

Measuring the Opportunity Set as Freedom: Meaning and Method

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Abstract

The purpose of this paper is to examine approaches to measuring individual capabilities based on the “Capability Panel Survey of Out-of-Home Activities in City A,” targeting nursing care recipients and persons with disabilities. It introduces a new method for measuring “capabilities as freedom” (i.e., real opportunity sets). Based on the analysis of the data, this paper presents two key findings. First, the capability approach enables the identification of individuals’ hidden needs by contrasting their intentions and judgments with their actual utilization abilities and achieved functionings. Second, it allows us to capture individuals’ “constraints on rational freedom” by measuring the difference between their achieved functioning values when going out and staying home. This paper also proposes an original method for estimating individual capability. This approach aggregates individual data by type as well as by group, based on a collection of individuals (groups) sharing a common set of available resources and utilization abilities but differing in type (e.g., choice patterns or habits).

“Individual claims are to be assessed not just by the incomes, resources, or primary goods people respectively have, nor only with reference to the pleasure or utilities they enjoy, but in terms of the freedom they have to choose between different ways of living they can have reason to value.” (Sen 2017, 357)

“[T]he more a conflict can be framed as within a state, as a civil war, as social, as domestic, the less human rights are recognized as being violated” (Mackinnon 1993, 94).

1. Introduction

1.1. Purpose and research interest

The purpose of this paper is to examine approaches to

measuring capabilities based on the “Capability Panel Survey of Out-of-Home Activities,” focusing on nursing care recipients and persons with disabilities. The survey was conducted by the authors in a small city in the suburbs of Tokyo. Drawing on these survey data, the paper proposes a new method for measuring “capabilities as freedom”—referred to here as “real opportunity sets.” More broadly, this paper tackles the somewhat ambitious goal of examining the human security inherent in the everyday repetitive action of “going and returning.” Based on this analysis, it envisions a normative and empirical “economics of capability.” This research question is elaborated in more detail below.

The capability approach focuses on the range of choices people have when using goods and services to realize various functionings (beings and doings, such as moving around, chatting, obtaining information, relaxing, or avoiding

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exposure to violence). This simple framework, however, has opened pathways to explore difficult problems of individuals and society that had previously been avoided due to their academic complexity. It seeks answers to questions such as: What constraints do people face today? What goods and services do they use to realize human functionings? What form and richness do individuals' capabilities—the ways of living that they have reason to value and are free to choose—possess?

The capability approach examines the freedom of individuals facing various natural and social contingencies across a range of contexts, such as welfare, healthcare, transportation, education, and labor, and explores how societies can realize equality in basic capabilities.

The capability approach, however, has seldom appeared in economics textbooks. The reason is that it constitutes a normative analysis, unsuited to fact-finding. If one attempted a positive (fact-finding) analysis, it would likely become merely a variant of microeconomics, focusing on consumer theory, producer theory, or human capital theory. Specifically, the following criticisms have been raised regarding the capability approach, particularly its measurement:

- (1) If the evaluation of capabilities depends on individual subjectivity, it could easily become a concept impossible to compare between individuals, similar to the concept of utility. Assuming inter-personal comparability, the concept would be entirely detached from the individual's agency, akin to resources, goods, income, or time.
- (2) What can actually be measured is an individual's achieved functioning vector, not the set of opportunities. While theoretically conceivable, it is empirically impossible to measure an individual's capability, including choices they could have made but did not. Is there any meaning in measuring choices an individual did not actually make?
- (3) An individual's capability is defined not just by the resources they currently possess and their ability to transform those resources into functionings, but by the entire set of all possible resources and all possible utilization abilities they could potentially access. Individual identity is shaped by the influence of the

relationships and groups to which they belong. To what extent can an individual's capability be identified as purely personal?

These are methodological conundrums that accompany any attempt at measurement. The capability approach has, in a sense, directly confronted these challenges that neoclassical economics has largely avoided. This is precisely where its originality lies. Consequently, constructing a field of "capability economics" should seriously take into account these methodological challenges (Gotoh 2021). This paper responds to these concerns by integrating insights from econometrics and social choice theory. The paper's main contributions are threefold.

First, it explores methods for evaluating capabilities that are comparable both within and across individuals, based on subjective (self-interpretive) data derived from individuals' actual experiences of going out versus staying home. It develops several Capability Evaluation Rules (CER) characterized by different evaluation criteria (axioms).

Second, using normative statistical methods, the paper infers what an individual who stayed home that day could have achieved if they had gone out, and what an individual who went out that day could have achieved if they had stayed home. This yields foundational concepts for mathematically representing the size and shape of an individual's capability.

Third, based on groups of individuals sharing a common set of conceivable resources and utilization abilities but differing in type (e.g., choice patterns, habits), the paper presents aggregated individual data by type and by group to estimate individual capability.

Below, we briefly explain these three ideas through an analysis of actual survey data. The data used here are drawn from the "Capability Panel Survey for Out-of-Home Activities in City A" (January 2020 to March 2024; 12 waves in total) targeting general elderly individuals, those requiring care, and persons with disabilities.¹ Section 2 introduces the basic concepts used in the survey. Section 3 draws on the "Willingness to Use Paid Volunteer Welfare Transportation"

¹ For an overview of the survey, see Kambayashi, Gotoh, et al. (2020, 2022). For an example analysis using the survey, see Gotoh and Kambayashi (2023).

survey and the “Opinions on the Survey Results” questionnaires within this dataset to reconsider the significance of “measurement” in the capability approach. From Section 4 onward, the paper introduces a new attempt to measure an individual’s capability set using the full panel survey. Section 5 presents intra-type and inter-type Capability Evaluation Rules (CER). Section 6 presents the three axioms that form the basis of the principle of freedom. Section 7 briefly provides a concrete example of applying the five CERs to actual data, and the conclusion in Section 8 reflects on the normative implications for capability and justice.

2. Basic Concept 1: Capability Panel Survey for Out-of-Home Activities in City A

2.1. Depth and Scope of Going Out/Staying Home Behavior

Going out and staying home are everyday yet profound activities. As the greeting “I’ll be back” implies, “going” inherently implies “returning,” and “returning” inherently implies “going.” Constraints on freedom on one side may directly lead to constraints on the other (cannot leave means cannot return; cannot return means cannot leave).

Going out/staying home activities form a junction point for multiple purposeful activities (working, studying, shopping, medical visits, eating, socializing, walking, etc.), multiple derivative activities (checking maps/weather/facilities, arranging attendant and transportation, getting ready), and multiple basic activities (resting, eating, using the restroom).

Going out/staying home are both highly personal and social matters. Local governments such as cities serve as hubs for creating mechanisms (reciprocal support and public policy) to “transport, send, evacuate, and relieve pressure” for individuals whose basic safety and security are threatened—from domestic violence victims to travelers who fall ill—by opening up the “blind spots” and “closed spaces” found in homes, schools, workplaces, facilities, hospitals, and other locations.

2.2. Out-In Capability Index (OICI)

This study constructs a list of ten functionings grouped into four categories: Security and Relaxation, Sense of Gaining, Joy and Sociality, and Comfortability with oneself (see [Table 1](#)). While these share similarities with the concept of “utility” in economics when referring to subjective evaluations, they are closer to the notion in medical science of “self-awareness” (as opposed to “objective awareness”) in terms of reflecting on specific experiences.

Individuals do not directly select functionings, but by

Table 1 Out-In Capability Index (OICI)

Security and relaxation	I had the sense of security and relaxation on the whole
Sense of gaining	I did not incur too much burden including financial costs
	More or less realized what I wanted (goal achievement)
	I felt good and healthy about my body and mind
	I maintained a sense of control
Joy and sociality	I had some stimulating new experience or perspective
	I had some unexpected encounter or discovery
	I refreshed myself, enjoyed myself, or smiled
	I talked and socialized with people
Comfortability with oneself	I had the sense of being myself and being comfortable

Source: Author

Table 2 Going Out/Staying Home Utilization Ability List

Environmental barriers	Difficult steps (stairs, cars, thresholds)
	Difficult to use facilities
	Difficult to carry baggage or equipment
	Difficult to have a good meal or take a break
Interpersonal barriers	Difficult to have a small conversation
	Difficult to understand important information
	Bothered with people's stare, attitude or language
	Difficult to receive understanding or help
Personal barriers	Felt tired or in pain and a little panicky
	Spent unplanned expenses
	Spent unplanned time
	Difficult to adjust my mind and body

Source: Author

choosing going out/staying home behaviors (more precisely, ratios $p \in [0, 1]$), certain functioning values are realized. An individual's capability is defined as the set of achievable functioning vectors, based on the set of resources available to them and their utilization capabilities.

The utilization ability list comprises 12 abilities across three categories: environmental, interpersonal, and (inner) personal (see [Table 2](#)). Resources are captured through indicators such as income (monthly transportation expenditure), means of transportation, and attendant support.

2.3. Paid Volunteer Welfare Transportation: A Social Resource Supporting Going Out Capability

Paid volunteer welfare transportation refers to a system in which neighbors assist individuals requiring support, nursing care recipients, persons with disabilities, pregnant women, children, and others—with going out and returning home by driving their “available vehicles” with “available manpower.”

The amended Road Transport Act took effect in October 2006, designating NPOs and similar entities as the operational bodies, and municipalities and prefectures as the responsible authorities. Within this flexible framework of paid volunteer

services linking welfare and transportation, details such as user fees are determined by an operational council composed of diverse concerned parties, including government, private taxi companies, operators, citizens, and experts.

According to one NPO's articles of incorporation, the purpose of the service is “to contribute to the realization of a rich society where the elderly and those with mobility difficulties can live independently within their local communities and lead fulfilling lives.” The following two anecdotes from service providers illustrate this in practice.

Example 1: A visually impaired person walking alone had his white cane broken by a passing bicycle. He could not go out to buy a new one because he did not have the cane needed to do so. As the bicycle receded from view, he was left standing frozen in place.

Example 2: An elderly couple in which the wife is the primary caregiver for her bedridden husband. One day, the husband rolled out of bed and fell on top of his wife while she was feeding him. They were unable to move for three days and nights.

How should society support people with disabilities or illnesses who strive to live independently? In Japan, according

to Article 14 of the Road Traffic Act, anyone passing by a person with mobility difficulties has an obligation to assist them to the extent possible. Yet, even when a visually impaired person raises their hand by the roadside, even taxis seldom stop. It is precisely because paid volunteer welfare transport services circulate throughout the city that they can recognize such situations and promptly notify the authorities.

Paid volunteer welfare transportation does not end with simply transporting the user. After delivering them and closing the front door, the driver listens intently for a moment to the user's situation, ensuring that they have not collapsed with a thud behind the door. When a member who made a prior reservation does not show up at the agreed time, they do not just charge a cancellation fee and call it a day. They look for ways to help with the difficulties that users face.

Fifteen years after the service's establishment, momentum grew for reassessing the costs and benefits of this paid volunteer welfare transportation service. How many unmet needs and hidden demands actually existed for such a service? Basic data became necessary for public discussion surrounding the city's mobility support policies. It was within this context that the present study, based on the capability approach, was developed.

3. Applying the Capability Approach

3.1. Survey Overview and Analytical Method

This section covers the “Capability Panel Survey for Out-of-Home Activities in City A” (January 2020 to March 2024: 12–13 rounds).

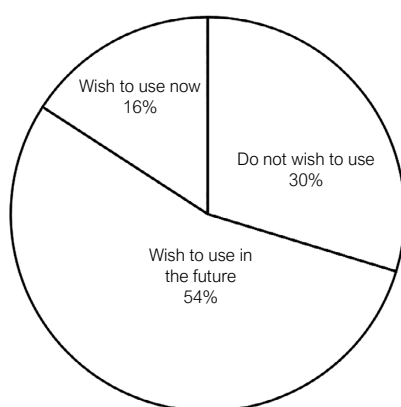
- (1) The “Willingness to Use Paid Volunteer Welfare Transportation” survey asks whether respondents intend to use paid volunteer welfare transportation now or in the future.
- (2) The “Opinions on the Survey Results” questionnaire presents respondents with the results of the willingness survey and then asks for their views on the reasons behind those results (see the specific question in [Figure 1](#)).

The research questions and analytical methods for this paper are as follows:

- (1) Despite the availability of affordable, reliable, and officially endorsed shuttle services provided by local governments, 30% of respondents indicated that they have no intention of using them. Is this simply because they do not need the service at all, or do they actually need the service but respond this way contrary to their true intentions?

Note: A question regarding the use of paid volunteer welfare transportation asked in the Survey of July 2021 and answers gained from the citizens

Would you wish to use welfare-funded transportation when you go out?



"The result shows that 30% answered that they do not wish to use the service. What reasons can you think of that the citizens responded this way?" (October 2022 Survey Questionnaire item 10-2, 10-3)

Figure 1 Question samples from “Willingness to Use Paid Volunteer Welfare Transportation” and “Opinions on Survey Results”

Source: Compiled by the author based on “Summary of the Number of Trips and Users by Operator of Paid Volunteer Welfare Transportation,” Road Traffic Division, Kunitachi City.

To distinguish between these possibilities, we examine the relationship between the willingness to use the service and the ability to use it when going out/staying home (where lower difficulty indicates greater ability). We perform a similar analysis for achieved functioning values.

(2) What are the characteristics of those who respond to the question “Why do you think 30% of people have no willingness to use the service?” with “Ultimately, it’s because the person lacks the desire to go out”? We examine the relationship between the ability to use the service when going out/staying home, and whether the respondents themselves are willing to use it. We also perform a similar analysis on achieved functioning values.

3.2. Analysis Results (1) (*For details, see Figures 2 and 3 in the Appendix at the end of the text)

Respondents who answered “no wish to use” [the service] have the following characteristics compared to those who answered “wish to use” [the service]:

1) Characteristics Regarding Utilization Ability

(i) The difference in utilization ability between the going out cluster and the staying home cluster is large (going out cluster > staying home cluster). However, the going out cluster here refers to people who reported going out at least once on a specific day, while the staying home cluster refers to people who did not go out at all on a specific day.

(ii) When viewed by cluster, the ranking of utilization ability is reversed between the going out cluster and the staying home cluster.

“No wish to use” going out cluster > “wish to use” going out cluster

“No wish to use” staying home cluster < “wish to use” staying home cluster.

(iii) At the item level, the “no wish to use” staying home cluster shows significantly greater interpersonal difficulties.

2) Functioning Characteristics

The “no wish to use” staying home cluster has significantly lower achieved functioning values not only for “Goals/Health

Achievement” but also for “Socializing/Enjoyment” and “Sense of Control.”

3.3. Analysis Results (2) (*For details, see Figures 4 and 5 in the Appendix at the end of the text)

Respondents who inferred (judged) that the reason why people have “no wish to use” is that “the individual lacks desire to go out,” exhibit the following five characteristics:

- (i) Most respondents answered “no wish to use”;
- (ii) Most respondents have significant difficulties in utilization ability, particularly interpersonal difficulties;
- (iii) Most respondents have low achieved functioning values;
- (iv) Many respondents were in the staying home cluster at the time of the survey;
- (v) Even among the going out cluster, those with low achieved functioning values tended to give this response.

It should be added that among respondents, those in the going out cluster often attributed their reason for “no wish to use” to “unable to find an attendant.” Improving the usability of paid volunteer welfare transportation (e.g., allowing solo use) could potentially increase the number of people expressing a willingness to use it.

3.4. Interpretation

The above analysis reveals a significant gap between the going out cluster and the staying home cluster among respondents who expressed “no wish to use” the paid volunteer welfare transportation, in terms of both utilization ability and achieved functioning values. When interpreting this gap, the first point to note is that this difference does not necessarily represent a causal difference in achieved functioning values between going out and staying at home for the same individual. There is a risk of endogeneity persisting here, as described in econometrics. For example, it cannot be ruled out that individuals with inherently high utilization abilities and achieved functioning values tend to cluster in the going out cluster, while those with inherently low utilization abilities and achieved functioning values tend to cluster in the staying home cluster.

If this possibility is high, the following interpretation

becomes plausible: The going out cluster who reported no willingness to use the service may already be able to utilize regular public transportation like buses and trains, or be able to move around sufficiently by bicycle or on foot. Therefore, they do not have a significant need for paid volunteer welfare vehicles. In contrast, the staying home cluster who reported no wish to use the service may currently be refraining from going out, so their needs are not readily apparent. However, their potential need for paid volunteer welfare transportation is clearly high. It should be noted that they also require assistance at home. Their inherently low ability to use services suggests the presence of environmental barriers, such as tripping hazards within the home, as well as the possibility of severe interpersonal barriers, including difficulty accessing critical information such as evacuation advisories or communicating effectively with visiting caregivers.

It is also interesting to analyze the characteristics of respondents who attribute the reason for “no wish to use” [the service] to a “loss of motivation to go out.” The above analysis shows that individuals who selected this reason also reported they had “no wish to use” [the service], and many belonged to the “staying home group.” Furthermore, these respondents had low utilization abilities (especially in terms of interpersonal relationships) and significantly low achieved functioning values. This implies that the analysis concerning the “no wish to use” in the staying home cluster above applies directly here. That is, while the need is not apparent now because going out is being refrained from, the potential necessity for paid volunteer welfare transportation is high, and assistance at home is also required.

Furthermore, it is important to note that even among those who go out, respondents with low achieved functioning values tend to attribute their “no wish to use” to a loss of personal motivation to go out: “I went out that day. But the result was disastrous. While supporting my swaying body with a cane, I somehow managed to cross the crosswalk, only to be treated like a nuisance by passersby, and my friend left hurriedly.” If such an experience vividly resurfaces, it is hardly surprising that the equation “no wish to go out = loss of desire to go out” might cross one’s mind.

These results indicate that cases where individuals express no wish to use public transport, including those

where this is attributed to a loss of desire to go out, cannot serve as sufficient justification for local governments to shirk their responsibility to provide mobility support.

3.5. The Significance of Measuring by Applying the Capability Approach

The goal of regional public transportation policy is to “maintain and ensure essential transportation that allows everyone to move more comfortably and easily” in all areas. Even if equal opportunity to use established public transportation is achieved, individuals who do not express a desire to use transportation in the first place, or those deemed to have lost the desire to go out, risk being excluded from support. Voices collected from stakeholders in awareness surveys may steer public opinion toward reducing transportation services.

The capability approach enables us to capture hidden individual needs by focusing on the underlying personal capabilities and achieved functionings behind an individual’s intentions or judgments. This perspective highlights not only the need for support for going out but also the necessity for support at home.

Moreover, if the functionings value gap between the two clusters approximates the gap between going out and staying at home for each individual, the capability approach enables us to pinpoint where individual freedom resides. A brief hypothetical scenario is outlined below. They do not express willingness to use paid volunteer welfare transportation because they do not feel much difficulty when going out. Conversely, difficulties at home are severe, and they actually need support, yet these needs are difficult to articulate. Two behavioral principles can be considered. One is “sum maximization behavior,” aiming to maximize the combined functioning value of going out and staying at home. The other is “difference minimization behavior,” seeking to reduce the disappointment caused by the disparity between the functioning value when going out and staying at home.

Assuming the guarantee of agency freedom, in the former case, it is expected that they will go out more often to increase the sum (e.g., cases where the functioning value of going out is greater than that of staying home and the ratio of going out is high, or cases where the functioning value of

going out is less than that of staying home and the ratio of going out is low). In the latter case, it is predicted that individuals will go out less often to minimize the difference (e.g., cases where the functioning value of going out is greater than that of staying home and the ratio of going out is low, or cases where the functioning value of going out is less than that of staying home and the ratio of going out is high).

These two cases, while differing in direction, share the commonality that individuals are compelled to make choices differing from their desired frequency of going out. When an individual attempts to make a rational choice, if there is only one option that is optimal for them (or at least no worse than others), choosing it may be a rational necessity, but it hardly qualifies as freedom.

To truly respect individual freedom, it is essential not only that agency freedom is guaranteed, but also that individuals have multiple options from which they can make rational choices (in other words, the differences between options are not too great), and that the level of well-being associated with these options is reasonably high.

4. Fundamental Concept 2: Measuring Capability Sets

The following sections introduce Gotoh and Kambayashi (2026), based on all 12 waves of the “Capability Panel Survey for Out-of-Home Activities in City A,” to measure capability as individual freedom.

4.1. Types and Groups

The advantage of panel surveys lies in tracking the same individuals over a fixed period, enabling the collection of going out ratios (the number of times going out / (number of times going out + number of staying home)) on an individual basis. Furthermore, they allow for the collection of the sum and difference between the average functioning values when going out and staying home on an individual basis. As mentioned earlier, if the difference in utilization abilities between the going out cluster and the staying home cluster fundamentally represents the difference between

individuals with inherently high utilization abilities and those with inherently low utilization abilities, then within each individual, the difference between the average functioning values during going out and staying home should be zero. However, the panel survey shows that this difference is not zero. This suggests the existence of constraints within an individual's rational choices.

This paper seeks to capture individual capability as an opportunity set functioning vectors by collecting data on the going out ratio and the average functioning values for going out and staying home for n (number of individuals), then aggregating this data using statistically and normatively sound methods.

First, it is notable that the two behaviors of going out and staying home (along with different ratios of going out) are mutually independent and technically substitutable. This enables the application of an economic opportunity set model with two dimensions: going out and staying home. An individual's capability is captured as a set of mutually substitutable choices achievable under given resources and technological constraints.

This paper introduces the concepts of “type” and “group.” A group refers to a set of people who share factors that individuals cannot choose (e.g., the range of available resources and utilization capabilities). A type refers to a set of people who share factors that individuals can choose (though they are difficult to change due to tendencies, habits, etc.). Here, we capture types based on the “going-out ratio.”

4.2. Mathematical Formulation of Capability Sets

Suppose an individual i , under a going out ratio p , utilizes a resource z_i with a utilization ability c_i to achieve a certain functioning values when going out or staying home. The entire set of pairs of functioning values for going out and staying home that individual i could achieve by selecting different going-out ratios, different utilization abilities, and different resources constitutes individual i 's capability set. It is expressed as the set of functioning vectors for individuals within a given group who have different going-out ratios. It can be rewritten as a function of the set of resources Z_j , the set of capabilities K_j , and the set of going-out ratios that

individuals belonging to a given group can share.²

Typically, the set of resources available to individual i is denoted as Z_i —i.e., as that individual's resource constraint. Similarly, the set of utilization abilities is denoted as K_i —i.e., as that individual's technical constraint. In contrast, the key point of this formulation is that individuals belonging to the same group j are subject to resource and technical constraints with a common index.

However, it should be noted that this does not imply that individuals can actually share a specific set of resources or capabilities. Rather, it means that individuals can form a certain group consciousness based on this information, recognizing the functioning values achieved by others as values they themselves could have achieved or might achieve in the future.

Adding several conditions (such as compactness and inclusiveness) to the above definition yields a diagram similar to an opportunity set (budget set or production possibility set) in neoclassical economics (though convexity is not necessarily satisfied). Its frontier consists of technically feasible optimal points under given resource constraints. Points between the origin and the frontier form interior (non-optimal) points of the set.

A perspective extending beyond neoclassical economics' concept of the opportunity set is as follows. Neoclassical economics focuses on selecting optimal points on the frontier. In contrast, the capability approach sometimes actively considers the selection of interior (suboptimal) points as a matter of freedom. For example, an individual possesses the freedom to undertake a hunger strike for political reasons, even though adequate nutritional intake is possible. A more fundamental difference is outlined below.

In the neoclassical economics' opportunity set, points not selected at time t need not actually exist at time t . Considering market price fluctuations, there is no guarantee that they will exist at time $t+1$. In contrast, within the capability

approach, every point in the opportunity set, including those not chosen, actually exists. The capability vector not selected at time t constitutes precisely that person's capability (potential ability), existing not only at time t but also at time $t+1$, and remains freely selectable over time.

Defined in this manner, the capabilities of individuals contain rich information. The task of empirical research is to aggregate this information and mathematically represent individual capability. More specifically, it involves identifying the size and shape of the capability set. Here, we draw on two approaches: one is a statistical method from econometrics, and the other is an axiomatic method based on social choice theory.

4.3. General Formulation of Capability Evaluation Rules (CER)

The procedure for aggregating an individual's information while satisfying certain criteria (concerning informational space and informational focus, as described later) is referred to here as the Capability Evaluation Rule (CER).

Formally, CER is expressed as a function that consistently maps any individual capability value profile to a binary capability relation (at least as good, better, or equivalent). Multiple CERs can be considered depending on which information space is assumed and where the informational focus is placed within the individual functioning value profile.

Informational spaces are characterized by whether their measurement units can be expressed as cardinal (capable of arithmetic operations) or only ordinal (capable of ranking), and whether they possess complete comparability or only allow comparison of units or levels. This paper assumes either cardinal unit comparability or ordinal level comparability within the same group. Within the same type in the same group, it assumes complete comparability.

The informational focus represents which positions in the corresponding individual functioning value profiles are evaluated as better when comparing any two capability sets. CER can be broadly divided into two parts. One is the aggregation procedure for individual functioning value profiles within the same type, and the other is the aggregation procedure for functioning value profiles by type within the same group. These are introduced sequentially in the next section.

² Given a possible set of resource bundles, z_i , a possible set of utilization abilities, K_i , and a possible set of types, $p \in [0,1]$, the capability of individual $i \in N^i$, C_i , is formally defined as $C_i := C(Z_i, K_i; p) = \{(F_{ip}^O, F_{ip}^S) : F_{ip}^O = C_{ip}^O(z_i), F_{ip}^S = C_{ip}^S(z_i), \text{ for some } z_i \in Z_i, c_i \in K_i \text{ and } p \in [0,1]\}$, where F_{ip}^O is the going out achieved functioning vector, while F_{ip}^S is the staying home achieved functioning vector.

5. Intra-type and Inter-type CER

5.1. Intra-Type CER

The Intra-Type CER is a procedure for aggregating individual functioning value profiles within the same type. Formally, it is defined as a function whose domain is the universal set of individual functioning value profiles and whose range is the universal set of binary relations on capabilities.

Here, we present two Intra-Type CERs. One is the “Difference β -Minimization Rule,” which evaluates capability as improved if the difference β between the going out functioning value and the staying home functioning value for a given type decreases (while maintaining consistency with other types). The other is the “Size α -Maximization Rule,” which evaluates capability as improved if the size α of the smaller value between the going out functioning value and the staying home functioning value increases (while maintaining consistency with other types).³

This paper attempts to approximate α and β using a type-specific fixed effects model based on panel survey data that collects information on both going out and staying home for the same individuals.⁴ The key point of the type-specific fixed effects model is that it estimates effects specific to going out behavior and those specific to the group while controlling for the personal attributes of individuals within each type. The effect specific to going out behavior corresponds to the difference β . The effect specific to the group corresponds to the size α .

5.2. Capability Evaluation Rule (CER)

CER is a procedure for aggregating α profiles and β profiles (collecting the α and β values of each type across all types) obtained for each type. Formally, it is defined as a function whose domain is the universal set of α profiles and β profiles, and whose range is the universal set of binary

relations on capabilities.

This paper examines five types: Weighted Utilitarian CER, Unbiased Utilitarian CER, Rawlsian CER, α Maximum-Maximizing CER, and β Minimum Set-Maximizing CER. Weighted Utilitarianism assigns weights proportional to population size to each type; if net benefit increases, capabilities are evaluated as improved. Unbiased utilitarianism assigns equal weights to each type and evaluates that capabilities have improved if net benefits increase. Rawls’s difference principle evaluates that individual capability has improved if the level of the minimum value within a type rises. These three CERs are familiar as rules for distribution among individuals within society.

This paper further introduces the α Maximum-Maximizing CER and the β Minimum Set-Maximizing CER. The α Maximum-Maximizing CER, in contrast to Rawls’s difference principle, evaluates an individual’s capabilities as improved if the level of the maximum value within a type increases. The β Minimum Set-Maximizing Rule evaluates an individual’s capability as improved if the number of types achieving the β minimum value increases, based on a comparison of these numbers.

6. The Three Axioms of Freedom

An axiomatic approach is a method for making the characteristics of different CERs more transparent. An axiom refers to foundational, non-decomposable normative judgments. Examples include (strong/weak) Pareto efficiency, equity, anonymity, and separability. The axiomatic approach characterizes rules by combining multiple axioms. This section presents three axioms that form the basis of the principle of freedom.

(1) Agency freedom: This is defined as the freedom to realize any personal evaluation of two actions (or any two ratios of going out): going out or staying home.⁵ Empirically, this can be approximated by methods such as the functioning of “having a sense of control over

³ More generally, it is defined as a value that balances the sum and the difference of the going out functioning value and the staying home functioning value using a fixed weight.

⁴ Formally, a type specific fixed effects model is defined as follows. $F_{it} = \beta \cdot OUT_{it} + u_i + wave_t + \alpha + \varepsilon_{it}$.

⁵ This is essentially identical to the definition of liberty used in the proof of the liberal paradox (i.e., the proposition that there exists no social choice procedure that generally guarantees both the Pareto condition and minimum liberty) (Sen, 1970/2017).

oneself.”

(2) Rational freedom: Greater freedom exists when more actions or types yield the maximum functioning value, or equivalently, when the functioning value difference β between actions is smaller. Alternatively, greater freedom exists when more types yield the smallest difference β .

(3) Well-being freedom: Greater freedom exists when the level of the maximum functioning value is higher. Alternatively, greater freedom exists when the level of the minimum functioning value is higher.

Gotoh and Kambayashi (2026) confirmed that the “Difference β -Minimization Rule,” constructed based on “effects specific to going out behavior” in a type-specific fixed-effects model, satisfies the axiom of rational freedom while the “Size α -Maximization Rule,” constructed based on “effects specific to the group,” satisfies the axiom of welfare freedom.

7. Application Examples

Applying these five CERs (Weighted Utilitarianism, Unbiased Utilitarianism, Rawlsian Difference Principle, α -Maximum-Maximization Rule, β -Minimum-Set-Maximization Rule) to actual data naturally yields different calculation results. However, interestingly, focusing solely on rankings reveals commonalities. Regarding size α , values generally decrease in the order: General Elderly Group > Disabled Group > Nursing Care Recipient Group. However, under the α Maximum Rule, the Nursing Care Recipient Group has the highest value among the three groups. For the Disabled Group, the value decreases under the unbiased utilitarian CER compared to the weighted utilitarian CER (this is interpreted as reflecting a greater emphasis on smaller, but less common, types of disadvantage in the latter). Regarding the difference β , significant differences in cardinal measurement values emerge between the Rawlsian CER and other CERs. For further details, see Gotoh and Kambayashi (2026).

8. Conclusion

The ultimate goal of the capability approach lies in equal concern and respect for each individual. To borrow Kant’s words, individuals possess a value (dignity) that is priceless, meaning it is not mutually comparable.⁶ At the same time, individuals belong to various kinds of groups. An individual’s inner integrity (the unity of well-being and autonomy) fosters cooperation within the group. For example, if people facing similar difficulties in life, those sharing common experiences of victimization, or even neighbors who happen to live next to each other, can find within one another “a way of living they can have reason to value,” then a path to constituting individual capability opens up.

Paid volunteer welfare transportation services operate on dual reciprocity. Citizens who can drive support those with transportation difficulties, and simultaneously, taxpaying citizens support those facing hardship. Someone who happens to have time now offers their car, and someone whose need arises now requests it. Someone who happens to have the means now pays taxes, and someone whose need arises now receives benefits.

When citizens who currently can offer transportation face transportation difficulties in the future, they become recipients of support. When citizens currently facing transportation difficulties recover and eventually offer transportation, they become providers of support in turn. Similarly, if citizens who currently have resources face livelihood difficulties, they become recipients of benefits. If citizens who currently face livelihood difficulties gain resources, they become providers of benefits in turn.

The method for measuring individual capability presented in this study holds the promise of evolving justice theory—often framed in terms of the relationship between the individual and the public—into a group-mediated theory of justice. Using “trans-positional assessment” (Sen 1993) as a key concept, future research should explore the conceptualization of individual experiences and the possibilities for peacebuilding

⁶ See Gotoh (2024).

through intra-type cooperation, inter-type and intra-group cooperation, and inter-group cooperation.

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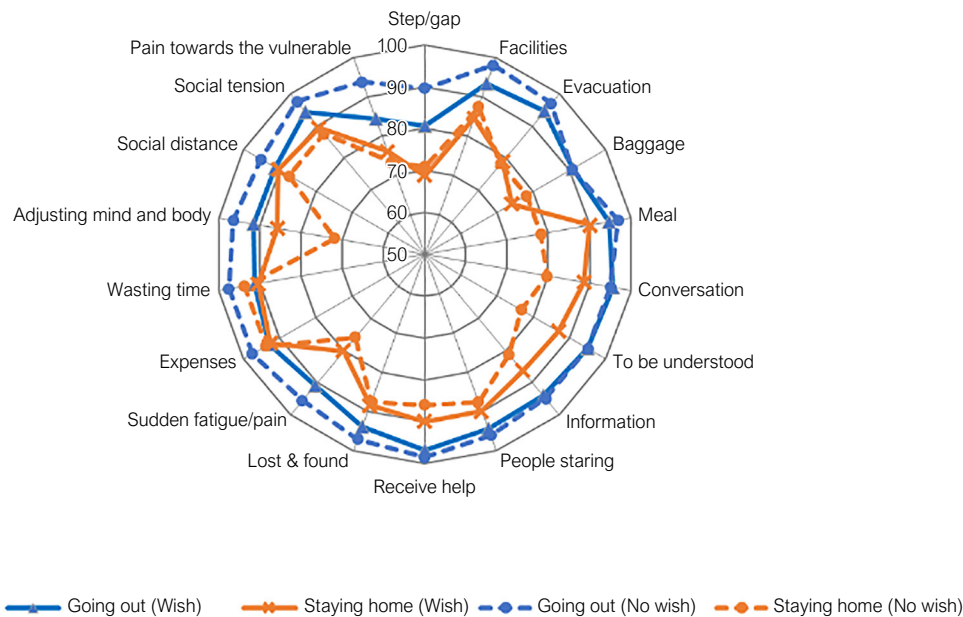
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Appendix

1) Willingness to use × Utilization abilities when going out/staying home

Figure 2 Difficulties experienced when staying at home/going out
No wish to use welfare-funded transportation

The smaller the circle connecting the 18 items, the greater the perceived difficulty.

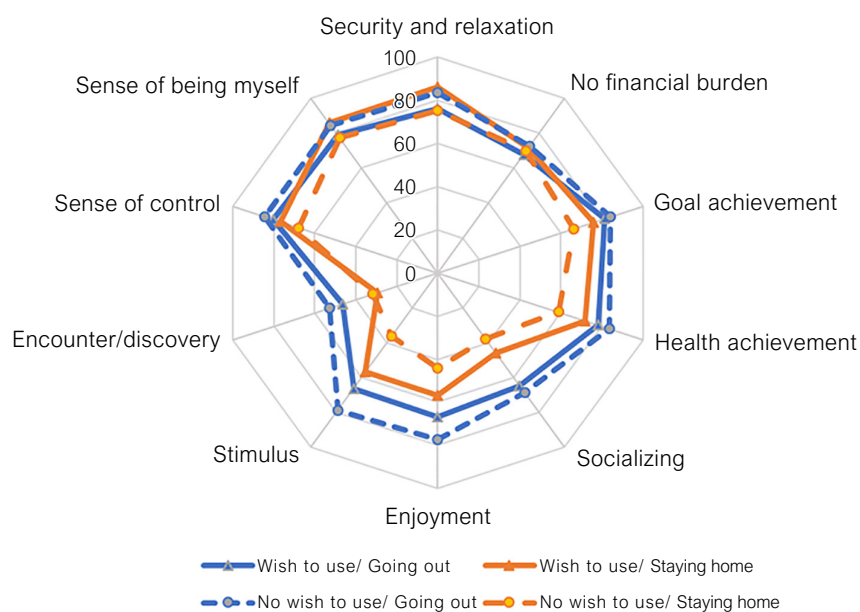


*Compared to difficulties experienced when going out, difficulties experienced while staying at home are larger for those “who do not wish to use welfare-funded transportation.” In the case of blue (going out cluster), the dotted line (“no wish to use”) is outside the solid line (“wish to use”), whereas in the case of orange (staying home cluster), the dotted line (“no wish to use”) is inside the solid line (“wish to use”).

2) Willingness to use × Achieved functioning value for going out/staying home

Figure 3 Going out/Staying home functionings based on wish to/no wish to use welfare-funded transportation

The larger the circle connecting the 10 items, the higher the achieved functioning value.



* Compared to the functioning values during staying at home, the values during going out are larger for those “who do not wish to use welfare-funded transportation.” In the case of blue (going out cluster), the dotted line (“no wish to use”) is outside the solid line (“wish to use”), whereas in the case of orange (staying home cluster), the dotted line (“no wish to use”) is inside the solid line (“wish to use”).

3) Willingness to use paid volunteer transport service for those having difficulties in a personal relationship × Reasons (comments) for answering “do not wish to use.”

Figure 4 Respondents by reason

Wish to use welfare-funded transportation/ individual utilization ability (interpersonal barriers applicable)

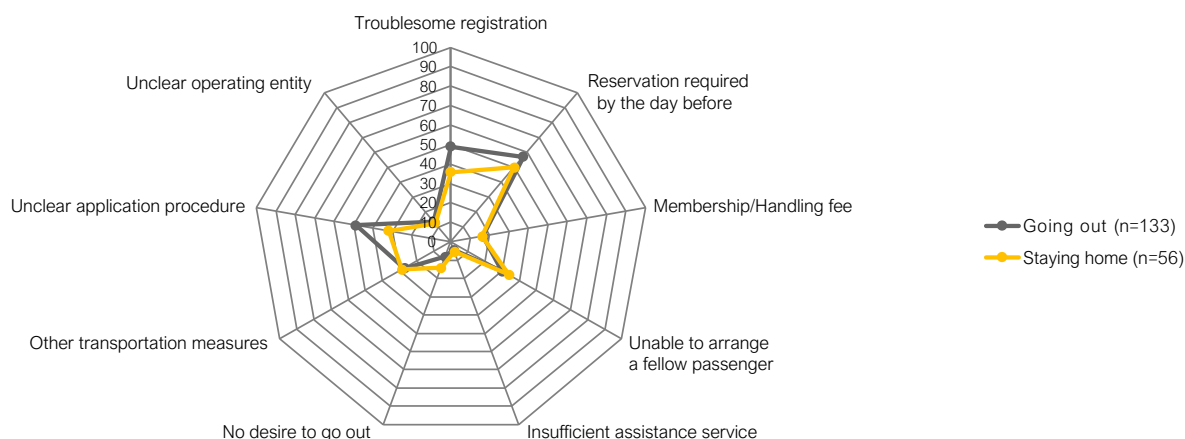
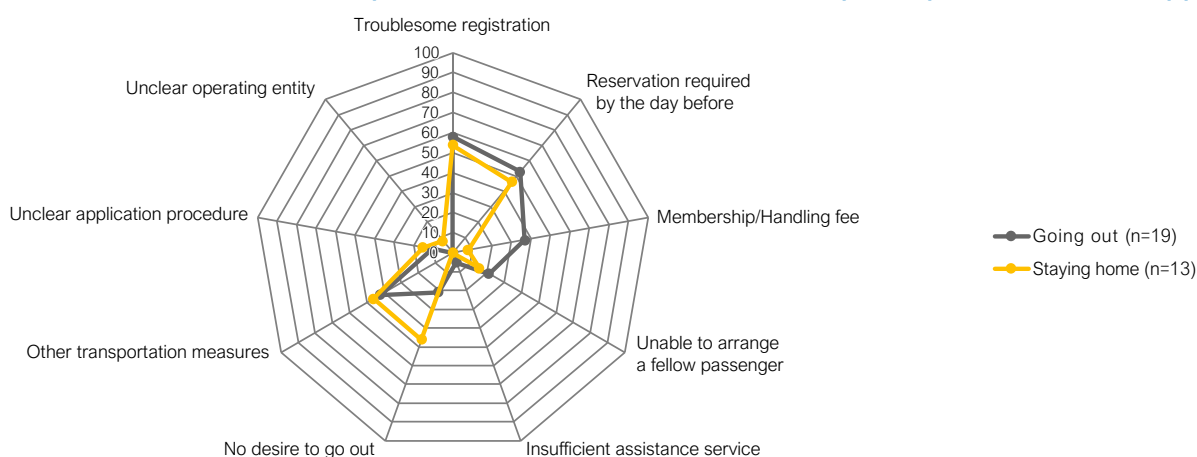


Figure 5 Respondents by reason

No wish to use welfare-funded transportation/ Individual utilization ability (interpersonal barriers applicable)



*The higher the value for each item, the more people cite it as a reason.

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