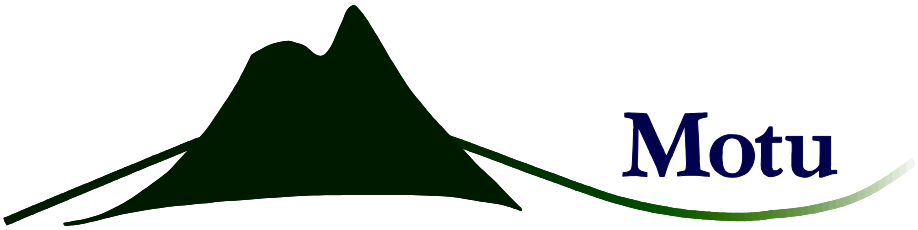


Homeownership and Social Capital in New Zealand

Matthew Roskruge, Arthur Grimes, Philip McCann, Jacques Poot

Motu Working Paper 11-02
Motu Economic and Public Policy Research

March 2011

Author contact details

Matthew Roskruge
University of Waikato
mattr@waikato.ac.nz

Arthur Grimes
Motu Economic and Public Policy Research and University of Waikato
arthur.grimes@motu.org.nz

Philip McCann
University of Groningen
p.mccann@rug.nl

Jacques Poot
University of Waikato
jpoot@waikato.ac.nz

Acknowledgements

We thank the Royal Society of New Zealand Marsden Fund (grant MEP-07-003, Homeownership) for funding this research, and the Quality of Life Research Team for provision of data. The authors are solely responsible for the analysis and views expressed.

Motu Economic and Public Policy Research

PO Box 24390
Wellington
New Zealand

Email info@motu.org.nz
Telephone +64 4 9394250
Website www.motu.org.nz

 ISSN 1176-2667 (Print), ISSN 1177-9047 (Online).

Abstract
Does homeownership affect individual social capital and thereby influence local outcomes? Following DiPasquale and Glaeser, a body of literature suggests that homeownership is positively related to social capital formation. Homeowners have an incentive to engage in the local community in order to preserve or enhance the value of their housing asset. Moreover, homeownership creates barriers to geographic mobility, which increases the present value of the expected stream of benefits from local community social capital. We test the homeownership hypothesis alongside other individual, household and locational determinants of social capital using unique data created by merging the 2006 and 2008 samples of the New Zealand Quality of Life survey. The measures of social capital used in our analysis include trust in others, participation in social networks, attitude towards local governance and sense of community. Since homeownership is not randomly assigned, we complement our regression models with propensity score matching to control for selection effects. The results confirm that homeownership exerts considerable positive impact in the formation of social capital in New Zealand communities. In raising accountability of local government it does, however, lead to reduced satisfaction by homeowners in the performance of local councils.

JEL codes
H54, R11, Z13

Keywords
social capital, homeownership, New Zealand, matching methods

Contents

1. Introduction

Homeownership has increasingly attracted the attention of socio-economic researchers as well as policy makers as interest in the impacts that such investment has on outcomes for nations, regions and individuals increases. Recent studies have attempted to measure whether there are non-conventional benefits to homeownership, such as improved outcomes for children (Mohantly and Raut, 2009; Haurin et al., 2002), for immigrants (Sinnings, 2010), crime (Sampson et al., 2007), labour markets (e.g., Borjas, 1985; Oswald, 1996) and general wellbeing (Cobb-Clark and Hildebrand, 2006). Many of these benefits relate to community interaction. The theory behind this relationship is that when someone purchases a home and becomes the owner-occupier, this financial investment also reduces geographical and labour mobility due to transactions costs. This provides an increased incentive for an individual or family to invest in their community, through engagement in local decision making as well as through interactions with other members of the community (networks) and through participation in community activities (DiPasquale & Glaeser, 1999; Glaeser et al, 2002; Earls et al., 1997).

In contrast to the argument for the benefits of home ownership, there exist in the literature arguments which suggest that high home ownership may be related to negative outcomes. These arguments stem primarily from papers by Oswald (1996, 1997a, 1997b, 1999), who argues that homeownership increases unemployment through reduced geographic and labour mobility caused by increased transaction costs. In contrast, authors such as Boehm and Schlottmann (1999) focus on the benefits of that reduced mobility, arguing that this increases neighbourhood quality and stability and that it also encourages socio-political activity in the local community. However, it is generally agreed by both proponents and critics of homeownership that homeowners have a greater incentive to invest in the local community than private or state landlords. It is through this mechanism that it is argued that homeowners attain higher stocks of social capital.

The concept of social capital has become increasingly popular since it was introduced into economics by Putnam (1993), who related community interaction as well as civic engagement to local government performance in Italian regions. Putnam's arguments brought social capital – which before then had been primarily a theoretical concept used by sociologists in the fields of education (e.g., Bourdieu, 1986; Coleman, 1988, 1990) – into the mainstream and provided the impetus for a range of theoretical and statistical investigations. While social capital as a concept has encountered some criticism (e.g., Arrow, 1999; Solow, 1997, 1999), empirical findings have consistently shown that measures of social capital are linked to improved

individual, local and national outcomes. However, while the effects of social capital have been well documented, there remains a deficit in the theory and evidence regarding the causes of social capital formation (Glaeser, 2001).

In this paper we seek to investigate the effects of homeownership on social capital by testing a model of local social capital using a range of dependent and explanatory measures obtained by merging two samples (2006 and 2008) of New Zealand's Quality of Life (QoL) survey. We combine this dataset with regional data from Statistics New Zealand.

We hypothesise that homeowners will attain larger stocks of social capital through investment in their local community due to the increased incentives they face as a result of the transactions costs of moving. We test this hypothesis using both regression and propensity score matching to estimate the effect of homeownership on several proxies for social capital.

This analysis aims to both complement and contribute to the existing body of literature on the micro foundations of social capital. The role of homeownership is examined using micro-level regression analysis on a range of proxies for social capital. When trying to establish a causal link from homeownership to social capital, we must take into account that, unlike in a randomised trial, there are certain selection mechanisms that draw households into homeownership, including the local level of social capital. Thus, we use propensity score matching to quantify the "treatment effect" (homeownership) on the "treated" (homeowners). This approach has been used to identify causal effects in other micro-econometric studies (e.g., Angrist and Pischke, 2009), but to our knowledge this paper is its first application to estimating the impact of homeownership on social capital.

The paper is arranged as follows. Section 2 discusses the general theoretical framework for the analysis of the determinants of social capital held by individuals and the methodology used for the analysis. Section 3 examines the underlying methodology used in the analysis, including a detailed description of the propensity score matching procedure. Section 4 reviews our data and provides summary statistics while Section 5 reports the empirical results of both the regression and PSM analyses. The final section presents the conclusions and suggests avenues for further research.

2. Analytical Framework

In conducting this analysis, we adopt a definition of social capital provided by Westlund (2006), who describes social capital as "Social networks which are created, maintained and used by the network participants in order to distribute norms, values, preferences, information and

social attributes" (p. 8). As such, social capital can be thought of as the linkages between actors by which information flows.

The underlying stock of individual social capital, being the sum and strength of the linkages in an individual's network, is both intangible and unobservable. This has forced researchers to look for suitable alternative measures in order to estimate social capital stocks at various levels. The result has been the adoption of a wide range of proxy variables where a theoretical link exists between that variable and the underlying stock of social capital. In this paper, we utilise four proxies for social capital in developed democratic societies: trust, participation, sense of community, and attitudes towards local government.

Both interpersonal trust and community participation are commonly used measures of the stock of social capital, primarily due to their inclusion in both the World Values Survey and the General Social Survey. These surveys are conducted in many nations throughout the world and researchers such as Zak and Knack (2001) have provided robust theoretical links which validate their use. Higher levels of trust relate to increased ease in establishing linkages with others, while participation in community activities facilitates the formation and strengthening of linkages.

Measures of a sense of community and attitudes towards local government bodies are less commonly applied as proxies for social capital. The rationale for their inclusion stems from the work of Putnam (1993, 1995) which suggested that social capital is, in part, expressed in community interaction. Using Putnam's theory, we assume that individuals who had a positive sense of community would be more engaged in that community, and therefore experience greater social capital through stronger network linkages. Both Putnam and DiPasquale and Glaeser (1999) propose that individuals with high levels of social capital will also be more fully engaged in local political processes. One result of this is that they are likely to hold their local council more fully to account. This may make them feel more or less positive towards their council than non-homeowners, depending on council performance. Indeed, to the extent that council services benefit all residents while property taxes (rates) are paid directly only by property owners, it is quite likely – given this theory – that homeowners will have a less favourable attitude towards local government than renters.

Based on the literature, four distinct groupings of determinants of social capital have been identified for inclusion in an econometric model. They are: (i) demographic variables, (ii) geography and location-specific variables, (iii) variables relating to human capital, and (iv) a measure of homeownership.

(i) Demography.

Of an individual's demographic characteristics, a person's age and gender appear to be consistently associated with social capital (e.g. Glaeser et al., 2002; Putnam, 2000; van Emmerik, 2006). Additionally, ethnicity matters too. In New Zealand, the framework for analysis of social capital developed by Statistics New Zealand (Spellerberg, 2001), as well as the work of Williams and Robinson (2001), suggest that analysis of social capital in New Zealand needs to take account of differences between various ethnic groups, particularly Māori (New Zealand's indigenous people), as there are cultural differences in social beliefs and attitudes which may influence social capital formation.

(ii) Geography.

Geography and location have also been identified as important issues. Several European studies have shown social capital formation in rural settings to be significantly different from that of urban social capital, with more "bonding" rather than "bridging" social capital in evidence. This effect can be examined using population density as a proxy for urbanisation, with higher population densities reflecting more urbanised areas. There may also be unobserved differences between locations that can be controlled for using fixed effects estimation.

(iii) Human Capital.

Human capital has been consistently found to be related to social capital (e.g. Huang et al., 2009; Glaeser et al., 2002; Helliwell and Putnam, 2007). As with much of the writing on social capital, the exact relationship is under some debate. Amongst others, Bowles and Gintis (2001) argue that social skills are a product of education, and as such, social capital could be considered a subcomponent of human capital. This is in contrast to the standard approach which is to view social capital as related to, but separate from, human capital. As the connection between social capital and human capital is one of the most robust and consistent findings in the social capital literature, inclusion of measures of individual human capital are included in our model.

(iv) Homeownership.

As outlined above, homeownership has been shown inter alia by DiPasquale and Glaeser (1999) and Glaeser et al. (2001) to have a significantly positive effect on variables relating to social capital. However, homeownership is not randomly assigned. It is likely that those who own their homes are also likely to have higher incomes, to have higher educational attainment, to be older, and to have a partner to share the mortgage with. These selection effects may cause bias in the estimates as those who own homes are likely also to be those who possess other characteristics commonly associated with social capital; therefore the effect of owning the home on social capital may be overstated. Among those who do not own homes, there may be differences in

contributions to social capital between those who live rent free in a home owned by family, those who rent from a private landlord, and those who rent from a public landlord.

In summary, assuming that individual i's social capital (K_{Si}) is determined by that individual's personal characteristics (P_i), the geographic variables of the individual's region, r, (G_{ir}), human capital (K_{Hi}), and homeownership status (HO_i), we can specify a framework for the regression model as follows:

(1) $$K_{Si} = K(P_i, K_{Hi}, G_{ir}, HO_i)$$

This framework can be used to aid the selection of variables from available micro datasets. The exact form of the model will depend on both availability of data and the form in which the data is available.

3. Methodology

When participants in a study are not randomly assigned into control and treatment groups, we do not have an experimental setting to separate the causal effects of a treatment (in this case homeownership) from the selection effects which may arise. A number of options can be considered to estimate the effect of an intervention on a dependent variable. One approach to dealing with selection bias is to use a standard non-experimental estimator such as OLS regression and control for as many other influences as possible. A second method is to use a matching methodology in order to control explicitly for potential selection bias. The latter method is preferred in this case given that homeownership is not randomly assigned.

3.1. Regression Analysis

We report the results of OLS regression of the association between homeownership and the four proxies for social capital. We include controls for demography (age, gender, ethnicity, and household size and composition), human capital (years of schooling, employment status and income), and geography (years resident in the region). Our equation also includes both spatial and time fixed effects (but not individual fixed effects since we do not have longitudinal data on individuals). The resulting estimation can be shown as:

(2) $$K_{Sirt} = a + \beta_0 HO_{irt} + \mathbf{X}_{irt}\,\boldsymbol{\beta} + R_r + D_t + \varepsilon_{irt}$$

where K_{Sirt} is the outcome of interest, in this case the proxy for social capital, of individual i in region r at time t, HO_{irt} is a dummy representing the treatment, in this case whether the individual is a homeowner or not, $\mathbf{X}_{irt}$ are the observations for individual i in region r at time t on a set of

explanatory and control variables pertaining to geography, demography and human capital while R_r and D_t are the coefficients for the spatial and time fixed effects respectively.

We estimate the regression model in equation (2) for each of the four social capital proxies: trust, participation, community and council. As trust is a binary variable, we used a logit model in this case. Due to truncation of the values that the participation index can exhibit, this proxy was analyzed using a tobit regression. As community is an ordinal Likert-scale type of variable (with a higher score representing a 'better' outcome), an ordered logit regression is appropriate. The council variable was created by taking the first principal component of three binary variables relating to an individual's attitude towards local government. The resulting variable has a normal distribution with zero mean and 1.25 standard deviation, so (ignoring selection issues) ordinary least squares regression is appropriate.

A major concern with cross-sectional regressions is that omission of unobservables in relation to individuals may bias coefficients in regressions of a social capital proxy on a set of observable explanatory variables. Furthermore, omission of unobservables makes interpretation of causality problematic. These problems can be substantially mitigated where: (a) there are multiple proxies for social capital; (b) one of the proxies is theoretically related to exogenous personal characteristics; and (c) that proxy is not a function of the explanatory variable of interest for determining another form of social capital. If (c) does not hold, one can still use a proxy that meets condition (b) to test the robustness of results.

As a particular example, take two social capital proxies: trust and participation. The psychological literature on attachment theory (Bowlby 1982) indicates that early life experience affects subsequent personal relationships throughout life, including the likelihood that an individual will generally trust others. Thus there is an unobserved personal element to trust that is additional to the impact of societal factors such as ethnicity, age, geographical location, et cetera. A longitudinal regression can control for such factors using fixed effects, but this is not possible with a cross-section regression. However, we can make use of the unobservable component affecting trust in order to control for individual unobservables in a regression of the determinants of participation.

To see how we can do so, consider the following system of equations representing the structural relationships between the variables:

$$(3) \qquad TRUST_i = \beta X_i + \alpha HOME_i + \mu_i$$

$$(4) \qquad PARTICIPTION_i = \gamma X_i + \delta HOME_i + \varphi\mu_i + \varepsilon_i$$

where: i refers to an individual; X_i is a variable (or vector of variables) affecting both $TRUST_i$ and $PARTICIPATION_i$; $HOME_i$ is homeownership status; μ_i reflects unobservable personal characteristics; ε_i is a random error term;[1] $TRUST_i$ and $PARTICIPATION_i$ are defined as before; and (consistent with our subsequent results) each of $\alpha, \delta, \varphi > 0$.

If the individual unobservables (μ_i) that contribute to high trust are positively correlated with $HOME_i$, then estimation of (4), with μ_i excluded, will result in omitted variables bias with an over-estimate of the effect of $HOME_i$ on $PARTICIPATION_i$. From equation (4):

$$\mu_i = TRUST_i - \beta X_i - \alpha HOME_i$$

Thus:

$$PARTICIPATION_i = \gamma X_i + \delta\, HOME_i + \varphi(TRUST_i - \beta X_i - \alpha HOME_i) + \varepsilon_i$$

Hence:

$$(5) \qquad PARTICIPATION_i = (\gamma - \varphi\beta)X_i + (\delta - \varphi\alpha)HOME_i + \varphi TRUST_i + \varepsilon_i$$

Equation (5) shows that by including TRUST in the PARTICIPATION equation we can control for individual unobservables, μ_i, (at least those unobservables affecting TRUST). We can no longer interpret the coefficients on X_i structurally (unless we also have the β coefficients) but given that our interest is in δ, this is not a major concern. If $\alpha=0$ (so that homeownership does not affect TRUST) then we can interpret δ structurally as the effect of homeownership on PARTICIPATION after controlling for both observable (X_i) and unobservable (μ_i) characteristics of individuals. If $\alpha>0$ then, by including TRUST in the equation for PARTICIPATION, the coefficient on HOME in (6) will now provide an under-estimate of HOME on PARTICIPATION.

Following this logic, we estimate the impact of homeownership on participation, community and council in two ways. The first omits trust in the regression, while the second includes $TRUST_i$ as an explanatory variable. The two resulting estimates of the $HOME_i$ coefficient provide bounds for the impact of homeownership on three of the social capital proxies, variously controlling for (not controlling for) individual unobservables that impact on an individual's level of personal trust. In both sets of equations, we also include a self-reported variable that measures the respondent's belief in the importance of community; this variable also assists in controlling for otherwise unobservable character traits of the individual.

[1] We could add another random error term to (1), separate from μ_i, but this complicates the exposition without adding insight.

3.2. Propensity Score Matching Methods

An alternative to regression estimation is to use a quasi-experimental method in the form of propensity score matching (PSM) in order to compare individuals who are observationally similar except with respect to the treatment. In a randomised experiment, the randomization procedure itself would ensure that a sufficiently large control and treatment group would be on average observationally similar, as well as having on average the same unobserved attributes (Bryson et al., 2002). A quasi-experimental design differs from an experimental design because in the former the data have not been generated by a random assignment of individuals into the treatment or control group. The estimation process for the treatment effect needs to take into account that there may be underlying reasons why individuals are likely to fall into the treatment or control group. Several quasi-experimental methods have been developed (see Greenstone and Gayer, 2009). Most require longitudinal data on an individual to measure before and after treatment outcomes while taking into account heterogeneity in the population in terms of unobserved personal attributes. Given the data available for this study, we can only account for selection on observables, and matching methods are then the best option for controlling for selection bias.

Matching methods involve the process of matching observations in a treatment and control group based on observed characteristics such that we compare two or more individuals who are observationally similar but happen to belong to either one or the other group. The result is that we gain an estimate of the effect of the treatment while removing the underlying bias that self-selection into the treatment group (on the basis of observables) may have caused.

The specific technique of PSM was introduced by Rosenbaum and Rubin (1983), who proposed that matching individuals on a set of observable characteristics would reduce the bias present in observational studies which lacked randomisation.[2] PSM takes a set of characteristics shared by both treatment and control groups, and creates a single-index variable rather than having a large matrix which would be difficult to match on. The propensity score can then be used to match observations such that those with a similar propensity score possess similar characteristics. While this may not completely remove the selection bias, it provides improved estimation through the reduction in bias resulting from having matched individuals. Propensity score matching requires individuals who have the same propensity score to have the same likelihood of being selected for the treatment group.

[2] Our application of PSM is estimated using PSCORE for Stata (Becker and Ichino, 2002).

To our knowledge, the present paper is the first PSM evaluation of the effects of homeownership on individual social capital. However, other applications of the methodology are widespread. Dehejia and Wahba (2002) suggest that for PSM to successfully reduce selection bias, observations for both treatment and control groups must be at the same location (and date) and have used the same questionnaire. The dataset must contain a rich set of variables which are relevant to both the intervention (homeownership) and the outcome (social capital). The results of the PSM are calculated by taking a researcher-specified list of variables which reflect the characteristics of observations within a sample and must relate not only to the treatment but also to the dependent variable. Using these variables, the method generates an index score which represents the characteristics of the individual. PSM requires scores to be balanced between treatment and control groups in terms of their representation within propensity score blocks. The balancing refers to the idea that exposure to the treatment effect is random for any given propensity score. Therefore, treated and controlled observations should be, on average, observationally identical (Becker and Ichino, 2002). This does not require control and treatment groups to be equal, but rather to have means which are not significantly different given the variables they are matched on. The balancing property is satisfied by dividing the propensity scores into 'blocks' and testing to see whether the control and treatment groups within each block are on average identical. Further discussion and formal proofs can be found in Rosenbaum and Rubin (1993), Imbens (2000), or Becker and Ichino (2002).

Once propensity scores are obtained, there are several different methods of matching in order to obtain treatment effects. They include stratification, nearest neighbour, radius and kernel matching. Each method matches treatment and control groups based on their propensity score, using different matching criteria.

The stratification method divides the propensity scores into ranges such that within each range, treatment and control groups have the same PSM score on average, essentially the same as the blocks used for balancing the PSM scores. The average treatment effect is then calculated by taking the average effect from each block and weighting it by the number of treated observations.

The nearest neighbour matching method compares treated observations with observations that have not been treated but that are observationally the nearest. The pair-wise difference between the outcomes of the treated and their non-treated neighbours is then calculated and the average difference reported. However, it is possible that with nearest neighbour and stratified methods, observations in the treated group or the control group will be

compared with very different observations from the opposite group in terms of propensity scores.

To overcome this problem, both radius and kernel matching methods can be implemented. Radius matching is similar to nearest neighbour matching, but matched observations are constrained to be within a given proximity to each other. Kernel matching compares the treated with weighted averages of all those in the control group, where the weights are inversely proportional to the distance between the propensity scores of the treated and the controls.

For the purposes of our analysis, both nearest neighbour and kernel matching algorithms were used. We provide two sets of estimates. The first uses the treatment of whether or not an individual owns the home they live in, while the second compares homeowners to private renters only. The dependent variables are the three proxies for social capital specified earlier, with trust included as one of the variables on which individuals are matched. Balanced blocks for homeownership have been obtained using variables relating to trust; com_imp, which is a measure of how important the individual believes it is to feel a sense of community; age; ethnicity; education; income; employment status; relationship status; and regional population density, which acts as a proxy for the regional fixed effects.

4. Data Overview and Descriptive Statistics

We use pooled cross-sectional micro data obtained by merging the 2006 and 2008 samples of the New Zealand Quality of Life (QoL) survey. The QoL survey is unique to New Zealand and is a national survey sponsored by local government, with data available on request from the Quality of Life Research Team after approval of a formal proposal. [3] The survey is designed with the aim of measuring aspects relating to an individual's quality of life, living situation, community interactions, and aspects of health and wellbeing, in order to assist local government decision making and provide insight into regional issues, particularly for people living in urban areas.

Four QoL surveys have been completed to date (in 2003 and then biennially from 2004). However, due to changes in the questionnaire and coding only the 2006 and 2008 surveys were selected for our analysis. The merged dataset has a sample size of 15,700, with 7,545 participants in the 2006 survey and 8,155 in the 2008 survey. Surveying was conducted using computer assisted telephone interviewing (CATI) and the sample was drawn from New Zealand residents

[3] See http://www.bigcities.govt.nz/contacts.htm

aged 15 and over, with quotas for age, gender and ethnicity. Our final sample was restricted to those over 18 at the time of the survey. Participants were drawn at random from the electoral roll and were notified by mail prior to the phone interview. The final response rates were 22% in 2006 and 37% in 2008. Because actual levels of social capital are not directly observable, we require suitable proxy variables which represent individual social capital. As noted earlier, we were able to construct four proxy measures of social capital, namely: trust in others, participation in social networks, sense of community, and attitude towards local governance.

In addition to the data available through the quality of life survey, data regarding the regional demographics for New Zealand were obtained from the Statistics New Zealand 2006 Census of Populations and Dwellings. A full list of the variables obtained through these datasets using the framework specified earlier is presented in Appendix 1.

Table 1 shows the descriptive statistics of the final variables reported in the regression equations, from which a subset is used in the propensity score matching. These statistics suggest that the combined and cleaned dataset was largely representative of the underlying general New Zealand population. Regarding gender, males were slightly under-represented, as 48% of the New Zealand population over 18 are male compared to 44% in the sample. The age distribution was fairly consistent with the New Zealand distribution; however there was an under sample of those aged 20 to 29 and 75 to 84, particularly amongst women. Those aged 45 to 49 were the only group largely overrepresented in the sample, however women aged 50 to 64 sixty-four were also slightly oversampled. Dealing with ethnicity is problematic in New Zealand following the introduction within many surveys of a new ethnic category, 'New Zealander', in addition to the traditional European and Māori and other ethnic groups. Our prior is that this group should be combined with 'European' and 'Pakeha' [4] to form a single group, European, and when we compare the ethnic distribution we use this assumption. We find the pooled dataset to be almost perfectly representative of the underlying ethnic distribution of New Zealand, primarily due to the survey methods of the QoL survey. The sample is not particularly representative of the underlying geographical distribution between New Zealand's regions. Rural regions are consistently undersampled, and while New Zealand's major city, Auckland, appears to be accurately represented, there is a strong oversample in the urban and peri-urban regions around Wellington, the capital city, with 21% of the sample coming from Wellington and the surrounding regions compared to 9% of the population. The regions of the South Island are also under-represented, with 18% of the sample residing in the South Island compared to 25.5% of

[4] Māori term for people of European descent.

Table 1: Means and Percentages of Variables used in Multivariate Analysis

Variable	Full sample	Homeowners	Family housing	Private Renters	State housing
N	15,056	10,861	1,930	1,734	531
Dependent var.					
participation	2.87	2.85	3.12	2.77	2.67
community	3.62	3.69	3.39	3.39	3.71
council	0.00	-0.05	0.14	0.09	0.34
trust	0.77	0.79	0.73	0.74	0.70
Explanatory var.					
com_imp	0.70	0.73	0.62	0.63	0.74
male	0.44	0.43	0.51	0.43	0.41
age	46.25	51.02	27.28	37.73	45.52
foreign	0.24	0.24	0.29	0.23	0.26
maori	0.13	0.11	0.15	0.19	0.30
pacific	0.05	0.03	0.12	0.07	0.19
asian	0.08	0.06	0.16	0.13	0.04
other	0.04	0.05	0.02	0.06	0.05
education	13.46	13.53	13.16	13.60	12.54
income q2	0.32	0.30	0.37	0.34	0.45
income q3	0.27	0.28	0.23	0.30	0.23
income q4	0.27	0.31	0.09	0.20	0.11
part-time	0.21	0.19	0.29	0.21	0.23
unemployed	0.15	0.12	0.24	0.21	0.28
retired	0.11	0.14	0.02	0.03	0.12
hhsize	3.12	2.95	3.94	3.23	3.31
children	0.52	0.55	0.24	0.55	0.60
partner	0.76	0.88	0.22	0.64	0.64
reg0_10	1.44	1.34	1.22	2.25	1.48
reg10+	0.71	0.74	0.76	0.46	0.68
popdens	466.33	448.62	527.45	501.79	490.59

the actual population. The regressions reported in section 5 are based on unweighted data, as appropriate weighting remains somewhat arbitrary and weights are not transferable to the PSM. Nevertheless, exploratory regressions weighted by age and location using census frequencies yielded very similar results. Our sample earned more than the underlying population, with each quartile above the first containing more than 25% of the observations in the pooled sample. Participants who indicated they were foreign born comprised 24.4% of the sample. This is close to the proportion of foreign born aged 18 and over in the New Zealand 2006 census, which was approximately 26%.

In comparing the proxy variables for social capital for foreign and New Zealand born participants, foreign born participants were almost identical to New Zealand born participants in all measures with the exception of the attitudes towards local government. The index here was derived as the first principal component of three variables. Foreign Born participants scored a mean first component value of 0.038 compared to -0.012 for New Zealand born participants.

In comparing the descriptive statistics across the four homeownership categories we note that males were over-represented in family housing and under-represented in state housing (relative to their sample proportion). All non-European ethnic groups are under-represented as homeowners. Those identifying as Māori and Pacific Islander were much more likely to be living in state housing than their share of the population would suggest, while those identifying as Asian were more likely to live in family accommodation. A high proportion of those in lower income quartiles are accommodated in state housing, while those in the top income quartile are under-represented in private rentals and very strongly under-represented in family housing and state housing. The family housing result is consistent with the low mean age of those in family housing, indicating that this category is likely to comprise a significant number of young adults still living with parents.

5. Results

To examine the impact of homeownership on social capital, we first use standard regression techniques to estimate the model specified earlier using the four separate dependent variables. We then use PSM analysis to estimate the impact of homeownership on social capital.

5.1. Regression Results

The determinants of each of the four separate dependent variables are estimated by means of regression methods that are appropriate to the type of dependent variable. We used a standardised model with a fixed set of explanatory variables chosen using the theoretical

framework developed in section 3, with consideration of the available data introduced in section 4. The variables are described in Appendix 1 and table 1. All variables are related to one of the four categories specified in the framework: either geographical, demographic, human capital or home ownership.

The binary trust variable is examined using a logit regression, while the participation index is examined using tobit regression due to the truncation of the index. Sense of community was examined using ordered logit regression while the first principal component of the council variables is examined using ordinary least squares. In each regression, we control for both spatial (i.e. regional) and time fixed effects. As discussed in the methodology section, the variable trust may be used as a proxy for unobservable personal traits of an individual gained through early childhood. In order to utilise this information, we estimate each of the other three proxies for social capital using first the standardised model and secondly the model plus the variable "trust" to control for the influence of these unobservable character traits. Appendix 2 presents the full regression results. Table 2 presents the results pertaining just to the homeownership and trust variables.

5.1.1. Impact on Trust

The results for the logit regression of trust can be seen in column (1) of table 2. We distinguish four categories of homeownership: owner-occupier, renting from a family member (or provided rent free), renting from a private landlord and renting from the state. The default category in the regression is owner-occupier. We find that those renting from a private landlord or from the state are significantly less trusting than homeowners (or those living with a family member).

The results in Appendix 2 show that males, those with a partner, and people with higher education report higher trust, while people of Asian and Pacific ethnicity report lower levels of trust. These results are consistent with earlier research on the determinants of trust, using a different dataset, the World Values Survey (see Roskruge et al., 2011). Working part time was significantly related to higher trust. This variable also has a positive impact, where significant, on the other social capital variables of participation, sense of community, and attitudes towards local government. Being unemployed was also positively related to trust and sense of community. It is possible that these two variables pick up that lower, or zero, hours of work reflect a high reservation wage and greater productivity in the non-market sector, particularly given that unemployment was amongst the lowest in the OECD during this period, averaging 3.85% in

Table 2. Unstandardized coefficients from regression models predicting outcomes of proxies for social capital.

VARIABLES	(1) Trust	(2a) Participation†	(2b) Participation††	(3a) Community	(3b) Community	(4a) Council	(4b) Council
trust			0.287***		0.315***		0.260***
			(0.029)		(0.038)		(0.024)
ho_fam	-0.058	-0.009	-0.007	-0.017	-0.019	0.156***	0.155***
	(0.083)	(0.051)	(0.051)	(0.066)	(0.066)	(0.043)	(0.043)
ho_renter	-0.157**	-0.107**	-0.103**	-0.115**	-0.108**	0.121***	0.129***
	(0.067)	(0.042)	(0.042)	(0.053)	(0.054)	(0.034)	(0.034)
ho_state	-0.289***	-0.240***	-0.216***	0.034	0.038	0.385***	0.409***
	(0.106)	(0.068)	(0.068)	(0.087)	(0.088)	(0.056)	(0.057)
Observations	14,860	14,980	14,860	14,911	14,799	14,935	14,841
Pseudo R-squared	0.0349	0.0304	0.0324	0.130	0.132	0.067#	0.075#

Notes: Time period and spatial fixed effects included; standard errors in parentheses; Significant at: *** p<0.01, ** p<0.05, * p<0.1; # Standard R-squared. Cut points for ordered logit 3a: -1.03, 0.92, 2.79, 4.99. 3b: -0.98, 0.98, 2.86, 5.06. Full regression model presented in appendix 2.

2006 and 4.175% in 2008. Non-participation and part-time paid work are associated with higher rates of voluntary work (for New Zealand, see e.g., Clark and Kim, 2009).

5.1.2. Impact on Participation

Columns (2a) and (2b) in table 2 report the results for the determinants of the participation index using a tobit regression respectively excluding and including trust as an explanatory variable. The participation index ranged from 0 to 8, where zero had the participant engaged in no activities and 8 where the participant engaged in all activities surveyed in the QoL questionnaire. The two models are very similar, indicating that controlling for individual unobservables (through the inclusion of trust) makes little difference to the results. The variable trust and believing in the importance of community are strong and significant predictors of increased participation.

The positive impact of homeownership on social capital is confirmed in each of regressions (2a) and (2b). Both renting from a private landlord and living in a state owned house yield a negative impact on social participation, significant at the 5% and 1% level respectively, relative to people who are homeowners (or renting from a family member).

The effect of age is non-linear, with minimum participation in social activities at around age 50. This reflects the opportunity cost of time devoted to such activities. The typical concave age earnings profile suggests that this cost is indeed the highest around age 50. Māori, Pacific Islanders, and females reported higher levels of participation in social activities, consistent with those groups having on average lower hourly labour market earnings. However, those with Asian ethnicity participate less, as do those who were born overseas. This is possibly because many are recent immigrants who may be less integrated in New Zealand society.[5] The coefficient on the years of schooling is significant. There is also strong evidence that residing in a region longer than ten years is associated with increased participation. Plausibly, larger households participate more in social activities.

5.1.3. Impact on Sense of Community

Columns (3a) and (3b) in table 2 show the impact of homeownership and other factors on an individual's sense of community. The two models are again consistent, with no changes in significance as a result of introducing the trust variable. Both trust and believing in the importance of community are significant and positive at the 1% level.

[5] The results are consistent with those of Clark and Kim (2009).

The relationships between homeownership status and this proxy for social capital are somewhat more complex than for the prior two proxies. Renting from a private landlord is associated with a lower sense of community than for homeowners (or those living with family), significant at the 5% level in each equation. However, there is no statistically significant difference between homeowners and people living in state owned housing. One of the purposes of state housing provision is to provide more deprived families with stable housing tenure, so providing a more stable community especially for children in these families (Murphy, 2003; Schrader, 2005); thus many of these tenants will have long-term relationships with their community. This policy intention is reflected in the lack of significant difference in sense of community between homeowners and those with a state tenancy.

Growing older raises the sense of community. This relationship is concave and reaches a maximum at the top end of the age range of the survey respondents. All ethnic minorities have a more positive sense of community than do Europeans, reflecting the strong networks that operate within such communities. Those who are retired, in part time employment, unemployed, and in larger households also report a greater sense of community. Moreover, as we might expect, there is an increase in the sense of community for additional years of living in a region. Interestingly, increased education had a significant negative impact on an individual's sense of community.

5.1.4. Impact on Attitudes Towards Local Government

Columns (4a) and (4b) present the results of the ordinary least squares regression model that tests for factors influencing attitudes of residents towards the activities of their local government. The two models are again remarkably consistent, and both trust and community importance are significant at the 1% level.

Each of the three housing measures (private renting, state renting, and living with family) is significant and positive at the 1% level when compared to homeowners. Thus homeowners have a more negative view of their local government's performance than do non-owners. Homeownership in New Zealand brings with it the obligation to pay local property taxes. The cited work of DiPasquale and Glaeser finds that homeowners hold local politicians to account more stringently than do other residents. Together, these considerations indicate that homeowners feel they are not getting value for money (at least relative to the views of other residents) from their councils. Consistent with the homeownership result, the attitude towards the council significantly declines with increasing duration of residence. A longer stay in a region

therefore appears to make residents even less satisfied with the performance of their local council.

The age coefficients indicate that the attitude towards council activities over the life cycle initially becomes more negative with age, and then becomes more positive after people have reached midlife. Pacific and Asian ethnic groups are more positive towards their local council than are other ethnicities, while more educated people also have a more positive attitude towards local government. The attitude is more positive in regions with greater population density (i.e., more urbanised regions).

5.1.5. Comparison of Homeownership Effects Across Models

Comparing the models, we see that both trust (when it is included as an explanatory variable) and a stated belief in the importance of community are significant determinants of each of the other proxies for social capital. Thus our results are robust to the inclusion of controls for individual unobservables about a person's underlying traits. Compared to home owners, those who rent from either a private or state landlord are significantly less likely to trust others or participate in social activities, and private renters are also less likely to feel a sense of community. However, when considering attitudes towards local government, those living in family, private rental, and state rental housing are all significantly more likely to have a positive attitude towards local government compared to those who own their own homes. This result may in part be due to the fact that local government rates and levies are paid for explicitly by home owners, while those who are renting have these costs incorporated into their rent, and therefore they do not face these costs directly. All residents, however, benefit from the services provided by local government. As homeowners are faced with a bill for local government services, they have a stronger incentive to hold local government to account and are therefore more critical of council actions. They may also experience an increased sense of "ownership" over the local council, and therefore demand better services. The positive coefficients for people who are not owner-occupiers suggest that those groups are less actively involved in holding local authorities to account.

In summary, the regression estimates show that homeownership has a significant positive effect on three of the proxies for social capital. An exception occurs with respect to attitudes to local government performance, where homeownership is associated with less positive attitudes, consistent with a greater involvement by homeowners in holding their local government to account.

Table 3. ATT estimates using propensity score matching.

	N. Treated	N. Control	ATT	Std. Err.	t
Participation; homeowners versus non-homeowners					
Nearest Neighbour	10721	1956	0.138	0.061	2.25***
Kernel	10721	4123	0.136	0.044	3.06***
Community; homeowners versus non-homeowners					
Nearest Neighbour	10721	1946	-0.001	0.032	-0.03
Kernel	10721	4123	0.042	0.032	1.34*
Council; homeowners versus non-homeowners					
Nearest Neighbour	10721	1954	-0.195	0.048	-4.03***
Kernel	10721	4123	-0.205	0.040	-5.17***
Participation; homeowners versus private renters only					
Nearest Neighbour	10721	1301	0.222	0.070	3.17***
Kernel	10721	1710	0.133	0.049	2.73***
Community; homeowners versus private renters only					
Nearest Neighbour	10721	1296	0.027	0.050	0.53
Kernel	10721	1710	0.093	0.034	2.70***
Council; homeowners versus private renters only					
Nearest Neighbour	10721	1300	-0.117	0.051	-2.29***
Kernel	10721	1710	-0.152	0.042	-3.57***

Notes: Bootstrapped standard errors in parentheses with 100 replications; one-tailed t statistic significant at: *** p<0.01, ** p<0.05, * p<0.1; Matched on: trust, com_imp, age, age^2, maori, asian, other, log(education), income Q2, Q3 & Q4, fulltime, unemployed, partner and the log of regional population density. ATT is the average treatment effect for the treated (i.e. for homeowners relative to the reference category).

5.2. PSM estimates

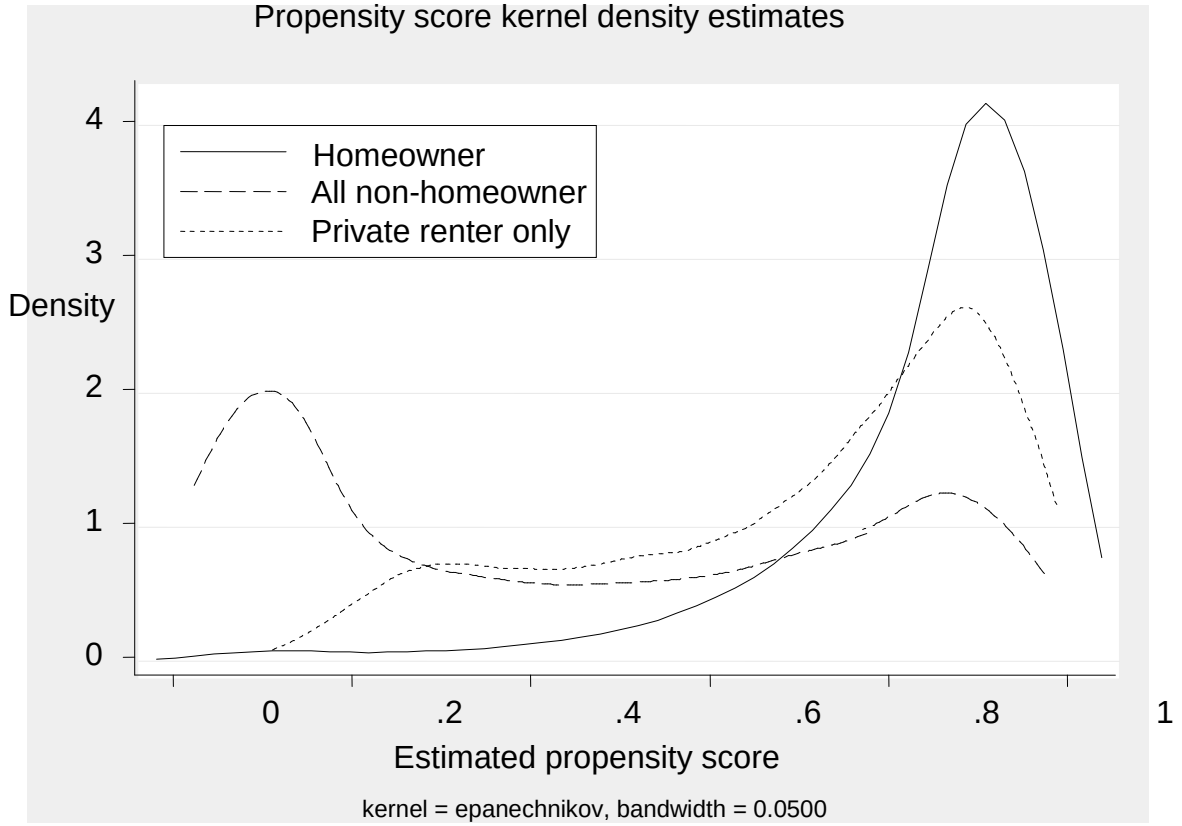
In this section we discuss the results of the PSM model of the impacts of homeownership on the three proxies for social capital (i.e. excluding trust). We estimated the PSM model using homeownership as a treatment for two separate control groups. The first compared homeowners to all non-homeowners pooled, while the second compared them to private renters only. For each approach we used both kernel and nearest neighbour matching to estimate the effects with bootstrapped standard errors obtained with 100 repetitions. The results

of each of the models for the three proxies are presented in table 3. To ensure balancing, we adopted a more parsimonious model than that used in the regression estimations. The matching model utilised the following variables: trust, belief in the importance of community, age, age^2, maori, asian, other, log(education), income from quartiles 2, 3 and 4, fulltime, unemployed, partner and the log of regional population density. Using this model we were able to balance the propensity scores for both homeowners versus non-homeowners and homeowners versus renters at the 0.01 level. Importantly, the inclusion of trust as a matching variable means that we are matching not just on standard observable characteristics of individuals but also on unobservable personal characteristics reflected in an individual's trust in others.

Figure 1 presents the kernel densities of the propensity scores for homeowners, non-homeowners and renters using the control variables specified above. The figure suggests that while there is considerable overlap in the distributions, the kernel density for homeowners has considerable density for high propensity scores, with a strongly negative skew. The distribution for non-owners has one overlapping mode in the same range (between 0.8 and 0.95) but another mode between propensity scores of 0 and 0.2 while the distribution of private renters much more closely resembles that of homeowners. This is reflected in the very different means between the groups, with the mean propensity score for homeowners being 0.83, 0.7 for renters and 0.43 for all non-homeowners combined. We therefore place more emphasis on the results that compare homeowners just with private renters than with all non-homeowners combined.

The estimates of the average treatment effect of homeownership on the treated (ATT) are reported in Table 3 for the three proxies of social capital, the two matching methods and the two comparator groups. When considering homeowners compared both to all non-homeowners and to private renters only, the effect of homeownership is positive and significant for participation. However, there is weaker evidence for homeownership impacting on the sense of community. For this social capital proxy, the treatment effect is not significant using nearest neighbour matching but is significant (at the 10% and 1% levels respectively) using kernel density matching for the two samples. Both matching methods and both samples provide clear evidence that homeowners have less positive attitudes towards local government than do other tenure groups (and significant in each case at the 1% level).

Figure 1: Kernel density estimate for homeowners, non-homeowners and private renters



The average treatment effects provide us with some understanding of the likely effect that owning a home has on participation, sense of community, and attitudes towards local government for observationally similar individuals, where similarity extends to their stated attitude towards trust in others. For participation, the interpretation is that the average number of social activities is 0.13 to 0.22 higher for homeowners than for non-owners. For the sense of community, even the statistically significant estimates show only a very small effect size. The findings for attitudes towards local government are strongly significant and negative when compared to both all non-homeowners and renters only. The effect sizes are large considering that the variable council has a normal distribution with mean zero and standard deviation 1.25.

Across the PSM results, there is therefore considerable evidence showing an impact of homeownership on at least two of the proxies for social capital. Specifically, homeownership status impacts positively on participation in community activities and negatively on attitudes towards local government performance. These results are consistent with the prior OLS results. These results are obtained after controlling for both observable and unobservable individual characteristics that are embodied in an individual's stated attitude towards trust.

6. Conclusions

By applying both regression and matching techniques to survey data collected in New Zealand, we have estimated the impacts of homeownership on four separate proxies of individual social capital, after controlling for other observable and unobservable factors.

Using regression methods, and controlling for a wide range of other individual, local and time characteristics, we find that when an individual owns the home they live in, they report significantly higher levels of social capital than those who do not own their own home. Specifically, they have higher trust in others, participate more in local activities, and have a more positive sense of community. Homeowners have a less positive attitude towards local government performance than do people in other forms of housing tenure. Even here, this outcome likely reflects a stronger involvement in the governance of their community by homeowners, where this involvement makes them less satisfied with the performance of their local representatives.

The PSM estimates of the average treatment effect of homeownership yield similar results. Homeowners participate in more social activities than non-homeowners. However, once like individuals are matched, there is weaker evidence that homeownership increases the sense of community an individual feels. Again, however, we find strong evidence that homeownership leads to a less positive attitude towards local government performance.

Both sets of results support the hypothesis that homeownership encourages personal investment in the local community. These results may have implications for policy, particularly for those areas where there are low levels of owner-occupied dwellings. In such areas, a range of social 'bads' may arise from lower levels of social capital associated with the lack of homeownership. The PSM results (on which we place most reliance) imply that increasing levels of homeownership improves participation in community activities, but may not engender a material increase in the sense of community. Thus whether or not homeownership should be encouraged depends on the outcome that is being sought. If a greater sense of community is desired, a policy favoring homeownership may have little effect. If policy-makers wish to increase participation in local activities, they may wish to consider policies that enhance homeownership. In addition, if central government wishes to raise the incentives on local residents to hold local government to account, a policy that raises homeownership levels may be an effective means of engendering extra scrutiny of local government performance.

Future work could expand on our homeownership definition to test whether single-occupier dwellings are significantly different from couple, family or communally occupied

dwellings. It could also be worthwhile to investigate the type of social capital which is formed through homeownership. This would be particularly interesting when considering the difference between bridging and bonding social capital and how that impacts new arrivals' integration into a community.

References

Angrist, J.D. and J.S. Pischke. 2009. *Mostly Harmless Econometrics: An Empiricist's Companion*. Princeton: Princeton University Press.

Arrow, K. 1999. "Observations on Social Capital," in *Social Capital: A Multifaceted Perspective*, P. Dasgupta and I Serageldin, Eds. Washington DC: the World Bank, pp. 3–5.

Becker, S.O. and A. Ichino. 2002. "Estimation of Average Treatment Effects based on Propensity Scores," *The Stata Journal*, 2:4, pp. 358–77.

Boehm, T.P. and A. M. Schlottmann. 1999. "Does Home Ownership by Parents have an Economic Impact on their Children?" *Journal of Housing Economics*, 8:3, pp. 217–32.

Borjas, G. 1985. "Assimilation, Changes in Cohort Quality, and the Earnings of Immigrants," *Journal of Labor Economics*, 3:4, pp. 463–89.

Bourdieu, P. 1986. "The Forms of Capital," in *Handbook of Theory and Research for the Sociology of Education*, J.G. Richardson, Ed. New York: Greenwood Press, pp. 241–58.

Bowlby, J. 1982. "Attachment and Loss: Retrospect and Prospect," *American Journal of Orthopsychiatry*, 52:4, pp. 664–78.

Bowles, S. and H. Gintis. 2002. "Schooling in Capitalist America Revisited," *Sociology of Education*, 75:1, pp. 1–18.

Bryson, A., R. Dorsett and S. Purdon. 2002. *The Use of Propensity Score Matching in the Evaluation of Active Labour Market Policies*. London: University of Westminster, Policy Studies Institute and National Centre for Social Research.

Clark, J. and B. Kim. 2009. "The Effect of Neighbourhood Diversity on Volunteering: Evidence from New Zealand". *Working Paper 09/2009*, University of Canterbury Department of Economics and Finance, Christchurch.

Cobb-Clark, D.A. and V. A. Hildebrand. 2006. "The Wealth and Asset Holdings of US-born and Foreign-born Households: Evidence from SIPP Data," *Review of Income and Wealth*, 52:1, pp. 17–42.

Coleman, J. 1988. "Social Capital in the Creation of Human Capital," *The American Journal of Sociology*, 94, pp. 95–120.

Coleman, J. 1990. *Foundations of Social Theory*. Cambridge MA: Harvard University Press.

Dehejia, R.H. and S. Wahba. 2002. "Propensity Score-Matching Methods for Non-Experimental Causal Studies," *The Review of Economics and Statistics*, 84:1, pp. 151–61.

DiPasquale, D. and E. Glaeser. 1999. "Incentives and Social Capital: Are Homeowners Better Citizens?" *Journal of Urban Economics*, 45:2, pp. 354–84.

Earls, R.J., S.W. Sampson S.W. and F.E. Raudenbush. 1997. "Neighborhoods and Violent Crime: A Multilevel Study of Collective Efficacy," *Science*, 277:5328, pp. 918–24.

Glaeser, E.L., D. Laibson, D. and B. Sacerdote. 2002. "An Economic Approach to Social Capital," *The Economic Journal*, 112, F437–58

Glaeser, E.L. 2001. "The Formation of Social Capital," in *The Contribution of Human and Social Capital to Sustained Economic Growth and Well-being: International Symposium Report*, J. F. Helliwell, Ed. Quebec: Human Resource Development Centre, pp. 381–393.

Greenstone, M. and T. Gayer. 2009. "Quasi-Experimental and Experimental Approaches to Environmental Economics," *Journal of Environmental Economics and Management*, 57:1, pp. 21–44.

Haurin, D. R., T.L. Parcel and R.J. Haurin. 2002. "Does Home Ownership Affect Child Outcomes?" *Real Estate Economics*, 30:4, pp. 635–66.

Helliwell, J.F. and R.D. Putnam. 2007. "Education and Social Capital," *Eastern Economic Journal*, 33:1, pp. 1–19.

Huang, J., H.M. van den Brink and W. Groot. 2009. "A Meta-Analysis of the Effect of Education on Social Capital," *Economics of Education Review*, 28:4, pp. 454–64

Imbens, G.W. 2000. "The Role of the Propensity Score in Estimating Dose-Response Functions," *Biometrika*, 87:3, pp. 706–10

Mohantly, L.L. and L.K. Raut. 2009. "Home Ownership and School Outcomes for Children," *American Journal of Economics and Sociology*, 68:2, pp. 465–89.

Murphy, L. 2003. "Reasserting the 'Social' in Social Rented Housing: Politics, Housing Policy and Housing Reforms in New Zealand," *International Journal of Urban and Regional Research*, 27:1, pp. 90–101.

Oswald, A. 1996. "A Conjecture on the Explanation for High Unemployment in the Industrialized Nations: Part I," *University of Warwick Economic Research Paper No. 475*, University of Warwick Department of Economics, Coventry UK.

Oswald, A. 1997a "Theory of Homes and Jobs," mimeo, Coventry UK: University of Warwick.

Oswald, A. 1997b. "Thoughts on NAIRU," *Journal of Economic Perspectives*, 11:1, pp. 227–28.

Oswald, A. 1999. "The Housing Market and Europe's Unemployment: A Non-Technical Paper," mimeo, Coventry UK: University of Warwick.

Putnam, R.D. 1993. *Making Democracy Work: Civic Traditions in Modern Italy*, Princeton NJ: Princeton University Press.

Putnam, R.D. 1995. "Bowling Alone: America's Declining Social Capital," *The Journal of Democracy,* 6:1, pp. 65–78.

Putnam, R.D. 2000. *Bowling Alone: The Collapse and Revival of America's Community.* New York: Simon & Schuster.

Rosenbaum P.R. and D.B. Rubin. 1983. "The Central Role of Propensity Score in Observational Studies of Cause and Effect," *Biometrika,* 70:1, pp. 41–55.

Roskruge, M., A. Grimes, P. McCann and J. Poot. 2011. "Social Capital and Regional Social Infrastructure Investment: Evidence from New Zealand," *International Regional Science Review:* forthcoming

Sampson, R.J., S.W. Raudenbush and F. Earls. 1997. "Neighborhoods and Violent Crime: A Multilevel Study of Collective Efficacy," *Science*, 277:5328, pp. 918–24.

Schrader, B. 2005. *We Call It Home*, Auckland: Reed Books.

Sinning, M. 2010. "Homeownership and Economic Performance of Immigrants in Germany," *Urban Studies*, 47:2, pp. 387–409.

Solow, R. 1997. "Tell Me Again What We Are Talking About?" *Stern Business Magazine* 4:1.

Solow, R. 1999. "Notes on Social Capital and Economic Performance," in *Social Capital: A Multifaceted Perspective*, P. Dasgupta and I. Serageldin, Eds. Washington DC: the World Bank, pp. 6–10.

Spellerberg, A. 2001. *Framework for the Measurement of Social Capital in New Zealand.* Wellington: Statistics New Zealand.

Van Emmerick, I.J.H. 2006. "Gender Differences in the Creation of Different Types of Social Capital: A Multilevel Study," *Social Networks*, 28, pp. 24–37

Westlund, H. 2006. *Social Capital in the Knowledge Economy*, Heidelberg: Springer.

Williams, T. and D. Robinson. 2001. "Social Capital Based Partnerships, a Maori Perspective from a comparative approach," in *Building Social Capital*, D. Robinson, Ed., 2002. Wellington: Institute of Policy Studies, pp. 14–30.

Zak, P.J. and S. Knack. 2001. "Trust and Growth," *The Economic Journal*, 111 pp. 295–321.

Appendix 1: Definitions for Variables

	Variable	Description
Attitudinal variables	participation†	Index of activities individuals are an active participant in
	community†	Reported sense of community
	council†	Index of attitudes towards council
	trust†	0= "cannot be too careful" 1= "most people can be trusted"
	com_imp	Reported belief in the importance of community
Demographics	euro*	Identified as ethnic European
	maori	Identified as ethnic Maori
	pacific	Identified as ethnic Pacific Islander
	asian	Identified as ethnic Asian
	other	Identified as belonging to another ethnic group
	foreign	Not born in New Zealand
	male	0= female, 1=male
	age	Age in years
	hhsize	Size of household, truncated at 6.
	children	Child under 15 currently living in same residence
	partner	Partner currently living in same residence
Home ownership	ho_owner*	Owner of household
	ho_fam	Living in home owned by family
	ho_renter	Living in privately rented accommodation
	ho_state	Living in a state owned home
Human capital	education	Years of formal schooling
	income q1-q4	Quartile of New Zealand income distribution
	fulltime*	1= currently in full time employment
	part-time	1= currently in part time employment
	unemployed	1= currently not in labour force
	retired	1= currently retired
Geographic	reg0_10	Number of years living in region, up to 10
	reg10+	0= less than 10yrs, 1= 10yrs+
	popdens	Population per km^2 in territory individual resides in
	Regional dummies	51 dummies created from 72 New Zealand territorial authorities.

*Indicates baseline variables, † indicates dependent variables.

Appendix 2: Unstandardized Coefficients from Regression Models Predicting Outcomes of Proxies for Social Capital

	(1)	(2a)	(2b)	(3a)	(3b)	(4a)	(4b)
VARIABLES	trust_net	participation†	participation††	Community	Community	Council	Council
trust			0.287***		0.315***		0.260***
			(0.029)		(0.038)		(0.024)
com_imp	0.316***	0.448***	0.432***	2.354***	2.340***	0.291***	0.275***
	(0.044)	(0.027)	(0.027)	(0.039)	(0.039)	(0.022)	(0.022)
male	0.073*	-0.128***	-0.131***	-0.050	-0.053	0.037*	0.035
	(0.043)	(0.026)	(0.026)	(0.033)	(0.033)	(0.022)	(0.022)
age	0.014	-0.023***	-0.026***	0.029***	0.027***	-0.015***	-0.017***
	(0.009)	(0.006)	(0.006)	(0.007)	(0.007)	(0.005)	(0.005)
age^2x100	-0.008	0.023***	0.025***	-0.014*	-0.013*	0.020***	0.022***
	(0.010)	(0.006)	(0.006)	(0.008)	(0.008)	(0.005)	(0.005)
foreign	-0.070	-0.118***	-0.114***	0.048	0.049	0.004	0.005
	(0.057)	(0.034)	(0.034)	(0.044)	(0.044)	(0.028)	(0.028)
maori	-0.002	0.294***	0.298***	0.333***	0.336***	0.019	0.017
	(0.063)	(0.038)	(0.038)	(0.049)	(0.049)	(0.032)	(0.032)
pacific	-0.179**	0.448***	0.461***	0.278***	0.303***	0.236***	0.245***
	(0.091)	(0.058)	(0.058)	(0.076)	(0.076)	(0.048)	(0.048)
asian	-0.420***	-0.178***	-0.164***	0.179***	0.200***	0.245***	0.263***
	(0.083)	(0.052)	(0.052)	(0.067)	(0.067)	(0.044)	(0.043)

other	0.037	0.036	0.035	0.137*	0.137*	0.061	0.059
	(0.105)	(0.063)	(0.062)	(0.080)	(0.080)	(0.052)	(0.052)
ln(education)	1.474***	1.608***	1.555***	-0.203**	-0.254***	0.351***	0.293***
	(0.128)	(0.074)	(0.075)	(0.095)	(0.096)	(0.062)	(0.062)
income q2	-0.043	-0.025	-0.026	0.039	0.041	0.044	0.045
	(0.067)	(0.041)	(0.041)	(0.052)	(0.053)	(0.034)	(0.034)
income q3	-0.025	-0.005	-0.005	0.078	0.073	0.032	0.030
	(0.078)	(0.047)	(0.047)	(0.060)	(0.060)	(0.039)	(0.039)
income q4	0.068	0.059	0.050	0.059	0.054	0.081*	0.080*
	(0.085)	(0.051)	(0.051)	(0.065)	(0.065)	(0.042)	(0.042)
Part-time	0.249***	0.216***	0.203***	0.219***	0.208***	0.033	0.025
	(0.063)	(0.037)	(0.037)	(0.047)	(0.048)	(0.031)	(0.031)
unemployed	0.163**	-0.018	-0.034	0.211***	0.202***	0.045	0.040
	(0.071)	(0.043)	(0.043)	(0.055)	(0.056)	(0.036)	(0.036)
retired	0.060	-0.010	-0.012	0.293***	0.297***	-0.042	-0.051
	(0.115)	(0.067)	(0.067)	(0.086)	(0.086)	(0.056)	(0.056)
ho_fam	-0.058	-0.009	-0.007	-0.017	-0.019	0.156***	0.155***
	(0.083)	(0.051)	(0.051)	(0.066)	(0.066)	(0.043)	(0.043)
ho_renter	-0.157**	-0.107**	-0.103**	-0.115**	-0.108**	0.121***	0.129***
	(0.067)	(0.042)	(0.042)	(0.053)	(0.054)	(0.034)	(0.034)
ho_state	-0.289***	-0.240***	-0.216***	0.034	0.038	0.385***	0.409***
	(0.106)	(0.068)	(0.068)	(0.087)	(0.088)	(0.056)	(0.057)

hhsize	0.055***	0.096***	0.090***	0.069***	0.066***	0.032***	0.030***
	(0.019)	(0.011)	(0.011)	(0.015)	(0.015)	(0.009)	(0.009)
children	-0.072	-0.062**	-0.051*	-0.024	-0.017	-0.055**	-0.053**
	(0.050)	(0.030)	(0.030)	(0.039)	(0.039)	(0.025)	(0.025)
partner	0.133**	0.033	0.025	0.080*	0.075*	-0.044	-0.053*
	(0.056)	(0.034)	(0.034)	(0.044)	(0.044)	(0.028)	(0.028)
reg0_10	-0.025*	0.010	0.012	0.046***	0.047***	-0.017**	-0.015**
	(0.015)	(0.009)	(0.009)	(0.011)	(0.011)	(0.007)	(0.007)
reg10+	-0.146*	0.188***	0.202***	0.342***	0.361***	-0.149***	-0.143***
	(0.088)	(0.053)	(0.053)	(0.068)	(0.068)	(0.044)	(0.044)
constant	-3.517***	-1.699***	-1.689***	-1.032***	-0.980***	-1.331***	-1.313***
	(0.417)	(0.247)	(0.247)	(0.319)	(0.321)	(0.204)	(0.204)
Observations	14,860	14,980	14,860	14,911	14,799	14,841	14,935
Pseudo R-squared	0.0349	0.0304	0.0324	0.130	0.132	0.075	0.067
Log likelihood	-7663	-26593	-26307	-18114	-17939	-23803	-24015
Chi squared	553.7	1667	1760	5415	5445	N/A	N/A

Notes: Time period and spatial fixed effects included; standard errors in parentheses; Significant at: *** p<0.01, ** p<0.05, * p<0.1; Sigma is †1.460*** and ††1.453*** and is equivalent to the standard error of estimate in OLS regression; # Standard R-squared. Cut points for ordered logit 3a: -1.03, 0.92, 2.79, 4.99. 3b: -0.98, 0.98, 2.86, 5.06.

Recent Motu Working Papers

All papers in the Motu Working Paper Series are available on our website www.motu.org.nz, or by contacting us on info@motu.org.nz or +64 4 939 4250.

11-02 Roskruge, Matthew, Arthur Grimes, Philip McCann and Jacques Poot. “Homeownership and Social Capital in New Zealand”.

11-01 Fabling, Richard. 2011. “Keeping It Together: Tracking Firms on New Zealand’s Longitudinal Business Database”.

10-14 Stroombergen, Adolf. 2010 “The International Effects of Climate Change on Agricultural Commodity Prices, and the Wider Effects on New Zealand”.

10-13 Olssen, Alex; Hugh McDonald, Arthur Grimes, and Steven Stillman. 2010. “A State Housing Database: 1993–2009”.

10-12 Cochrane, William; Arthur Grimes; Phillip McCann and Jacques Poot. 2010. “The Spatial Impact of Local Infrastructural Investment in New Zealand”.

10-11 Grimes, Arthur and Chris Young. 2010. “Anticipatory Effects of Rail Upgrades: Auckland’s Western Line”.

10-10 Grimes, Arthur and Chris Young. 2010. “A Simple Repeat Sales House Price Index: Comparative Properties Under Alternative Data Generation Processes”.

10-09 Evans, Lewis; Greame Guthrie and Andrea Lu. 2010. "A New Zealand Electricity Market Model: Assessment of the Effect of Climate Change on Electricity Production and Consumption".

10-08 Coleman, Andrew and Hugh McDonald. 2010. "“No country for old men”: a note on the trans-Tasman income divide".

10-07 Grimes, Arthur; Mark Holmes and Nicholas Tarrant. 2010. "New Zealand Housing Markets: Just a Bit-Player in the A-League?"

10-06 Le, Trinh; John Gibson and Steven Stillman. 2010. "Household Wealth and Saving in New Zealand: Evidence from the Longitudinal Survey of Family, Income and Employment".

10-05 Grimes, Arthur. 2010. "The Economics of Infrastructure Investment: Beyond Simple Cost Benefit Analysis".

10-04 van Benthem, Arthur and Suzi Kerr. 2010. “Optimizing Voluntary Deforestation Policy in the Face of Adverse Selection and Costly Transfers”.

10-03 Roskruge, Matthew; Arthur Grimes; Philip McCann and Jacques Poot. 2010. "Social Capital and Regional Social Infrastructure Investment: Evidence from New Zealand”.

10-02 Coleman, Andrew. 2010. "Uncovering uncovered interest parity during the classical gold standard era, 1888-1905".

10-01 Coleman, Andrew. 2010. "Squeezed in and squeezed out: the effects of population ageing on the demand for housing".

09-17 Todd, Maribeth and Suzi Kerr. 2009. "How Does Changing Land Cover and Land Use in New Zealand relate to Land Use Capability and Slope?"

09-16 Kerr, Suzi and Wei Zhang. 2009. "Allocation of New Zealand Units within Agriculture in the New Zealand Emissions Trading System”.

09-15 Grimes, Arthur; Cleo Ren and Philip Stevens. 2009. "The Need for Speed: Impacts of Internet Connectivity on Firm Productivity”.

09-14 Coleman, Andrew and Arthur Grimes. 2009. "Fiscal, Distributional and Efficiency Impacts of Land and Property Taxes”.

09-13 Coleman, Andrew. 2009. "The Long Term Effects of Capital Gains Taxes in New Zealand”.