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My-mobility Co-creation Center



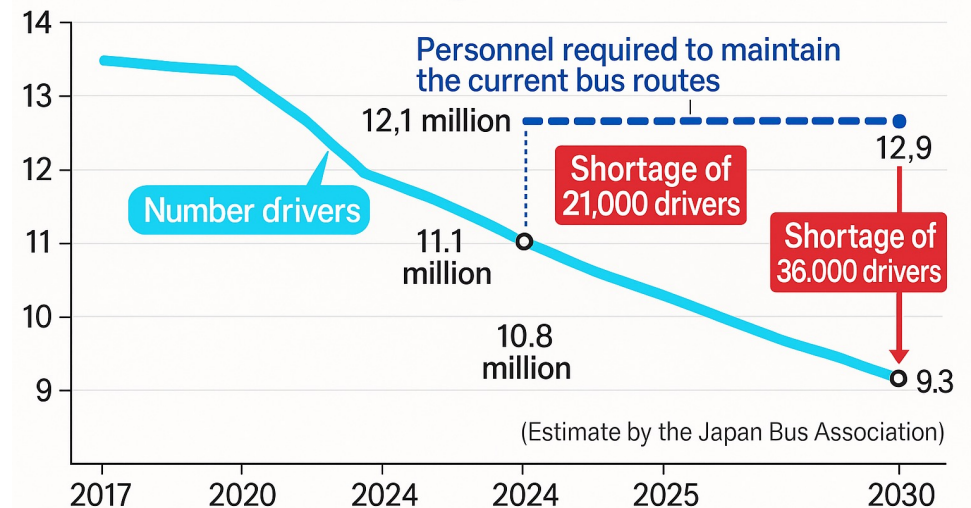
Social acceptance of automated bus services in Gifu

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Gifu University

- Shortage of bus/taxi drivers
- Decrease of the service level of public transport services
- **Introduction of autonomous vehicle technologies** is thought to be one of the solutions. However,...

Trends in the Number of Bus Drivers and the Estimated Shortage



The introduction of autonomous driving technologies **faces several challenges:**

- field experiments are **typically limited to short-term intervals,**
- the technology must **gain broad social acceptance** before real-world deployment.

- To facilitate the introduction of autonomous driving, it is essential to **understand actual vehicle maneuvers and social acceptability**, and to derive insights for technical improvements and enhancing public acceptance.
- Study site: **Gifu City**
 - Gifu City is undertaking various initiatives to **create a town where autonomous buses are always running**.

- 2019

- Establishment of the Gifu City Research Association for the Utilisation of Autonomous Driving Technologies in Public Transportation (Apr 22)
- First autonomous driving demonstration experiment in Gifu City (Nov 17)

- 2020

- First public-road autonomous driving demonstration in Gifu City (Nov 12-15)

- 2021

- Demonstration using autonomous vehicles without steering wheels, accelerator, or brake pedals (Oct 23-31)

- 2022

- Implementation of routes to tourist destinations, assuming use by visitors including tourists (Oct 22-Nov 20)

- 2023

- Launch of "**GIFU HEART BUS**" field experiment
 - ✓ Nation's first continuous operation of autonomous buses in a central urban area for approximately five years (Nov 25)

- **Demonstration Period**

- November 25, 2023 - March 31, 2028

- **Routes**

1. **Central Route (5km, 40 min)**

- ✓ Operates daily,
- ✓ Every 30 minutes,
- ✓ 12 trips per day

2. **Gifu Park Route (9km, 70 min)**

- ✓ Operates on weekends and holidays
- ✓ Every 2 hours,
- ✓ 3 trips per day

- **Other information**

- Free for anyone to use
- Reservation are generally made via LINE app
- Operating speed: 19 km/h
- SAE Level 2 operation → Level 4 service will begin soon.
- Jan 2026: Passenger numbers exceeded **90,000**.



- An aggregate analysis of social acceptance of autonomous bus services using questionnaire survey data
 - **Trends** in public support and opposition toward the introduction of autonomous driving,
 - Impact of individual attributes,
 - Differences in opposition factors based on level of awareness.
- **Structural equation modelling** to understand the relationship between impressions of autonomous buses and social acceptance

• Objective

- Analysing how individual characteristics influence social acceptance of autonomous buses in Gifu City and how perceptions shift before and after riding the bus.

Overview of questionnaire survey

	1 st Survey	2 nd Survey
Period	March, 2023	July, 2024
# of samples	600	665
Method	Web-based questionnaire	
Respondents	People living in Gifu City	

Autonomous Bus service started in November 2023

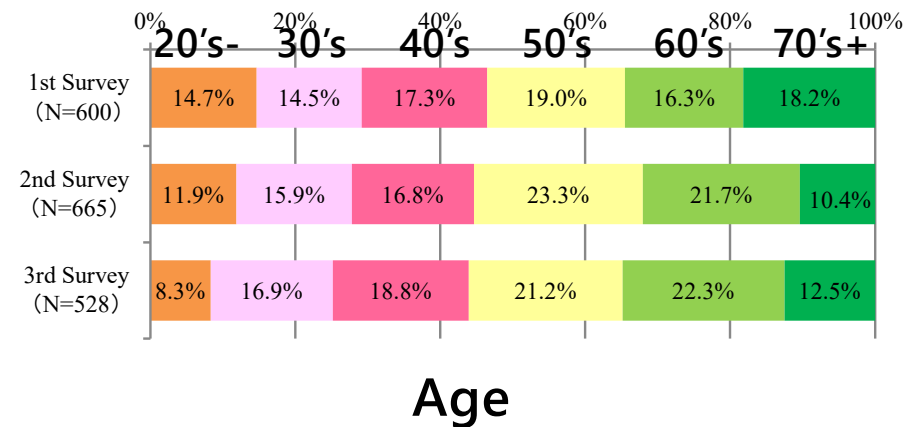
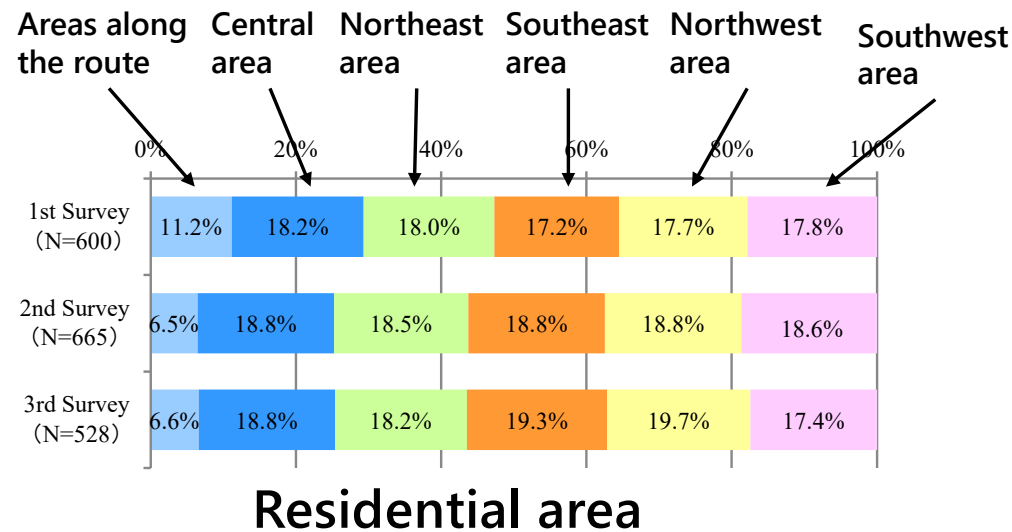
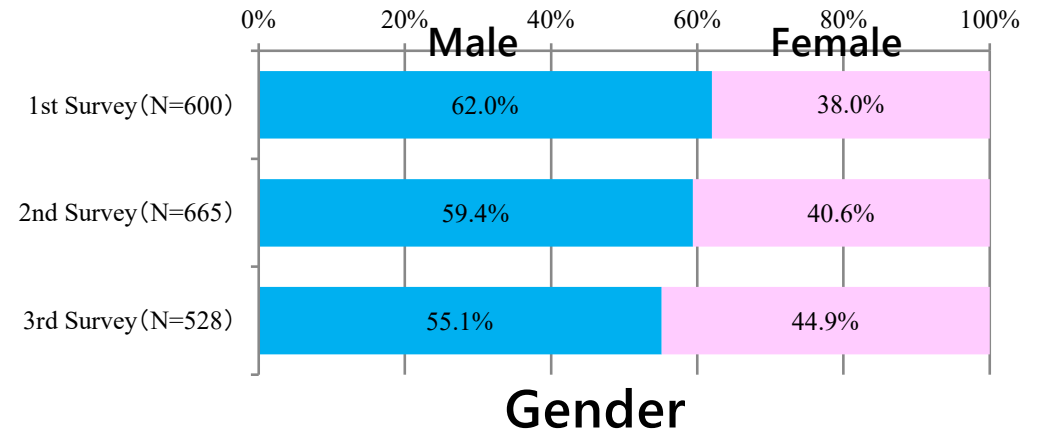
We did not collect responses from same individuals.

Questions in the survey

Category	Survey items
1. Personal attributes	Gender/Age/Residence/Freq. of driving cars
2. Attitudes toward AV	Stage of introduction of autonomous driving technology Intention to use autonomous vehicles
3. Usage Status of Autonomous Buses in Gifu	Awareness of Gifu City's autonomous bus Awareness of the reservation system
4. Attitudes toward Autonomous Buses in Gifu	Needs for utilization when introducing autonomous buses in Gifu City
5. Social Acceptance of Autonomous Buses in Gifu	Impressions of autonomous buses Impressions of mobility using autonomous buses Approval or disapproval of autonomous buses
6. Attitudes toward Gifu	Awareness of Gifu City

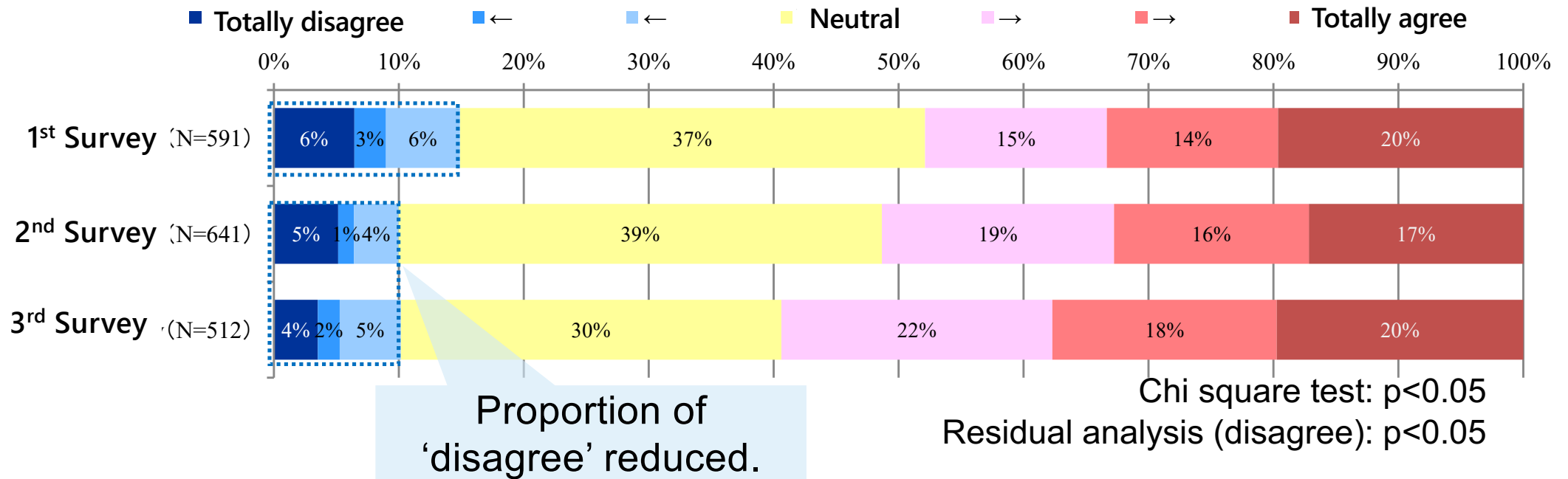
An aggregate analysis of social acceptance of autonomous bus services – respondents' attributes

- The survey was allocated to ensure that respondents' attributes were evenly distributed.



Trends in public support and opposition toward the introduction of autonomous driving

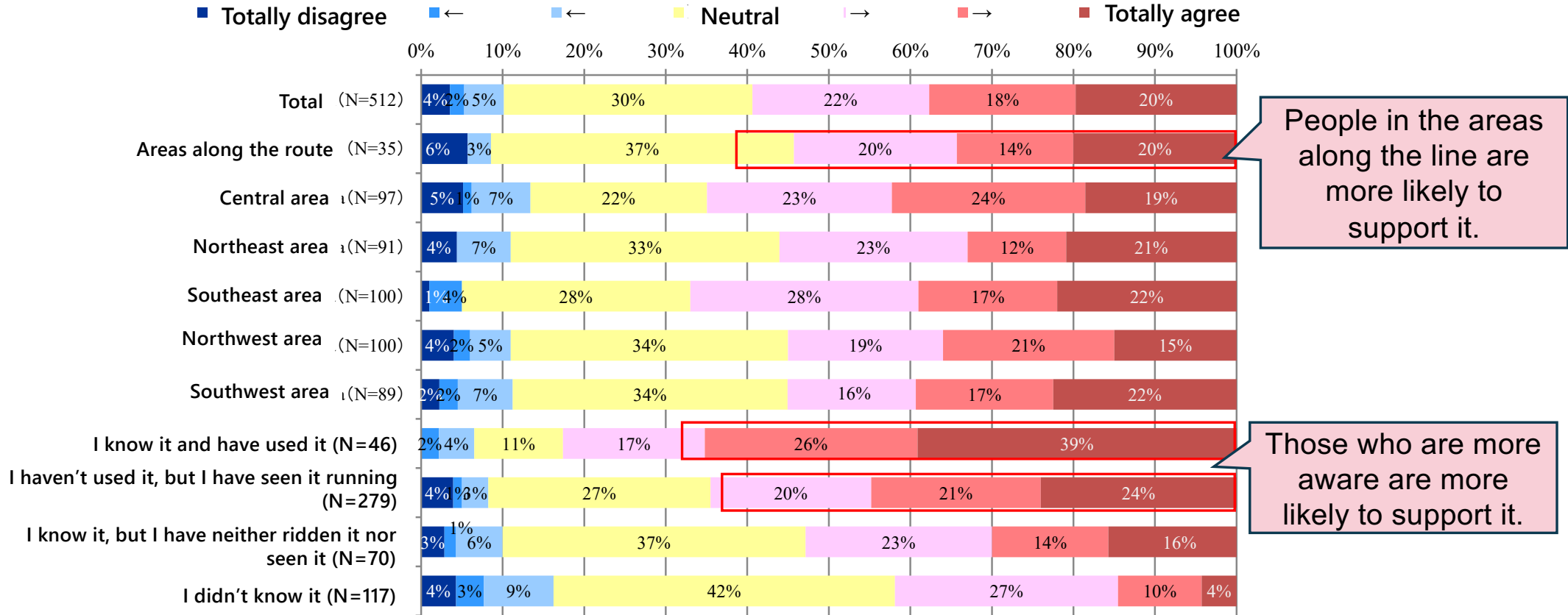
Question: Do you agree to introduce autonomous buses in Gifu City?



Operation of autonomous buses in Gifu City may have increased social acceptance of autonomous bus services.

Impact of individual attributes

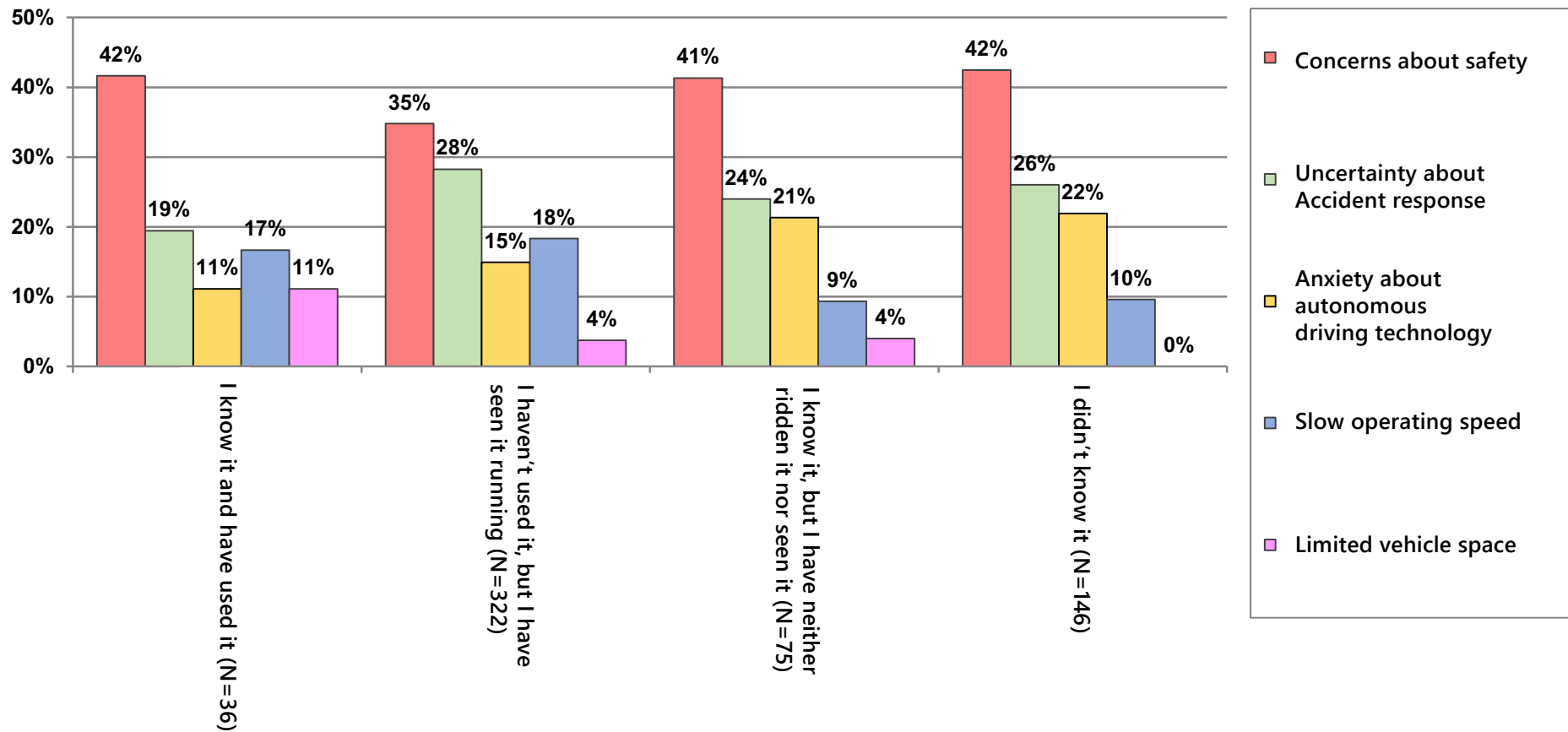
Question: Do you agree to introduce autonomous buses in Gifu City?



The more opportunities people interact with autonomous buses, the higher the social acceptance of autonomous driving technology.

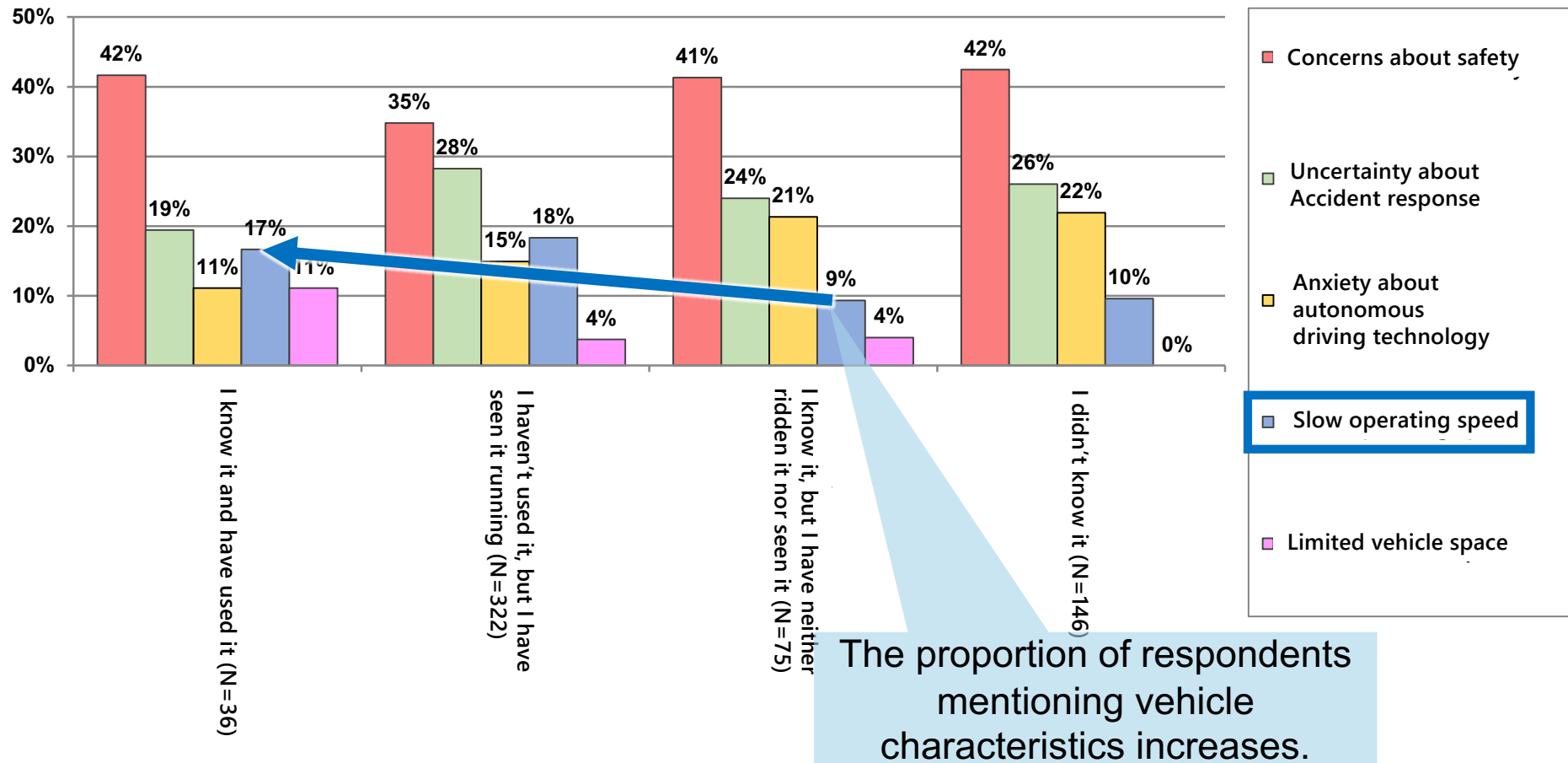
Differences in opposition factors based on level of awareness

Question: Reasons for opposing to the introduction of autonomous buses in Gifu?



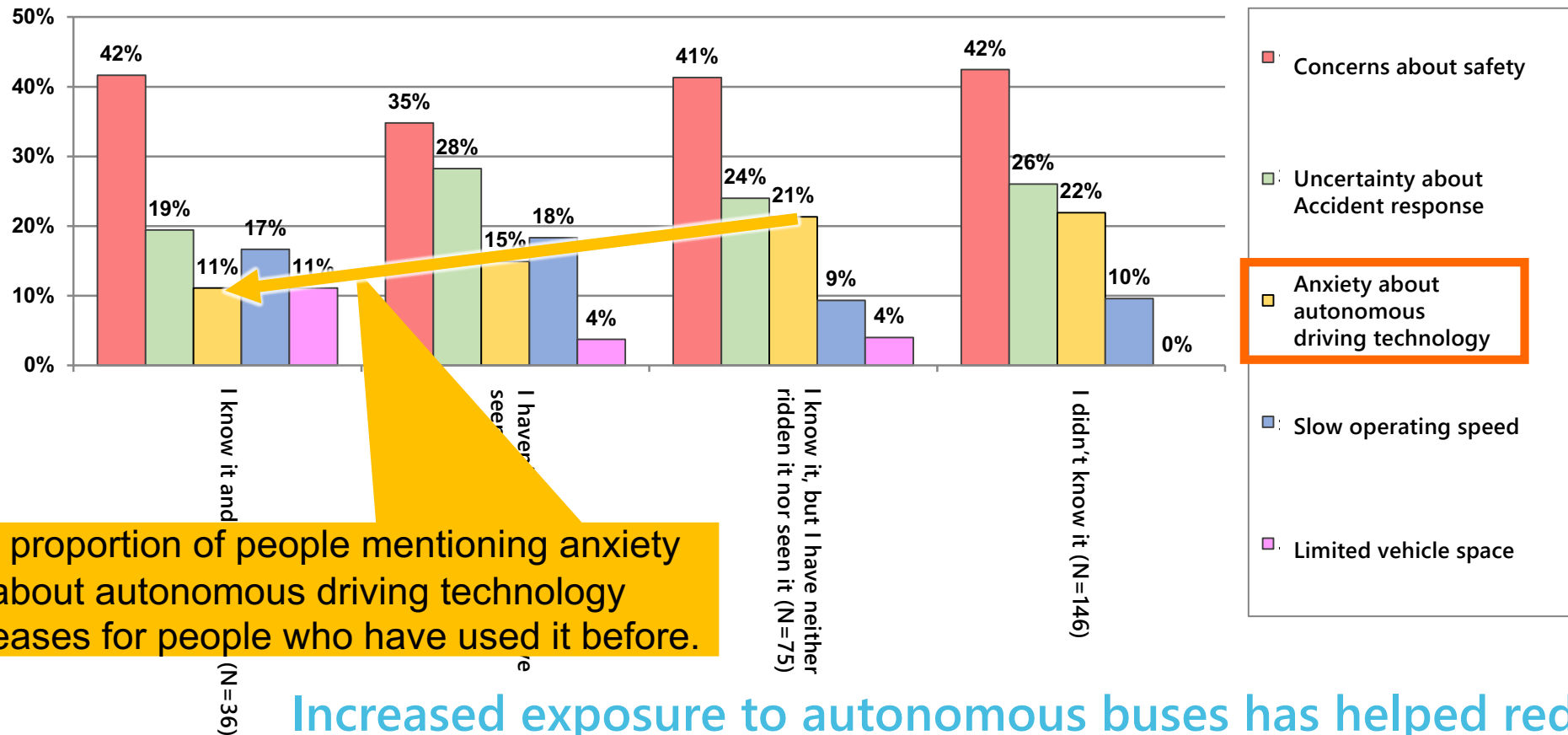
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Differences in opposition factors based on level of awareness

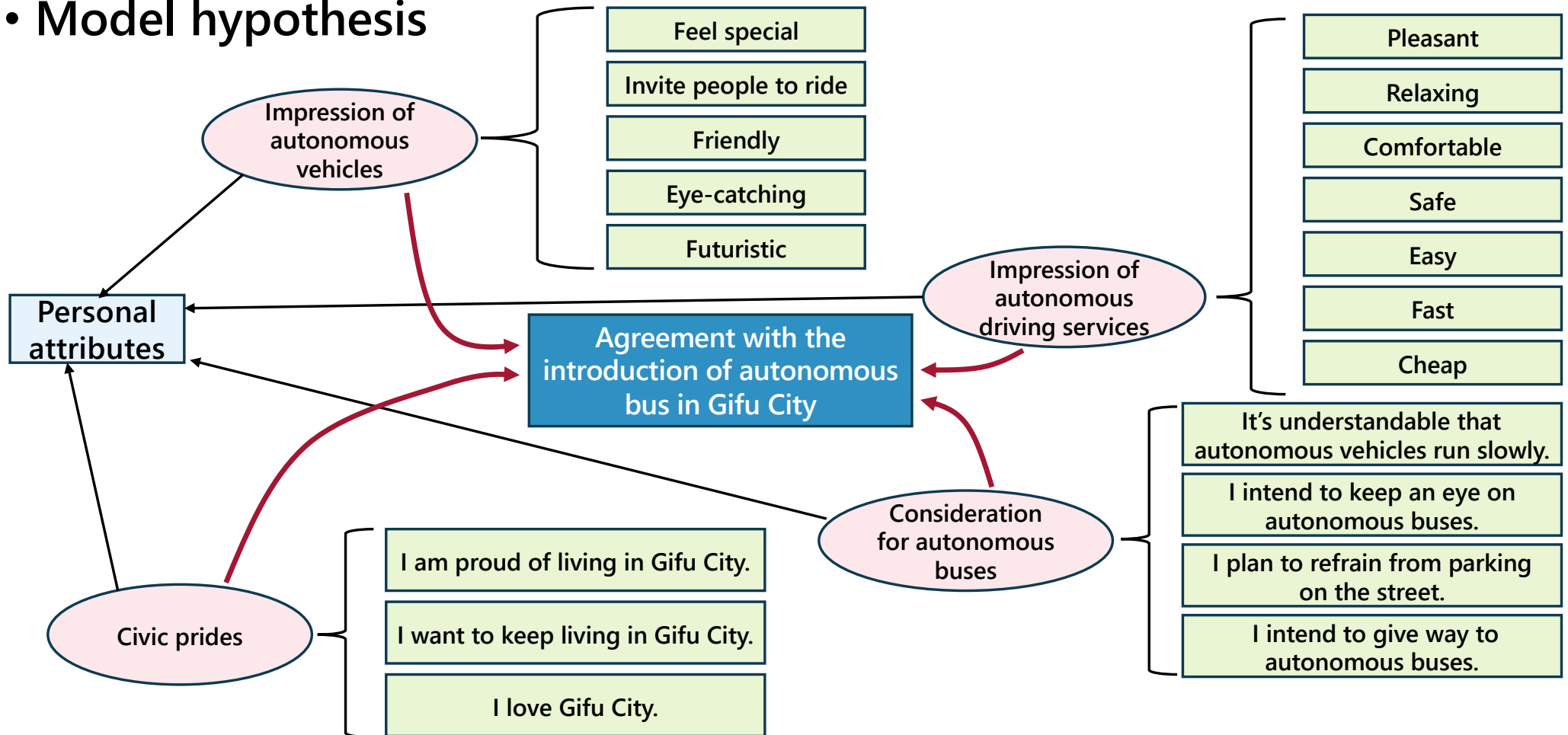
Question: Reasons for opposing to the introduction of autonomous buses in Gifu?



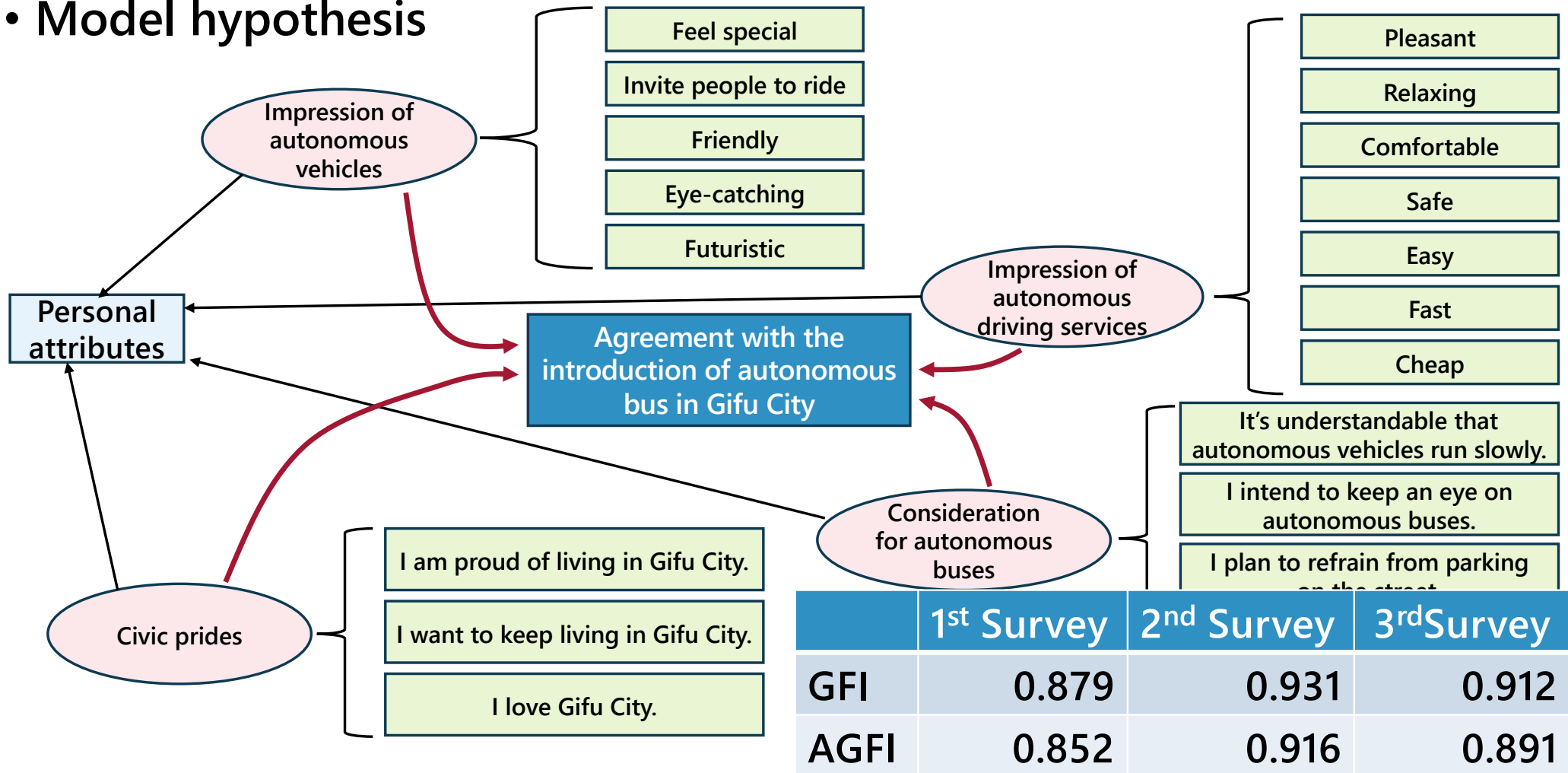
The proportion of people mentioning anxiety about autonomous driving technology decreases for people who have used it before.

Increased exposure to autonomous buses has helped reduce safety concerns about autonomous driving technology.

• Model hypothesis

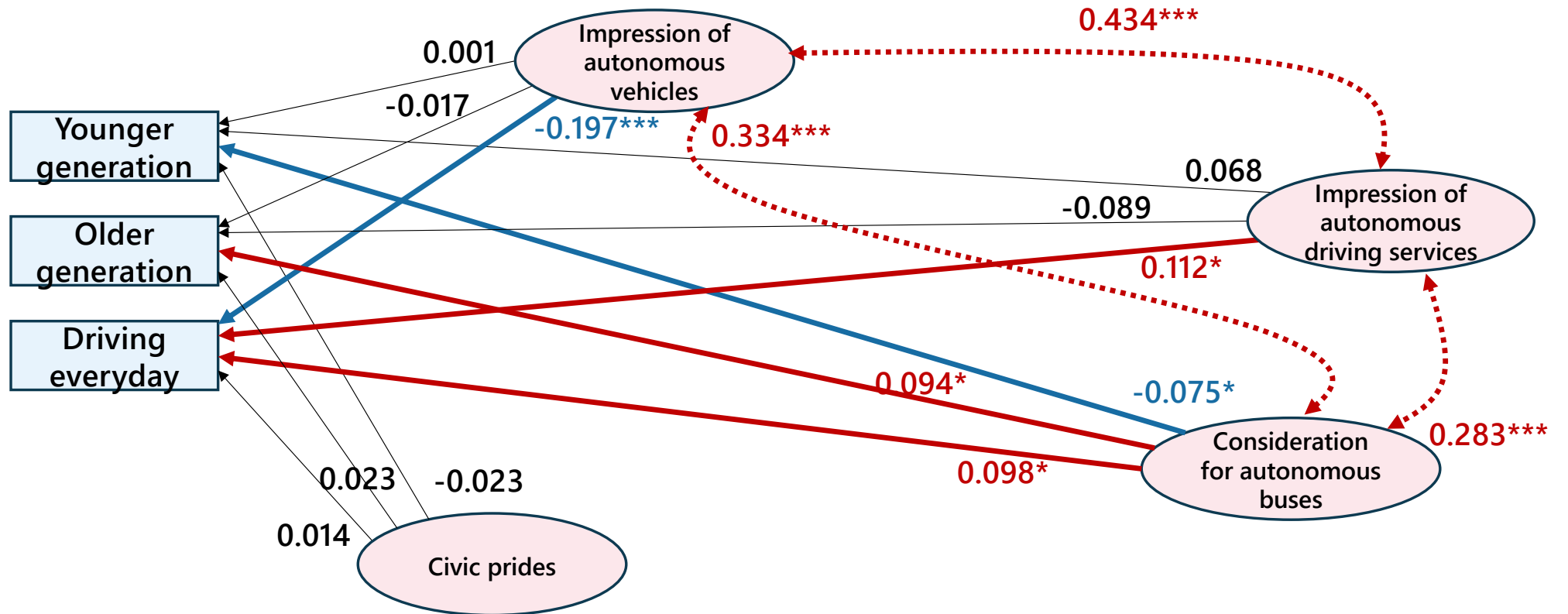


• Model hypothesis



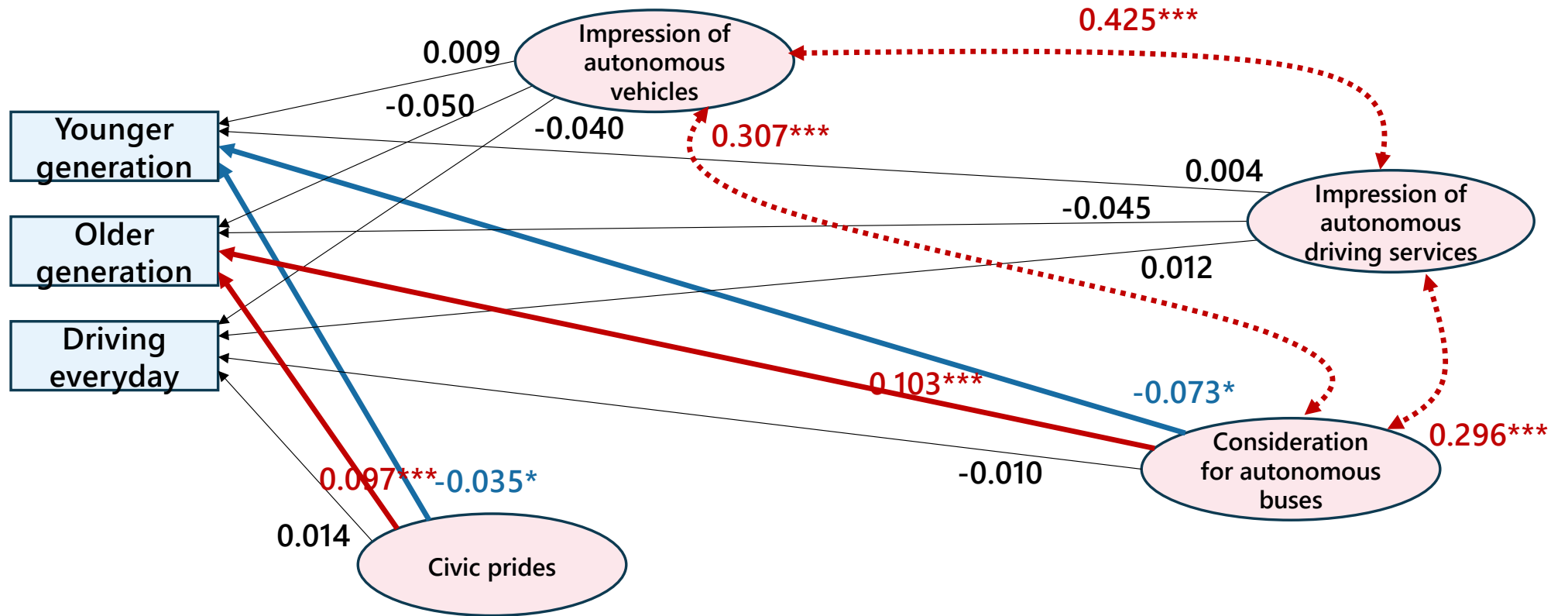
Relationship between personal attributes and endogenous variables

• Result of 1st Survey



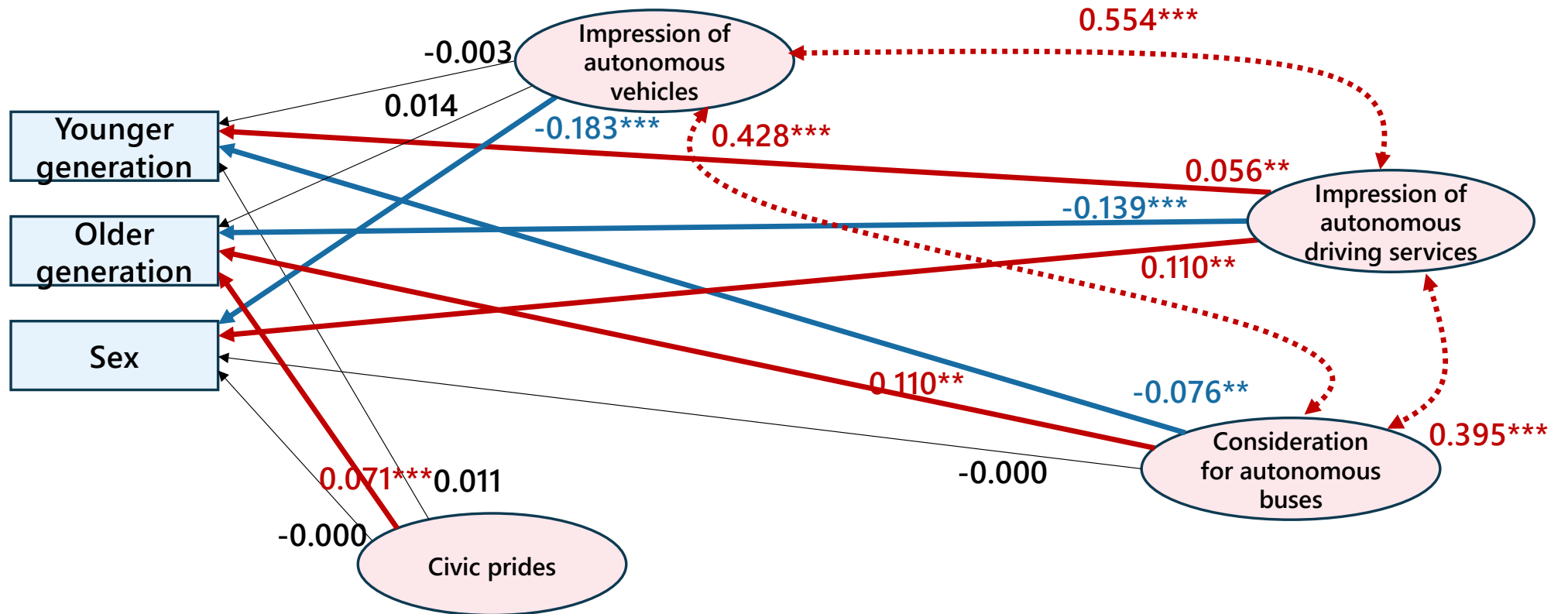
Relationship between personal attributes and endogenous variables

- Result of 2nd Survey



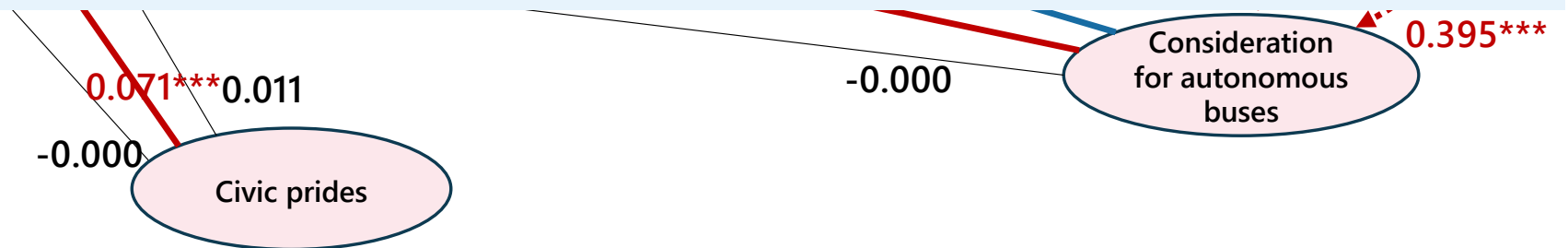
Relationship between personal attributes and endogenous variables

• Result of 3rd Survey



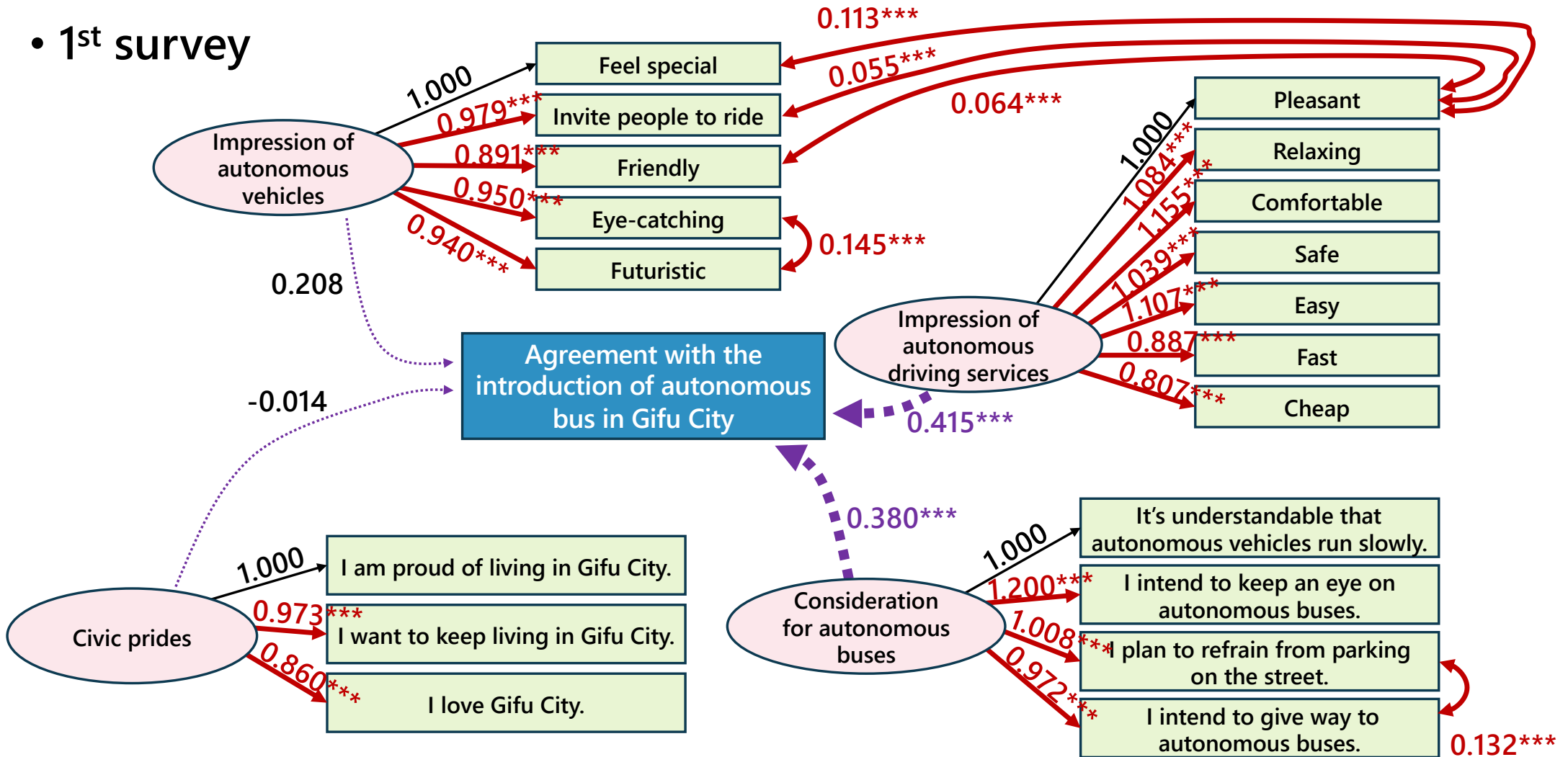
- Result of 3rd Survey

- In all surveys, **younger respondents exhibited a negative causal relationship** with considerations for autonomous buses, whereas **older respondents showed a positive one**.
- Only in the first survey did people who drive every day show **a positive causal relationship with impressions and considerations for autonomous buses**.



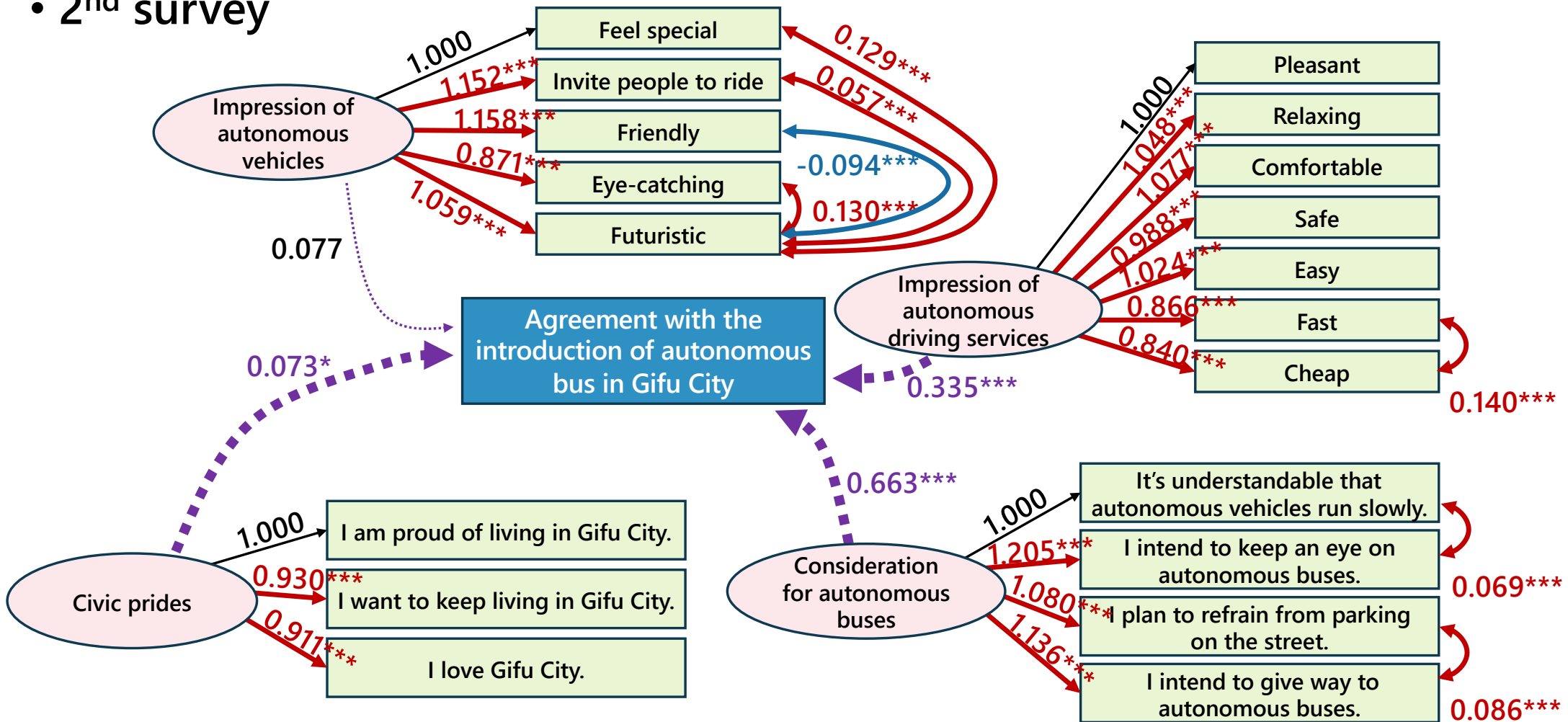
Relationship between endogenous variables and agreement with the introduction of AV bus

• 1st survey



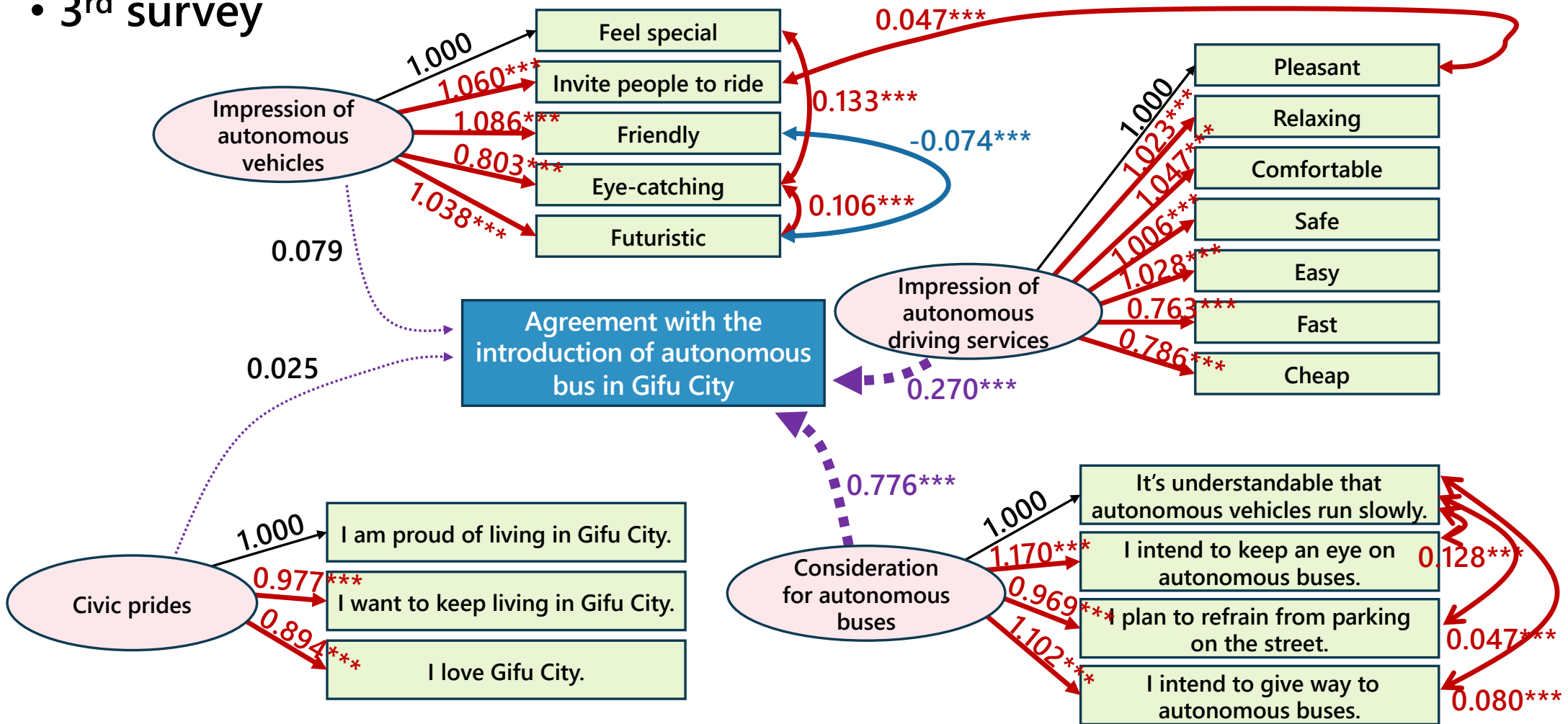
Relationship between endogenous variables and agreement with the introduction of AV bus

• 2nd survey



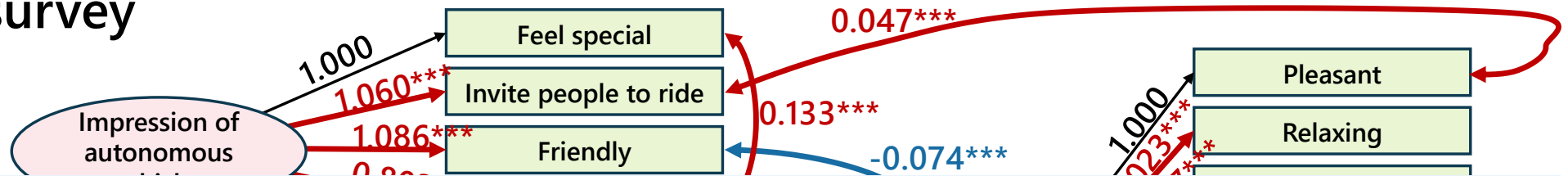
Relationship between endogenous variables and agreement with the introduction of AV bus

• 3rd survey

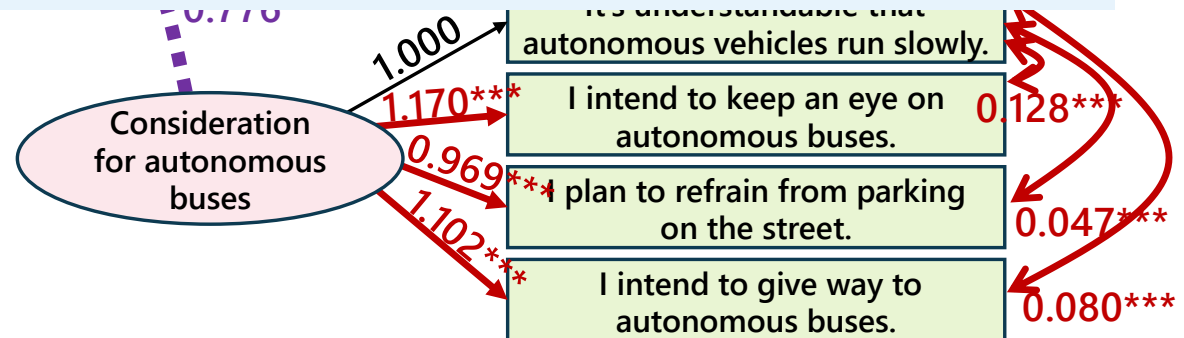
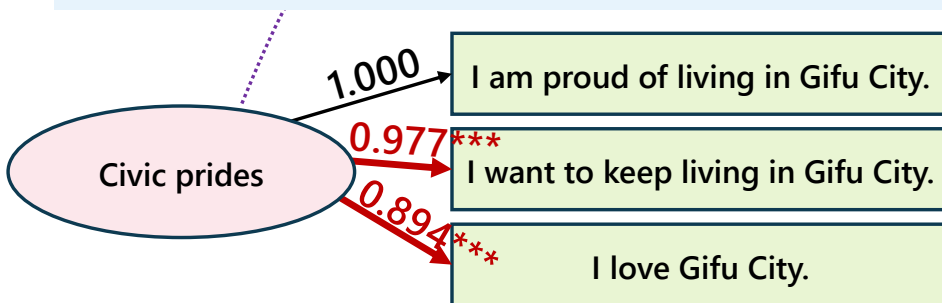


Relationship between endogenous variables and agreement with the introduction of AV bus

• 3rd survey



- Civic pride showed a positive causal relationship with attitudes towards autonomous buses only in the second survey, but not in the first and third surveys.
- Stronger impact of 'Consideration for autonomous vehicles' found in the third survey.





- How will citizens' acceptance by this new vehicle?

- **An aggregate analysis of social acceptance of autonomous bus services using questionnaire survey data**
 - Improved social acceptance and precise understandings through experiences of riding in or observing autonomous buses
- **Structural equation modeling**
 - Social acceptance of autonomous buses varies depending on the individual attributes.
 - Civic pride showed a positive causal relationship with attitudes towards autonomous buses (only in 2nd survey)
 - Stronger impact of 'Consideration for autonomous vehicles' found in the third survey.

- Conducting surveys over five years to observe longitudinal changes in social acceptance.
- Discussion of possible countermeasures to improve social acceptance.

Thank you!

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Acknowledgements:

This research was conducted with the generous support of Gifu City, to whom we express our sincere gratitude.