Measuring the Benefits of Homeowning: Effects on Children

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In this paper we examine whether homeowning benefits children by testing whether children of homeowners stay in school longer than children of renters and whether daughters of homeowners are less likely to have children as teenagers than daughters of renters. We use both probit models and a bivariate probit technique which takes account of possible selection bias due to differences between parents who choose to own versus rent. We find in several data sets that both effects are statistically significant and quantitatively important—particularly for low-income households. We also estimate that the dollar benefit per low-income household of parents being homeowners rather than renters is at least $31,000.   © 1997 Academic Press

At least as far back as the 1920s, it has been an article of faith among policymakers that homeowning is desirable and should be encouraged. These quotations are illustrative: Herbert Hoover: "A family that owns its own home takes pride in it and has a more wholesome, healthful, and happy atmosphere in which to bring up children"; Franklin D. Roosevelt: "A nation of homeowners is unconquerable"; and Lyndon B. Johnson: "Owning a home can increase responsibility and stake out a man's place in his community." More recent policymakers continue to believe in the value of homeowning, although they are less specific about its benefits: former H.U.D. Secretary Jack Kemp: "Democracy can't work without the compo-

nent that goes to the heart of what freedom is all about—the chance to own a piece of property"; and the Clinton/Gore compaign: "Homeowner-ship and decent housing are an essential part of the American Dream."[1] Policymakers have consistently been willing to back up these sentiments with public funds: the Office of Management and Budget calculates that allowing owners to deduct property taxes and mortgage interest payments from taxable income cost the Federal government $55 billion in foregone tax revenues in 1993 and allowing homeowners who are over 55 to exclude $125,000 in capital gains on housing from tax cost an additional $4.4 billion.[2]

These statements in effect are claiming that homeowning is a means to a set of policy ends. Homeowning should be encouraged because owners take greater responsibility for their families, their communities, and their country and provide a better environment for their children. Our goal is to test this view by examining whether children of homeowners behave in socially more desirable ways than children of renters. In particular we test whether, controlling for other factors, children of homeowners stay in school longer than children of renters and are less likely to have children themselves as teenagers. We use both simple probit models and a bivariate probit technique which takes account of selection bias due to differences between parents who choose to own versus rent.

The paper is organized as follows. Section 1 discusses theoretical consid-erations and prior research. In Section 2, we investigate probit models of whether parents' tenure status affects their children's success, using three different data sets. We find that homeowning by parents has a significant effect on children's success in all three. In Section 3, we investigate a bivariate probit model of the stay-in-school decision that attempts to sort out the effects of homeowning per se from the effects of differences between parents who choose to own versus rent. In Section 4 we use the results to calculate a dollar figure for the benefit to children of homeown-ing by parents.

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[1]Quotations are taken from Stegman *et al*. [19], except for that from the Clinton/ Gore campaign, which comes from "Clinton/ Gore on Affordable Housing for All Americans" (campaign statement).

[2]See Office of Management and Budget [16], Table 24-1, Part Two, p. 26. An alternate means of measuring the cost of favorable tax treatment of owner-occupied housing would be to examine the reduction in Federal tax revenue that results from excluding imputed rent on owner-occupied housing from taxable income. However, the O.M.B. does not include this in its computations of tax expenditures. Note that in some years rental housing has also been treated favorably by the U.S. tax code; but its tax treatment has changed frequently in recent years. See Gordon *et al*. [7].

1. THEORETICAL CONSIDERATIONS AND PRIOR RESEARCH

How might parents' decisions to own versus rent affect their children's behavior? One possibility is that when people own their own homes, they invest in do-it-yourself skills by learning to do some maintenance jobs themselves and they also learn financial skills since they must meet the cost of unexpected home repairs. Homeowners also may learn interpersonal skills by hiring professionals such as plumbers and roofers or by pestering City Hall to provide better services. The learning-by-doing model suggests that the cumulative experience of maintaining a house may cause homeowners to become better managers. Further, these skills may be transferable, so that as homeowners learn to better manage their home environments, they may also take better care of their children. In contrast, renters are rarely forced to manage their home environments, so they are less likely to acquire these transferable skills.[3]

Another difference between homeowners and renters is that homeowners have a larger financial stake in their neighborhoods, because most of their wealth is tied up in their residences. Bad behavior by children—their own or their neighbors'—may reduce the attractiveness of the neighborhood and threaten the value of their homes. Thus homeowners have a stronger incentive than renters to monitor their own children and their neighbors' children and prevent them from engaging in behavior which would threaten housing values. This provides an alternate mechanism through which homeowning may cause better outcomes for children. In addition, homeowners have higher moving costs and tend to remain in the same neighborhoods longer than renters. This makes them better at monitoring and influencing the behavior of children in the neighborhood. The extra monitoring by adults in neighborhoods dominated by owners is hypothesized to benefit children.

A contrary view is that children of homeowners do better than children of renters not because their parents are homeowners, but because their parents are different. In this view, some parents are more likely both to buy homes and to bring up successful children, while other parents are more likely both to rent and to bring up less successful children. If this view is correct, then homeowning could appear to be a significant determinant of children's success because it captures the unmeasured effect of parents' personality type rather than because it is important per se. We consider this possibility in Section 3 below.

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[3]In the learning by doing literature, greater cumulative experience with the production process reduces production costs and the benefits may accrue either internally to the firm itself based on its own past production level or externally to other firms based on all firms' past production levels. See Fudenberg and Tirole [6].

Most economists probably disagree with the notion that homeowning can affect behavior: they tend to view whether a household owns or rents to be merely a financial decision with tax consequences. Research by economists on owner-occupied housing has instead focused on the fact that Federal tax treatment of homeowning reduces the per unit price of housing and gives households an incentive to increase their housing consumption. Economists have argued that U.S. households consume too much housing, thereby reducing funds for more productive investments in plant and equipment.[4] They have also examined the distributional impact of the tax treatment of owner-occupied housing and concluded that the benefits go disproportionately to upper-income households.[5]

There is also literature in both sociology and economics on the determinants of children's success. Examples include Duncan and Hoffman's [4] study of whether black teenage girls have out-of-wedlock children, An *et al.*'s [2] study of whether teenage girls have out-of-wedlock children and go on welfare, Kane's [13] study of whether blacks graduate from high school and enter college, Parcel and Menagham's [17] study of the effect of parents' jobs on young children's cognitive development, and Case and Katz' [3] study of neighborhood influences on a variety of young behaviors. For a review of this literature, see Haveman and Wolfe [10]. With the exception of the study by Kane, none of these papers considers the possibility that homeowning by parents might be a determinant of children's success.

2. PROBIT MODELS AND RESULTS

We start by estimating probit models which explain whether youths behave in socially desirable ways as a function of whether their families live in owner-occupied housing and other variables. We focus on 17- or 18-year-old youths because they have been exposed to the maximum amount of parental influence. But since they are still likely to be living with their parents, we can determine whether their parents are owners or renters. We examine whether youths are still in school and whether daughters have had a child themselves. Three different data sets are examined: the Panel Study of Income Dynamics (PSID), the Public Use Microsample of the 1980 Census of Population and Housing (PUMS), and High School and Beyond (HSB).

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[4]Alm *et al.* [1] estimated that the benefit–cost ratio for programs to stimulate housing demand was around 0.6. Also see Hendershott and Shilling [11], Rosen [18], and Mills [15].

[5]See Rosen [18] and Follain *et al.* [5].

PSID Results

The PSID data set consists of children of PSID households who were 17 years old in any of the years 1980–1987. The dependent variable equals one if youths are still in school or have already graduated from high school and equals zero if they have dropped out of school. The explanatory variables are whether the youth's household lives in owner-occupied housing, the race of the household head (black equals one), family size, family income (in thousands of 1982 dollars), a dummy variable for whether the household head was less than 18 years old when the child was born, three dummy variables measuring the household head's educations level: whether the head graduated from high school, attended college, or graduated from college (the omitted category is non-high school graduate), whether the household head is female, whether the household head is divorced, and whether the household head worked in the past year.[6]

Table 1, column 1, gives the results.[7] (Standard errors are given in parentheses in all the tables.) The homeowning variable is positive and significantly different from zero, with a *t* statistic of 3.25. It thus provides support for policymakers' contention that homeowning matters. Of the other variables, race, family income, whether the head was young when the child was born, and whether the head worked the past year are also statistically significant. Since a likelihood ratio test rejects the null hypothesis that the samples of homeowners and renters come from the same population, we also run the same probit model separately on the subsamples of youths whose parents own versus rent. The results are given in columns 2 and 3 of Table 1. The top portion of Table 2 gives the predicted probabilities of 17 year olds being in school at different family income levels, where all variables other than family income are set equal to their overall mean values. Model 1 gives the predictions from the probit regression reported in Table 1, column 1, and model 2 gives the predictions from the probit regressions reported in Table 1, columns 2 and 3. In model 1, when family income is $10,000 in 1980 dollars (equivalent to $18,000 in 1994 dollars), children of owner-occupiers have a predicted probability of being in school of 0.91, compared to 0.82 for renters—a 9 percentage point differential. The differential falls as family income rises, and is 3 percentage points at the average income level. In model 2, when family

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[6] We also tried including a set of variables which measures whether the relevant state requires that children remain in school until age 17, age 18, or some other age. These were not found to be statistically significant and are not reported.

[7] Variable means and standard deviations are given in the last column of Table 1 and similar tables discussed below. Dollar values in all the tables are in 1980 dollars.

TABLE 1

Results of Probit Regressions Explaining the Stay in School Decision (PSID)

	Full sample (1)	Homeowners (2)	Renters (3)	Means (full sample) (4)
Homeowner	0.26	—	—	0.63
	(0.08)			(0.48)
Black	0.32	0.40	0.27	0.49
	(0.08)	(0.12)	(0.11)	(0.50)
Young parent	−1.16	−1.24	−1.03	0.54
	(0.11)	(0.18)	(0.14)	(0.50)
Family income	0.007	0.005	0.07	27.1
	(0.003)	(0.003)	(0.007)	(24.3)
Parent HS graduate	0.004	0.02	−0.02	0.29
	(0.11)	(0.16)	(0.16)	(0.45)
Parent attended college	0.28	−0.001	0.65	0.15
	(0.23)	(0.28)	(0.37)	(0.36)
Parent college graduate	0.12	−0.39	0.11	0.11
	(0.11)	(0.15)	(0.16)	(0.31)
Female head	0.05	0.07	−0.5	0.29
	(0.09)	(0.15)	(0.13)	(0.45)
Divorced parent	0.04	−0.23	0.20	0.12
	(0.11)	(0.19)	(0.15)	(0.32)
Family size	−0.02	−0.06	0.002	4.61
	(0.02)	(0.03)	(0.03)	(1.76)
Parent worked in last year	0.19	3.9	0.03	0.70
	(0.09)	(0.13)	(0.12)	(0.43)
Intercept	0.84	1.24	0.65	—
	(0.17)	(0.18)	(0.20)	
N	2237	1430	807	
Pseudo R^2	0.177	0.186	0.139	—
Dependent variable mean	—	—	—	0.89
				(0.31)

income is \$10,000, children of owners also have a 9 percentage point higher probability of being in school than children of renters. The differential falls as family income rises and is 4 percentage points at the average income level and 2 percentage points at an income level of \$40,000. Overall, evidence from the PSID suggests that homeowning has an important effect on the probability of children staying in school until age 17 and that the effect is strongest for children of low-income households.[8]

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[8] We also ran the same models using the weights which allow the PSID to be interpreted as representative of the U.S. population. The homeowning variable was still statistically significant and the coefficients remained approximately the same.

TABLE 2
Predicted Probabilities of Children of Owners versus Renters Staying
in School

	Model 1			Model 2		
	Children of owners	Children of renters	Difference	Children of owners	Children of renters	Difference
PSID						
Income						
$10,000	0.91	0.82	0.09	0.91	0.82	0.09
$20,000	0.92	0.86	0.06	0.92	0.86	0.06
$30,000	0.93	0.89	0.04	0.92	0.89	0.03
$40,000	0.93	0.92	0.01	0.93	0.92	0.02
Average	0.92	0.89	0.03	0.92	0.89	0.04
PUMS						
Income						
$10,000	0.90	0.83	0.07	0.89	0.87	0.02
$20,000	0.92	0.85	0.07	0.91	0.88	0.03
$30,000	0.93	0.87	0.06	0.92	0.89	0.03
$40,000	0.94	0.89	0.05	0.94	0.89	0.05
Average	0.92	0.87	0.06	0.92	0.89	0.03
Income of $10,000 and 4 years of tenure				0.88	0.81	0.07
HSB						
Income						
Average	0.99	0.98	0.01	0.99	0.98	0.01
Missing	0.87	0.80	0.07	0.92	0.65	0.27

PUMS Results

The next data set is the 1980 PUMS, which is a one-in-one-thousand sample of households from the 1980 U.S. Census of Population and Housing. We include all households that contained a 17 year old in 1980. The dependent variable is the same as in the PSID. The independent variables are similar to those in the PSID, except that we also include a length of tenure variable and a variable measuring housing quality. The length of tenure variable equals the number of years the household has lived in its present housing unit. Having a direct measure of tenure length is valuable since homeowners generally move less frequently than renters. Without a direct measure of tenure length, the homeowning variable could be acting as a proxy for longer tenure and the more stable home environment that longer tenure implies. The housing quality variable, which we interpret as a proxy for neighborhood quality, equals rent per year if the

housing unit is rented and equals the user cost of housing per year if the unit is owner-occupied.[9]

The results of the probit regression are given in Table 3, column 1. Again the homeowning variable is positive and significant, with a t statistic of 4.0. Both the housing quality and the length of tenure variables have the predicted positive signs and are statistically significant. We again ran the same probit model on separate subsamples of owner versus renter households and the results are shown in columns 2 and 3 of Table 3. The coefficient of length of tenure is much larger for renters than for homeowners.

Table 2 shows the predicted probabilities of youths staying in school at different family income levels, using both the combined probit regression (model 1) and the separate probit regressions (model 2). Examining model 1, when family income is $10,000 in 1980 dollars, children of homeowners have a 0.90 probability of being in school, compared to 0.83 for children of renters—a 7 percentage point differential. The differential falls slowly to 5 percentage points at an income level of $40,000. In model 2, the differential is smaller, 2 percentage points when family income is $10,000, and it gets larger rather than smaller as income rises.

The length of tenure and the homeowning variables interact with each other, so that longer tenure mitigates the adverse effect of renting on the probability that youths stay in school and homeowning mitigates the adverse effect of short tenure on the probability of staying in school. But on average renters in the PUMS sample have much shorter tenure than owners: 4 years versus 11. Since the average tenure over the entire sample is 9.8 years, this means that the predicted values given in Table 2 reflect tenure typical of owners rather than renters. If we rerun the model 2 predictions for low-income households assuming that all households have 4 years of tenure, we find that the predicted probabilities of staying in school are 0.88 for children of homeowners and 0.81 for children of renters, or a differential of 7 percentage points.

Thus evidence from the PUMS also suggests that homeowning matters.

HSB Results

The HSB data come from a follow-up survey in 1982 of the original 1980 cohort of high school sophomores. The sample is entirely composed of 18 year olds. The dependent variable is the same as in prior regressions. The independent variables are similar to those in prior regressions, but some of the previously used household characteristics are not available. Household income is represented as a series of dummy variables for different income ranges, with the omitted category being income less than $8,000 per year.

[9]The calculation of user cost follows the method described in Green and Hendershott [8].

TABLE 3
Results of Probit Regressions Explaining the Stay in School Decision
(PUMS (1980))

.	Full sample (1)	Homeowners (2)	Renters (3)	Means (full sample) (4)
Homeowner	0.32	—	—	0.79
	(0.08)			(0.42)
Black	0.62	0.58	0.60	0.14
	(0.10)	(0.15)	(0.14)	(0.35)
Young parent	−0.76	−0.27	−0.76	0.09
	(0.10)	(0.23)	(0.13)	(0.29)
Female child	0.14	0.26	−0.001	0.49
	(0.07)	(0.09)	(0.10)	(0.50)
Family income	0.01	0.01	0.006	26.4
	(0.003)	(0.003)	(0.005)	(16.6)
Parent HS graduate	0.42	0.35	0.57	0.35
	(0.08)	(0.10)	(0.13)	(0.48)
Parent attended college	0.38	0.30	0.55	0.17
	(0.10)	(0.13)	(0.18)	(0.38)
Parent college graduate	0.79	0.68	1.09	0.16
	(0.15)	(0.17)	(0.37)	(0.38)
Female head	−0.10	−0.41	0.16	0.20
	(0.12)	(0.19)	(0.15)	(0.41)
Single parent	−0.14	−0.11	−0.13	−0.22
	(0.12)	(0.19)	(0.16)	(0.41)
Family size	−0.06	−0.10	−0.02	−4.72
	(0.02)	(0.03)	(0.03)	(1.66)
Housing quality	0.0008	0.0008	0.0001	3986
	(0.00002)	(0.00002)	(0.00004)	(2231)
Length of tenure	0.02	0.01	0.04	9.86
	(0.005)	(0.005)	(.01)	(16.9)
Intercept	0.24	0.81	−0.12	—
	(0.15)	(0.20)	(0.24)	—
N	3249	2465	784	
Pseudo R^2	0.253	0.137	0.287	—
Dependent variable mean	—	—	—	0.83
				(0.38)

Because other characteristics suggest that households for whom income is not reported are predominantly low income, we include a dummy variable which equals one if income is missing. We also include dummy variables for the youth being handicapped and for the language spoken in the home being predominantly English. As proxies for the quality of the neighborhood, we include a dummy variable which equals one if the youth attends an academic high school, where the omitted category is any other high

school type, and two dummy variables which measure whether the high school is rural or suburban, where the omitted location category is urban.

The results are shown in Table 4, column 1. Once again, the homeowners' variable is positive and statistically significant, with a t statistic of 6.0. Note that the income missing variable is negative and statistically significant. Of the proxy variables for neighborhood quality, academic high school is positive and statistically significant, but the rural and suburban variables are insignificant. We also ran the same probit model separately for children of owners versus renters and the results are shown in columns 2 and 3 of Table 4. Again a likelihood ratio test rejects the null hypothesis that the two samples are drawn from the same population.[10]

Table 2 shows the predicted probabilities of youths staying in school, evaluated at the average family income level and evaluated separately for households whose income is not reported. In both models, children of owners have a probability of 0.99 of being in school and children of renters have a probability of 0.98 of being in school when family income equals the average level. An artifact of the HSB data is that virtually all respondents who answered the question about family income also graduated from high school. Therefore the probability of youths staying in school does not vary with income. The results suggest that the effect of homeowning on children's stay-in-school decision is small. However, we also evaluated the predicted probabilities of youths staying in school for households whose income is missing since, as noted above, these households appear to have low income. In model 1, the predicted probability of children of owners staying in school is 0.87 if family income is missing, compared to 0.80 for children of renters—a differential of 7 percentage points. In model 2, the differential increases to 27 percentage points.

We also use the HSB data set to investigate whether homeowning by parents affects the probability of their daughters having a child or children by age 18. For daughters to have a child during high school is assumed to be undesirable since it reduces the probability that the daughters will finish high school and increases the likelihood that they will be poor and unable to provide a stable environment for the children. The independent variables are the same as in the previous equation. The results, shown in Table 4, column 4, show that daughters of homeowners are significantly less likely than daughters of renters to have a child by age 18—the t

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[10] Note that the dummy variables for being black have positive coefficients in all three data sets used here. In their review of the literature on determinants of high school graduation and years of schooling, Haveman and Wolfe [10] note that five studies found positive effects of being black or nonwhite and two studies found negative effects.

TABLE 4

Results of Probit Regressions Explaining the Stay in School Decision and
Whether Daughters Have Children (HSB)

	Stay in school			Have children	
	Full sample (1)	Homeowners (2)	Renters (3)	Daughters (4)	Means (Full sample)
Homeowner	0.30	—	—	−0.12	0.81
	(0.05)			(0.05)	(0.39)
Black	0.22	0.23	0.17	0.34	0.13
	(0.07)	(0.09)	(0.10)	(0.06)	(0.34)
Female child	0.08	0.12	−0.01	—	0.56
	(0.04)	(0.05)	(0.08)		(0.49)
Income, $8,000−15,000	0.06	−0.08	0.39	−0.06	0.12
	(0.11)	(0.13)	(0.18)	(0.09)	(0.32)
Income, $15,000−20,000	0.23	0.30	0.18	0.01	0.10
	(0.12)	(0.17)	(0.19)	(0.19)	(0.30)
Income $20,000−25,000	0.02	0.07	−0.02	0.02	0.11
	(0.11)	(0.15)	(0.19)	(0.10)	(0.31)
Income, $25,000−30,000	0.08	0.10	0.04	0.02	0.11
	(0.12)	(0.15)	(0.22)	(0.10)	(0.31)
Income, $30,000−40,000	0.13	0.17	0.03	−0.10	0.13
	(0.12)	(0.15)	(0.24)	(0.10)	(0.34)
Income > $40,000	0.20	0.10	0.51	−0.15	0.07
	(0.17)	(0.18)	(15951)	(0.13)	(0.26)
Income missing	−1.51	−1.53	−1.44	0.84	0.21
	(0.08)	(0.10)	(0.12)	(0.07)	(0.40)
Parent HS graduate	0.32	0.26	0.51	−0.13	0.05
	(0.10)	(0.11)	(0.22)	(0.10)	(0.22)
Parent attended college	0.36	0.38	0.33	−0.26	.39
	(0.05)	(0.06)	(0.09)	(0.05)	(0.49)
Parent college graduate	0.38	0.40	0.25	−0.45	0.15
	(0.08)	(0.09)	(0.16)	(0.08)	(0.36)
Female head	0.16	0.14	0.15	−0.12	0.20
	(0.07)	(0.09)	(0.12)	(0.08)	(0.40)
Single parent	−0.40	−0.45	−0.27	0.32	0.29
	(0.06)	(0.07)	(0.12)	(0.06)	(0.45)
Family speaks English	0.17	0.20	0.08	−0.04	0.90
	(0.07)	(0.9)	(0.14)	(0.07)	(0.30)
Handicapped child	−0.26	−0.28	−0.18	0.17	0.35
	(0.04)	(0.05)	(0.08)	(0.04)	(0.48)
Academic HS	0.67	0.75	0.49	−0.41	0.39
	(0.06)	(0.08)	(0.11)	(0.05)	(0.48)
Rural	−0.5	0.10	0.05	−0.02	0.22
	(0.11)	(0.07)	(0.10)	(0.06)	(0.41)
Suburban	0.01	0.02	0.09	−0.34	0.52
	(0.05)	(0.06)	(0.10)	(0.05)	(0.50)
Intercept	1.83	1.87	1.39	−0.87	—
	(0.09)	(0.12)	(0.16)	(0.08)	
N	10981	8861	2120	5780	10981
Pseudo R^2	0.390	0.372	0.322	0.171	—
Dependent variable mean	—	—	—	—	0.91
					(0.29)

statistic is 2.40.[11] Evaluating this equation at the average family income level, the predicted probability of daughters of homeowners having children by age 18 is 0.11, compared to 0.13 for children of renters—a two percentage point differential. For daughters of households whose income is missing, the figures jump to 0.30 for children of owners and 0.34 for children of renters—a 4 percentage point differential. Thus the evidence suggests that homeowning by parents also affects whether their daughters have children while they are teenagers.

Summary

The probit results are remarkably consistent: all three data sets support the hypothesis that homeowning by parents is a statistically significant and economically important determinant of whether their children stay in school, even when we control for a large number of other factors that prior research suggests are important.[12] Thus the single equation results support policymakers' contention that homeowning matters. In addition, results from HSB suggest that homeowning by parents reduces the probability that daughters have children by age 18 and the relationship is statistically significant.

We also considered several possible reasons why the association between homeowning and socially desirable behavior by children of homeowners might be spurious. One possibility is that the homeowning variable is acting as a proxy for variation in the type or quality of the neighborhood. Children might behave in more socially desirable ways if they lived in better neighborhoods, regardless of whether their parents are homeowners or not. The various data sets provided us with a variety of proxy measures for neighborhood quality, but when we allowed for their effects we still

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[11] In an identical regression for sons (not reported), the homeowning variable was not statistically significant.

[12] We also estimated probit models explaining whether 17- or 18-year-old youths are in school, whether they have had a child (or children), and whether they have ever been arrested, using the *1989 National Bureau of Economic Research Boston Youth Survey*. This survey covers youths who live in three high-poverty areas of central Boston. The results showed that children of homeowners are significantly more likely to stay in school than children of renters and that youths (sons and daughters combined) are significantly less likely to have a child of their own if their parents are owners. Youths were also less likely to have been arrested if their parents were owners, but this result was not significant at the 5% level. These results are available from the authors. We are grateful to Anne Case for providing us with this data. See Case and Katz [3] for discussion of the data set.

In addition, evidence from a study by Kane [13] suggests that we would find similar results using the Current Population Survey. Kane estimated probit regressions explaining whether 18- or 19-year-old blacks graduate from high school and (separately) whether blacks and whites enroll in college. In all the regressions, he includes a measure of whether parents own their own housing. The owner-occupancy variable is always positive and always strongly statistically significant.

found homeowning to be statistically significant and an important determinant of whether 17 year olds stay in school. Another possibility is that homeowning serves as a proxy for a more stable home environment, since homeowners move less frequently than renters. But the PUMS data set allowed us to measure length of tenure directly and the results show that homeowning is still a significant determinant of the stay in school decision.

3. A SELECTION MODEL OF THE STAY-IN-SCHOOL DECISION

An alternate explanation for the importance of homeowning in the probit models is that the association between parents' homeowning and children's success is due to selection bias. Parents who own housing may be systematically different from parents who rent housing and the same characteristics that make the former group more likely to own may also make them more likely to bring up successful children. Thus policymakers may be crediting to homeowning the effect of these unobservable differences among households. To address this issue, we estimate a bivariate probit (endogenous switching) model which explains both parents' tenure decision and children's stay-in-school decision.

Assume that there is a first stage in which parents make the choice between owning and renting and a second stage in which children of owners and children of renters each decide separately whether to stay in school.[13] Suppose Z is a vector of variables affecting parents' tenure choice, I^* is a measure of parents' propensity to own housing, γ is a vector of parameters, and μ is an error term. Parents choose to become homeowners if $I^* = \gamma'Z + \mu > 0$ and they choose to rent if this expression is reversed.

Suppose J_r^* is a measure of the propensity of children of renters to stay in school, X is a vector of variables affecting children's decision to stay in school conditional on parents' renting, β_1 is a vector of parameters, and ϵ_1 is an error term for renters. Children of renters stay in school until age 17 if $J_r^* = \beta_1'X + \epsilon_1 > 0$ and they drop out of school by age 17 otherwise. Finally, suppose J_0^* is a measure of the propensity of children of owners to stay in school. β_2 is a vector of parameters, and ϵ_2 is an error term for owners. Children of owners stay in school until age 17 if $J_0^* = \beta_2'X + \epsilon_2 > 0$ and they drop out of school by age 17 otherwise. The error terms μ and ϵ_1 may be correlated and the error terms μ and ϵ_2 may also be correlated. Estimating a model of the stay-in-school decision without taking account of this problem could produce biased parameter estimates.

[13]See Maddala [14], pp. 278–280, for discussion of the model and Hughes and Snyder [12] and An *et al*. [2] for applications.

We do not observe the variables I^*, J_0^*, and J_r^*, but we do observe the indicator variables I, J_o, and J_r. I equals one if parents choose to own and zero if they choose to rent; J_r equals one if children of renters stay in school until age 17 and zero if they drop out; and J_0 equals one if children of owners stay in school until age 17 and zero if they drop out.

We use FIML to estimate two likelihood functions. The first explains parents' tenure decision and the stay-in-school decision of renters' children. The log likelihood function is

$$\ln L_r = \sum_{i=1}^{n} \left[(I_i) \ln Pr(\mu_i > -\gamma'Z_i) \right.$$
$$+ (1 - I_i)(J_{ri}) \ln Pr(\epsilon_{1i} > -\beta_1'X_i, \quad \mu_i < -\gamma'Z_i) \quad (1)$$
$$\left. + (1 - I_i)(1 - J_{ri}) \ln Pr(\epsilon_{1i} < -\beta_1'X_i, \mu_i < \gamma'Z_i) \right].$$

The first term in (1) is the probability of parents choosing to own, the second term is the probability of parents choosing to rent and their children staying in school and the third term is the probability of parents choosing to rent and their children dropping out of school. The second likelihood function explains parents' tenure decision and the stay-in-school decision of owners' children. The log likelihood function is

$$\ln L_o = \sum_{i=1}^{n} \left[(1 - I_i) \ln Pr(\mu_i > -\gamma'Z_i) \right.$$
$$+ (I_i)(J_{oi}) \ln Pr(\epsilon_{2i} > -\beta_2'X_i, \quad \mu_i > -\gamma'Z_i) \quad (2)$$
$$\left. + I_i(1 - J_{oi}) \ln Pr(\epsilon_{2i} < -\beta_2'X_i, \mu_i > -\gamma'Z_i) \right],$$

where the first term is the probability of parents choosing to own and the other terms are the probabilities of children of owners choosing to stay in school and to drop out. We estimate the vectors of coefficients γ, B_1, and B_2 and, since the variance of μ is not identified, two correlation coefficients, $\rho_1 = \sigma_{\mu 1}/\sigma_\mu \sigma_1$ and $\rho_2 = \sigma_{\mu 2}/\sigma_\mu \sigma_2$.

To illustrate, suppose all parents belong to one of two personality types: A or B. Type A parents generally have low discount rates, so that they both save a high proportion of their incomes and invest heavily in their children. The high level of investment by type A parents makes their children more likely to stay in school. As a byproduct of saving more, type A parents are more likely to buy houses, but this is not assumed to affect their children's success. In contrast, type B parents have high discount rates and they save less and invest less in their children. Their children are therefore more likely to drop out of school. Due to their lack of savings, type B parents are also more credit constrained and less likely to buy

houses, but again this is not assumed to affect their children's success. Because personality type is not measured, it is part of the error term in the tenure choice decision, μ, and also part of the error terms in the two stay-in-school decisions, ϵ_1 and ϵ_2. Estimating the selection model would reveal these relationships because μ would be correlated with both ϵ_1 and ϵ_2. On the other hand, if homeowning per se were an important determinant of children's stay-in-school decisions, then μ would be uncorrelated with either ϵ_1 and ϵ_2. Thus a finding that the two correlation coefficients ρ_1 and ρ_2 are insignificantly different from zero would strengthen the argument that homeowning per se matters in children's stay-in-school decisions, rather than homeowning being significant only because it serves as a proxy for parents' personality type or some other unmeasured variable.

We estimate the endogenous switching model, Eqs. (1) and (2), using data from the PSID. The PSID is used because its longitudinal nature allows us to make use of information from the year when parents last moved to explain their tenure choice, while we again use information from the year when children are 17 years old to explain children's stay-in-school decisions. None of the other data sets allows us to match decisions and time periods in this way. The vector Z of variables that influence parents' tenure choice is measured during the year of the household's most recent move, assuming that the household moved during the 10 years before the child was 17 years old. If the household's last move was earlier, then—to avoid losing too many observations—the variables in Z are measured 10 years earlier, i.e., when the child was 7 years old. The most important variable in the vector Z is the relative cost of owning versus renting, or the ratio of the average user cost of owner-occupied housing to the average rent on rental housing in the year of the household's most recent move.[14] Relative housing cost should affect parents' tenure choice, but not children's stay-in-school decision. Other variables in Z include family income, the number of weeks that the household head worked during the previous year, family size, whether the household head is divorced, race of the household head (white $= 1$), and four dummy variables representing the education level of the household head, where the omitted variable is less than 12 years of education. The vector X of variables that influence children's stay-in-school decision includes household income, family size, whether the household head is female, education of the household head, race of the household head, and whether the household head was under 18 years old when the child was born. Because of the use of data from earlier years, the size of the sample drops from 2074 to 840.

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[14] The housing cost figures are national average values corrected to 1980 dollars.

TABLE 5

Results of Bivariate Probit Model Explaining Children's Stay-in-School
Decision and Parents' Tenure Choice (PSID)

	Own housing (1)	Stay in school (renter) (2)	Own housing (3)	Stay in school (homeowner) (4)
Relative housing cost	− 14.2 (2.0)		− 14.4 (2.0)	
Divorced head	− 0.17 (0.14)		− 0.18 (0.14)	
Weeks worked last year by head	0.004 (0.003)		0.005 (0.003)	
Female head	− 0.48 (0.13)	0.18 (0.25)	− 0.47 (0.13)	− 0.43 (0.22)
Family size	0.004 (0.03)	− 0.11 (0.05)	0.001 (0.03)	− 0.18 (0.05)
Income	0.02 (0.004)	0.015 (0.008)	0.02 (0.004)	0.013 (0.005)
Parent HS graduate	0.001 (0.14)	0.02 (0.27)	0.002 (0.15)	0.16 (0.21)
Parent some college	− 0.19 (0.28)	0.56 (0.79)	− 0.13 (0.28)	0.23 (0.48)
Parent college graduate	0.03 (0.15)	− 0.11 (0.31)	0.03 (0.16)	(0.19) (0.26)
Race (white = 1)	0.43 (0.11)	− 0.19 (0.24)	0.42 (0.11)	− 0.73 (0.25)
Young head		− 0.89 (0.25)		− 1.23 (0.28)
Intercept	1.20 (0.31)	0.90 (0.48)	1.22 (0.31)	2.33 (0.54)
Correlation coefficient		0.07 (0.32)		0.08 (0.31)

Columns (1) and (2) of Table 5 give the results of estimating Eq. (1), where column (1) contains the results for parents' tenure choice (the γ' vector) and column (2) contains the results for children's stay-in-school decision (the β'_1 vector) and the correlation coefficient ρ_1. Columns (3) and (4) give the analogous results for Eq. (2). The most important result of Table 5 is that the correlation coefficients, ρ_1 and ρ_2, are very small and not significantly different from zero. Thus the results of the bivariate probit model do not support the selection bias hypothesis. Table 5 shows that relative housing cost is a statistically significant determinant of tenure choice and has the expected negative sign.

Using the results of the bivariate probit model and assuming that the household income is $10,000, children of owners have a predicted probabil-

ity of staying in school of 0.86, compared to 0.67 for children of renters, or a difference of 19 percentage points. When household income is $40,000, the difference is 12 percentage points and at the average income level, the difference is 13 percentage points.

An additional possibility is that there might be selection bias for low wealth households only, because low wealth parents are only able to surmount the wealth constraint to homeowning if they are unusual in their ability to plan and save for the future. But if selection bias is applied to low wealth households only, it might not show up as a statistically significant correlation coefficient in the bivariate probit model. Because the PSID only occasionally collects wealth data, we cannot test this possibility directly. However, if we suppose that income and wealth are correlated, then we can test for selection bias for low wealth households by estimating the model separately for households having low income. We therefore re-estimated the bivariate probit model for the subsample of households with income less than $25,000. The resulting correlation coefficients ρ_2 and ρ_2 are both 0.005—compared to 0.07 and 0.08 for the entire sample—and they remain statistically insignificant. Thus the results of the bivariate probit model do not support the selection bias hypothesis even for households that have low income and therefore are likely to have low wealth.[15]

Thus using a bivariate probit model to test for selection bias in the stay-in-school decision, we could not reject the null hypothesis of no selection bias. The evidence is consistent with homeowning being important in itself, rather then homeowning being important only because it captures the effect of omitted variables such as parents' personality type.

4. POLICY IMPLICATIONS

The rather surprising result of the paper is that homeowning by parents benefits their children, who are less likely than children of renters to drop out of high school or to have children as teenagers. Both effects are largest for children of low-income households. The PSID results show that children of owners have a 4 percentage point higher probability of staying in school than children of renters at the mean value of parents' income (Table 2, model 2); compared to a 9 percentage point difference when parents' income is low. For the PUMS sample, the analogous differences are 3 percentage points for children whose parents have average income and 2 percentage points for children whose parents have low income. But the differential for low-income households is much greater—7 percentage

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[15] We also reran the probit models reported in Section 3 using only the observations in the lower half of each income distribution. The results were similar to those reported and the homeowning coefficients always had the same signs and remained statistically significant.

points—when evaluated at 4 rather than 10 years of tenure. The HSB results show only a small effect of homeowning since nearly all respondents that reported household income also graduated from high school, but children of homeowners have a 27 percentage point higher probability of staying in school when parents' income is not reported. We also find using HSB that daughters of homeowners have a lower probability of having children of their own as teenagers than children of renters. Finally, we tested for selection bias using a bivariate probit model, but the results could not reject the null hypothesis of no selection bias.

Overall, the evidence suggests that homeowning matters and it thus provides some justification for government policies that favor homeowning. However, it also suggests that current U.S. tax policy toward homeowning—with its heavy emphasis on deducting mortgage interest and property taxes—is misguided, because it mainly benefits higher income households who would own homes regardless and therefore has little effect on tenure choice. Our evidence suggests that housing policy ought to focus instead on providing subsidies that would encourage renter households to become homeowners. Further, housing policy ought to focus on lower income households, who otherwise would be unlikely to buy homes.[16]

We can use the results to estimate the benefit of government policies to encourage homeowning by low-income households. Suppose that youths who are still in school at age 17 or 18 will graduate from high school; while youths who have dropped out of school by age 17 or 18 will not. Since children of homeowners are more likely to graduate from high school than children of renters, and high school graduates earn more, children of homeowners have higher expected future incomes than children of renters. In the results for the PSID (Table 2), children of low-income homeowners had a 9 percentage point higher probability of staying in school than children of renters. Now consider the difference in lifetime earnings for high school graduates versus high school dropouts. To estimate this, we regressed the earning of household heads on a series of dummy variables representing age ranges, a dummy variable for whether the head graduated from high school, a series of variables interacting age with high school graduation, and several other variables, using data from the 1980 PUMS. The results are shown in Table 6.[17] The lifetime earnings differential for

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[16] Gyourko and Linneman [7] document that homeownership rates have been falling since 1970 for low-income households.

[17] In Table 6, the dependent variable is earnings of household heads in the 1980 *PUMS*. The variable $A15-19$ equals one if the head is 15 through 19 years old and zero otherwise (and other age variables are similarly defined), G equals one if the person graduated from high school and zero otherwise, and $G15-19$ equals G interacted with $A15-19$ (and other interaction variables are similarly defined). In addition to dummy variables measuring race, sex, and marital status, we also include four dummy variables for size of city, in order to capture differences in the cost of living. The omitted category is a rural area.

TABLE 6
OLS Regression Explaining Earnings of Household Heads
(1980 PUMS)

	Coefficient	SE
A15−19	−901	523
A20−24	407	632
A25−29	2,135	629
A30−34	3,096	621
A35−39	4,261	604
A40−44	4,410	598
A45−49	4,813	589
A55−59	3,602	569
A60−64	2,336	565
A65−69	485	563
A70−74	−76	565
A75−79	496	585
A80−84	385	636
G	2,646	877
G15−19	−1.567	1,126
G20−24	−27	962
G25−29	1,413	957
G30−34	3,607	952
G35−39	5.201	944
G40−44	5,884	943
G45−49	6,415	940
G50−54	5,527	929
G55−59	5,161	929
G60−64	4,097	932
G65−69	2,769	938
G70−74	2.526	953
G75−79	1,469	994
G80−84	181	1,077
Black	−3.693	139
Female	−5,348	125
Married	−2,495	117
Large city	1,588	136
Small city	3.496	127
Large town	1,305	142
Small town	434	170
Intercept	9,075	523
$R2$	0.28	
N	65,700	

high school graduates versus high school dropouts equals the sum of the coefficients of all the variables measuring the effect of high school graduation, where each coefficient is discounted to its value when the head is 18 years old using a real interest rate of 2% and each coefficient is also discounted by the probability of an 18 year old surviving to that age range. The result is $344,000 in 1994 dollars. Using these figures, the expected benefit of a government policy which would enable a low-income renter household to become a homeowner is ($344,000)(0.09) = $31,000, assuming that the household has one child who becomes a household head. This figure is biased downward since a typical household has more than one child. If the additional children became household heads, then the benefit of their extra earnings would be calculated in the same way; while if the additional children did not become household heads, then they also would have higher lifetime earnings if they were high school graduates. The figure also ignores other benefits to children of homeowners, such as the reduced probability that they become parents during the teenage years. But it is biased upward in that the benefits of the policy have been evaluated as of the time when the child is 18 years old, while the costs to the government occur earlier.

Our results thus provide support for government policies to encourage low-income households to become homeowners. But rather than the current policy of giving open-ended tax subsidies to all homeowners regardless of income, our results suggest that more focused programs—such as giving one-time tax credits or reduced rate mortgages to first-time homebuyers with relatively low incomes—would be much more cost-effective.

REFERENCES

1. J. Alm, J. R. Follain, and M. A. Beeman, Tax expenditures and other housing programs to stimulate housing: Do we need more? *Journal of Urban Economics*, **18**, 180–195 (1985).
2. C.-B. An, R. Havenman, and B. Wolfe, Teen out-of-wedlock births and welfare receipt: The role of the childhood events and economic circumstances, *Review of Economics and Statistics*, **LXXV:2**, 195–208 (1993).
3. A. C. Case and L. F. Katz, The Company You Keep: The Effects of Family and Neighborhood on Disadvantaged Youths, National Bureau of Economic Research working paper 3705 (1991).
4. G. Duncan and S. Hoffman, Welfare benefits, economic opportunities and the incidence of out-of-wedlock births among black teenage girls, *Demography*, **27**, 519–557 (1990).
5. J. R. Follain, D. C. Ling, and G. A. McGill, The preferential income tax treatment of owner-occupied housing: Who really benefits? *Journal of Housing Research*, **4**, 1–25, (1993).
6. D. Fudenberg and J. Tirole, Learning by doing and market performance, *Bell Journal of Economics*, **14**, 522–530, (1983).

7. R. Gordon, J. R. Hines, Jr. and L. H. Summers, Notes on the tax treatment of structures, *in* ''The Effects of Taxation on Capital Accumulation'' (M. Feldstein, Ed.), Univ. of Chicago Press, Chicago (1987).

8. R. Green and P. H. Hendershott, Age, Housing Demand, and Real House Prices, *Regional Science and Urban Economics*, **26**, 465–480 (1996).

9. J. Gyourko and P. Linneman, ''The Changing Influences of Demographics, Family Structure, Income and Affordability on Homeownership,'' Wharton School, University of Pennsylvania (1994).

10. R. Haveman and B. Wolfe, Do investments in children matter? A review of methods and findings, *Journal of Economic Literature*, **XXXIII**, 1829–1878 (1995).

11. P. H. Hendershott and J. D. Shilling, Capital allocation and the economic recovery tax act of 1981, *Public Finance Quarterly*, **10**(2), 242–273 (1982).

12. J. W. Hughes and E. A. Snyder, Policy analysis of medical malpractice reforms: What can we learn from claims data? *Journal of Business and Economic Statistics*, **7**, 423–431 (1989).

13. T. J. Kane, College entry by blacks since 1970: The role of college costs, family background, and the returns to education, *Journal of Political Economy* **102**, 878–907 (1994).

14. G. S. Maddala, ''Limited Dependent and Qualitative Variables in Econometrics,'' Cambridge Univ. Press, New York (1983).

15. E. S. Mills, Has the United States overinvested in housing? *AREUEA Journal*, **15**, 601–616 (1987).

16. Office of Management and Budget, U.S. Government, ''Budget of the U.S. Government, Fiscal Year 1993,'' U.S. Government Printing Office, Washington, DC (1992).

17. T. L. Parcel and E. G. Menaghan, ''Parents' Jobs and Children's Lives,'' Aldine de Gruyter, New York (1994).

18. H. S. Rosen, Housing subsidies: Effects on housing decisions, efficiency and equity, *in* ''Handbook of Public Economics, Vol. 1'' (A. Auerbach and M. Feldstein, Eds.), North-Holland, Amsterdam (1985).

19. M. A. Stegman, R. Quercia, G. W. McCarthy, and W. Rohe, Using the P.S.I.D. to evaluate the affordability characteristics of alternative mortgage instruments and homeownership assistance programs, *Journal of Housing Research*, **2**, 161–211 (1991).