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Citizens' Distrust in Government and Project Implementation in the Public Sector

Hyungna Oh* · Jong Ho Hong**

Using survey data, this paper shows that citizens' subjective trust in either government itself or its capacity to complete an announced goal can largely influence their willingness-to-pay for a public project administered by the government. Given that distrust toward the government prevails in most advanced economies, this outcome raises concerns that distrust can be a plague in implementing public projects administered by the government.

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Keywords: Distrust, Trustworthiness, Willingness-to-pay, Public Project

I. Introduction

Economists have found that income, education, gender, NGO membership, parental status, importance of environmental issues to the individual, risk-perception, amount of leisure time to enjoy an environmental good, and illness and consequent medical expenses are critical factors in determining a respondent's willingness-to-pay (henceforth, *WTP*) for a public project to improve environmental quality. However, these links are often inconsistent with empirical outcomes. Instead, economic literature has begun to establish a positive association between a citizen's trust in government and his *WTP* (Svedsäter, 2003; Huffman et al., 2003; Mao, 2000).

Before economic literature began paying attention to this association, political science literature had extensively addressed the critical role of citizens' trust in determining the levels of social capital, social integration, democratic stability,

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* Associate Professor, College of International Studies, Kyung Hee University, Gyeonggi-do, Korea. E-mail: h.oh@khu.ac.kr

** Corresponding Author, Professor, Graduate School of Environmental Studies and Asian Institute for Energy, Environment and Sustainability, Seoul National University, Seoul, Korea, E-mail: hongjongho@snu.ac.kr

support of government and its policies, and economic efficacy (Newton, 2001; Jamal and Nooruddin, 2010). Levi (1993) claimed that distrust in government is formed when citizens feel exploited and their contributions are wasted. Given this, a citizen who bears suspicion concerning the government's true intentions or its ability to achieve its announced goals is not willing to pay enough to fully fund projects administered by the government, and states *WTP* less than needed.

Despite the importance of trust in effective implementation of the government's policies, few studies have theoretically linked citizens' trust in government to their *WTP*, or empirically examined the relationship between the two. Our earlier work (Oh and Hong, 2012) focused on a theoretical understanding on the positive association between citizens' trust in government and their *WTP*. With the present study, we offer an empirical evidence for our theoretical hypothesis. For this exercise, Korean survey data concerning citizens' *WTP* for a public project to reduce indoor air pollution in subway stations is used.

The remainder of the paper is structured as follows: Section 2 presents a brief sketch of the relationship between citizens' trust in government and their *WTP*. Section 3 describes Korean survey data and a contingent valuation method (hereafter, *CVM*) to measure the influence of trust in government on *WTP*. In Section 4, we demonstrate that the estimation outcomes statistically support our hypothesis. Section 5 concludes this study.

II. A Sketch of the Problem

We will begin with a sketch for an underlying economics of different levels of trust in government among citizens, and consequences of trust for their stated *WTP*. Our sketch is within a simplified version of cheap talk, replicating Farrell and Rabin (1996) and Dixit (2004). Consider an economy with a government (*G*) and a representative citizen (*C*). A single citizen is assumed in order to avoid a free riding problem. Suppose a concern for the level of public good (*E*) exists and a public project to improve *E* is considered. The level of the project is determined by interactions between *G* and *C*. Rules of the game are as follows: first, *G* proposes a project to *C* to improve *E*; in response to *G*'s proposal, *C*, the potential beneficiary of and at the same time payer for the project, states his *WTP* for the project. In this simple version, we actively consider two strategies for both players: the government can announce either a high level improvement or a low level improvement, (E_H, E_L); in responding to the announcement, a citizen can select either a high *WTP* or a low *WTP*, (W_H, W_L). We should be aware that *G* can say things contrary to its true intention, or hide the fact that the announced goal is beyond *G*'s capacity.

First, consider a situation in which *G*'s ability is high enough to implement any level of improvement (E_H and E_L). If d in the payoff matrix (see Figure 1) is so

small (i.e., $d < 2$), *G* has no incentive to lie, because a lie would induce *C* to make a mistake, and *C*'s mistake would be bad for *G*. In this situation, cheap talk conveys *G*'s true intention and true capacity. Then, the following strategies constitute equilibrium: *G* says "high intention (E_H)", if both *G*'s true intention and *G*'s ability are high, or "low intention (E_L)", if either *G*'s true intention or *G*'s ability is low. *C* infers that *G*'s intention is high, and states W_H, if *G* says "high intention (E_H)"; *C* infers that *G*'s intention is low, and states W_L, if *G* says E_L. Once W_H (or W_L) is stated, *G* will implement corresponding action, E_H (or E_L).

[Figure 1] Payoff Matrix

		Citizen (*C*)'s *WTP*	
		W_H	W_L
Government (*G*)'s plan	E_H	(1,3)	(-1, 2)
	E_L	$(-1+d, 0)$	(1,1)

(*G*'s payoff, *C*'s payoff)

Unfortunately, there are many cases in which the government has incentives to mislead the citizen in order to increase tax revenues with ill-intent or to finance other projects, or is in a situation in which it exaggerates its policy goals to increase political support from the citizen. These cases can be illustrated with $d \geq 2$ in the payoff matrix. Note that *G* is always better off when *C* chooses W_H when $d \geq 2$. When *G*'s long-term disutility related to losing citizens' trust is not an issue, *G* therefore wants *C* to believe that *G* is going to conduct E_H and announces E_H, regardless of *G*'s true intention. Knowing this, *C* does not rely on *G*'s talk anymore but views government's verbal utterances with cynicism and distrust. Here, a large d encompasses *C*'s suspicion on *G*'s announcement of W_H: *G*'s one-time utility gain of receiving W_H and implementing E_L is larger than the discounted long-run sum of *G*'s disutility of losing trust among citizens.

Lastly, consider a case in which *G* is not capable of implementing a high level of improvement. Then, whatever *G* has announced or *C* has responded, *G* cannot help doing E_L. The influence of d in *G*'s action is the same as that for the capable *G*: when $d < 2$, *G* has no incentive to lie and announces E_L; when $d \geq 2$, *G* will announce E_H in order to entice *C* to state W_H, although it cannot fulfill the policy goal it has announced, E_H. Knowing this, *C* will state W_L.

This example demonstrates that a less-informed *C* assesses the credibility of *G*'s announced policy by evaluating the size of d and of *G*'s capacity of fulfilling the announced goals, and determines the level of *WTP*. Table 1 summarizes information in possible cases for *C*. Let σ and φ denote the probability that the government is capable of implementing a high level of improvement and the probability that the government has no incentive to lie, $Prob(d < 2)$, respectively.

When G announces E_L, C, who knows that G surely does E_L, will state W_L since the expected payoff of $W_L\,(=1)$ is larger than that of $W_H(=0)$. Meanwhile, when E_H is announced by G, C knows that there is a chance for G to do E_L at the end. Bayesian updating renders the C's posterior belief on G's action of implementing E_H, given the announced E_H and the stated W_H, as $\frac{\sigma\varphi}{\sigma\varphi+\sigma(1-\varphi)+(1-\sigma)(1-\varphi)}$. Hence, the citizen's expected payoff from W_H is $\frac{3\sigma\varphi}{\sigma\varphi+\sigma(1-\varphi)+(1-\sigma)(1-\varphi)}$, while that from W_L is 1. Thus, C will choose W_H if $\varphi(2\sigma+1)>1$ and W_L, otherwise.

[Table 1] A Summary of the States Faced by the Citizen

State		Probability	G's action (announcement $\rightarrow$ implementation)
Capacity to implement E_H (σ)	Does G have an incentive to announce its true intention? (φ) ~ depending on the size of d		
G is capable	*Yes*($d<2$)	$\sigma\varphi$	$E_L \rightarrow E_L$ and $E_H \rightarrow E_H$
	No ($d\geq 2$)	$\sigma(1-\varphi)$	$E_H \rightarrow E_L$
G is not capable	*Yes*($d<2$)	$(1-\sigma)\varphi$	$E_L \rightarrow E_L$
	No($d\geq 2$)	$(1-\sigma)(1-\varphi)$	$E_H \rightarrow E_L$

Note: σ is the probability that G has a capacity to implement E_H when W_H is stated. Let φ denote the probability that G's announced E_k is the same as its implemented E_k for $k=H,L$.

This implies that a citizen's *WTP* would depend on his subjective projection of σ and φ (or d). When both σ and φ approach to 1 for a citizen (i.e., the citizen believes that G is capable and has an incentive to announce its true intention), the citizen will believe what the government announces and state *WTP* according to the government's announcement: W_H to E_H and W_L to E_L. On the other hand, a low-trust citizen believes that $\sigma\varphi$ is small enough to make G state E_H even though either G's true intention or true capacity is only E_L, and states W_L regardless of G's announcement. When most citizens' $\sigma\varphi$ is small, the aggregate *WTP* will be lower than that desired to financially support an announced project even if case the project is designed by a benevolent government maximizing citizens' welfare. This choice is rational, since the change in public good is not large enough to compensate for income lost to finance a project.

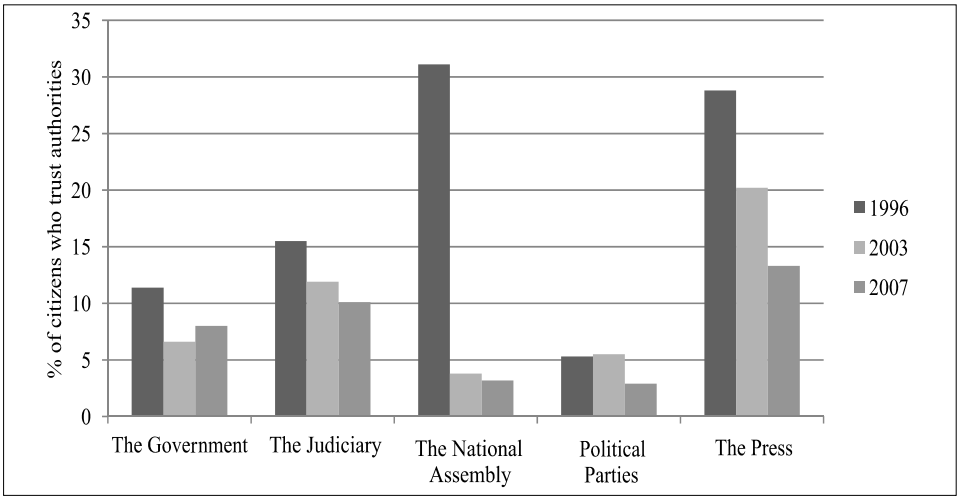
In this paper, we set a trust factor in government, $\delta_i=\sigma\varphi$, and allows δ_i to vary across individuals. This represents a citizen i's subjective probability with which he assesses the trustworthiness of the government or its ability to achieve its announced goals (Oh and Hong, 2012). Although trust is not uniquely defined in the literature, and this paper does not aim to further dispute meaning, our concept of δ_i is similar to the neo-classical notion of trust: a particular level of the subjective probability with which an agent assesses whether another agent will

perform a particular action before she can monitor such action (Gambetta, 1988); trust is accompanied with insufficient information about other agent's choice (Della Giusta, 2008).

The question is how the level of trust is determined. In the literature, it can be born and/or formed with the citizen's personal experiences. This implies that δ_i is not necessary unique (Lorenz, 1999) but varies across citizens, as noted with a subscript i. Of course, δ_i decreases for most citizens when allegations of corruption, scandal, embezzlement, or abuse of public trust from the government side are present and repeated. For instance, trust in government in Japan had reached an appalling level by 2000 following a series of scandals that were relentlessly covered in the media (Richey and Ikeda, 2009).

As a citizen observes that the government breaks its promises, he begins to distrust not only the government but also his self-referential confidence in assessing the other's trustworthiness, and becomes hesitant to trust the government (Barbalet, 2009). Distrust in government also spreads from one field to another. Once a government is viewed as untrustworthy in one field, it is also viewed as untrustworthy in other fields (Lazarus, 1991). As this the case, it is not easy to reverse distrust in government among citizens. When distrust in a government has formed, citizens hesitate to pay for public projects in the form of donations or specifically targeted taxes, public projects led by the government are thereby hindered from working due to insufficient support from citizens, and, finally, distrust in the government is reinforced. This is the circular procedure between distrust and ineffective implementation of the government's performance noted in Blackburn and Christensen (1989) and Grabel (2000).

[Figure 2] Decrease in Authorities among Citizens over the Past 10 Years in Korea



Source: Institute for Social Development and Policy Research (2007).

In Korea, distrust in government and other authorities has become more prevalent over the past 10 years (see Figure 2). This is not unique to Korea, but observed in many advanced economies (Kim, 2010). Jennings (1998) used survey data to show the erosion of trust in the US government over the past 30 years. Peel (1998) and Blamey (1998) described the cynicism and distrust with which Australians viewed their government initiatives. This phenomenon raises concerns about the supply of public good: citizens' distrust in government causes actual need for public good to be underestimated, and it can prevent the provision of public good at an optimal level.

III. Data and the Modeling Framework

An underlying model for investigating the correlation between δ_i and WTP_i is given by

$$WTP_i = f(\delta_i, S_i, E^0, E^A) + e_i = X_i\beta + e_i \text{, where } X_i = [\delta_i, S_i] \quad (1)$$

, where X_i is the explanatory variable set, β is the coefficient vector, and e_i is a standard disturbance term following a logistic distribution. Let E^0 be the original (and degraded) level of indoor air quality in subway stations, and E^A be the level of improvement announced by the government. Neither E^0 nor E^A is included in X_i since they are identical for every respondent. S_i is the vector of social-economic variables for each respondent. Including S_i in the model, we can obtain a controlled relationship between trust in government (δ_i) and WTP_i.

This empirical exercise is carried out using Korean survey data. In 2004, the Korean government instituted the *Indoor Air Quality Management Act*, mandating the improvement of indoor air quality in public spaces. As a policy implementation, the government planned a project to upgrade indoor air quality in subway stations in Seoul, the capitol of Korea. To measure the economic value of the project, a *CVM* study was conducted in 2005.[1] Nine hundred and fifty citizens, reflecting actual distributions of subway users, were interviewed face-to-face by trained interviewers.

Although trust is not uniquely defined in the literature, it is generally accepted that it is based on the evaluation of three dimensions: the trustee's ability to properly deliver what citizens expect; the degree of integrity, measuring how seriously the government adheres to principles acceptable to citizens; and benevolence, indicating the degree to which the government is assessed as being concerned about

[1] An earlier version of survey outcomes and the estimated *WTP* was reported in Hong and Oh (2006). In Hong and Oh (2006), however, the correlation between trust and *WTP,* the subject of this paper, was not considered.

citizens' welfare (Msanjila and Afsarmanesh, 2008). In Earle (2010), the first is referred as confidence (or calculative trust) related to the government's abilities while the other two are termed trust (or relational trust) which is concerned with the government's intentions. In many surveys, various dimensions of trustworthiness are mixed and posed in one question. Examples of this case were provided in Earle (2010): "Taking everything into consideration, how would you grade the U.S. Forest Service for handling forest fires in Colorado?" and "I believe that the present regulatory standards covering the storage and disposal of nuclear waste are adequate to ensure the safety of the public."

A question in our survey measuring the level of trust with a focus on abilities rather than intentions is another example of this mixture. Survey respondents were asked: "Do you believe that the proposed project will make indoor air quality meet international standards once it is implemented by the government?" Answers are recorded on a 5 point scale, and we set $\delta_i = 1$ when i's response for this question is "A Lot," and reduce the value of δ_i by 0.25 as the response changes from 1 ("A Lot") to 0 ("Very Little").

Interviewees were also asked questions about their general socio-economic status, such as age, education, income, gender, out-of-pocket family medical expenses, exposure to health risk, awareness of risk, or sincere attitudes toward environmental issues, environmental NGO memberships and parental status. Answers to these questions form the explanatory variable set, X_i, in equation (1). Summary statistics are reported in Table 2.

[Table 2] Characteristics of the Respondents (N = 950)

Variable (X_i)	Description	Mean	Std
Age	Age (years)	40.4	9.5
Education	Years of schooling	13.3	2.2
Family_inc	Family income (before tax, 10,000 KRW/month)	385.1	88.6
F_MedExp	Family medical expenses (10,000 KRW/month)	23.4	46.6
SubwayM	Average duration of subway rides (minutes/week)	263.6	273.9
	5-point scale variable	Mean	Std
Trust ($=\delta_i$)	Do you believe that the proposed project will make indoor air quality meet international standards once it is implemented by the government?	0.47	0.21
	Dummy variables (yes=1, no=0)	# of 1	# of 0
D_Trust2	If δ_i is "*Some*"	419	531
D_Trust3	If δ_i is either "*More than Some*" or "*A Lot*"	207	743
D_Female	Female?	475	475
D_Kids	Parent?	675	275
D_NGO	Member of any environmental NGOs?	27	923
D_Informed	Have you been informed that indoor air in subway stations	849	101

	is polluted?		
D_WhiteC	White-collar worker?	307	643
	Would you say that our society should be more concerned about the following?		
D_Education	Quality of school education	887	63
D_Security	Security	873	77
D_Environment	Environmental Quality	895	55
D_Integrity	Integrity	865	85
D_EconGrowth	Economic growth	905	45
D_Equality	Equality	897	53
	Would you say that the following is important in your life?		
D_Wealth	Wealth	912	38
D_Success	Career success	867	83
D_Health	Health	889	61
D_Family	Family happiness	911	39

Adopting a standard double-bounded dichotomous method, developed by Hanemann et al. (1991), two sequential closed-ended questions were asked: "Would you be willing to pay $\$w$ (a one-time payment per user) for a project with a goal to improve E by E^A?" and "If your answer is 'yes (no)' for the first question, would you still be willing to pay twice $\$w$ (half of $\$w$) for the same project?" If a respondent i agreed to pay the two provided reference values, (yes, yes), then $r_{yy}^i = 1$. Similarly, $r_{yn}^i = 1$ when i said "yes" to paying the first reference value but not the second, and so on. Reference values initially asked for in the survey ranged between 3,000 KRW ($\doteqdot$ US $2.7) and 100,000 KRW ($\doteqdot$ US $88.3).This implies that we do not estimate a respondent's WTP_i given in equation (1) directly but the probability that his WTP_i is located within an interval specified by reference values, $\$w$ and $\$2w$ (or $\$0.5w$). Probabilities of observing each response at given reference values and an individual-specific explanatory vector X_i are given by

$$\Pr(r_{yy}^i = 1) = \Pr(WTP_i \geq b_H^i) = \Pr(e_i \geq b_H^i - X_i\beta) = 1 - F(b_H^i) \tag{2}$$

$$\Pr(r_{yn}^i = 1) = \Pr(b_I^i \leq WTP_i < b_H^i) = F(b_H^i) - F(b_I^i) \tag{3}$$

$$\Pr(r_{ny}^i = 1) = \Pr(b_L^i \leq WTP_i < b_I^i) = F(b_I^i) - F(b_L^i) \tag{4}$$

$$\Pr(r_{nn}^i = 1) = \Pr(WTP_i < b_L^i) = F(b_L^i) \tag{5}$$

, where b_I, b_L, and b_H are an initial reference value, a reduced value in the follow-up question, and an increased value in the follow-up question, respectively. Reference values asked for in the survey are reported in Table 3. $F(\cdot)$ is the logistic cumulative density function of the WTP_i at the proposed reference value. Then, log likelihood of an individual i's response is defined following Cameron and Quiggin (1994) as follows:

$$l_i = r_{yy}^i \ln[1-F(b_H^i)] + r_{yn}^i \ln[F(b_H^i)-F(b_I^i)] + r_{ny}^i \ln[F(b_I^i)-F(b_L^i)] + r_{nn}^i \ln[F(b_L^i)] \quad (6)$$

, and that of all respondents is given by $L(\beta,\sigma)=\Sigma_i l_i$. A survival analysis[2] is applied to estimate β maximizing L.

[Table 3] Reference Values Asked in the Survey

Initial reference value (b_I) (Korean Won)	Responses to the first and second reference values				Number of respondents
	(b_I, b_H) = (Yes, Yes)	(b_I, b_H) = (Yes, No)	(b_I, b_L) = (No, Yes)	(b_I, b_L) = (No, No)	
3,000	54	31	32	79	196
5,000	40	33	30	77	180
10,000	21	35	31	106	193
20,000	3	27	35	125	190
50,000	5	9	26	151	191
Total	123	135	154	538	950

IV. Analysis of the Estimation Outcomes

Estimation is performed using the PROC LIFEREG procedure in SAS. Estimation outcomes are summarized in the first column of Table 4. Parameter estimates of *Education, Family_inc, F_MedExp, D_Female, D_NGO* and *D_Kids* indicate that effects of corresponding variables on *WTP* are statistically ignorable. The parameter estimate (2.32) of *SubwayM*, and its statistical significance imply that the longer citizens stay in the subway, the higher *WTP* is likely to be stated. A positive parameter estimate (1,659.17) of *D_Informed*, measuring how *WTP* changes as a respondent becomes informed about potential risks in subway stations, appears to reveal that *WTP* rises with being informed. Similarly, white-collar workers tend to state high *WTP*. This is confirmed by its statistically significant parameter estimate (1,340.37) of *D_WhiteC*. Meanwhile, a positive and significant parameter estimate for *Age* (72.40) also demonstrates that senior citizens tend to state a higher level of *WTP*.

[2] Cameron and Quiggin (1994) and Carson and Mitchell (1987) showed how survival analysis statistical techniques were employed to analyze dichotomous choice with follow-up data and estimated *WTP*.

[Table 4] Estimation Results

Dependent Variable →	*WTP*			Trust
Age	72.40*	65.21	75.31*	0.0031***
	(42.92)	(44.72)	(42.44)	(0.0010)
Education	106.01	105.04	112.76	0.0012
	(163.28)	(163.21)	(161.35)	(0.0037)
Family_inc	0.51	1.09	0.39	-0.0002**
	(3.41)	(3.56)	(3.37)	(0.0001)
F_MedExp	9.62	10.16	9.89	-0.0002
	(6.55)	(6.61)	(6.44)	(0.0001)
SubwayM	2.32**	2.40**	2.40**	-0.00001
	(1.11)	(1.12)	(1.09)	(0.00003)
D_Female	681.30	536.12	733.11	0.0509***
	(620.92)	(670.97)	(611.73)	(0.0141)
D_Kids	-625.78	-420.06	-672.99	-0.0736***
	(842.30)	(915.69)	(832.24)	(0.0196)
D_NGO	199.21	13.72	252.59	0.0656*
	(1,776.95)	(1,808.85)	(1,762.84)	(0.0397)
D_Informed	1,659.17*	1,671.66*	1,497.42*	0.0154
	(913.82)	(913.93)	(898.03)	(0.0228)
D_WhiteC	1,340.37*	1,255.78*	1,292.79*	0.0352**
	(715.98)	(731.00)	(705.18)	(0.0164)
Trust	8,224.06***	11,048.24**		
	(1,392.28)	(5,131.99)		
Residual(Trust)		-3,034.19		
		(5,302.89)		
D_Trust2			2,941.19***	
			(633.70)	
D_Trust3			4,801.30***	
			(810.47)	
D_Education				0.0382
				(0.0308)
D_Security				-0.0390
				(0.0269)
D_Environment				0.0472
				(0.0336)
D_Integrity				0.0212
				(0.0262)
D_EconGrowth				0.0182
				(0.0329)
D_Equality				0.0949***
				(0.0327)
D_Wealth				-0.1092***
				(0.0354)
D_Success				-0.0882***
				(0.0258)

D_Health				-0.1436*** (0.0308)
D_Family				-0.0948** (0.0377)
LogLH	-4,989.71	-4,989.54	5,009.89	-1,118.18

Note: *, **, *** represent 10%, 5%, and 1% significance levels, respectively. Standard errors are in parentheses. Constants are not reported.

Empirical outcomes support the point that *WTP* increases with trust in government. This is demonstrated by the statistically significant positive coefficient (8,224.1) of δ_i (see the first column in Table 4). It should be noted that citizens' trust in government or its ability to complete the announced project influences *WTP* more than any other determinants. As summarized in Table 5, the elasticity of δ_i is 0.712, which informs us that a citizen's *WTP* increases by 0.712 percent as his trust factor increases by 1 percent, and this is the largest of the eleven *WTP* determinants. A similar argument is also carried with the largest beta-coefficient of δ_i, 0.806, which implies that changing δ_i by one standard deviation, holding others constant, would change *WTP* by 0.806 standard deviations (shown in the last column in Table 5).

[Table 5] Relative Importance of Statistically Significant *WTP* Determinants

Determinants	x_k		$\hat{\beta}_k$	Elasticity (ϵ_k)	Beta-coefficient
	Average ($\bar{x}_k$)	Std (σ_k)	(Model 1)		
Trust in G($=\delta_i$)	0.47	0.21	8,224.1	0.712	0.806
Age	40.40	9.54	72.4	0.542	0.324
F_MedExp	23.41	46.56	9.6	0.042	0.210
SubwayM	263.62	273.89	2.3	0.113	0.298
D_Informed	0.89	0.31	1,659.2	0.275	0.240
D_whiteColor	0.32	0.47	1,340.4	0.080	0.294

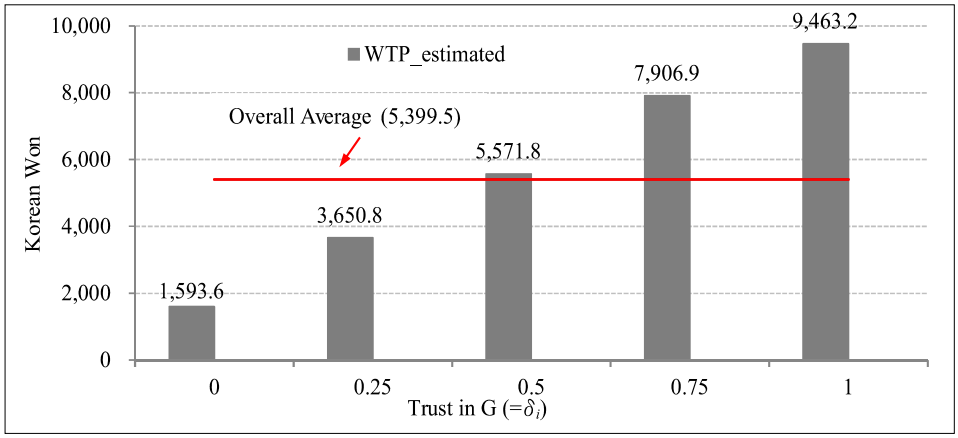
Note: Elasticity $\epsilon_k = \hat{\beta}_k \cdot (\bar{x}_k / \overline{wtp})$, Beta-coefficient $Beta\text{-}coefficient_k = \hat{\beta}_k \cdot (\sigma_k / \sigma_{wtp})$.

When we compare averages of computed *WTP* by trust level, we find that low-trust respondents evaluate the potential benefit from the project as considerably lower than high-trust respondents (see Figure 3). For high-trust respondents (with $\delta_i \geq 0.75$, average *WTP* reaches 8,042.9 KRW (equivalent to US $7.1). This is approximately 2.3 times the average *WTP* (=3,441.8 KRW) of low-trust respondents (with $\delta_i \leq 0.25$).

The problem is that the proportion of high-trust citizens in Korea was only 21.5 percent in the survey. The rest were somewhat skeptical about the announced change. Since a small portion of respondents belong to high-trust groups, total *WTP*

appears too small to support the announced public project. Overall computed average *WTP* is only 5,399.5 KRW, approximately $4.8 in US dollars. This is far below the requested cost[3] to finance the project at the announced target level, E^A.

[Figure 3] Positive Correlations between a Citizen's Trust in Government and His *WTP*



It is arguable that citizens' trust in government may not be truly exogenous. Applying Smith (1987) and Smith and Blundell (1986), we test the existence of potential endogeneity bias in regard to δ_i. The test model consists of two equations. First, an *Ordered Logit Model* predicts δ_i.

$$\delta_i = z_i\pi + v_i \tag{7}$$

, where z_i contains the vector S_i and the other instrumental variables that will be described below. Once we estimate (7), $\hat{v}_i$ will be obtained. This estimated residual for δ_i is used in the original model to estimate *WTP*.

$$WTP_i = X_i\beta + \hat{v}_i\rho + e_i, \text{ where } X_i = [\delta_i, S_i]. \tag{8}$$

The usual t-statistic of $\hat{\rho}$ is considered a valid test of the endogeneity of δ_i. If the parameter estimate of the estimated residuals is statistically significant, the presence of endogeneity bias is confirmed. This econometric technique has been

[3] How to compute total welfare effects of the project based on average *WTP* is still under discussion. We consider a situation in which the project improves indoor air quality in stations and, as a result, not only current subway users but also other citizens use subways as a main transportation mode. The total welfare change due to the project was computed as the product of total households in Seoul (3,341,352) and average *WTP*. That was 18.04 Billion KRW. This was significantly lower than project costs. Project cost was approximately 795 Billion KRW (estimated project cost per station was 3 Billion KRW and there were 265 stations in Seoul).

utilized to test the endogeneity associated with discrete regressors (see Czarnitzki et al., 2013 and Rivers and Vuong, 1988).

Several empirical works advise how to construct the explanatory variable set of the first equation, determinants of trust at the individual level. Unfortunately, the impact of those demographic variables on trust in government has not evaluated clearly in the literature (Kim, 2010): several studies found that it was weak or nonexistent, while some reported a somewhat significant impact of demographic variables. Determinants of trust considered in the literature (Algan and Cahuc, 2010; Jamal and Nooruddin, 2010) are age (positively correlated with trust), its squared term (negatively), length of education (positively), income (positively), gender (positively for a male dummy), the overall trust level of a country where the respondent's parents had grown (positively) and employment status (positively). Kim(2010) also found that trust is statistically high for older people, those with more years of education, internet use and a higher level of individual national pride. In contrast to findings of others, Kim(2010) found that trust is higher for women than for men.

According to La Porta et al. (1997), a government's performance history and religion can be good instrumental variables to predict δ_i. On the other hand, Alesina and La Ferrara (2002) suggested that religion or ethnic origins do not affect trust, but the strongest factors associated with low trust are a recent history of bad experiences, minority status, female, low income, and low education. Although 'willingness to trust a stranger' was a concern in Ermisch et al. (2009), home ownership, income level, marital status, mental health condition and activeness in organizations on a regular basis were considered trust determinants.

In our survey, we asked about only a limited range of socio-economic characteristics and did not ask about citizens' thoughts on the government's performance, national pride, or religion. Instead, we asked several questions to elicit respondents' attitudes toward social issues such as economic growth (*D_EconGrowth*), the environment (*D_Environment*), integrity of public administration (*D_Integrity*), security (*D_Security),* equality in the society (*D_Equality*), and quality of school education (*D_Education*). Also, respondents were asked to evaluate whether or not they were personally interested in wealth (*D_Wealth*), career success (*D_Success*), health (*D_Health*), and keeping their family happy (*D_Family*). These attitude variables are obtained by asking respondents to rate how important each issue is to their life. Estimation results of the trust equation are shown in the last column of Table 4.

Trust in government tends to be high for senior citizens (*Age*), white-collar citizens (*D_WhiteC*), NGO participants (*D_NGO*) or citizens concerned about equality in society (*D_Equality*). Gender difference in regard to trust was confirmed in our empirical outcomes: women trust the government more than men (see the coefficient of *D_Female*). In contrast, trust in government was low for parents

(*D_Kids*), respondents whose family income was high (*Family_inc*) or who cared about equality in the society (*D_Equality)* or had personal concerns regarding wealth, success in career, health, and family's well-being (*D_Wealth, D_Success, D_Health* and *D_Family*, respectively). Estimation results suggest that endogeneity bias is statistically ignorable. As reported in the second column of Table 4, the positive effect of trust in regard to *WTP* still holds even though we take into account the possibility of endogenous δ_i, by employing the predicted values of $\delta_i (= \hat{\delta}_i)$.

A possible non-linear relationship between δ_i and *WTP* is also taken into account by employing two trust level dummies[4]: the value of *D_Trust2* is set to 1 if δ_i is "some" and that of *D_Trust3* is 1 if δ_i is either "More than some" or "A lot." Being the base case representing low-trust responses (i.e., δ_i is either "less than some" or "little"), the estimated coefficient is positive for both *D_Trust2* and *D_Trust3*(see Table 4) and is larger for *D_Trust3* (4,801.30) than for *D_Trust2* (2,941.19). This delivers the same conclusion, the positive correlation between δ_i and *WTP*.

V. Conclusion

This paper empirically tests a hypothesis derived in our earlier paper: citizens' trust in government is the critical factor in determining *WTP*. Empirical outcomes suggest that citizens' trust in government could leverage their *WTP* for the project highly. As shown in this case, the substantially low *WTP* obtained by survey data can be contributed either to widely distributed distrust in government, its ability to achieve announced policy goals or both. Given that public projects need to be supported by citizens financially and politically, we conclude that the distrust toward government which prevails in most advanced economies can cause the economic value of their public projects to be underestimated and hamper actual implementation.

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[4] Given the small number of respondents whose trust in government is reported as "little" or "less than some," and responses for "more than some" or "a lot" are collapsed into one.

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