### Thesis Prospectus 2023-24

**Name: Sihe Sun**  **ID Number: A00432967**

**Email: sihe.sun@evergreen.edu**

**Student Final Submission (date): December 15, 2023**

**Faculty Reader Approval (date):**

**MES Director Approval (date):**

1. Working title of your thesis[[1]](#endnote-1).

Factors Influencing Ridership in a Zero-Fare Bus Network: A Case Study of Intercity Transit in Thurston County, Washington State

1. In 250 words or less, summarize the key background information needed to understand your research problem and question.

Public transit systems are important for reducing traffic, pollution, and ensuring transportation access for all. However, ridership has declined in many areas for various reasons such as the rise of ride-sharing services and more car-centric urban planning.

Intercity Transit provides public transportation services in Thurston County, Washington, operating 18 bus routes. In 2018, IT’s ridership decreased for the fourth consecutive year. In 2019, ridership began to grow again, and then starting from 2020, they implemented a Zero-Fare policy.

Intercity Transit's goal of increasing ridership through eliminating fares thus aims to address challenges in achieving a sustainable and equitable transportation system.

The ridership was expected to keep growing with Zero-Fare policy. However, between 2019 and 2020, total ridership dropped 51%. Ridership increased in 2021 and 2022 but remains 45% below the 2019 total.

1. State your research question(s).

What factors influence individuals' decisions to use or not use the Zero-Fare bus services of Intercity Transit, Thurston County, WA?

1. Situate your research problem within the relevant literature. What is the theoretical and/or practical framework of your research problem?

The research problem is situated within the literature on public transportation, commuting behavior, urban sustainability, and related social sciences.

King et al. (2023) introduced the concept of elasticity of demand for transit. This framework captures how responsive changes in quantity demanded are to factors like price, income, and service levels. Several studies have estimated elasticities of demand for different transit agencies and cities. One relevant insight from this literature is that riders tend to be more responsive to changes in service quality than fare levels. In other words, riders respond more to improvements in service characteristics compared to fare reductions. Additionally, peak period travel tends to have a lower elasticity of demand than off-peak travel periods.

The elasticity of demand framework is well-suited for my research problem as it provides a standard approach to quantify the impacts of the zero-fare policy change. With this framework adopted, one goal of my study will be to estimate the elasticity of demand for Intercity Transit ridership with respect to the fare change implemented during the pandemic. Using ridership data before and after the policy change, elasticities will be estimated to understand how responsive riders were when fares were eliminated. Insights from previous elasticity studies, such as differences in responses between peak and off-peak periods, can help guide the analysis.

1. Explain the significance of this research problem. Why is this research important? What are the potential contributions of your work? How might your work advance scholarship?

This research is significant because it pursues a better understanding on the role Zero-Fare policy plays in ridership change, and has the potential to help Intercity Transit optimize services, increase ridership, and better serve the community. Existing studies on fare-free transit programs (e.g. Boston Transportation Department 2023) have largely focused on short-term ridership impacts rather than comprehensive evaluations of factors influencing travel behavior changes. Findings on how demographics, travel patterns, perceptions, and satisfaction impact transit use under a long-term fare-free system would advance the literature by Litman (2023) and Erhardt et al. (2022) on understanding the determinants of mode choice.

Identifying barriers that discourage bus use in the context of Intercity Transit's program could help address limitations noted in King et al.'s (2023) research synthesis on how fares impact ridership. Evaluating the impacts of a permanent Zero-Fare policy, as called for by Kębłowski (2020), could help improve understanding of the effects of such policies on equity, accessibility, and ridership compared to temporary fare-free pilots.

With increasing mobility and climate challenges, the thesis aims to not only benefit Intercity Transit but also advance scholarship on strategies to make public transportation systems more effective, efficient and inclusive to meet various policy goals.

1. Summarize your study design[[2]](#endnote-2). If applicable, identify the key variables in your study. What is their relationship to each other? For example, which variables are you considering as independent (explanatory) and dependent (response)?

The study design involves collecting survey data from Intercity Transit bus riders and non-riders, as well as historical ridership volume data acquired from Intercity Transit.

The explanatory variables in the study include individuals’ demographic characteristics, travel patterns, perceptions of the Zero-Fare system, preference on travel mode, and overall opinion of the service. The response variable is bus-riding frequency by individuals. The relationship between these variables will be examined to understand the underlying motivations and considerations that influence individuals' decisions to utilize the bus system.

The historical ridership data acquired from Intercity Transit will be used to conduct a separate analysis of ridership variation trend, as a supplement of this study.

1. Describe the data that will be the foundation of your thesis. Will you use existing data, or gather new data (or both)? Describe the process of acquiring or collecting data[[3]](#endnote-3).

The foundation of the thesis will be survey data collected from Intercity Transit bus riders and non-riders in Thurston County, Washington. Both existing data and new data will be used. The process of acquiring data involves distributing surveys through online and paper-based methods. Online surveys will be shared through social media platforms, while paper flyers with QR code will be made available at various public locations in the area, e.g. TESC campus, grocery stores. Pre-testing of the survey will be conducted to ensure its validity and reliability.

Additionally, historical data will be requested from Intercity Transit to complement the survey data and provide context for the analysis.

1. Summarize your methods of data analysis. If applicable, discuss any specific techniques, tests, or approaches that you will use to answer your research question.

The method of data analysis will involve a mixture of different approaches, with qualitative approaches being the major component and quantitative and spatial approaches serving as supplements.

For the qualitative data derived from the open-ended questions in the survey, I plan to develop a coding scheme derived from the literature reviewed, and use Atlas.ti, a qualitative data analysis software to code and analyze the data collected. Qualitative analysis will help locate potential correlations between examine variables (demographic characteristics, perceptions, and factors influencing mode choice) and the key variable (bus-riding frequency).

Quantitative (statistical for a few numeric variables, based on Likert scale) and spatial analysis (distance analysis for GIS location data, based on GPS coordinate) will also be used to supplement the results, but the focus remains on qualitative analysis.

1. Address the ethical issues[[4]](#endnote-4) raised by your thesis work. Include issues such as risks to anyone involved in the research, as well as specific people or groups that might benefit from or be harmed by your thesis work, perhaps depending on your results. List any specific reviews you must complete first (e.g., Human Subjects Review or Animal Use Protocol Form).

The ethical issues raised by the thesis work include ensuring the protection of human subjects involved in the research. This includes obtaining informed consent from participants, maintaining confidentiality and anonymity of their responses, and ensuring their privacy throughout the data collection and analysis process. Risks to participants may include potential breaches of privacy or discomfort when answering certain survey questions. Steps will be taken to minimize these risks, such as using anonymous surveys and ensuring data security.

The specific people or groups that might benefit from this thesis work include Intercity Transit, as the research findings can inform policy and practice improvements to enhance ridership. The local community and residents of Thurston County may potentially benefit from improved transportation options and reduced traffic congestion. In case that the research contributes to greater use of public transportation, reduction of greenhouse gas emissions can be an even more global benefit.

Approval from the relevant Institutional Review Board (IRB) is needed on Human Subjects Review, to ensure compliance with ethical standards for research involving human subjects.

1. List specific research permits[[5]](#endnote-5) or permissions you need to obtain before you begin collecting data (e.g. landowner permissions, agency permits).

Specific research permits or permissions may be required before collecting data. These may include obtaining permission from Intercity Transit to conduct the research and access passenger traffic data.

1. Reflect on how your positionality as a researcher could affect your results and how you will account for this in the research process[[6]](#endnote-6).

I have lived for a long time in a metropolitan area where public transportation was the primary mode of travel, and that description does not fit with Thurston County's urban planning. In this research, it is very possible that I over-idealize people's preferences for public transportation and the difficulty of planning improving. I will avoid bias in the data analysis process, and read a lot of relevant literature to gain a deep understanding of the feasibility of popularization of public transportation locally.

1. Provide at least a rough estimate of the costs associated with conducting your research, if any.  Provide details about each budget item so that the breakdown of the final cost is clear.

The costs associated with conducting the research may include expenses for survey flyer printing, incentives for survey participants, and possibly transportation costs for interview. The breakdown of the cost is listed in the budget, and the estimated total is about $123.

The budget request does not include data analysis software since The Evergreen State College has licenses for both software packages needed for this research. The flyer distribution budget is also excluded, as most flyers will be posted on TESC campus and at public places like grocery stores, which can be completed concurrently with other tasks.

1. Provide a detailed working outline of your thesis.

I. Introduction

 A. Background of public transportation in Thurston County

 B. Intercity Transit and Zero-Fare policy concepts

 C. Research problem and objectives

 D. Significance of the research

II. Literature Review

 A. Overview of public transportation and ridership behavior

 B. Zero-fare bus systems and their impact

 C. Factors influencing mode choice and ridership

 D. Other agencies’ fare-free transit implementation

III. Methodology

 A. Survey design

 B. Primary analysis method: qualitative analysis

 C. Secondary analysis method: quantitative and geographical

 D. Case study

IV. Results and Analysis

 A. Qualitative analysis result

 B. GIS analysis result

 C. Historical ridership data analysis results

 D. Interpretation of findings

V. Discussion

 A. Comparison of results with existing literature

 B. Implications for Intercity Transit and policy recommendations

 C. Limitations of the study and avenues for future research

VI. Conclusion

 A. Summary of key findings

 B. Contributions to scholarship and practical implications

 C. Final remarks

1. Provide a specific work plan and a timeline for each of the major tasks in the work plan. Be as realistic and specific as you can at this point, including the deadlines for Spring quarter.

Before Winter Quarter:

 - Finalize prospectus and have it signed (Dec 15)

 - Get in touch with IT and TRPC to communicate research design updates; get in touch with Thurston Food Bank for potential flyer distribution method

 - Keep improving survey questionnaire

 - Submit IRB application

 - Write Introduction section for peer review

Winter Quarter:

 - Finalize Introduction section after peer review, keep improving survey questionnaire (Week 1)

 - Write Methods section for peer review; make sure not to miss deadline for IRB application (Weeks 2-3)

 - Finalize survey design, and distribute it after getting IRB approval (Weeks 4-5) (collection of survey responses will last at least until the end of quarter)

 - Start on data analysis basing on response so far, prepare for Results section (Weeks 6-7)

 - Work on Results section (Weeks 8-9)

 - Continue working on Results, start on Discussion section (Week 10)

Spring Quarter:

 - Finish Results and Discussion sections, wrap up for complete draft (Weeks 1-2)

 - Work on Conclusion section (Weeks 3-4)

 - Continue revising draft (Weeks 5-6)

 - Prepare for presentation (Weeks 7-8)

 - Finish final draft (Week 9)

1. Who (if anyone), beyond your MES thesis reader, will support your thesis (in or outside of Evergreen)? Be specific about who they are and in what capacity they will support your thesis. If you are working with an outside agency or expert, be specific about their expectations for your data analysis or publication of results.

Collaboration with Intercity Transit staff and other experts in the field of sustainable transportation (e.g. Thurston Commutes from Thurston Regional Planning Council) may also provide support and guidance. The expectations of these individuals may include supporting survey design, reviewing data analysis, providing insights into practical application of the research findings.

I will also seek suggestions on GIS and geographical analysis techniques from Mike Ruth, our MES faculty member.

For potential quantitative analysis issues, I may seek help from John Withey, another MES faculty member. However, quantitative analysis is not a key method in this research design, and major problems are not anticipated with this method.

1. Provide the 5 most important references you have used to identify the specific questions and context of your topic, help with issues of research design and analysis, and/or provide a basis for interpretation. Annotate these references with notes on how they relate to/will be helpful for your thesis. For any other sources cited in your prospectus in other answers, provide a complete bibliographic citation here as well.

Babbie, E. R. (2016). *The Basics of Social Research* (7th edition). Cengage Learning.

 Recommended by Shangrila, will help with my research design.

Boston Transportation Department. (2023). *City of Boston Fare Free Program: Mid Program Report*. <https://www.boston.gov/departments/transportation/free-route-23-28-and-29-bus-program>

 Most detailed similar fare-free project report, very strong as a sample case.

Erhardt, G. D., Hoque, J. M., Goyal, V., Berrebi, S., Brakewood, C., & Watkins, K. E. (2022). Why has public transit ridership declined in the United States? *Transportation Research Part A: Policy and Practice*, *161*, 68–87. <https://doi.org/10.1016/j.tra.2022.04.006>

 Basis of my argument: Why has public transit ridership declined in the United States?

Litman, T. (2023). *Evaluating Public Transit Benefits and Costs: Best Practices Guidebook*. Victoria Transport Policy Institute. <https://www.vtpi.org/tranben.pdf>

Valuable insights for public transit service evaluation.

Sener, I. N., Lee, R. J., & Elgart, Z. (2016). Potential health implications and health cost reductions of transit-induced physical activity. *Journal of Transport & Health*, *3*(2), Article 2. <https://doi.org/10.1016/j.jth.2016.02.002>

Useful source of background information in terms of general public transportation.

King, H., Taylor, B. D., & University of California, L. Angeles. I. of T. S. (2023). *Considering Fare-Free Transit in the Context of Research on Transit Service and Pricing: A Research Synthesis* (UC-ITS-2022-08; Issue UC-ITS-2022-08). <https://rosap.ntl.bts.gov/view/dot/67223>

Provides a key framework for quantitative analysis.

The complete bibliography so far:

Babbie, E. R. (2016). *The Basics of Social Research* (7th edition). Cengage Learning.

Boston Transportation Department. (2022a). *Route 28 Fare-Free Pilot Survey: Summary Findings*. <https://www.boston.gov/sites/default/files/file/2022/03/Route28_Report_FINAL.pdf>

Boston Transportation Department. (2022b). *Route 28 Fare-Free Pilot Survey: Survey Results Appendix*. <https://www.boston.gov/sites/default/files/file/2022/04/Route28_Full%20Survey_Results_Methods.pdf>

Boston Transportation Department. (2023). *City of Boston Fare Free Program: Mid Program Report*. <https://www.boston.gov/departments/transportation/free-route-23-28-and-29-bus-program>

Brown, V., Barr, A., Scheurer, J., Magnus, A., Zapata-Diomedi, B., & Bentley, R. (2019). Better transport accessibility, better health: A health economic impact assessment study for Melbourne, Australia. *The International Journal of Behavioral Nutrition and Physical Activity*, *16*, 89. <https://doi.org/10.1186/s12966-019-0853-y>

Conceição, M. A., Monteiro, M. M., Kasraian, D., Van den Berg, P., Haustein, S., Alves, I., Azevedo, C. L., & Miranda, B. (2023). The effect of transport infrastructure, congestion and reliability on mental wellbeing: A systematic review of empirical studies. *Transport Reviews*, *43*(2), Article 2. <https://doi.org/10.1080/01441647.2022.2100943>

Erhardt, G. D., Hoque, J. M., Goyal, V., Berrebi, S., Brakewood, C., & Watkins, K. E. (2022). Why has public transit ridership declined in the United States? *Transportation Research Part A: Policy and Practice*, *161*, 68–87. <https://doi.org/10.1016/j.tra.2022.04.006>

Fearnley, N. (2013). Free Fares Policies: Impact on Public Transport Mode Share and Other Transport Policy Goals. *International Journal of Transportation*, *1*(1), Article 1. <https://trid.trb.org/view/1409417>

Federal Transit Administration. (2023, October 21). *Transit and Sustainability*. <https://www.transit.dot.gov/regulations-and-programs/environmental-programs/transit-and-sustainability>

Hay, I., & Cope, M. (Eds.). (2021). *Qualitative Research Methods in Human Geography* (Fifth Edition, Fifth Edition). Oxford University Press.

Hillsman, E. L., Reeves, P., & Blain, L. (2001). Estimation of Effects of Washington State’s Trip-Reduction Program on Traffic Volumes and Delays: Central Puget Sound Region. *Transportation Research Record*, *1765*(1), Article 1. <https://doi.org/10.3141/1765-03>

Intercity Transit. (2023a). *Draft 2023—2028 Transit Development Plan*. <https://www.intercitytransit.com/sites/default/files/2023-09/FINAL%20DRAFT%20TDP%202023-2028_4.pdf>

Intercity Transit. (2023b, October 20). *About Us*. <https://www.intercitytransit.com/about-us>

Intercity Transit. (2023c, October 20). *Zero-Fare Services*. <https://www.intercitytransit.com/zerofare-faqs>

Kębłowski, W. (2020). Why (not) abolish fares? Exploring the global geography of fare-free public transport. *Transportation*, *47*(6), Article 6. <https://doi.org/10.1007/s11116-019-09986-6>

Lagerberg, B. (1997). Washington State’s Commute Trip Reduction Program: Phase 1: Assessment and Implications for Program Design. *Transportation Research Record*, *1598*(1), Article 1. <https://doi.org/10.3141/1598-06>

Litman, T. (2020). *Evaluating Transportation Equity: Guidance For Incorporating Distributional Impacts in Transportation Planning*. <https://trid.trb.org/view/1755608>

Litman, T. (2023). *Evaluating Public Transit Benefits and Costs: Best Practices Guidebook*. Victoria Transport Policy Institute. <https://www.vtpi.org/tranben.pdf>

Parker, M. E. G., Li, M., Bouzaghrane, M. A., Obeid, H., Hayes, D., Frick, K. T., Rodríguez, D. A., Sengupta, R., Walker, J., & Chatman, D. G. (2021). Public transit use in the United States in the era of COVID-19: Transit riders’ travel behavior in the COVID-19 impact and recovery period. *Transport Policy*, *111*, 53–62. <https://doi.org/10.1016/j.tranpol.2021.07.005>

Sener, I. N., Lee, R. J., & Elgart, Z. (2016). Potential health implications and health cost reductions of transit-induced physical activity. *Journal of Transport & Health*, *3*(2), Article 2. <https://doi.org/10.1016/j.jth.2016.02.002>

Siddiq, F., Wasserman, J. L., Taylor, B. D., & Speroni, S. (2023). Transit’s Financial Prognosis: Findings from a Survey of U.S. Transit Systems during the COVID-19 Pandemic. *Public Works Management & Policy*, 1087724X231160097. <https://doi.org/10.1177/1087724X231160097>

U.S. Census Bureau. (2022). *U.S. Census Bureau QuickFacts: Thurston County, Washington*. <https://www.census.gov/quickfacts/fact/table/thurstoncountywashington/PST045222>

U.S. Department of Transportation. (2017). *Travel Behavior and Transportation Equity*. <https://www.fhwa.dot.gov/policy/otps/shared_use_mobility_equity_final.pdf>

US Insurance Agents. (2019, November 5). *The Most and Least Car-Dependent States [Complete Study]*. <https://www.usinsuranceagents.com/car-dependency-by-state/>

Zipper, D. (2023, March 27). *How to save America’s public transit systems from a doom spiral*. Vox. <https://www.vox.com/future-perfect/23653855/covid-transit-fares-buses-subways-crisis>

1. You are not locked into this title; we want you to identify the main point or topic of your thesis. [↑](#endnote-ref-1)
2. You might discuss a selection of case studies, sampling methods, experimental design, and/or specific hypotheses you will test. You should also address any specialized knowledge or skills that are necessary to complete the research. [↑](#endnote-ref-2)
3. If you are planning to use existing data, explain the specific source, contact information, arrangement with collaborating agencies, and expectations about use of data and final products of your research. If you are planning to gather new data, describe specific methods, time, place, and equipment that will be required. [↑](#endnote-ref-3)
4. If you’re not sure where to start, consult a ‘Code of Ethics’ or other similar document from an academic society in an applicable field of study. [↑](#endnote-ref-4)
5. If you are collecting ANY samples or data, even observational data, on public lands (city, county, state and/or federal) it is your responsibility to find out the permit requirements BEFORE you collect data. Conducting research with tribal members/on tribal lands will have different and additional requirements. [↑](#endnote-ref-5)
6. Your *positionality as a researcher* refers to the fact that one’s “…beliefs, values systems, and moral stances are as fundamentally present and inseparable from the research process as [one]’s physical, virtual, or metaphorical presence when facilitating, participating and/or leading the research project…” (The Weingarten Blog 2017). [↑](#endnote-ref-6)