000	.457096	.6199459
Home Delivery#7	.5817747	.0543331	10.71	0.000	.4752839	.6882656
Parcel Locker#1	.2577314	.0425884	6.05	0.000	.1742597	.3412032
Parcel Locker#2	.2519542	.0321239	7.84	0.000	.1889924	.3149159
Parcel Locker#3	.2442829	.0229998	10.62	0.000	.1992042	.2893616
Parcel Locker#4	.234887	.0175729	13.37	0.000	.2004448	.2693292
Parcel Locker#5	.2239821	.0189953	11.79	0.000	.1867519	.2612122
Parcel Locker#6	.2118167	.025642	8.26	0.000	.1615594	.2620741
Parcel Locker#7	.1986583	.033983	5.85	0.000	.1320529	.2652638
Collection Point#1	.4192057	.0635811	6.59	0.000	.2945891	.5438223
Collection Point#2	.3838993	.0487138	7.88	0.000	.2884219	.4793767
Collection Point#3	.3489264	.0355628	9.81	0.000	.2792246	.4186282
Collection Point#4	.3146586	.0264727	11.89	0.000	.262773	.3665442
Collection Point#5	.2814582	.0247396	11.38	0.000	.2329695	.3299469
Collection Point#6	.2496623	.0297998	8.38	0.000	.1912558	.3080688
Collection Point#7	.2195669	.0373518	5.88	0.000	.1463587	.2927751

Annex

Annex No. 1

STUDENT DECLARATION

Signed below _____ **Edward Tyrel R. Tan** _____, student of the Hungarian University of Agricultural and Life Sciences, _____ **Gödöllő** _____ Campus, Supply Chain Management MSc Course <u>full time</u>/correspondence* declare that the presented Thesis is my own work, and I have used the cited and quoted literature in accordance with the relevant legal and ethical rules. I understand that the one-page-summary of my thesis will be uploaded on the website of the Campus/Institute/Course, and my thesis will be available at the Host Department/Institute and in the repository of the University in accordance with the relevant legal and ethical rules.

Confidential data are presented in the thesis: yes   <u>**no**</u>*

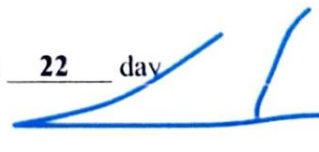Date: _____ **2024** _____ year _____ **April** _____ month __ **22** __ day

_____
Student

SUPERVISOR'S DECLARATION

As primary supervisor of the author of this thesis, I hereby declare that review of the thesis was done thoroughly; the student was informed and guided on the method of citing literature sources in the dissertation, attention was drawn to the importance of using literature data in accordance with the relevant legal and ethical rules.

Confidential data are presented in the thesis: yes   <u>**no**</u>*

Approval of thesis for oral defense on Final Examination: <u>**approved**</u>   not approved *

Date: _____ **2024** _____ year _____ **April** _____ month __ **22** __ day

_____
Internal Supervisor

* Please underline the correct one!

Annex No. 2

CONTENT SUMMARY OF THE THESIS

Thesis title: Unlocking the Potential of Parcel Locker Adoption in Philippine E-commerce: A Stated Choice Experiment on Last-Mile Delivery Options
Author's name: Edward Tyrel R. Tan

Supply Chain Management MSc, full time course

Department of Agricultural Logistics, Trade and Marketing, Institute of Agriculture and Food Economics

Internal Supervisor: **Dr. Lencsés Enikő**

The exponential growth of e-commerce in the Philippines, catalyzed by the COVID-19 pandemic, has placed unprecedented demands on logistics service providers to deliver efficiently and reduce face-to-face interactions during the national health crisis. In response, parcel lockers have emerged as an innovative logistics solution. These secure, automated storage units are located in accessible areas such as shopping centers, residential complexes, and public spaces, offering a convenient and flexible alternative for 24/7 package collection without direct human contact.

Despite their potential, the adoption of parcel lockers in the Philippines has been slow, with the majority of Filipinos unaware of this delivery option. Major online marketplaces like Lazada and Shopee currently do not offer parcel locker delivery, further limiting its visibility and use. This study aims to identify the factors influencing Filipino consumers' delivery method preferences, employing a stated choice experiment to evaluate preferences for home delivery, parcel lockers, and collection points across varied attributes such as location, distance, payment method, and shipping fee.

The findings reveal that less convenient locations, greater distances, and higher costs significantly deter the selection of certain delivery methods. However, when parcel lockers are presented under optimal conditions—strategically located, with simplified payment methods and at no cost—their market share increases dramatically to 56.2%. This surge underscores a strong consumer preference for parcel lockers when perceived barriers are minimized, suggesting substantial potential for their wider adoption in the Philippines. This research provides essential insights for logistics service providers and policymakers to develop strategies that enhance the attractiveness and utilization of parcel lockers among Filipino e-commerce consumers.

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Annex No. 3

Certification of participation in consultations

Name of the student: Edward Tyrel R. Tan

Name of internal supervisor and position: Dr. Lencsés Enikő

Name of the independent organisational unit that published the topic: Institute of Agricultural and Food Economics
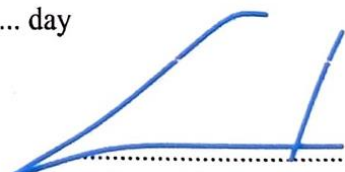
In the 20 22 / 20 24 academic year, the nominated student regularly participated in the consultations related to the preparation of the diploma thesis. The completed dissertation:

Unlocking the Potential of Parcel Locker Adoption in Philippine E-commerce: A Stated Choice Experiment on Last-Mile Delivery Options

presented. I agree with the submission of the dissertation to the assessment procedure related to the Final Exam.

Gödöllő, 20 24 year .... April .... month .... 22 ...... day

....
Sign of Supervisor

Annex No. 4

DECLARATION

on authenticity and public assess of master's thesis

Student's name:	**Edward Tyrel R. Tan**
Student's Neptun ID:	**CUO36P**
Title of the document:	**Unlocking the Potential of Parcel Locker Adoption in Philippine E-commerce: A Stated Choice Experiment on Last-Mile Delivery Options**
Year of publication:	**2024**
Department:	**Institute of Agricultural and Food Economics**

I declare that the submitted master's thesis is my own, original individual creation. Any parts taken from an another author's work are clearly marked, and listed in the table of contents.

If the statements above are not true, I acknowledge that the Final examination board excludes me from participation in the final exam, and I am only allowed to take final exam if I submit another master's thesis.

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