# Operationalizing the Capabilities Approach for Urban Policy Evaluation: The Travel Welfare Impacts of Government Job Resettlement

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*This paper operationalizes the Sen-Nussbaum Capabilities Approach (CA) towards measuring household travel welfare shifts after relocating government jobs to China's new towns. As a major type of urban decentralization practice, government job resettlement (GJR) programs have been implemented in several Chinese cities in an attempt to provide seed employment and population in new towns. Nevertheless, the travel welfare impacts of GJR programs are largely under-examined. In this paper, we make the first attempt by proposing a quantitative modelling approach to examining how households undergoing GJR programs have experienced changes in their travel welfare after job resettlement. We contend that travel welfare evaluation should be extended from the current paradigm that focuses on subjective feelings (e.g., satisfaction and happiness) about travel activities and objective measures of trip characteristics (e.g., travel time, travel costs and travel mode choices). We argue that the current evaluative framework can be enhanced by operationalizing the CA. That is, re-conceptualizing travel welfare as having real opportunities or freedom to achieve valuable doings and beings that people have reason to value for their own travel activities. We further propose our CA-based modeling approach and illustrate its promise in correcting some of the conceptual errors in the current travel-welfare models.*

***Keywords:*** *Job resettlement; travel welfare; travel well-being; Capabilities Approach; policy evaluation; new towns; China*

Since around the turn of this century, there has been a significant movement of new town planning and development in cities across China. Located in the urban periphery, new towns are envisioned in urban spatial plans as the spatial carriers for urban expansion, as ways to accommodate population and economic growth in cities and to alleviate some of the negative externalities of urbanization, such as crowding, traffic congestion, high housing costs and declining environmental

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quality (see Yang, Day and Han, 2015 for a review on urban spatial plans related to China's new towns). This type of urban decentralization practice is engaged in often-parallel efforts in relocating government administrative offices to new towns (Yang et al., 2015). Government job resettlement (GJR) programs have been incorporated in several cities' new town development, e.g., Kunming, Xi'an (Yang et al., 2015), Hebi (Liu, Yin and Ma, 2012), Erdos (Tencent News, 2013) and Lanzhou (Lanzhou News, 2013). The key policy goal of GJR programs is by and large rationalized in urban policy language as to provide seed employment and population in new towns; and on the other hand, to serve as the flagship project for attracting investment and guiding urban growth in these new development areas (e.g., Yunnan Provincial Government, 2008; Weiyang District Government, 2014; Sohu Focus, 2013). Indeed, from the perspective of urban spatial restructuring, there are legitimate reasons for incorporating GJR programs in China's new town development. For one, in the context of Chinese cities, government administrative function is conventionally located in cities' central area wherein high intensities of urban development occur. In this regard, the relocation of government jobs to new towns signifies a substantial endeavor of local government to promote new towns as the frontier of urban development, which can assist in creating the sub-center or even the new core of urban regions. For another, associated with the formation of functional urban fabric in the outskirt, the redistribution of population and employment is expected to generate promise for addressing some of the above-mentioned negative externalities of urbanization, so as to contribute to improving the collective welfare of urban habitants.

Despite the existing rhetoric and theoretical arguments in favor of national adoption of such urban policies, there is significant evidence that China's urban policy has been to some degree steeped in motives ulterior to the stated goals. Growth machine policies in housing, for instance, serve local elites (Zhang and Fang, 2004) and often improve the lives of only some people (Day and Cervero, 2010). In order to deliver urban policy toward the betterment of human well-being and justice – the root and ongoing ideology of the urban planning profession – the outcomes of GJR programs should be scrutinized in respect to not only the collective welfare benefits gained from urban spatial restructuring, but also to the welfare costs paid at the immediately affected population, i.e., the households of job resettled government workers. This paper focuses on examining the welfare impacts of GJR programs on this affected population, with particular respect to changes in household travel welfare after job resettlement.

A focal question for researchers to measure household travel welfare lies in the conceptual and analytical issue: if travel welfare (we often use the term, 'well-being' interchangeably with 'welfare') is conceived as the quality, 'wellness,' of people's travel-related activities, how should researchers choose the measures and dimensions of the travel experience that are reflective of what people value? As we will demonstrate in this paper, the standard of practice is currently for researchers to generate an *a*

*priori* list of measures, which are largely standardized across countries and contexts. As some scholars have recently pointed out, these standardized measures often have limited relevance to people's actual lives. In the selection and measurement of travel welfare indicators, we argue, researchers should explicitly address a different set of issues than are currently considered, in order to generate meaningful empirical assessment of urban policy outcomes and to draw insightful policy implications.

This paper takes on the conceptual and analytical issue of extending the reach of travel well-being indicators from the *a priori* boilerplate list to one that accounts for those travel options that people value. In the proceeding sections of this paper, we first outline the current state of quantitative research on travel welfare evaluation in the context of China's GJR programs and beyond, in terms of resettlement research and transportation research that includes travel welfare evaluation. This is followed by a critical survey of the quantitative modelling approaches applied so far to selecting and measuring travel welfare indicators. We contend that the current quantitative approaches to measuring travel welfare are deficient to capture the multi-dimensional nature of and behavioral realities in people's quality of travels. We further argue that such drawback is by and large due to a reliance on the framework of instrumental rationality for evaluating people's well-being.

Drawing on the methodological superiority of the Sen-Nussbaum *Capabilities Approach* (CA) to instrumentally-rational models to measuring well-being, we then suggest that the current evaluative framework of travel welfare can be enhanced and expanded by incorporating the CA to conceptualizing travel welfare as having *real opportunities* to achieve *valuable doings and beings* that people have reason to value for their own travel-related activities. We further propose and illustrate our quantitative modelling approach that incorporates the CA, qualitatively-informed survey instruments and Structural Equation Modeling to assessing household travel well-being shifts after job resettlement to new towns in China's urban periphery.

## AN OVERVIEW OF CURRENT QUANTITATIVE MODELLING APPROACHES TO MEASURING TRAVEL WELFARE: RESETTLEMENT AND BEYOND

### *Travel welfare impacts of China's GJR programs*

So far, GJR programs in China have resettled thousands of government workers to the urban periphery. However, the impacts of these programs on household travel welfare are largely under-examined. To the best knowledge of the authors, the only academic work shedding light on the travel welfare outcomes of GJR programs is found in the study by Liu et al. (2012). This work indicates that the resettlement of government jobs in Hebi City in Henan Province, China was accompanied by

the "forced" housing relocation to new town among the resettled government workforce[1]. Indeed, the co-location of jobs and residence in the new town is likely to generate easy job access for the resettled government workers. However, for dual-earner households, the change of residence might induce longer commute or lowered job accessibility for the spouse of resettled government workers, which in turn might cause a loss of travel welfare for the entire household.

The impacts of GJR programs on household travel well-being are also reflected in national media accounts. Some recent media stories indicate that households undergoing GJR programs appear to have low interest in relocating their residences to new towns. For example, in Kunming and Erdos, although both cities provide resettled government workers with heavily-subsidized housing in a new town, these housing projects reportedly were experiencing low uptake rates after government offices had been relocated to new town for three years in Kunming and seven years in Erdos (Nandu News, 2014; Tencent News, 2013). Unsurprisingly, the low interests in living in new towns reportedly were accompanied by the common co-existence of reverse commuting pattern and lengthened commuting time among the resettled government workers in both cities (Nandu, 2014; Tencent News, 2013). However, in terms of the extent to which changes have occurred in government workers' commuting patterns, these media accounts appear to offer little solid evidence.

### *Beyond China's GJR programs: Resettlement and transportation research*

Apart from the particular context of China's GJR programs, travel welfare is examined in several resettlement studies that focus on residential relocation (e.g., Kapoor *et al.*, 2004; Takeuchi *et al.*, 2006; Yang, 2006; Day and Cervero, 2010; Day, 2013) and transportation research in the general context where changes in residential/job location are not involved (cf. De Vos *et al.*, 2013 for an excellent review). Among this body of literature on residential relocation and the cities studied in De Vos *et al.* (2013)'s review, the quantitative modelling approaches to measuring travel welfare are constructed with indicators that are generally in one of two categories: 1) subjective feelings, such as satisfaction and happiness, about one's travel-related activities (see Ettema *et al.*, 2011; Abou-Zeid and Ben-Akiva, 2012; Olsson *et al.*, 2013; Day, 2013); and 2) objective measures of trip characteristics, e.g., travel time, travel costs and transportation mode choice (see Yang, 2006; Day and Cervero, 2010) and of potential travel opportunities, e.g., job accessibility (see Kapoor *et al.*, 2004; Takeuchi *et al.*, 2006; Day and Cervero, 2010).

The theoretical framework underlying the selection and measurement of these travel welfare indicators illustrates a strong reliance of the field on the hedonic stance of well-being and assumptions of instrumental rationality. The hedonic perspective of well-being views that happiness, in terms of the pleasures experienced from the satisfaction of preferences in order to maximize one's internal utility equation, is an adequate measure of one's quality of life (cf. Ryan and Deci, 2001 for an excellent review of the hedonic stance of well-being; Nussbaum, 2011, pp. 50-56, pp. 125-

126 for a description and criticisms of subjective measures used in the utilitarian approach of well-being evaluation). In line with the hedonic stance of well-being, the quantitative research on travel well-being regards that the subjective feelings experienced in travel-related activities are a viable representation of people's travel well-being. Studies in this paradigm often incorporate measurement of self-reported satisfaction scores with one's travels (e.g., Ettema *et al.*, 2011; Abou-Zeid and Ben-Akiva, 2012; Olsson *et al.*, 2013) and with potential travel opportunities, e.g., in the form of regional access measured in Day's (2013) work.

In relation to instrumental rationality, our review of resettlement-welfare literature in a forthcoming paper (Yang and Day, in press) finds that this centerpiece of econometric models is embedded in the current resettlement studies as a singular, universally applicable assumption for understanding people's behaviors toward attaining their own well-being after resettlement. The instrumentally-rational logic assumes the revealed choice outcome is a full representation of a person's optimal alternative selected from an *a priori* choice set. For instance, if a traveler chooses to take a bus to work and travel 40 minutes, an instrumentally-rational framework assumes that the revealed choice of traveling on a bus for 40 minutes represent the product of that traveler's internal utility maximizing process, wherein he is always able to choose an optimal option from a set of alternatives pre-defined by the analyst. The problem with this assumption is not linked to the application of utility maximization as a universal behavioral rule, but that the *a priori* set of alternatives might be constrained for some people. We take up this issue in the next section. Based on the instrumentally rational framework, empirical travel-welfare studies view that the revealed changes in trip characteristics and accessibility levels are reliable indicators to reflect people's travel welfare shifts over time (e.g., Kapoor *et al.*, 2004; Takeuchi *et al.*, 2006; Yang, 2006; Day and Cervero, 2010).

## CRITICISMS OF THE CURRENT QUANTITATIVE MODELLING APPROACHES

In the above-mentioned forthcoming paper, Yang and Day (in press) lay out an argument that the instrumentally-rational framework of travel welfare evaluation is of limited capacity to reflect the multi-dimensional nature of the 'wellness' in people's travel-related activities, and that an enhanced modelling approach is needed for accommodating welfare-based research objectives. Though Yang and Day (in press) look at urban resettlement practices in general, a number of key arguments in this forthcoming paper offer important implications for enhancing the current approaches to evaluating travel welfare shifts in response to GJR programs, a particular type of urban resettlement practice. We briefly summarize those arguments here in particular reference to the core objective of this paper.

### *Accounting for interpersonal diversity*

Much of the existing travel well-being literature focuses on self-reported satisfaction ratings or satisfaction of preference as revealed in choice outcomes. Amartya Sen and Martha Nussbaum make an argument against the reliability of pleasure and preference satisfaction in reflecting and comparing people's quality of life (cf. Sen, 1992, pp. 53-55; Nussbaum, 2011, pp. 50-56). Nussbaum asserts that "[t]he term "satisfaction," like "pleasure," the other term often used by utilitarians as an all-purpose metric, suggests singleness and commensurability, where real life suggests diversity and incommensurability. … [the] commitment to a single metric effaces a great deal about how people seek and find value in their lives" (Nussbaum, 2011, 52-53). In addition, the capabilities approach also critiques that utility, or desire fulfillment and satisfaction of preference put in another way, differs in not only quantity but also quality across different people (Nussbaum, 2011, pp. 50-56). The existence of human diversity in desire fulfillment also relates to the 'intensities of desire' and the actual achievement of those desired objects (Sen, 1992, p. 54). In relation to travel welfare evaluation, these criticisms of the subjective measures of well-being suggest that it is problematic to aggregate or conduct interpersonal comparison of travel well-being, by relying on either reported satisfaction or satisfaction as revealed in choice outcomes.

Another major omission of interpersonal diversity in the current approach to travel well-being analysis, is people's capacities to convert their internal abilities (e.g., driving skills, confidence in riding a bicycle to work in rush hours) and external goods or resources in their social, economic and environmental contexts (e.g., income, transportation infrastructures and services, social norms toward particular travel mode choice and etc.) into the wellness of their travels. As a compelling remedy to this limitation, the capabilities approach places an explicit focus on taking 'conversion factors' into account for evaluations and interpersonal comparison of well-being (Sen, 1992, pp. 79-85; Robeyns, 2005b). We take this issue up in developing our theoretical framework of travel well-being evaluation (from the next section onward).

### *Accounting for the intrinsic values of choice*

Another area that we call into question the current framework of travel welfare evaluation, is its underlying logic of instrumental rationality that neglects the value of choice, i.e., the freedom to choose, for achieving wellness in one's travel-related activities. As we discuss in another paper (Yang and Day, in press), one very common area in which transportation research undervalues the freedom of choice is in travel mode choice studies. These studies often use discrete choice models and travel surveys with the *a priori* choice set of travel modes. Yang and Day (in press) present that regardless of the explanatory variables included in discrete choice models, the large majority of studies on travel mode choices are constructed by assuming all

alternative travel modes in the *a priori* choice set are available to every respondent in the sampled population. Then, based on the assumption of utility maximization as people's 'behavioral choice rule' (Hensher *et al.*, 2005, 80), discrete choice models are developed to estimate the relative possibility of choosing certain travel modes, compared to the reference mode. In relation to travel surveys, they are conventionally designed by listing a pre-defined choice set of different travel modes and often asking people to specify how they travelled or would like to travel from this *a priori* set. The revealed/stated mode choice indicates one's satisfaction of preference yielded from selecting an optimal alternative, which is invoked by the utility-maximizing behavioral choice rule. We note that there are some notable exceptions to this specification of the choice set; for example, works that take into account constrained choice set such as Manski, 1977; Swait and Ben-Akiva, 1987; Ben-Akiva and Boccara, 1995; Swait, 2001; Martinez et al., 2009; Li et al., 2015; among others. However, these approaches are the exception rather than the norm.

We argue that it is behaviorally unrealistic for transportation research to rely on the *a priori* choice set of travel modes. As suggested by Sen (2002), the presence of a full choice set versus a constrained choice set does matter for researchers to judge the achievement of an optimal choice outcome, because of the doubtful existence of "internal consistency of choice" and "menu-independence of preference." For example, although the analyst observes that a person selected 'car' as her travel mode to work, it does not necessarily mean that the choice maker considers car as an "optimal" and "the most preferable" option for travel. That is, when facing a constrained choice set C {Car, Bus} instead of a full choice set S {Car, Bus, Train}, the loss of freedom to choose train might lead a person to choose car as a "*suboptimal*" (following Sen's language, 2002) choice outcome.

There are many reasons why a particular travel choice might or might not be available to a person that are outside the conventional idea that if the option is there, it is a real choice. Hutabarat (2011), for instance, raises the issue of how her survey's assumed notions of a fixed 'home' confounded her attempts to implement a travel survey in Jakarta. We contend that travel welfare studies should reflect the real choices that people actually have, and not just an *a priori* listing of presumed choices that researchers think people have. In the remainder of this paper, we present a framework that brings the measurement of these real choices to measuring and modelling travel well-being.

## THEORETICAL FRAMEWORK FOR CA-BASED QUANTITATIVE MODELLING

In this section, after briefly introducing the core concepts of the capabilities approach, we conceptualize our CA-based quantitative modelling approach to meas-

uring household travel welfare shifts after resettling jobs to China's new towns. In the sections that follow we outline how such an approach could be achieved.

### *An introduction to the Capabilities Approach*

Amartya Sen and Martha Nussbaum develop their *Capabilities Approach* (CA) as an alternative theory to the standard welfare economics, development economics and political philosophy, e.g., the growth approach, the utilitarian approach and the resources approach, to measuring well-being, poverty and social equality (cf. Sen, 1992, 1993, 1999; Nussbaum, 2011, for partial of their work). In relation to well-being evaluation, Sen and Nussbaum contend that the notion of well-being – the quality or wellness of doings and beings in one's life – can be conceptualized as having *capabilities* (real opportunities or freedom) to achieve valuable *functionings* (the selected doings and beings) that one has reason to value in his/her own life (Sen, 1992, Ch. 3; Sen, 1993, Ch. 5; Nussbaum, 2011; Ch. 2). According to Sen and Nussbaum, capabilities represent "the various combinations of functionings (doings and beings) that the person can achieve" (Sen, 1992, 40), which are essentially equivalent to the answer to the question, "What is this person able to do and to be?" (Nussbaum, 2011, 20). In this regard, functionings – the active realizations of capabilities – can be regarded as the integral elements of capabilities; and capabilities can be viewed as "a set of vectors of functionings, reflecting the person's freedom to lead one type of life or another" (Sen, 1992, 40).

In relation to the analytical framework of quality-of-life assessment, the CA contends that the most appropriate space for evaluating, and particularly conducting interpersonal comparison of, well-being, should be capabilities and functionings (Sen, 1992, 40-41; Nussbaum, 2011, 18-19). This framework of quality-of-life assessment focuses on the *ends* of well-being – having capabilities to function – as the objective of evaluation, rather than the *means* (e.g., commodities, resources and social norms, etc.) that are instrumental to obtain the wellness of one's life. The logic of such analytical framework can be justified as its acknowledgement of the above-discussed interpersonal plurality in viewing and pursuing wellness in people's own lives.

The core concepts of the CA relevant to our argument in this paper are: evaluative space and choice. In the CA, the *evaluative space* is important. Consisting of capabilities and functionings, the evaluative space articulates the enablers for or constraints over the effective realization of a person's functionings. The term 'conversion factors' is then used in the CA to characterize one's capacity to convert personal abilities and external goods in his/her socio-environmental context into the valued doings and beings in his/her life (Robeyns, 2005b, pp. 90-100). '*Choice*,' i.e., the freedom to choose, is core because the act of having and making choices is valuable to people's quality of lives, which in Sen's language is 'well-being freedom' (Sen, 1992, 40). Together, these two concepts represent powerful concepts in people's lives, and thus important concepts to operationalize in modelling of well-being outcomes. The

evaluative space contains the real opportunities and options that people have; the power to choose among them ultimately creates the functioning that people realize.

### *A conceptual framework for travel welfare evaluation*

In relation to travel welfare, we operationalize the CA to conceptualizing it as having *real opportunities or freedom* to achieve *valuable doings and beings* that people have reason to value for their own travel-related activities. For example, doing well and being well in one's travel-related activities may refer to being able to access destinations at an affordable cost (in both time and monetary terms), having the capacity or freedom to choose one's preferred transportation mode, having adequate access to services and social interactions necessary for one's lifestyle, and other aspects valued by the trip maker.

In terms of travel-related activities, we define this term as out-of-home activities facilitated by travels. Drawing upon the categorizations used by De Vos *et al.* (2013), we select travel-related activities relevant to our empirical setting of job resettlement and group them into three categories: 1) mandatory travel, i.e., daily commute and school trips; 2) out-of-home activity participation at trip destinations, e.g., social interaction with friends and relatives, shopping, seeing doctors, and other forms of activity participation necessary for one's lifestyle; and 3) activities during travels, e.g., reading, chatting with household members or friends who travel together, and other valuable activities during one's travels.

By focusing on the ends of travel well-being – having real opportunities or freedom to achieve valuable dimensions in one's travel activities, we frame the evaluative metric of travel well-being around three categories of variables as below. We operationalize the measurement of these variables in the next section and describe their use in models in the section that follows:

- Importance: this category indicates the importance of each of those valuable dimensions in one's travel activities. In other words, it reflects the values that a person endorses with the various doings and beings in his/her own travel experience.
- Travel capabilities: this category refers to the set of achievable options related to one's travel activities. It can be conceptualized as the "substantial freedoms" (following Sen's language) to choose and achieve valuable doings and beings in one's travel activities.
- Achieved travel functionings: this category refers to the active realization of valuable dimensions in one's travel activities. Put differently, it means the achievement of one of more travel capabilities.

This evaluative space places an explicit focus on capturing the real choices that people have from which they are able to choose their achievable functionings. We regard this initiative, along with the identification of the importance of various doings and beings in people's travel experience, as promising to address some of the limitations in the current models developed from the logic of instrumental rational-

ity. That is, to correct some of the conceptual errors we introduce when assuming that revealed choice outcomes are a viable measure of people's optimal alternative selected from an *a priori* choice set, and that there is a singular way of valuing wellness in travel experience across different people.

Below, we incorporate the above CA-based evaluative process into quantitative models of household welfare changes that result from GJR programs in China. The over-arching aim of this model is still to understand how people's lives and livelihoods are affected by job resettlement. This intention of our study shares in common with the literature outlined above. Our study differs from these studies in that it allows the evaluative space of the Capabilities Approach to be part of the empirical observation of travel well-being. As such, our proposed models identify the determinants of the observed changes in household travel well-being and the endogenous relationships between those determinants, while incorporating CA-based indicators of the real choices that people have.

The following diagram illustrates our conceptual framework of evaluating the travel welfare impacts of China's GJR programs (Figure 1). We develop it based on operationalizing the core concepts of the capabilities approach and the visual illustration of the relationships between those concepts by Robeyns (2005b).

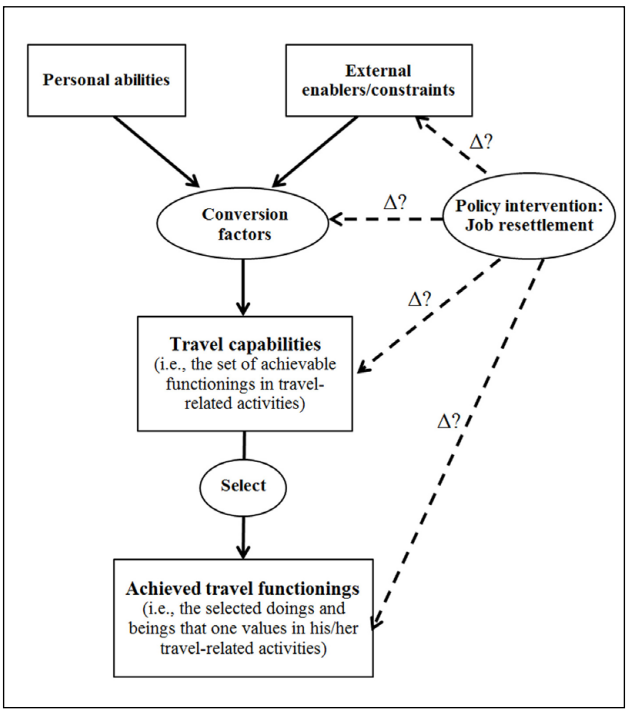


**Figure 1:** A conceptual framework of evaluating the travel welfare impacts of China's government job resettlement (GJR) programs

## CA-INFORMED MEASURES OF CHANGES IN TRAVEL CAPABILITIES AND FUNCTIONINGS

This section describes the building blocks of a modelling approach that integrates CA-based indicators into the modelling framework. The subsequent section describes how these building blocks are put together and estimated in models. To apply the CA-based evaluative framework of travel welfare in our empirical setting of GJR programs, it requires the selection of relevant capabilities and functionings to be measured and the specification of viable scales to be used. The importance of this process has been actively advocated by scholars making efforts in operationalizing the CA in empirical studies toward generating more reflective and meaningful quality-of-life assessment, contrary to the standard approaches like the utilitarian approach (see Clark, 2005; Robeyns, 2005a; Kuklys, 2005; Comin, 2008; among many others). In the sections below, we present our method and procedures used to measuring travel capabilities and achieved functionings among households undergoing job resettlement to a new town.

### *The selection of relevant travel capabilities*

Nearly all existing research on travel welfare outcomes presumes the relevance of a set of travel options that can be reliably set *a priori* by the analyst. For example, analysts measuring welfare will ask travelers to report their travel for certain types of trips (home-based work trips, personal trips, etc.) via an *a priori* list of mode choices (transit, car, etc.). As Hutabarat's (2011) work described above illustrates, this assumption of a reliable, analyst-generated list of trip types and modes greatly limits the capacity of analysts to reflect people's actual capacities and options. For instance, she describes how the ideas of home and work are sometimes quite fluid in Jakarta, and thus, the idea of a home-based work trip confused a significant proportion of those she surveyed. The CA provides a framework to rethink the application of these *a priori* structures in modelling travel welfare outcomes.

Of great relevance to the selection of relevant travel capabilities, Robeyns (2005a) suggests that the selection of capabilities should be in compliance with 1) the *epistemological* goal and limitations of the research; and 2) *legitimacy*, encompassing on one hand, the legitimate grounds based on which those selected capabilities can be reflective of what people value in their lives, and on the other hand, the legitimate process in which those capabilities are selected. In our study, the epistemological goal is to understand how household travel welfare is affected by job resettlement to a new town, with the use of quantitative modelling approach. Modelling of any sort is almost always underpinned by the ontological assumption of *objectivism* – that is, the underlying determinants being researched in our study are objective and exist independently from observer's perception and research actions, and thus await discovery. We do not depart entirely from this framework, but rather employ the

CA-based indicators to allow for a much wider conception of outcomes and welfare to enter the analysis framework.

Tied by the objective stance of ontology, our process of selecting relevant travel capabilities is inevitably encountered by a methodological challenge: how do we as researchers know which dimensions are actually valued in people's travel activities and experience? To address this challenge in relation to travel capabilities, we regard that the use of qualitatively-informed survey instruments, as advocated by Yang and Day (in press), holds promise in bridging the gap between the values endorsed by researchers and by the researched population with various dimensions in people's travel activities. We illustrate below an example of integrating one particular type of qualitative data collection methods – focus group discussions – in the selection of travel capabilities among households undergoing GJR programs in China (Box 1).

### *The measurement of travel capabilities*

After finalizing the list of travel capabilities, our proposed CA-based modelling framework requires data input to reflect the extent to which households have real opportunities or capacities to achieve their valued dimensions in travel activities. Changes in household travel capabilities after job resettlement are examined with survey data on the pre- and post-resettlement time points. We illustrate below a set of sample survey questions designed to reflect changes in households' capabilities to choose their most preferred transportation mode for daily commute (Table 2). Following the similar structure, survey questions are designed to reflect changes in other travel capabilities to be modeled in our proposed modelling framework.

#### *Measurement of achieved travel functionings*

Another core metric of our CA-based evaluative framework is the achieved functionings in people's travel activities. As presented in Section 4.2, achieved travel functionings refer to the active realization of one or more valued doings and beings in one's travel activities. In other words, this metric can be conceptualized as the travel-related activities that a person *chooses* to do and be for obtaining the wellness in his/her travel experience. The value of choice – the freedom to choose – is, thus, intrinsic for a person's travel well-being. Relatedly, the extent to which a person has the freedom to choose is intimately linked to the degree of divergence between the revealed travel outcomes and the achievement of valued dimensions in people's travel experience. Table 3 below demonstrates a sample set of survey questions to reflect changes in household achieved functionings in travel mode choices.

**Box 1: An example of integrating focus group discussion in selecting relevant travel capabilities**

Among the resettled government workers, a small group of four to ten participants will be invited to join the discussion with us to indicate whether our *a priori* set of travel capabilities is relevant to those dimensions actually valued in their travel experience.

We first generate a set of possibly-valued doings and beings in three different types of travel activities: mandatory travel, out-of-home activity participation facilitated by travels and activities during travels (the first two columns in Table 1 below). Then, we will ask participants in the focus group to indicate the importance of each item in our list for them in relation to having a good quality of travel experience. Given that the term 'capabilities' might not be in participants' daily vocabulary, we use plain language 'the real capacity/freedom/opportunities available' (whichever suits best the given travel capability in the *a priori* list), to convey the meaning of capabilities referred in our study. In the discussion process, we will identify whether our wording of capabilities-based survey questions is easily accessible to participants. Next, we discuss with the focus group to identify additional dimensions that they value in their travel experience, and to indicate the importance of those additional travel capabilities using the 1-to-5 Likert scale. Lastly, the final list of travel capabilities put in the survey questionnaires for enlarged sampling work, will include both our *a priori* set of travel capabilities and those additional dimensions indicated by the focus group. Responses from the enlarged sample will verify the relevance of each of those listed capabilities to their travel experience. Data collected on the importance scores will be used for weighting travel capabilities in the modelling procedures (see the section below).

In general, contrary to having an *a priori* list of possibly-valued dimensions in people's travel activities and a number of rows of 'others' as conventionally used in survey questionnaires, this qualitatively-informed list of travel capabilities is helpful to enhance the representativeness of our survey questions.

**Table 1:** An example of qualitatively-informed survey questions on travel capabilities

**In your household's opinion, how importantly does each of the following factors contribute to "a good quality of travel experience?" (please rate the importance based on the 1-to-5 scale as below)**

| | | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|---|
| Unimportant | | Unimportant | Slightly Important | Important | Very Important | Critical |
| Daily commute/ school travel | Have the real capacity to travel to workplace/school at an affordable time cost<br>Have the real capacity to travel to workplace/school at an affordable monetary cost<br>Have the real freedom to choose the most preferable transportation mode to travel to workplace/school<br>Additional dimension (1) indicated by focus group<br>… | | | | | |
| Out-of-home activity participation facilitated by travels | Have adequate access to services and social interactions necessary for your household's lifestyle<br>Have the real capacity to travel to the location of service/ regular meeting place at an affordable time cost<br>Have the real capacity to travel to the location of service/ regular meeting place at an affordable monetary cost<br>Have the real freedom to choose the most preferable transportation mode to travel to the location of service/regular meeting place<br>Additional dimension (k) indicated by focus group<br>… | | | | | |
| Activities during travels | Have real opportunities to do valuable activities during travels (e.g., reading)<br>Additional dimension (n) indicated by focus group<br>… | | | | | |

**Table 2.** Sample survey questions on changes in household travel capabilities

**1) Please tell us the most preferred transportation mode for daily commute by each of the wage-earners in your household (please tick the applicable mode according to each wage-earner's preference):**

| | **BEFORE** job resettlement (October 2010) | | | | | **AFTER** job resettlement (Current) | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Walking | Cycling | Public transport | Private car | Other | Walking | Cycling | Public transport | Private car | Other |
| Myself | | | | | | | | | | |
| My spouse | | | | | | | | | | |
| My child/relative who live with me | | | | | | | | | | |

**2) Please indicate the extent to which each of the wage-earners in your household has/had the real capacity to choose their most preferable transportation mode for daily commute (please tick the applicable score to each wage-earner's condition):**

| | **BEFORE** job resettlement (October 2010) | | | | | **AFTER** job resettlement (Current) | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 1 | 2 | 3 | 4 | 5 |
| | Not at all | To little extent | To some extent | To a moderate extent | To a large extent | Not at all | To little extent | To some extent | To a moderate extent | To a large extent |
| Myself | | | | | | | | | | |
| My spouse | | | | | | | | | | |
| My child/relative who live with me | | | | | | | | | | |

**Table 3:** Sample survey questions on changes in household achieved travel functionings

**1) Which is/was the primary transportation mode used by each of the wage-earners in your household for daily commute, before and after your job resettlement?**

| | BEFORE job resettlement (October 2010) | | | | | AFTER job resettlement (Current) | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Walking | Cycling | Public transport | Private car | Other | Walking | Cycling | Public transport | Private car | Other |
| Myself | | | | | | | | | | |
| My spouse | | | | | | | | | | |
| My child/relative who live with me | | | | | | | | | | |

**2) Please indicate the extent to which each of the wage-earners in your household** has/had the real capacity to choose **their respective transportation mode stated in last question:**

| | BEFORE job resettlement (October 2010) | | | | | AFTER job resettlement (Current) | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 1 | 2 | 3 | 4 | 5 |
| | Not at all | To little extent | To some extent | To a moderate extent | To a large extent | Not at all | To little extent | To some extent | To a moderate extent | To a large extent |
| Myself | | | | | | | | | | |
| My spouse | | | | | | | | | | |
| My child/relative who live with me | | | | | | | | | | |

*Inclusion of conversion factors in household travel well-being evaluation*

Our proposed CA-based modelling approach also requires survey data reflecting conversion factors. The following table (Table 4) lists the observed variables related to personal abilities of household members and external enablers in the social and environmental context within which the household is living and making travels. The design of survey questions for these variables needs to incorporate inquiries on both the pre- and post-resettlement time points, in order to assist in examining how household travel well-being has shifted in response to the policy intervention of GJR programs.

## STRUCTURAL EQUATION MODELLING FRAMEWORK FOR EVALUATING HOUSEHOLD TRAVEL WELL-BEING CHANGES

In the previous section we described the necessary building blocks for integrating CA-based indicators into quantitative models. In this section, we specify our model structure for measuring the travel welfare impacts of GJR programs. That is, to examine to which extent the observed changes in household travel well-being are related to the policy intervention of job resettlement itself, comparing with the relative influences exerted by other factors measured in our model (i.e., personal abilities, external enablers/constraints, and household conversion factors). The estimation tool used in our model is Structural Equation Modelling (SEM), i.e., a statistical technique that uses a simultaneous modelling system to test and depict the relationships among variables. SEM has been widely applied in various disciplines including but not limited to well-being evaluation (e.g., Kuklys, 2005) and transportation research (e.g., Choo 2004; Flamm 2006; Day, 2009).

In our proposed model, SEM includes the confirmatory factor analysis (CFA) to test which set of observed variables best defines the latent dependent variable of travel well-being shifts and the latent independent variable of conversion factors in the study. The alternative sets of observed variables and their relationships to the latent variables are hypothesized in accordance with the CA-based theoretical framework of travel well-being presented previously. For explanatory modelling, SEM estimates the relationships between observed variables with multiple regression models and path models; it also specifies the interrelations between latent variables with the use of structural models. Altogether, the entire process helps us to depict the complexity in the causes of household travel welfare shifts after job resettlement (cf., Schumacker and Lomax, 2010 for excellent instructions on SEM).

Furthermore, in order to reflect the plurality in which different households view and achieve valuable doings and beings in their own travel experience, the entire modelling process also incorporates and tests several interactions among three metrics, i.e., *importance* ($I_i$), travel capabilities, reflected by self-rated *real opportunities to achieve* valuable dimensions in travel activities ($RO_i$), and *revealed travel outcomes* ($RV_i$).

**Table 4:** List of observed variables related to personal abilities and households' social and environmental context

| Category | Variable | Measurement |
|---|---|---|
| Households Socio-economic characteristics | Number of wage-earners | Numeric |
| | Number of schooling-age kids | Numeric |
| | Job seniority | Numeric (in years) |
| | Monthly Income | Numeric (in CNY) |
| | Receive transport subsidies after job resettlement | (1, 0) |
| | Receive subsidies for relocating housing to new town | (1, 0) |
| Personal characteristics and abilities | Disposable income on transportation expenditures | Chinese yuan per month (CNY/month) |
| | Vehicle ownership (car, bicycle, motorcycle and others if any) | (1, 0) |
| | Degree of skills to drive a car and ride a bicycle/motorcycle | 1-to-5 Likert scale |
| | Degree of freedom to choose different transportation mode (i.e., car, public transport, cycling, walking, workplace shuttle bus) | 1-to-5 Likert scale |
| | Whether or not is physically disabled | (1, 0) |
| | Attitudes toward using certain transportation mode(s) for travels (e.g., pro-car attitude) | (-1, 0, 1) |
| Social context (focused on social norms, public policies and gendered roles) | Social norms toward using certain transportation mode(s) for travels (e.g., travel by private car is endorsed with relatively higher value by the society) | 1-to-5 Likert scale |
| | Policies dis/encouraging certain transportation mode(s) | 1-to-5 Likert scale |
| | Gendered roles in travel-related activities (e.g., females tend to take more responsibilities for sending kids to school than their spouse do) | 1-to-5 Likert scale |
| Environmental context (focused on built environment) | Locations of residence | The nearest traffic intersection from home |
| | Location of workplace (including all wage-earners in the household) | The nearest traffic intersection from each wage-earner's workplace |
| | Location of kids' school | Name of school |
| | Access to major roads and public transport (from home and workplace) | 1-to-5 Likert scale |
| | Access to public amenity (kids' schools, shops, restaurants, parks, gardens, and etc.) | 1-to-5 Likert scale |
| | Traffic conditions of reported trips (i.e., degree of road congestion and/or crowding on public transport) | 1-to-5 Likert scale |

Interactions are expressed in individual functions "$g(I_i, RO_i, RV_i)$" for dimensions measured at the interval level, e.g., travel time. The actual form of the interaction among these terms can be specified at the modelling phase, based on the measurement units for *I*, *RV*, and *RO*. Possible ways of interacting these terms include a multiplicative interaction ($I_i^*RO_i^*RV_i$), or a ratio interaction (e.g., $RV_i / (I_i^*RO_i)$). Effectively, as a model term, these interaction terms serve to scale the revealed outcome according to the value (*I*) and real opportunity (*RO*) people attach to the revealed choice (*RV*).

These interactions are this new modelling approach's critical contribution to the operationalizing of the Capabilities Approach. They allow the model to reflect not only the revealed choice, but also the value people place on that choice and the real opportunities people have to make that choice. Most welfare models focus on only the revealed outcomes, as we discuss above.

Figure 2 below illustrates the hypothesized relationships among the set of latent and observed variables included in our proposed CA-based modelling approach. This sample SEM framework focuses on measuring household travel well-being shifts (ΔTWB) in the space of achieved travel functionings ($\Delta TF_i$). Changes in household travel capabilities are specified as $\Delta\, RO_i$, with some interactions with the other two above-mentioned metrics, i.e., importance and revealed travel outcomes.

The terms inside the dotted box represent a system of simultaneous equations that the SEM estimator solves. Exogenous factors such as personal characteristics are shown outside the dotted box, with arrows pointing toward the dotted box. For readers more comfortable with equations, the system pictured in Figure 2 is represented in the equations below:

$$\Delta(TF_{acccess}) = \alpha + \beta'[g_{a2}(I_{access2}, RO_{access2}, RV_{access2}) - g_{a1}(I_{access1}, RO_{access1}, RV_{access1})] + \mu'[\Delta(TF_{time})] + \lambda'[\Delta(TF_{costs})] + \delta'(\Delta PCA) + \omega'(\Delta S) + \theta'(\Delta E) + \gamma'(\Delta SECs) + \varepsilon$$

$$\Delta(TF_{time}) = \alpha + \beta'[g_{t2}(I_{time2}, RO_{time2}, RV_{time2}) - g_{t1}(I_{time1}, RO_{time1}, RV_{time1})] + \mu'[\Delta(TF_{access})] + \lambda'[\Delta(TF_{costs})] + \delta'(\Delta PCA) + \omega'(\Delta S) + \theta'(\Delta E) + \gamma'(\Delta SECs) + \varepsilon$$

$$\Delta(TF_{costs}) = \alpha + \beta'[g_{c2}(I_{costs2}, RO_{costs2}, RV_{costs2}) - g_{c1}(I_{costs1}, RO_{costs1}, RV_{costs1})] + \mu'[\Delta(TF_{access})] + \lambda'[\Delta(TF_{time})] + \delta'(\Delta PCA) + \omega'(\Delta S) + \theta'(\Delta E) + \gamma'(\Delta SECs) + \varepsilon$$

where,

*I* refers to importance;

*RO* stands for the extent to which the household or individual perceives it/his/her real opportunity to achieve a valuable dimension in travel activities (e.g., having the freedom and efficacy to select a particular mode). The real opportunity score is self-rated using a 1-to-5 Likert scale;

*PCA* stands for vectors of personal characteristics and abilities;

*S* stands for vectors of social context;

*E* stands for vectors of environmental context;

SECs stands for vectors of household socio-economic characteristics;

α stands for unobserved effects; and

ε is an idiosyncratic error term.

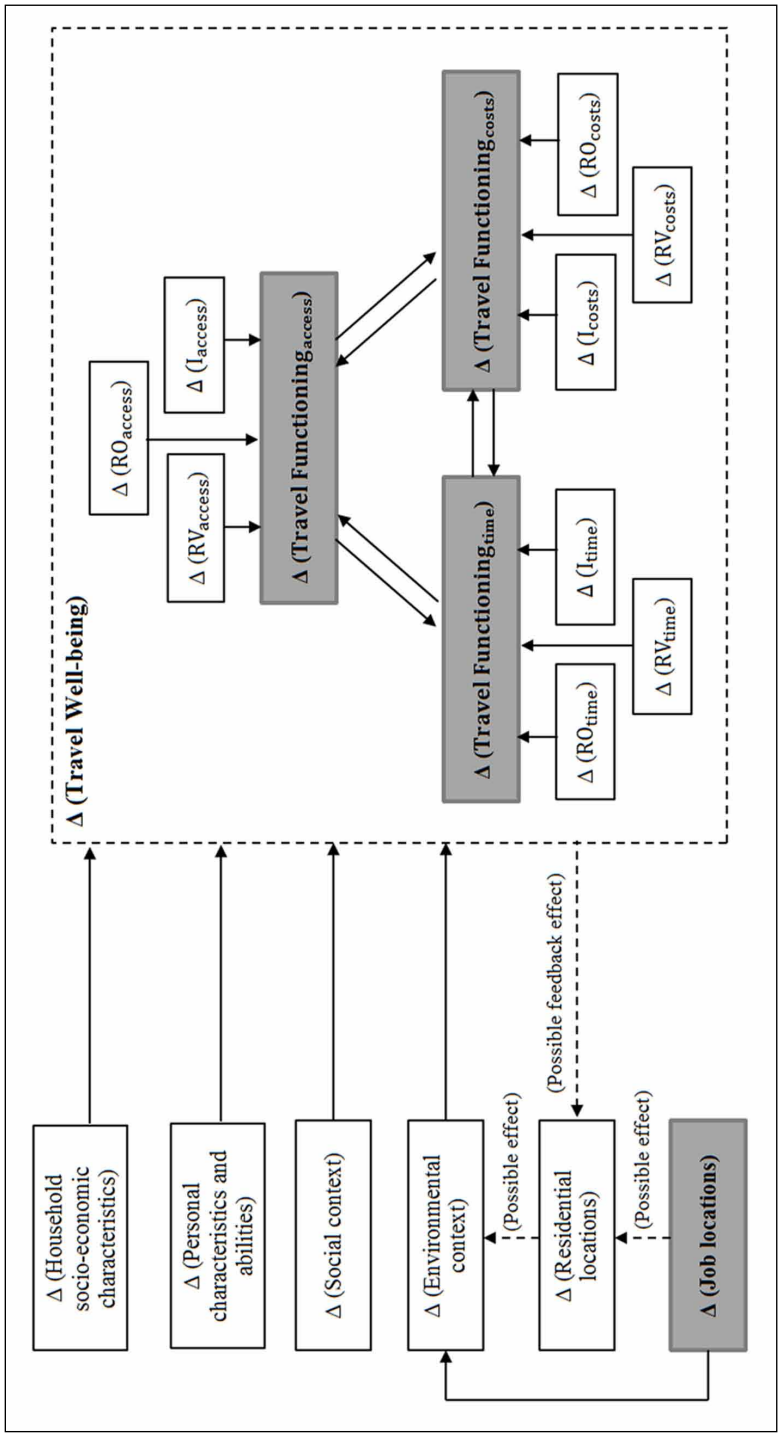


**Figure 2:** A Structural Equation Modeling (SEM) framework of household travel well-being evaluation

## CONCLUDING REMARKS

This paper focuses on proposing an enhanced quantitative modelling approach to measuring household travel well-being shifts in response to China's GJR programs. We do so by operationalizing the Sen-Nussbaum *Capabilities Approach* to extending the current reach of travel welfare evaluation developed based on the hedonic stance of well-being and the logic of instrumental rationality. In this paper, we conceptualize travel well-being as *having real opportunities or freedoms* to achieve *valued doings and beings* in people's travel-related activities. This CA-based framework focuses on evaluating travel well-being in the space of *travel capabilities* and *achieved travel functionings*. This evaluative framework extends the current models of travel welfare evaluation by placing an explicit focus on the intrinsic value of choice for people's travel well-being; and on the other hand, allowing for the account of human diversity in viewing and obtaining wellness in their own travel experience.

In our proposed CA-based modelling approach, we further incorporate qualitatively-informed survey instruments in the selection of relevant travel capabilities among households undergoing GJR programs, rather than solely depending on the *a priori* set of capabilities hypothesized by us as researchers. In the measurement of achieved travel functionings, we take into account of choice – the freedom to choose – as ways to identify the degree of divergence between the revealed travel outcomes and the achievement of valued dimensions in people's travel experience. Our proposed approach further includes the measurement of household conversion factors to assist in generating an objective assessment of the travel welfare impacts of GJR programs. We complete the illustration of our CA-based quantitative modelling approach with a sample modelling structure based on the application of Structural Equation Modelling (SEM).

By capturing more of the relevance to people's actual travel experience, we regard that our proposed CA-based modelling approach holds the promise in generating a compelling alternative to the current quantitative approaches to travel well-being evaluation. The operationalization of our proposed approach to assessing the travel welfare impacts of China's GJR programs in the empirical setting is promising to help researchers to generate reflective assessment of urban policy outcomes and to draw insightful policy implications. We hope our methodological discussion presented in this paper could prompt interests of future research in developing enhanced methodology to enhance the informative values of urban policy assessment in relation to household travel welfare.

## NOTES

1. "[A]lmost all government units in Hebi, including their staff members and families, moved on time [to Qibin new town] … Those officials who were unwilling or unable to comply would be dismissed (Interview 07090105)" (Liu et al., 2012, 113).

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