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Homeownership and investment for social capital in Japan: Dynamic Panel approach.

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Abstract

This paper explores how the rate of home-ownership is related to the formation of social capital using panel data from Japan during the period 1986□2006. I have used Dynamic Panel estimation to control unobserved prefecture-specific fixed effects and an endogeneity bias. I have found through this estimation that the rate of home-ownership enhances the participation in voluntary activities, leading to social capital accumulation. This is in accord with findings from the United States (DiPasquale and Glaeser, 1999).

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1. INTRODUCTION

Since the 1990s, the concept of social capital has had a great influence on various fields of social science (*e.g.*, Putnam 1993; Kawachi *et al*., 1997; Kawachi *et al*., 1999; Knack 1997; Knack and Keefer 1997). Recently, researchers in the field of regional science have been interested in the issue of social capital (see Glaeser and Redlick 2008; Kilkenny 2006; Westlund 2007). There are various definitions of social capital such as social network, interpersonal trust, or social norms of reciprocity and trustworthiness. If social capital is defined as social network, social capital can be accumulated through participation in community and voluntary activities (Putnam, 2000). This view can be explained formally by the simple investment theory (Glaeser *et al*., 2002). From a regional viewpoint, empirical analysis has been used to explore how social capital is formed based on the decision making of individuals; the suggestion is that homeowners are less likely to move from their current residences, and therefore are more inclined to invest in their local social capital (DiPasquale and Glaeser 1999; Hilber 2007).

Nonetheless, a social network of neighbors generates benefits for residents. A social network considered as social capital appears to contribute to technological diffusion among colleagues (Yamamura 2008a). This benefit disappears if households move, thereby reinforcing low residential mobility (Kan 2007). This implies that if social capital can be strongly accumulated, people are less likely to move away (David *et al*., 2010). However, there seems to be a reverse causality whereby people are apt to move to places and become homeowners where social capital formation is perceived to be larger, leading to an estimation bias. Furthermore, the culture and history of a residential area are also thought to influence a resident's decision-making concerning investment in the social capital of that area.

This paper examines whether homeowners are more likely to invest in social capital. Alternatively, an environment where social capital has sufficiently accumulated might appear comfortable and attractive to some people, persuading them to become homeowners. If this is true, the reverse causality seems to hold true. Accordingly, the causality between homeowners and investment in social capital is ambiguous. Estimates of this relationship are thought to suffer from biases such as the endogeneity of homeowners. Moreover, features of a residential place are not fully captured with independent variables. For instance, historical events occurring in the place possibly might affect an individual's decision making in investing in social capital for the moment. Such events can be regarded as having an unobserved fixed effect on a residential place. As a consequence, failing to capture that unobserved fixed effect leads to omitted-variable bias. It is thus necessary to account not only for endogeneity bias but also for omitted-variable bias. Although previous work used the instrumental variable to offset this endogeneity bias, these studies did not account for the unobserved fixed effects (DiPasquale and Glaeser 1999; Yamamura 2011). The Arellano-Bond Dynamic Panel model has an advantage in capturing unobserved fixed effects and in accounting for endogeneity bias through adjusting instrumental variables using a two or multi-period lagging (Arellano 2003, 168). By using panel data from the 47 Japanese prefectures[1] over the period 1986–2006, this paper employs the Arellano-Bond Dynamic Panel model (hereafter the AB model) to simultaneously control for the unobserved fixed effect and endogeneity bias at the prefectural level.

The organization of the remainder of this paper is as follows: In section 2, data, method of analysis and estimation strategies are described. The results of the estimations and their interpretation are provided in section 3. The final section offers concluding remarks.

[1] A Japanese prefecture is roughly equivalent to a state in the United States or a province in Canada.

2. DATA AND METHODS

2.1. Data

Following the discussion in Putnam (2000), the degree of civic engagement such as volunteer activities is considered to be an investment in social capital in this research[2]. I have obtained the proxy for investment in social capital from the report "The Survey of Time Use and Leisure Activities" which provided prefectural data on the degree of participation in volunteer activities every five years from 1986. This survey was conducted by the Statistics Bureau of the Ministry of Internal Affairs and Communications. Besides the proxy for investment in social capital, the rate of homeownership and other economic variables can be obtained for corresponding years[3]. Hence, this paper used prefectural level panel data, for each of the 47 prefectures and quinquennial years (1986, 1991, 1996, 2001, and 2006). Hence, the total number of observations is 235. Table I includes variable definitions, means, standard deviations, maximum values, and minimum values.

Table I Variable definitions and descriptive statistics

Variables	Definition	Mean	Standard deviation	Max	Min
SC	Percentage of people involved in volunteer activities (%).	30.4	5.58	46.3	17.4
HOME	Percentage of homeownership (%).	67.4	8.06	84.2	40.8
CCENTER	Number of community centers per capita (per 1000 persons).	0.21	0.17	0.91	0.07
GINI	Gini coefficients	0.28	0.01	0.38	0.25
INCOM	Per capita income (million yen)	2.74	0.48	4.90	1.70
POP	Population (million).	2.64	2.41	12.3	0.61

[2] DiPasquale and Glaeser (1999) used various variables as proxies for the investment of social capital because civic engagements covered various activities in daily lives. Participation in volunteer activities reported in "The Survey of Time Use and Leisure Activities" was divided into a number of categories. For instance, the survey for 2001 provided data for10 kinds of volunteer activities related to (1) health or medical concerns, (2) the elderly, (3) the handicapped, (4) children, (5) sports, culture or arts, (6) local improvements, (7) safety promotion, (8) conservation or environment, (9) disaster response, and (10) others. These sub-categories changed according to survey years although the sub-category “total volunteer activities” is available every survey year. Inevitably, I have not used those sub-categories providing more detailed information concerning investment for social capital due to data limitations.

[3] The Gini coefficient of yearly income was sourced from the "National Survey of Family Income and Expenditure". This quinquennial survey was conducted by the Statistics Bureau of the Ministry of Internal Affairs and Communications in years 1984, 1989, 1994, 1999, and 2004. It should be noted that there is a two-year lag between the Gini coefficient and the proxy for investment in social capital. Besides the Gini coefficients and rate of participation in volunteer activities, the data used as independent variables in the regression estimation were sourced from Asahi Shimbunsha (2008).

2.2. Econometric Framework and Estimation Strategy

It can be seen from Figure 1 that rate of participation in volunteer activities is not skewed. Figure 2 indicates that there is a positive correlation between the percentage of participation in volunteer activities and homeownership rates. Nevertheless, the causality between these is ambiguous. As suggested in earlier works (DiPasquale and Glaeser 1999; Hilber 2007), it seems appropriate that barriers to mobility give individuals an incentive to invest in social capital. Nonetheless, Figure 2 possibly suggests a reverse causality that people tend to become homeowners where investment in social capital is large. I have used regression estimations to clarify the causality as follows.

Figure 1 Distribution of percentage of participation in volunteer activities

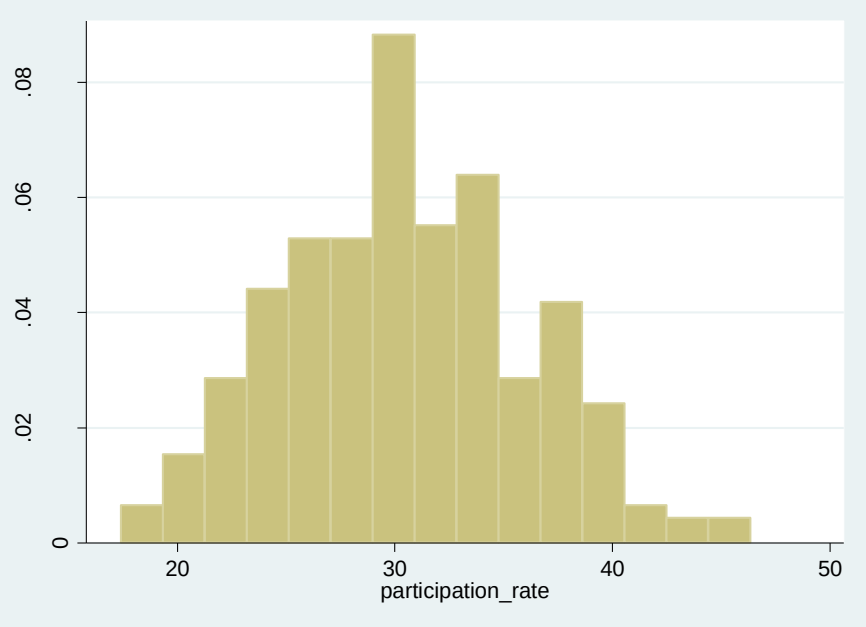
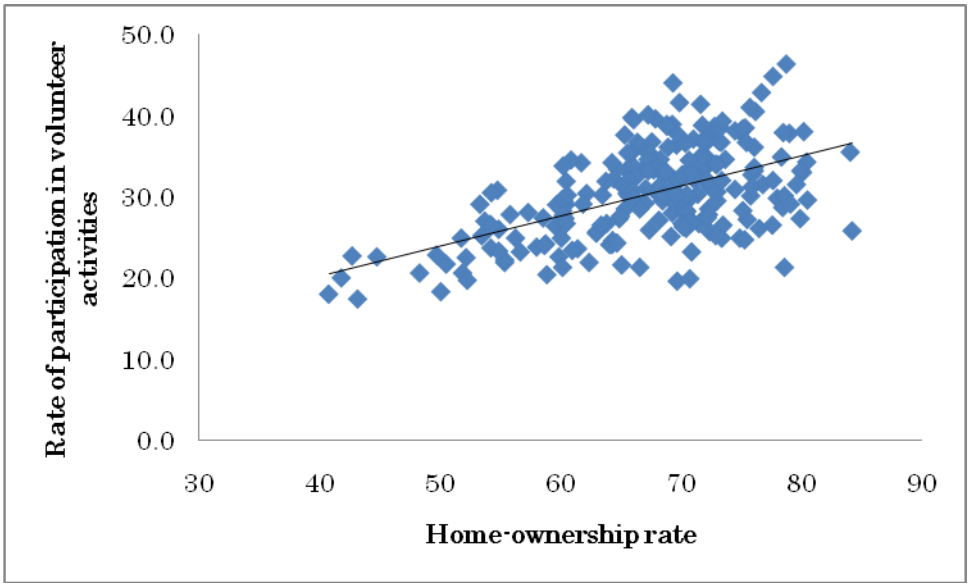


Figure 2 Relationship between homeownership rate and percentages of participation in volunteer activities



The AB model allows me to control for not only the fixed effect of a residential place but also the endogeneity bias (Baliamoune-Lutz, 2009). Using the AB model, the estimated function then takes the following form:

$SC_{it} = \alpha_1 SC_{it\_1} + \alpha_1 HOME_{it} + \alpha_2 CCENTER_{it} + \alpha_3 GINI_{it} + \alpha_4 INCOM_{it} + \alpha_5 POP_{it} + e_i + u_{it}$,

where SC_{it} represents the dependent variable in prefecture i and year t. The lagged variable, SC_{it_1}, treated as independent, is a proxy for social capital measured as a percentage of the people involved in volunteer activities. The α's represent regression parameters, e_i unobservable prefecture specific effects that are controlled by the AB model, and u_{it} the error term. In addition to the AB model, the OLS (ordinary least squares) and the Fixed Effects models, where a lagged dependent variable is not included as an independent, are both used to check robustness. The rate of homeownership, HOME, is used to capture the homeownership effect. If a homeowner tends to invest in social capital, the anticipated sign of HOME is positive. As discussed by DiPasquale and Glaeser (1999), HOME is possibly correlated with unmeasured factors included in u_t. HOME is thus thought to be an endogenous variable, resulting in estimation bias[4], and hence, handled as such in the AB model. An endogenous variable is treated similarly to a lagged dependent variable. Levels of endogenous variables lagged by two or more periods can serve as instruments (Arellano 2003, Ch. 8).

Community centers are places where residents of a community gather. Accordingly, such centers promote frequent gatherings for community activities. CCENTER, the number of community centers per capita, is predicted to be positive valued. An individual's decision seems to depend on those that surround the individual. For instance, people are less likely to cooperate in resolving collective problems in more heterogeneous communities (Alesina & La Ferrara, 2000; Yamamura 2008b). Hence, residents are less likely to invest in social capital if income inequality as reflected by GINI is relatively large. The sign of GINI is anticipated to be negative. Apart from variables referred as above, several control variables are also included to capture prefecture characteristics such as average income levels and population.

3.ESTIMATION RESULTS AND THEIR INTERPRETION

Table II presents estimations of the various variables using OLS and the Fixed Effects model. The Fixed Effects model controlled for the unobserved fixed effects for each prefecture but not the endogeneity bias. Table III exhibits similar results for the AB model where the unobserved fixed effects of each prefecture are taken into account and endogeneity bias is alleviated. I have attempted to estimate the elasticity so as to compare the magnitudes of dependent variables. Accordingly, dependent and independent variables are evaluated at the sample means, and therefore coefficient values reported can be interpreted as elasticities[5].

[4] DiPasquale and Glaeser (1999) used individual data to explore the effect of individual home-ownership on investment in social capital. They considered the average group home-ownership rate where an individual lives as an exogenous variable and used it as an instrument variable.

[5] For more details see Greene (1997, p.280). In the linear model, $y = x'\beta + e$, the elasticity of y with respect to changes in x is defined as

$$\gamma_k = \frac{\partial \ln y}{\partial \ln x_k} = \beta_k \left(\frac{x_k}{y} \right).$$

One can see from Table I that the standard deviation in each variable is not large compared with its mean values. Further, as referred to earlier, Figure 1 reveals that the dependent variable (rate of participation in volunteer activities) is not skewed. Hence, for estimating elasticity, evaluation at the sample means can be considered to be appropriate.

I begin by discussing results of Table II, presenting the OLS result in column (1) and the Fixed Effects result in column (2). HOME takes positive signs in columns (1) and (2); however, HOME is statistically significant only in column (2). Moreover, coefficient of HOME for the Fixed Effect model is remarkably larger than that for OLS. This suggests that suppressing prefectural fixed effects alleviates the estimation bias, leading to HOME values that are statistically significant. Aside from HOME, parameters CCENTER, GINI, and INCOM display similar results for both OLS and the FE model. It is significant to note that GINI does take a negative sign. This implies that income inequality curbs participation in voluntary activities, resulting in a decrease in social capital.

Table II Determinants of investment in social capital

Variables	(1) OLS	(2) Fixed Effects
HOME	0.02	1.20***
	(0.16)	(3.43)
CCENTER	0.01	0.002
	(1.28)	(0.05)
GINI	-0.38**	-0.34**
	(-2.38)	(-2.21)
INCOM	0.32***	0.43***
	(4.70)	(6.76)
POP	-0.14***	0.17
	(-7.02)	(1.23)
Adj R- square	0.41	0.23
Observations	235	235

Notes: Numbers are elasticities. Numbers in parentheses are t-statistics. Superscript asterisks *, **, and ** indicate significance at 10, 5 and 1 percent levels, respectively. To save space, a constant term is included when an estimation was conducted but its result is not reported.

I now turn to the results of Table III. All dependent variables are treated as exogenous in column (1) while HOME, CCENTER, and GINI are treated as endogenous in columns (2), (3), (4). In column (3), INCOME is also treated as endogenous while in column (4), both INCOME and POP are also treated as endogenous. Before discussing details of the results, it is necessary to check the validity of the estimation model. The consistency of the AB model estimator relies on the fact that there are no second-order serial correlations arising from any disturbance in the first-differential equation. Therefore, one should first check a test for the null hypothesis that there are no such correlations (Baltagi 2005, p.141). The null hypothesis

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There values can be estimated at the sample means as

$$\lambda_k = \beta_k \left(\frac{\overline{x_k}}{\overline{y}} \right).$$

As shown above, the model is transformed into the non-linear model. It is important that the coefficients in a non-linear model are not equal to the slope with respect to the variables. In this case, standard errors for these estimates should be obtained using the delta method (Seber 1982; Oehlert 1992; Powell 2007; Chattopadhyay 2010). That is, the standard error in the elasticity of y, γ_k, can be calculated by the delta method (Greene 1997, pp. 278-280).

is not rejected in columns (1) – (4) and so all estimation results pass the test. Second, one needs to look at the results from the Sargan test, which is the test for over-identification restrictions. The null hypothesis is that the instrumental variables are uncorrelated with respect to some set of residuals and, so they are acceptable as instruments. If the null hypothesis is not rejected, the instruments are valid by this criterion. Only in columns (3) and (4) is the p-value of the Sargan test presented not rejected. Hence, I place greater importance on the results presented in columns (3) and (4).

Table III Determinants of investment in social capital (Dynamic Panel model)

Variables	(1)	(2)	(3)	(4)
SC_1	-0.54***	-0.20***	-0.12**	-0.09**
(Lagged dependent variable)	(-5.79)	(-2.92)	(-2.26)	(-2.34)
HOME	0.93*	0.86*	1.12***	1.74***
	(1.89)	(1.85)	(2.73)	(5.03)
CCENTER	0.10	-0.07	-0.14*	-0.04
	(1.04)	(-0.92)	(-1.77)	(-0.63)
GINI	-0.68***	-1.66***	-1.65***	-1.18***
	(-5.74)	(-7.92)	(-7.88)	(-8.79)
INCOM	0.14	-0.07	-0.18	-0.16
	(0.89)	(-0.58)	(-1.62)	(-2.07)
POP	0.34***	0.45***	0.40***	0.17
	(3.18)	(3.10)	(3.22)	(1.61)
Serial correlation				
First order (P value)	0.88	0.00	0.00	0.00
Second order (P value)	0.35	0.83	0.83	0.64
Sargan test				
(P value)	0.00	0.06	0.13	0.13
Endogenous variables		HOME CCENTER GINI	HOME CCENTER GINI INCOM	HOME CCENTER GINI INCOM POP
Wald Chi-square	234	442	520	422
Groups	47	47	47	47
Observations	141	141	141	141

Notes: Numbers are elasticities. Numbers in parentheses are t-statistics. Superscript asterisks *, **, and ** indicate significance at 10, 5 and 1 percent levels, respectively. To save space, a constant term is included when an estimation was conducted but its result is not reported.

Consistent with prediction, as reported in Table III, HOME_1 takes a positive sign and is statistically significant at a 1 % level in columns (3) - (4) and at 5 % level in columns (1)-(2). Also in accord with expectation, the sign of GINI is negative and statistically significant at a 1 % level in columns (1) – (4). Considering Tables II and III jointly, homeowners are more likely to invest in social capital whereas income inequality reduces the investment for social capital. In contrast, the sign of INCOM is not stable and is statistically insignificant. POP is negative in column (1) and positive in columns (2) – (4). POP is statistically significant in column (3) but not in column (4). Hence, the effects of INCOM and POP are ambiguous.

4. COCLUSIONS

The seminal work of DiPasquale and Glaeser (1999) provided evidence that a homeowner is more likely to become a good citizen by investing in social capital through participation in various social activities. However, their previous work does not control for the unobserved fixed effect; hence, its result seems to suffer from estimation bias. This paper explored how homeownership influenced the investment in social capital using prefecture-level panel data during the period 1986–2006. Controlling for unobserved prefecture-specific fixed effects and using the AB model to offset the endogeneity bias related to homeownership, homeowners are more likely to invest in social capital by participating in volunteer activities. This is in agreement with findings in the United Sates suggested by DiPasquale and Glaeser (1999).

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