

Exploring senior officials' policy beliefs regarding sustainable transportation

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ABSTRACT

This study examines the policy beliefs of officials involved in developing and implementing sustainable transportation policies. It is found that officials tend to have stronger beliefs in the success of policies that impact less on personal freedoms of the public, and in particular, in policies that attract public support than force options upon them. It was also found that policy beliefs are positively related to officials' seniority.

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1. Introduction

Tackling the diversity of environmental problems associated with transportation will take time. While many studies have explored policy effectiveness, little attention has been given to the feasibility of implementing public policy from the perspective of the officials involved in policy development and implementation. They must identify and define the problems and develop strategies to address them. Generally, officials need to be confident a policy is feasible if they are to develop a positive attitude toward implementation. Feasibility is not an absolute; rather, it is a matter of degree and is based on objective constraints and subjective considerations. Following, Collantes (2008), "policy belief" is defined as a senior official's level of confidence that a policy is practicable.

The development of sustainable transportation policies often involves interdepartmental and/or central and local government collaboration. It is useful, therefore, to develop necessary coalitions, that the officials responsible for the implementation support the core value of sustainable transportation. Senior officials play a key role in determining whether the objectives of sustainable transportation policy can be realized. They must also be familiar with the strategy details to coordinate its agenda and effectively integrate the resources of industry, government, academia, and the private sector.

Many studies have noted the importance of understanding stakeholders' beliefs regarding environmental policies (Harrison and Burgess, 2000; Tarrant and Cordell, 2002), but few have focused on the policy makers themselves, in part because of a lack of suitable instruments to measure their viewpoints. Exploring policy beliefs can provide insights regarding the mindset of those initiating policies and, thus, help predict outcomes prior to implementation.

2. Methodology

Officials' policy beliefs are latent psychological constructs that influence their motivation to implement specific strategies to achieve objective. Latent constructs are typically explored through self-report questionnaires containing items geared to stimulating respondents to report their true thoughts and feelings about the target constructs. A questionnaire was developed with content based on 13 elements (MOTC, 2006). More specifically, each of the 13 items was a specific strategy

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deemed to benefit sustainable transportation (Table 1). To guide respondents, each was asked, “To what extent do you feel these strategies are practicable for achieving sustainable transportation?” Responses were provided using a five-point Likert-type scale ranging from 1 = “Strongly Disagree” to 5 = “Strongly Agree”.

It is assumed each senior official (n) has a unique value representing his/her policy belief regarding sustainable transportation (the person parameter θ_n). Hence officials who have stronger beliefs regarding sustainable transportation will respond with higher scores on more items than those who have weaker beliefs. Also, some policy strategies might be regarded as more practical than others in promoting sustainable transportation. Therefore, it can also be assumed that each item (i) has a unique value of inherent resistance (the item parameter b_i) against the official's belief. Items with lower inherent resistance are those strategies that officials consider more suitable for promoting sustainable transportation.

To provide a basis for comparison, the person parameters (i.e., policy beliefs) and item parameters (i.e., inherent resistance to the policy belief) are measured on a consistent interval scale. However, all responses were collected on an ordinal scale to allow respondents to describe their judgments more precisely. The Rasch model (Rasch, 1960), which is applicable to cumulative data based on Likert-style items, and has been used extensively as educational tests, is adopted. Because responses to individual items are used as indicators of a property that cannot be measured directly, the Rasch model is a latent trait model.

The model is regarded as a prescriptive approach rather than a descriptive approach (Bond and Fox, 2001). The data must fit the model or the assumptions of the model must be rejected for a particular dataset. As a result, assumptions must be made when applying it to measure policy beliefs; In particular, the senior officials differ in their policy beliefs, their responses to items depend only on their policy beliefs, their responses are probabilistic and conditional based on their policy beliefs, and the odds of achieving an item increases monotonically with the difference between θ_n and b_i .

3. Design and analyses

Data were obtained from individuals in on-the-job training programs designed for senior officials hosted by the National Civil Service Institute in Taiwan. Every year, about 1200 qualified management-level officials selected from similar professional fields seeking promotion to strategic levels, must successfully undergo a four-week program of development training. Questionnaires were administered to 150 attendees from federal and local governments who are engaged in sustainable development activities. They all had experience in a relevant field, were familiar with sustainable development issues, and involved in the implementation of sustainable development action plans. The respondents' self-rated scores for each item and their demographic characteristics were gathered. After eliminating invariant, inconsistent, and incomplete responses, 143 of the questionnaires were retained for final analyses; 104 were male and their average age was 46.4 years. Information relating to seniority and level of education was also collected.

The Rasch measurement model provides a means for constructing interval measures from raw ordinal category data and a value on an interval scale for each item (the item parameter) and for each respondent (the person parameter) was estimated. To analyze the responses to the 13 items WINSTEPS (Linacre and Wright, 1997) was used, an iterative program that estimates θ_n for senior official n and b_i for item i in logit units. It deals with polytomous responses by applying the Masters–Andrich

Table 1
Content of the questionnaire.

Items to explore self-rated perception	Type
Using the scale provided, please indicate the extent to which you agree the following strategies are practicable to achieve sustainable transportation	
Item 1 Construct rail transport systems (e.g., MRT, HSR, Train, etc.) to promote public transportation	5-Point scale
Item 2 Build public transport centers to facilitate transfer between different public transportation modes	5-Point scale
Item 3 Integrate schedules and tickets for public transportation (e.g., EasyCard, One Day Pass, etc.) to make transfers easier	5-Point scale
Item 4 Total vehicle volume control by limiting authorization of licenses (set quotas) to reduce auto growth	5-Point scale
Item 5 Increase gasoline prices to reduce car use	5-Point scale
Item 6 Increase parking fees to reduce car use	5-Point scale
Item 7 Implement electronic toll collection (ETC) on highways to alleviate congestion and, thus, reduce emission	5-Point scale
Item 8 Provide instant traffic information to reduce driving time and, thus, reduce oil consumption and improve air quality	5-Point scale
Item 9 Import public transportation that uses substitute energy such as natural gas, electricity, or combination-hybrid to reduce fossil fuel use	5-Point scale
Item 10 Develop new energy sources (electrical cars, fuel-batteries, etc.) to substitute for the use of fossil fuel	5-Point scale
Item 11 Establish bicycle lanes to promote the use of bicycle	5-Point scale
Item 12 Build a friendly walking environment to reduce the use of private modes	5-Point scale
Item 13 Encourage public and private firms to use public transport to slow the use of cars and motorcycles	5-Point scale
Respondent's personal characteristics	
Gender (male, 0; female, 1) binary response	
Age category response	
Seniority category response	
Education category response	

Table 2
Model estimation and fit statistics obtained from Rasch analysis.^a

Items 13 input 13 measured						
	Raw score	No. of observations	Measure	SE	Infit Zstd	Outfit Zstd
Mean	472.8	143	0.0	0.09	0.1	0.1
Item reliability: 0.98						
Persons 143 input 143 measured						
	Raw score	No. of observations	Measure	SE	Infit Zstd	Outfit Zstd
Mean	43.0	13	0.28	0.31	-0.2	-0.1
Person reliability: 0.83						
Standardized residual variance (in eigenvalue units)						
					Empirical (%)	Modeled (%)
Total variance in observations				35.2	100	100
Variance explained by measures				22.2	63.0	63.3
Unexplained variance (total)				13.0	37.0	36.6
Unexplained variance explained by 1st factor				2.9	8.3	
Unexplained variance explained by 2nd factor				2.4	6.7	

^a SE, standard error; Infit, information-weighted fit; Outfit, outlier-sensitive fit; Zstd, Z-standardized fit statistic.

modification (Masters, 1982) to the Rasch model. The estimated parameters and model fit statistics could, therefore, be calibrated via a joint maximum-unconditional-likelihood estimating procedure (Wright, 1996).

The parameters and fit statistics for the entire Rasch model are shown in Table 2. The average measure of all item parameters was fixed at zero logit as a comparative basis for the relative interval scale, and the average value of the policy beliefs of the respondents was 0.28 logit. This positive value indicates these senior officials generally have strong beliefs in sustainable transportation policies. Examination of the other descriptive statistics involving, for example, estimation of relevant Z-standardized fit statistics (Zstd) supports the notion that the observed and expected patterns are sufficiently close to meet acceptance criteria.

4. Results

4.1. Findings for item parameters

Estimates of the item parameters are displayed in Table 3; the second column contains the raw score (a linear combination of item scores with a possible scale range of 143–715) for each item; the third shows the estimate for each item; and the fourth and fifth show the infit and outfit statistics, which provide evidence of the validity of each item. The fit statistics for the 13 items do not deviate significantly from the assumptions of the Rasch model.¹

All estimates model relative and items with higher estimates (i.e., strategies with higher inherent resistance against policy belief) are those strategies that are generally considered to be more difficult to achieve; items with lower estimates are those strategies that are generally considered to be more practicable. Items 5 and 6 have the highest b_i values indicate that increasing the cost of using automobiles through higher gasoline prices or parking fees, has the greatest inherent resistance and, therefore, result in the having the lowest levels of confidence as being practicable strategies. On the other hand, the items with the two lowest estimates, 1 and 2 suggest senior officials believe that promoting and improving public transportation are the most feasible strategies and are confident they benefit sustainable transport.

Items 3, 9, 10, 11, and 12 all have negative estimates. Therefore, improving energy efficiency, by developing new energy sources to substitute for the use of fossil fuel, importing public transportation that uses substitute energy (e.g., natural gas, electricity, or combination-hybrid) to reduce fossil fuel use, enhancing transportation demand management, such as integrating schedules and tickets for public transportation to make transfer easier, building a friendly walking environment to reduce the use of private transportation modes, and establishing bicycle lanes to promote the use of bicycles seem practical options to senior officials. Items 4, 7, 8, and 13 (i.e., those with positive estimates) indicate senior officials lack confidence in their usefulness.

Table 3 also reveal that only Items 4, 5, and 6 are viewed by the official as restrictive strategies to limit the demand of private car use; others were favor strategies emphasizing the supply of alternative transportation modes. The data, thus, indicate senior officials are not inclined to restrict people's freedom to drive to implement sustainable transportation development.

4.2. Findings for person parameters

The Rasch model is also use to estimate the self-rated policy beliefs of the officials. Because the item and person parameters are both measured on the same interval-scaled unit (logit) the difference between the item and person estimates has a

¹ For comparison purposes, we ordered the items in Table 3 by their estimated values.

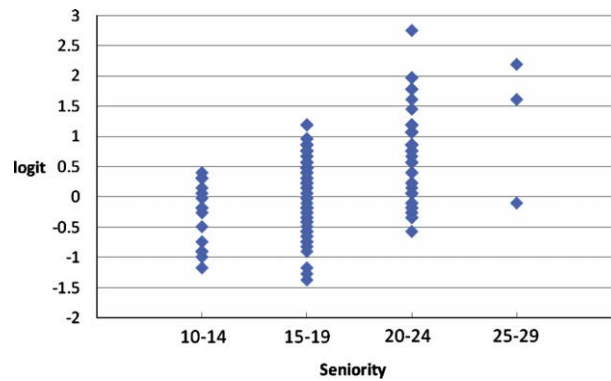


Fig. 2. Distribution of the seniority and policy belief measures of responding senior.

consistent meaning. The item–person map (Fig. 1), which plots the values of all parameters together, provides a graphic illustration of the relevant information behind the cross-comparisons parameters.

The left field of the figure shows the distribution of the respondents' self-rated policy beliefs ordered from the top. The respondents located at each level are represented by a combination of symbols “#” and “.”, and respondents located higher on the map have relatively strong levels of sustainable transport policy beliefs. The right of the map shows the item estimates representing inherent resistance to beliefs in a particular policy. Higher items on the vertical axis are thought by officials to be a tougher strategy to achieve. All item parameters are anchored at zero logit. When the person and item parameters are located at the same level, there is a 0.5 probability that an official will consider the strategy as practicable for producing sustainable transport development. If most respondents' beliefs are located at positions higher than the estimate of the corresponding strategies, the strategies are considered to be relatively practicable.

Fig. 1 shows Item 5 (increasing gasoline prices to reduce car use) is viewed as the least practicable strategy with only 16% of the respondents feeling confident that it would be a practicable strategy. Increasing parking fees to reduce car use (Item 6) and implementing electronic toll booths on highways to reduce oil consumption and improve air quality (Item 7) are viewed as the next two least practicable strategies, and only about 23% of the respondents believed they would be practicable. However, more than 64% of the respondents thought the seven strategies with negative item estimates (i.e., Items 1, 2, 3, 9, 10, 11, and 12) are practicable to achieve sustainable transportation development, and more than 94% of officials felt that implementing Item 1 (Constructing rail transport system to promote public transportation) and Item 2 (Building public transport centers to facilitate transfer between different public transportation modes) would achieve sustainable transportation development.

By relating each respondent's measure of policy belief to his/her level of seniority, one can easily observe some useful information. Each respondent's years of seniority and policy belief measures (logits) are graphed on the horizontal and vertical axes, respectively, in Fig. 2. On the horizontal axis, the respondents are divided into subgroups on the basis of their years of seniority, namely, 10–14, 15–19, 20–24, and 25–29 years. A clear correlation emerged between seniority and policy belief measures, with greater seniority are found to have higher policy beliefs about implementing sustainable transportation policies.

The correlation ratio Eta (η) between seniority and policy belief measures of 0.503, which indicated 50% of the variability in strength of policy beliefs is accounted for by seniority. The most likely explanation is that the longer an official is in a position the more experience and power he or she will attain; thus, seniority, experience and power tend to drive policy success. As the officials become more senior the more administrative experience the better they feel they can judge policy feasibility; they are more confident when implementing policy. However, senior officials' policy beliefs were not found to be significantly correlated with either sex or educational level.

5. Conclusions

This study looked at nature of policy beliefs of senior officials and their confidence in implementing various strategies for achieving sustainable transportation. We conceptualized policy belief as the combined effect of a senior official's objective constraints (e.g., financial infeasibility) and subjective considerations and viewed it as a latent trait determined, in part, by levels of expertise, seniority or authority, and administrative experience. Senior officials are found to believe that providing a more efficient and friendly public transportation service to attract people's patronage would be more practicable than limiting private car use by increasing usage costs. They are more likely to support strategies that do not infringe on personal preferences and freedoms. Thus to avoid angering the public, officials would seem more likely to support strategies that provide the option for people to make a choice to use public transportation rather than strategies forcing people to use public transportation.

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