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ABSTRACT

Second mortgages accounted for 10.8% of the stock of outstanding mortgage debt at the end of 1987, up from 3.6% at the beginning of the 1980s. This paper investigates the determinants of second mortgage borrowing and the characteristics of second mortgage borrowers. We first calculate the outstanding stock of home equity that remains to be borrowed against on tax-preferred terms, recognizing the limits on interest deductions in the 1986 Tax Reform Act and the 1987 Omnibus Budget Reconciliation Act. Despite these limits, we estimate that more than two trillion dollars of housing equity remains to be borrowed against by current homeowners. We then present cross-sectional evidence suggesting that households who obtain second mortgages after purchasing a home are less wealthy than other households with similar characteristics. Each dollar of second mortgage borrowing is associated with a seventy-five cent reduction in household net worth. While these results cannot be given a causal interpretation, they are consistent with the view that increased access to second mortgages has reduced personal saving.

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Second mortgages are one of the most rapidly growing financial products of the 1980s. While the real value of first mortgage debt climbed at an annual rate of 4.3% during the 1980-1987 period, junior mortgage debt grew at 23.3% per year. Second mortgages accounted for 10.8% of the stock of mortgage debt outstanding at the end of 1987, up from 3.6% just seven years ago. While some second mortgages are incurred when a home is purchased, the most rapid expansion has involved post-acquisition second mortgages.

The growth of second mortgages reflects increased utilization of traditional mortgage instruments as well as financial innovation. Home equity credit lines have become increasingly popular since their introduction in the early 1980s. They accounted for approximately one third of outstanding second mortgage debt at the end of 1987, and their recent growth -- doubling in 1987 alone -- far exceeds that of other mortgages. Restrictions on the tax-deductibility of non-mortgage interest payments contained in the 1986 Tax Reform Act are likely to spur continued growth of second mortgage borrowing.

One of the central issues associated with the increased availability and utilization of second mortgages concerns the impact of these instruments on private saving. Summers and Carroll (1987) argue that the growth in mortgage debt during the last eight years has spurred consumer spending and depressed private saving. While advertising for home equity lines may have encouraged households to accelerate spending plans, the adverse effect of second mortgage borrowing on private saving is

not obvious. Households may have used second mortgages to finance investments in other assets, or substituted second mortgages for other types of borrowing. This view is supported by a recent Survey Research Center study showing that more than half of those with home equity lines report using them at least in part to repay other debts.

This paper investigates the recent rise in second mortgage borrowing and examines its impact on private saving. The first section places the recent increase in second mortgage activity in context, documenting broad trends in residential borrowing during the last three decades and providing specific evidence on the recent growth in home equity credit lines. Section two examines the magnitude of potential home equity borrowing, recognizing that second mortgages have not diffused completely through the population. We explicitly account for recent limitations on the amount of tax-deductible second mortgage interest and show that even assuming households refrain from non-deductible borrowing, over two trillion dollars of home equity remains to be borrowed against.

The next two sections present evidence on the link between second-mortgage borrowing and wealth accumulation. Section three explains why aggregate evidence on the coincidence between declines in private saving and increased home equity borrowing is weak, and describes the data set drawn from the Survey of Income and Program Participation (SIPP) that underlies our results. Section four presents cross-sectional tests of the

impact of second mortgages on household wealth accumulation. The results show that on average, a household with one additional dollar of second mortgage borrowing has seventy-five cents less net worth than a household without a second mortgage. There is little evidence that households with second mortgages hold higher levels of financial assets, although we find a weak positive association between second mortgage borrowing and noncorporate business equity. Section five considers the factors that affect decisions to obtain second mortgages, focusing on how the stock of accrued residential capital gains alters the probability of remortgaging. Our conclusion discusses directions for future work on how the mortgage market affects residential capital accumulation.

#### 1. Trends in Residential Financing, 1950-1988

The rise in second mortgage borrowing during the 1980s has helped propel the debt-to-value ratio on owner-occupied housing to its highest level since World War II. Table 1 shows the time series for this ratio, which rises from the early 1950s through the mid-1970s. In part because owner-occupied house prices rose by 35 percent in real terms during the 1970s<sup>1</sup>, the debt-to-value ratio declined from 42% in 1970 to 36% in 1980. The combination of natural turnover, with its tendency to raise loan-to-value ratios, and second mortgage borrowing has raised this ratio

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<sup>1</sup>Poterba (1984) and Mankiw and Weil (1988) present alternative explanations for house price movements during the 1970s.

Table 1: First and Second Mortgage Debt, 1950-1987

Year	Total Mortgage Debt (% of Owner-Occupied Housing)	Second Mortgages (% of All Mortgages)	Loan-to-Value Ratio (%)
1950	25.5%*	3.1%	---
1960	36.8%	2.0%	72.9%
1970	42.1%	1.5%	71.5%
1980	35.8%	3.2%	72.9%
1982	38.0%	6.7%	72.9%
1984	40.2%	9.6%	77.0%
1985	42.5%	10.3%	75.8%
1986	43.8%	10.3%	74.1%
1987	45.2%	10.8%	75.2%

Source: Column 1: Federal Reserve Board (June 1988), 1950 value is for 1952:1. Column 2: Values for 1980 and before are drawn from decennial Census of Housing. Post-1982 values are drawn from NSMA Equity (Center Square, PA:National Second Mortgage Association, March 1988). Column 3: FHLBB data on new conventional mortgages. 1960 value refers to January 1963, 1970 to July, all others are annual averages.

during the 1980s.

The rise in the debt-to-value ratio coincides with rapid growth of second mortgage borrowing. While loan-to-value ratios for new mortgages have not changed substantially during the 1980s (see Table 1), the debt-to-value ratio was three percentage points higher than in 1970. If second mortgage borrowing as a share of the housing capital stock had remained constant at its 1980 level, the debt-to-value ratio would have been only 41.5% in 1987, slightly below the level of 1970.<sup>2</sup> In part, the rapid growth of second mortgages may reflect changes in nominal interest rates during the 1980s. Since lending institutions usually determine lending capacity by relating nominal interest payments to household income, falling interest rates enabled households to qualify for larger mortgages. Some households may have exercised their new borrowing power by obtaining a second mortgage rather than by refinancing their first mortgage.

The rise of second mortgage borrowing is significant in comparison to the decline in household saving during the 1980s. Since 1980, the annual flow of new second mortgage borrowing has averaged just below one percent of disposable income. The private saving rate in the 1980s has averaged 2.2 percent below

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<sup>2</sup>Our analysis focuses on second mortgage borrowing since this is one way for households to borrow against accumulated housing equity. Refinancing the first mortgage on a residence could also achieve this end. Quigley (1987) discusses the determinants of refinancing behavior and references recent studies.

its level in the 1970s. The present paper attempts to provide some insight on whether such a link between saving and second mortgages is appropriate.

The characteristics of actual and potential second mortgagors raise doubts about the role of second mortgages in reducing saving. Table 2 presents evidence on the fraction of homeowners in different age groups who have second mortgages, based on tabulations from SIPP. The table distinguishes between second mortgages that were obtained when the house was purchased, and those obtained after home purchase. The incidence of second mortgages peaks for households with heads between 35 and 44 years of age: more than 15% of households in this group report second mortgages. The rate is only slightly lower (14.3%) for households headed by 45-54 year olds. These two age groups account for more than two-thirds of the outstanding second mortgages. The lowest rates of second mortgage borrowing are for the very young (<25) and the elderly (>64), two groups that have low marginal propensities to save.

The reasons second mortgagors incurred their debts also raise questions about how these mortgages affect saving. Results from the 1980 Census of Housing on why second mortgagors obtained these debts are informative. Of those who responded, 51% of respondents cited the need to make home improvements as motivating their borrowing decision, 18% cited other investments either in real estate or other assets, 4.6% cited education or medical expenses, and 26% cited other reasons. More than half



Table 2: Age Distribution of Second Mortgage Borrowing and Home Equity

	Fraction With 2nd Mortgages		Share of Outstanding Second Mortgages (by Value)	
	Total	Post-Acquisition	Total	Post-Acquisition
< 25	13.6%	6.8%	1.4%	0.9%
25-34	13.2%	7.0%	17.1%	11.7%
35-44	15.4%	13.0%	38.0%	41.7%
45-54	14.3%	12.0%	29.6%	31.6%
55-64	6.1%	4.5%	12.2%	12.0%
> 64	1.4%	1.3%	1.7%	2.1%

Source: Authors' calculations using all homeowners in Survey of Income and Program Participation Wave VII (8943 households). Tabulations use sampling weights to reflect population statistics.

of the households with second mortgages reported investment, rather than consumption, factors as motivating their decision to borrow. The national accounts define some expenditures on renovations, as well as medical and educational expenses, as consumption. Part of these expenditures should be viewed as investments in human capital or consumer durables, and could therefore arguably be excluded from consumption.<sup>3</sup>

A 1987 survey by the Survey Research Center directed at second mortgagors with home equity lines (HELs) yielded similar findings. For these households, 53% reported that the first use of their HEL was to pay off other debt. One quarter indicated they obtained their home equity loan principally to finance a home improvement, although another 19% of the respondents indicated some subsequent use of the home equity loan to finance renovations. In addition, 12% of the respondents indicated the loan was used to finance a new car purchase, while only 8% used the HEL for medical or education expenses.<sup>4</sup> Measured consumption is clearly higher for these two groups, although the link with home equity loans is unclear. Many car buyers may have used HELs, which offer lower interest rates than other types of consumer debt, in place of other forms of automotive debt. The results do not reveal how many households initiated HELs for non-consumption reasons, but subsequently used these instruments

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<sup>3</sup>These 1980 survey results precede the recent growth in home equity borrowing, which may have changed the rationale for, and uses of, second mortgage debt.

<sup>4</sup>More detail may be found in Canner, Fergus, and Lockett (1988)

to finance consumption outlays. The impact of second mortgage borrowing on household consumption is therefore an empirical question.

## 2. How Much Home Equity Is Still Locked Up?

The previous section noted the rapid rise in second mortgage borrowing during the 1980s, but provided no evidence on the magnitude of potential future borrowing. Since the Tax Reform Act of 1986 (TRA) raised the attractiveness of home equity borrowing in comparison to other types of consumer debt, an increasing fraction of households are likely to incur second mortgages. While it is straightforward to calculate the household sector's net equity in owner-occupied real estate, recent tax changes restrict the amount of mortgage interest that households may deduct from their taxable income. Estimating the amount of home equity that could be borrowed against at favorable after-tax interest rates therefore requires information on the fraction of households that would be affected by the legal caps on interest deductibility, and the amount of housing equity they hold. In this section we describe the limits on tax-deductible borrowing, and then use the SIPP data base to estimate the amount of home equity that remains to be levered in a tax-deductible form.

### 2.1 Limitations on Tax-Deductible Home Mortgage Interest

The TRA phased out deductions for all consumer interest

except that on debt secured by first or second homes. Interest on original purchase home loans of less than \$1 million remains fully deductible under the TRA, and this upper limit binds for relatively few households. Mortgages obtained after purchase are subject to tighter restrictions. While the TRA instituted "tracing rules" that made interest deductibility contingent on the purpose for which debt was incurred, these complex rules were superceded by provisions in the 1987 Omnibus Budget Reconciliation Act. A taxpayer can deduct unlimited interest on post-acquisition borrowing provided the debt is used to finance additions or alterations to the residence. For other-purpose debt incurred after October 13, 1987, however, a taxpayer may deduct interest on mortgage debt of  $D_{cap} = \min(V, D_{original} + \$100K)$ .  $V$  is the current market value of the taxpayer's home, and  $D_{original}$  is the outstanding principal on the original purchase loan.<sup>5</sup> Early in a taxpayer's tenure as a homeowner, the home's current market value is likely to be the binding constraint on the amount of debt. At some stage, however, if debt repayment and home appreciation raise accumulated home equity above \$100,000, the second constraint binds.

A homeowner can never deduct interest on non-renovation mortgages in excess of the original purchase mortgage principal plus \$100,000, regardless of what mortgage instruments are combined in reaching this total. For a household incurring a

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<sup>5</sup>The OBRA restrictions apply to combined debt on first and second homes, although for simplicity our discussion focuses only on first homes.

new second mortgage while retaining an original-purchase first mortgage, these rules limit the amount of tax-deductible second mortgage borrowing for purposes other than additions and alterations to  $D_{cap2}$ , where

$$(1) \quad D_{cap2} = \min(V - D_{original}, \$100K).$$

For a household that previously refinanced its original purchase mortgage and therefore has current first-mortgage principal of  $D_{refin}$ ,  $D_{cap2}$  is given by:

$$(2) \quad D_{cap2} = \min(V - D_{original}, \$100K - D_{refin} + D_{original}).$$

Since after-tax borrowing costs rise discontinuously at  $D_{cap}$ , most households will probably avoid borrowing more than the limit except in circumstances of financial distress. Our next section calculates the amount of accumulated home equity that could be levered at tax-favored rates.

## 2.2 Estimates of Available Home Equity

To estimate the amount of equity that might be borrowed against for purposes other than home renovations, we make three assumptions: (i) households cannot borrow more than 90% of the value of their home, (ii) households borrow up to, but not more than, the amount of debt that they may incur while still completely deducting interest payments from their taxes, and (iii) half of the existing second mortgage debt was used to finance renovations and therefore would not be counted against

the \$100,000 limit on post-acquisition indebtedness. For most households, these assumptions lead to straightforward calculations of the amount of available tax-deductible borrowing. For households who refinanced their first mortgage, we do not have information on the remaining principal on their acquisition loan. We impute this using aggregate data on fixed-rate mortgage terms in the year when the home was purchased.<sup>6</sup>

Table 3 presents our tabulations on the stock of available home equity. The average property value for homeowners in our sample was \$79,500 (1988 dollars), with equity of \$58,000. The total home equity represented by our sample is therefore \$3.03 trillion.<sup>7</sup> The average amount of tax-deductible equity is \$45,800; this translates to a potential stock of \$2.53 trillion in unused borrowing. If the \$100,000 limit on tax-deductible second mortgage debt had been in place in 1985, only 10.5% of homeowners would have been affected.<sup>8</sup> Many elderly households

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<sup>6</sup>We assume that households that refinanced initially borrowed eighty percent of the purchase price of their home using a 30 year fixed rate mortgage at the FHLBB's average mortgage interest rate.

<sup>7</sup>The sampling weights for households in our sample translate into 55.2 million households, somewhat smaller than the Census Bureau's estimate of 55.5 million homeowners in 1985. The 1985 home equity in our sample, weighted to correspond to the population, is \$2.75 trillion. This is higher than the Federal Reserve Board's estimate of net housing equity (\$1.96 trillion) for 1985. The difference between SIPP and Flow of Funds estimates has been noted before, for example in U.S. Bureau of the Census (1986), although there is as yet no convincing explanation of the disparity.

<sup>8</sup>Our calculations on the effect of the \$100,000 limit examine 1985 nominal debt limits with a real value of \$100,000 in 1988 dollars.

Table 3: Estimates of Untapped Home Equity, 1988 dollars

	Homeowners with Current Mortgages	Homeowners Without Current Mortgages	All Homeowners
Property Value (thousands)	\$87.1	\$67.5	\$79.5
Home Equity (thousands)	\$52.0	\$67.5	\$58.0
Equity Available for Borrowing (D/V < .90)	\$43.4	\$60.8	\$50.1
\$100K Maximum for Tax- Deductible Borrowing:			
Available Equity for Borrowing (D/V < .90)	\$40.7	\$54.0	\$45.8
Fraction Constrained By Limitation (in 1985)	9.8%	11.7%	10.5%
\$50K Maximum for Tax- Deductible Borrowing:			
Available Equity for Borrowing (D/V < .90)	\$30.8	\$40.2	\$34.4
Fraction Constrained By Limitation (in 1985)	34.9%	47.3%	39.7%
Number of Homeowners (million)	33.9	21.3	55.2

Source: Authors' tabulations using SIPP Wave VII Topical Module Data.

appear reluctant to borrow against their home equity, although the reasons for such behavior are not well understood (see Venti and Wise (1988)). Assuming that households headed by someone over age 65 would not borrow, the stock of available equity is \$1.86 trillion.

We also calculated the pool of tax-deductible borrowing that would be associated with limits below \$100,000 on the amount of second mortgage debt. A limit of \$50,000 would reduce the stock of available equity to \$1.90 trillion. Even with such modest limits on borrowing, the diffuse distribution of home equity makes the amount of potential borrowing quite large.

Our final calculation concerns the amount of consumer debt that could be replaced by home equity borrowing. We tabulated the fraction of reported consumer debt that was held by homeowners and that could be replaced by mortgage debt. For example, if a homeowner reported \$120,000 of consumer debt, we assumed that only  $D_{cap2}$  would be borrowed as deductible housing debt. If a non-homeowner reported \$120,000 of consumer debt, we assumed that none would be replaced with housing debt. Our tabulations show that 52.2% of unsecured consumer debt (which totalled \$254 billion in the 1985 SIPP population) could be replaced by tax-deductible housing debt. For a broader credit aggregate consisting of unsecured consumer debt plus vehicle debt (\$403 billion), 55.9% could have been replaced with



borrowing backed by home equity.<sup>9</sup> This suggests that the long-run effects of the 1986 and 1987 tax reforms may be a significant reallocation of consumer borrowing from traditional consumer debt to mortgage debt.

### 3. Second Mortgages and Wealth Accumulation: Data and Methods

The extent to which increased access to and utilization of second mortgages has depressed private saving is difficult to gauge from aggregate time-series evidence. The data suggest a rough correspondence between the rise in second mortgages during the early 1980s and the decline in private saving. The limited information on second mortgage borrowing before 1980, however, largely precludes formal statistical analysis of the link between changes in mortgage borrowing and consumption.

This suggests the need for alternative data sources for addressing the impact of second mortgages on household saving. An ideal data set for this project would include longitudinal information on household income and consumption, first and second mortgage debt and other types of consumer borrowing, and other factors such as wealth that might affect spending decisions. Panel data might permit some controls for the obvious problem of population heterogeneity that clouds the interpretation of any cross-sectional results on saving behavior.

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<sup>9</sup>Our calculations assume that household behavior and asset prices will not adjust in response to the new rules on interest deductibility. Manchester (1988) discusses a variety of such general equilibrium effects.

Moreover, it would need evidence on access to second mortgage debt, since it is difficult to interpret the simple correlation between borrowing and consumption without some exogenous variation in borrowing opportunities.

While some data sets (i.e. the PSID) include the data outlined above, they are ruled out for this project because they were conducted before the recent growth of second mortgages.<sup>10</sup> The data set that comes closest to satisfying our requirements is the Survey of Income and Program Participation (SIPP), the Census Bureau's new longitudinal data base on household economic status. Each SIPP panel consists of nine sets of interviews at four-month intervals, with information on income, employment, and transfer receipt collected in each interview. Supplemental information on asset holdings, housing finance, pension wealth, and other topics is queried sporadically. The data we analyze were collected in 1985, after the rapid growth of second mortgages at the beginning of the 1980s but prior to the recent growth of home equity lines.

The crucial drawback of SIPP is the lack of data on household consumption expenditures. This limitation severely restricts our analysis. Instead of comparing consumption outlays by households with and without second mortgages, we follow an indirect procedure that has been used in previous

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<sup>10</sup> Skinner (1988) examines the links between housing capital gains and consumption outlays using data from the 1983 Panel Survey of Income Dynamics. His sample therefore precedes much of the recent growth in second mortgages which may have helped finance consumption from housing gains.

studies of how pensions and Social Security benefits affect household saving (see King and Dicks-Mireaux (1982) and the studies cited there). We study the correlation between second mortgage borrowing and household net worth, rather than consumption. If individuals are homogeneous except with respect to mortgage decisions, and if consumption is unaffected by mortgage borrowing, then we should find evidence that households with second mortgages also have other assets -- stocks and bonds, more valuable homes, or businesses -- that offset these debts. If second mortgages provide a way of financing college or cruises, however, households with such mortgages will exhibit lower net worth than those without. We begin by comparing the net worth of households with and without second mortgages, and then study how net worth changes when households obtain such mortgages.

Before examining the data, we must urge caution in interpreting our results. When households are heterogeneous and variation in second mortgage borrowing is correlated with unobserved household characteristics, it is difficult to use correlations to draw inferences about how policy changes, such as restrictions on second mortgage tax-deductibility, would affect consumption. A simple example illustrates this. Imagine two types of households: lucky and unlucky ones. Lucky ones experience unexpected capital gains on their portfolio assets such as stocks or human capital, and can finance a high level of consumption without resort to borrowing. Such households would

have high net worth and relatively little second mortgage debt. Unlucky households, in contrast, may experience unemployment or high medical costs and therefore need to borrow to finance consumption. These households will exhibit both high rates of second mortgage borrowing and relatively low net worth. The negative correlation between second mortgage debt and household net worth in this case results from the association between second mortgage borrowing and other household attributes. Nevertheless, such correlations may suggest stylized facts for structural models to explain.

### 3.1 The SIPP Data Set

The SIPP began with 26000 randomly-selected noninstitutional housing units in the United States, just over 80% of which (20,900) were actually occupied and eligible for interview. Attrition reduced that number to 16,259 by Wave VII, which inquired about housing and mortgage status. Our analysis focuses on the 8943 homeowners in this data set. The sample yields a homeownership rate of 59.0%, slightly below the national value of 63.9% for 1985.

SIPP is the best available data set for investigating the incidence and effect of second mortgage financing, but it suffers from several limitations. First, while the survey follows the sharp increase in traditional second mortgage borrowing at the beginning of the 1980s, it predates the recent growth in home-equity credit lines. Interviews for Wave IV

(Wave VII) were conducted between September and December, 1984 (1985). Federal Reserve Board estimates suggest that home equity lines were four times as large at the end of 1987 as at the end of 1985, so our data may fail to reflect the behavior of recent home equity borrowers.

The second limitation of SIPP results from steps to protect respondent anonymity. The public use file reports total mortgage debt top-coded at \$100,000 and does not separate first and second mortgages. The market value of the respondent's home is top-coded at \$200,000 and monthly income is also capped, although the upper limit varies across households.<sup>11</sup> We filed a Freedom of Information Act request and obtained supplemental information on total mortgage debt topcoded at \$200,000, as well as the share of that debt accounted for by junior mortgages. Only 33 of the 8943 homeowners in our sample (.4%) were affected by the upper limit on mortgage debt. A somewhat higher fraction -- 4.8% -- were affected by the topcoding on the total market value of their home.

Broad characteristics of our sample are presented in Table 4. We report sample means of several variables for all homeowners, for those with one or more mortgages, and for those who have second mortgages. Homeowners with multiple mortgages are younger, have higher annual incomes, and have more valuable homes than homeowners with just first mortgages or with no

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<sup>11</sup>An individual with irregular income will be allowed to report a higher income level in a given month than a salaried employee, since it would be easier to identify the latter.

Table 4: Sample Means for SIPP Wave VII Homeowners, Using Sampling Weights

Variable	All Homeowners	All Homeowners with Mortgages	All Homeowners with 2nd Mortgages
Property Value	\$73,384	\$81,180	\$92,560
Debt-to-Value Ratio	0.29	0.48	0.58
Mortgage Debt	\$22,683	\$36,935	\$51,931
Household Income (Annual)	\$33,491	\$38,755	\$41,097
Net Worth	\$108,416	\$93,133	\$88,982
Age	51.3	43.7	43.2
Household Size	2.8	3.2	3.4
Sample Size	8943	5402	904

Source: Authors' tabulations based on 1984 SIPP, Wave VII, homeowners sample.

outstanding mortgage debt.<sup>12</sup> The net worth of households with second mortgages averages approximately \$22,000 below that of all other homeowners, and roughly \$4,000 below that of homeowners with one mortgage (the "with one mortgage" category can be calculated from the data in Table 4). Net worth is defined inclusive of investments in individual retirement plans, such as Keoghs, but exclusive of the pension assets that employees may be entitled to. The measure also excludes Social Security wealth, which may be the principal asset for some retired or nearly-retired households.

Households with second mortgages have more total mortgage debt than other households -- \$32,500 more than the average for homeowners without second mortgages, and \$15,000 more than the average for homeowners with only first mortgages. This evidence indicates that households with second mortgages have lower net worth, but not by the full amount of their second mortgages, relative to households without such debts. Comparing means is suspect, however, because there are no controls for household characteristics; this is why the next section presents regression analysis.

### 3.2 Second Mortgages and Household Wealth: Cross Sectional Tests

Our specification for household net worth follows that of

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<sup>12</sup>One disturbing feature of the SIPP sample is its higher incidence of second mortgage holders than in the population at large. The 1985 National Housing Survey reported 56.15 million owner-occupied housing units, of which 3.3 million (5.9%) had outstanding junior mortgages. In our sample, the fraction with second mortgages is 9.8%.

King and Dicks-Mireaux (1982, 1983) in their studies of how pension wealth affects household accumulation. We begin by assuming that a household's net worth is an age-specific multiple of its income, and define indicator variables for six age categories based on the age of household head: <25, 25-34, 35-44, 45-54, 55-64, and 65+. We then relate net worth to each of these variables interacted with measured four-month income recorded in SIPP Wave VII. Our reduced-form equation for net worth also includes a household's marital status, number of children, and highest year of schooling, in part because these variables may affect a household's rate of accumulation and in part because they are choices that may reflect time preference or other factors that influence saving. We also add indicator variables for six broad classes of occupation and four indicator variables for region of residence, again proxying for income or cost-of-living factors that may impinge on a household's wealth but may not be captured in our simple specification, as well as an indicator variable for whether household mortgage debt or housing equity was top-coded.

We construct three variables to measure a household's mortgage debt position. The first is the outstanding acquisition indebtedness on the current property, the second is the liability on refinanced first mortgages, and the third is post-acquisition second mortgage borrowing. Refinancing may occur for either of two reasons: interest rates may have declined since the first mortgage was obtained, or the household's



consumption or investment demands may dictate an increase in home leverage. The latter possibility suggests that refinancing a first mortgage is an alternative to second mortgage borrowing, implying that the net worth of households with refinanced first mortgages may be lower than that of households with acquisition first mortgages.

Zero coefficients on the various mortgage debt measures in a regression explaining net worth would indicate that households with greater mortgage debt also hold greater assets. If all of the cross-sectional variation in mortgage behavior arises because different households had decided to buy houses of different sizes, consequently borrowing different amounts and possibly resorting to second mortgages to raise their loan-to-value ratio, net home equity might be relatively constant and therefore mortgage debt might not help predict net worth. If households that take out second mortgages after their homes appreciate reinvest the proceeds in housing, financial assets, or businesses, we would again expect no relationship between the second mortgage or refinanced-mortgage variable and net worth.<sup>13</sup>

If households use second mortgages and refinanced first mortgages to finance consumption outlays, then these debt variables should be negatively correlated with net worth. As we noted above, however, such a negative correlation could also

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<sup>13</sup>Our data show that 76.8% of all second mortgage debt was incurred subsequent to the home purchase, arguing against the view that the division of total mortgage debt between first and second mortgages is simply an artifact of the way acquisition debt was structured.

emerge if households differ in their returns on past investments or in their unexpected consumption needs. A zero coefficient is also possible in the presence of such heterogeneity. If households with large capital gains on their homes respond to these windfalls by obtaining second mortgages and consuming the gains, then net housing equity would vary relatively little across households and it would display little if any correlation with second mortgage borrowing. Nevertheless, second mortgages might be used to finance consumption. If households adhere to a pre-determined age-wealth profile, then unanticipated capital gains are consumed when they occur. Those with and without second mortgages will therefore show similar net worth positions, but those with second mortgages will have experienced larger housing capital gains and used second mortgages to liquidate them.

The importance of housing capital gains in the second mortgage decision suggests controlling for these gains in the net worth equation. SIPP includes a question on the purchase price of the current home, and in principle this could be used to calculate housing capital gains. However, many reported purchase prices seemed erroneous, especially for homes purchased more than thirty years prior to the survey. Several households reported purchase prices equal to their home's current market value, even though it was purchased long ago, perhaps because they misunderstood the questionnaire. Moreover, the change in value need not correspond to the household's capital gain. A

homeowner who spends significant amounts on renovations will report a current market value well above the purchase price, but may not have a capital gain.

We avoided these difficulties by developing an alternative measure of accrued gains. Since 1963, the Census Bureau has compiled an index of the purchase price for constant-quality single-family houses in four different regions. Using the household's reported date of purchase in conjunction with the regional identifier we constructed a variable measuring house price appreciation.<sup>14</sup> This variable also has disadvantages: it ignores land values and it neglects location-specific price moves that are not reflected in regional aggregates. It is nevertheless the housing capital gain variable used in the subsequent regressions.

The regression model we estimate is :

$$(3) \text{ NETWORTH} = \gamma_0 + \sum \beta_i * \text{AGE}_i * \text{INCOME}_i + \gamma_1 * \text{MORTACQ} + \gamma_2 * \text{REFIN} + \\ \gamma_3 * \text{MORT2} + \gamma_4 * \text{FAMSIZE} + \gamma_5 * \text{MARRIED} + \\ \gamma_6 * \text{YRSCHOOL} + \gamma_7 * \text{NUMKIDS} + \epsilon.$$

The equation also includes dummy variables for different Census regions and for occupational categories, as well as an indicator variable for households whose net worth was top-coded at

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<sup>14</sup>We extrapolated the Census Bureau series for pre-1963 years using the National Income and Product Accounts residential structures deflator, assuming that all regions experienced the same price movements.

\$200,000. In the twelve cases (of 904 with junior mortgages) when a household had both second and third mortgages, the aggregate stock of junior mortgages was included in MORT2. We estimate this equation by ordinary least squares, and also explore instrumental variable estimates in an effort to control for the endogeneity of MORT2.

#### 4. Estimation Results: Cross Sectional Evidence

We estimate equation (3) on three different data samples: all of the homeowners on SIPP, all homeowners except those with incomes in the top decile of the income distribution, and all homeowners except those with net worth in excess of one million dollars. Our sample choices are partly designed to mitigate the effect of mortgage debt topcoding, a problem that is more severe for higher income households. In addition, these sampling rules may shed light on behavioral differences in the population.

The estimation results are shown in Table 5. Most of the estimated coefficients seem plausible: net worth is a higher multiple of current income for older households than for younger ones, households in which the head of household is married are wealthier, but otherwise larger households have somewhat smaller net worth, and higher education yields higher net worth.

A consistent pattern emerges from the mortgage debt coefficients. Acquisition indebtedness has a small positive effect on net worth. The effect is statistically insignificant for the full sample, although the hypothesis of no effect can be

Table 5: Estimates of Net Worth as a Function of Mortgage Borrowing

Variable	All Homeowners	All Homeowners Except Top Income Decile	All Homeowners Except NETWORTH>\$1M
Constant	-17195 (6452)	-4510 (3973)	4165 (3828)
Acquisition Mortgage Amount	.035 (.073)	.143 (.050)	.113 (.044)
Refinanced Mortgage Amount	-.306 (.156)	-.213 (.107)	-.214 (.093)
Post-Acquisition Second Mortgage	-.745 (.198)	-.618 (.130)	-.743 (.117)
Income*Age Group:			
- < 25	17.98 (5.82)	9.52 (3.77)	9.13 (3.44)
- 25-34	20.17 (1.68)	11.38 (1.32)	13.22 (1.00)
- 35-44	24.38 (1.31)	15.08 (1.19)	18.03 (0.79)
- 45-54	26.88 (1.18)	15.74 (1.12)	18.41 (0.71)
- 55-64	34.92 (1.19)	26.60 (1.19)	25.72 (0.73)
- 65+	52.17 (1.68)	39.84 (1.45)	31.14 (1.06)
Size of Household	-2445 (2249)	-755 (1397)	-840 (1332)
Number of Children	-4426 (2737)	-2378 (1713)	-5764 (1622)
Married	11341 (12330)	19790 (7829)	17468 (7316)
Highest Grade Completed	2502 (280)	2089 (172)	2253 (166)
Housing Capital Gain Adjusted R <sup>2</sup>	1.356 (.059) .304	1.324 (.038) .359	1.246 (.035) .430

Notes: All estimates by OLS from SIPP Wave VII. See text for further details.

rejected in the smaller samples. For refinanced mortgage debt, there is a negative and statistically significant association with net worth. Each dollar of refinanced mortgage is associated with between a twenty and thirty cent reduction in net worth, with a stronger effect when high-income and high-wealth households are included.

The coefficients on the post-acquisition second mortgage debt variable are even larger than those on refinanced debts. Each dollar of second mortgage borrowing is associated with between a sixty and a seventy-five cent reduction in net worth. The samples excluding millionaires and the high income households yield similar results. Although the standard errors on these estimates are sizable, the null hypothesis that second mortgages do not affect net worth can be rejected at standard confidence levels. The hypothesis that each dollar of second mortgage borrowing translates into a one dollar reduction in household net worth is also rejected.

The house price appreciation variable affects net worth in a positive and significant manner. The coefficients suggest that an additional dollar of real housing capital gains is associated with roughly one dollar and thirty cents of additional net worth.<sup>15</sup> Since these equations include the stock of

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<sup>15</sup>Skinner (1988) finds relatively small effects of housing capital gains on consumption, consistent with our evidence that for non-second mortgage households, most housing capital gains augment net wealth. Our equations are concerned solely with capital gains on the current residence, however, so if a household with a large gain consumes it in part by moving to a new house, our analysis will not reflect this.

second mortgage debt, the capital gain variable indicates the net worth effect of a capital gain with no post-acquisition second mortgage. Our finding of a more than one-for-one effect from housing gains could reflect our omission of capital gains on land: land prices may have appreciated by more than house prices, generating a "multiplier" effect for the house price increase.

The principle objection to the ordinary least squares results in Table 5 is that mortgage borrowing and net worth are simultaneously determined. This makes it impossible to interpret the resulting correlations as evidence of what would happen if, for example, mortgage borrowing were restricted by law. Identifying the structural coefficient that measures the net worth effect of an exogenous shift in second mortgage borrowing is difficult, since it requires us to find instrumental variables that affect a household's demand for second mortgages but not its net worth. We are not convinced that valid instruments exist, although one possibility for future work might involve interstate variation in banking practices.

We explored the robustness of our OLS findings by treating second mortgage debt as endogenous, performing instrumental variable estimation with imperfect instruments. The instrumental variable results ranged widely, depending on the instruments we used. When the household's outstanding medical and tuition bills were used as instruments, on the grounds that they might reflect shocks to liquidity that would induce borrowing, the

estimated coefficient on MORT2 was  $-.96$  with a very large standard error. Adding indicator variables for the presence of such debt, or for Census region, to the first stage equation caused the coefficient on MORT2 to change signs and often yielded large positive coefficients. The lack of robustness in these equations reflects the low correlation between the instruments and the mortgage debt variables.

Much of the policy concern surrounding the low rate of private saving is motivated by concern that corporations are foregoing investment opportunities because of an inadequate supply of loanable funds. On this view, not only the level of household net worth but its allocation between different assets may be important. If second mortgage borrowing finances residential additions and alterations, the ultimate effects on the corporate capital stock are different than if households use their second mortgage proceeds to invest in corporate stock. Fortunately, SIPP records some detail on portfolio composition that enables us to address this issue.<sup>16</sup>

Table 6 reports estimates of disaggregated asset holding

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<sup>16</sup>SIPP may yield somewhat misleading information on the disaggregated structure of household portfolios. Net worth and income are reported on a household basis, while disaggregated assets and liabilities are reported on an individual basis. For assets held jointly, such as a husband-wife checking account, the survey attributes the asset's full value to both owners. Our analysis focuses on detailed balance sheet information for only the head of household, since the other alternative, aggregating all assets held by household members, will overstate actual asset holdings. Our procedure therefore omits assets held individually by household members other than the household head, although the consequent bias in our results is unclear.



Table 6: Portfolio Composition and Post-Acquisition Second Mortgage Borrowing

Asset Category	Acquisition Mortgage Amount	Refinanced Mortgage Amount	Post-Acquis- ition Second Mortgage	Accrued Home Capital Gain
Housing Equity	.002 (.012)	-.280 (.026)	-.536 (.033)	0.964 (0.010)
Other Real Estate	.058 (.021)	.161 (.044)	-.017 (.056)	0.108 (0.017)
Interest-Bearing Assets	-.020 (.013)	-.078 (.028)	-.185 (.035)	0.073 (0.010)
Net Vehicle Equity	.001 (.002)	-.002 (.005)	-.024 (.007)	0.019 (0.002)
Business Equity	.053 (.018)	.029 (.039)	.173 (.049)	0.009 (0.015)
Corporate Equity & Mutual Funds	-.039 (.035)	-.066 (.074)	-.117 (.094)	0.025 (0.028)
IRAs	.003 (.004)	-.026 (.008)	.035 (.011)	0.014 (0.003)
Unsecured Debt	.027 (.008)	.051 (.018)	.015 (.022)	-0.007 (0.007)
Other Total Assets	.005 (.047)	.006 (.098)	-.059 (.125)	0.137 (0.037)

Net Worth

Each set of coefficients is drawn from an equation relating a given asset stock to the explanatory variables in equation (3). Standard errors are shown in parentheses. All estimates are by OLS from SIPP Wave VII using the sample of all homeowners corresponding to Table 7 column 1.

equations in which the right hand side variables parallel those in equation (3), but the dependent variable is only one component of net worth. We parallel the analysis of Table 5 for the sample of all homeowners. The results suggest that second mortgages have relatively small effects on net holdings of most assets. There is little evidence that second mortgages are used to finance investments in traded assets such as corporate stock or bonds; households with second mortgages hold less, not more, of these assets. We find no evidence that households with larger second mortgages have less consumer debt outstanding.<sup>17</sup> The two asset categories that are significantly positively correlated with outstanding second mortgage debt are equity in sole proprietorships and holdings of IRAs. Conditional on a household having one additional dollar of second mortgage debt, we predict that it will have approximately seventeen cents of additional equity in a business. It will have three and one half cents of additional IRAs. These results suggest a direction for future work, exploring the links between residential borrowing and small business financing. The results in Table 6 also show that household with post-acquisition second mortgages have approximately fifty cents less net home equity per dollar of second mortgage borrowing. This statistic reflects an average across households with different behavioral patterns.

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<sup>17</sup> Since our sample period is prior to the growth of home equity loans, which facilitated debt consolidation, and prior to the Tax Reform Act of 1986, which provided incentives for such consolidation, findings are not conclusive.

For some, the full amount of the second mortgage may be ploughed back into home improvements. This would imply no change in net housing equity provided marginal "q" on these projects equals unity, while net housing equity would decline if marginal "q" is less than one. Alternatively, some households may obtain second mortgages and finance current consumption, causing a decline in net home equity by the full amount of their second mortgage.

Our regression results merely indicate the association between second mortgage debt and other financial characteristics of the homeownership population. They do not permit us to draw conclusions about what would happen if second mortgages were made less accessible, for example by tightening restrictions on tax deductibility. Such restrictions might instead lead to other forms of borrowing or asset sales to finance spending needs. Further work developing a structural model for borrowing and saving decisions is needed to resolve these questions.

#### 5. Second Mortgage Borrowing Decisions

SIPP respondents were asked about their housing assets and mortgage liabilities twice during the survey. The first set of questions were part of the Topical Module for Wave IV, administered during the last four months of 1984. One year later, a similar (but not identical) set of questions was included as part of Wave VII. Our cross-sectional tests focus on the Wave VII data, the most recent data available on the incidence of second mortgages. It is also possible to investigate the

characteristics of households acquiring second mortgages by studying differences in second mortgage liabilities between Waves IV and VII. We use these data to study the determinants of new second mortgage borrowing and to test the importance of accrued housing capital gains in motivating household decisions to obtain second mortgages.

The average second mortgage principal for households obtaining new, non-acquisition second mortgages between these two surveys was \$18,952 and the average decline in net worth was \$6855, or 36% of the borrowed amount.<sup>18</sup> This is roughly half our cross-sectional estimate that each dollar of second mortgage debt reduces net worth by approximately seventy-five cents. The smaller longitudinal estimate might reflect the time lag between mortgage borrowing and spending: asset balances may rise for a period after the debt is incurred while the household makes purchases. Households obtaining new loans also experience an average reduction of \$2071 in unsecured consumer debt, or approximately eleven percent of the new second mortgage amount.<sup>19</sup>

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<sup>18</sup>We identified 381 households with second mortgages in Wave VII but without second mortgages in Wave IV. This appears to be an unusually large increase in second mortgage borrowing, since only 904 households in Wave VII have second mortgages. We have not yet identified the source of this faster-than-national-average growth in second mortgage debt in our sample.

<sup>19</sup>We also estimated regression models for the change in net worth as a function of changes in second mortgages outstanding and other factors. The point estimates were inconsistent with those from the cross section: an additional dollar of second mortgage borrowing was associated with a five cent increase in net worth, although the large standard error for this coeffi-

Our principal interest in the longitudinal data is in exploring what determines second mortgage borrowing. In the last section we discussed the possibility that second mortgages are used to reduce net housing equity when unanticipated capital gains raise net worth above the desired age-net worth trajectory. This view implies that households with large accrued capital gains should be more likely to incur second mortgages than households without such gains, conditional on the level of housing equity before second mortgage borrowing. If a household has accumulated a significant stock of housing equity by paying down its first mortgage according to a lifecycle plan, it will not have an elevated remortgaging probability, while if the equity results from capital gains, it will.

We test this proposition by estimating a probit model for the decision to obtain a non-acquisition second mortgage between SIPP Waves IV and VII. The explanatory variables include the net value of home equity before second mortgages, other net worth, household income, our measure of house appreciation, as well as the demographic, occupation, and regional indicator variables included in Table 5.<sup>20</sup>

Table 7 reports estimates of the probit coefficients for

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cient (24.3 cents) makes it impossible to reject the hypothesis that net worth declines by thirty to forty percent of the second mortgage amount.

<sup>20</sup>In earlier equations we included the level of household income times age dummy variables, to reflect different levels of accumulated net worth at different points in the lifecycle. In these equations we include the age dummy variables without interactio

Table 7: Probit Estimates of Borrowing Probabilities

Variable	All Homeowner Sample		All Homeowner < 65 Sample	
	Coefficient	Derivative	Coefficient	Derivative
Net Housing Equity	-0.521 (1.066)	-.0005	0.485 (1.086)	.0006
Accrued Housing Capital Gain	5.750 (1.423)	.0058	4.617 (1.468)	.0058
Non-Housing Net Worth	-2.273 (0.401)	-.0023	-2.994 (0.499)	-.0038
Household Income/Month	39.137 (15.377)	.0396	50.902 (16.209)	.0643
Sample Size	7434 (364 new mortgages)		5379 (348 new mortgages)	

Notes: All equations include additional demographic, regional, and household variables as described in text. Derivatives denote effect of a ten thousand dollar increase in the dependent variable on the probability of obtaining a second mortgage, evaluated at sample mean probability. Standard errors are reported in parentheses.

the four variables of principal interest.<sup>21</sup> The equation is estimated for two data samples: one including all homeowners without second mortgages in Wave IV, and the other all such homeowners who were less than 65 years of age in Wave IV. The results provide striking confirmation for the view that second mortgages are used by households with significant accrued capital gains. The household's net home equity has a statistically insignificant and substantively trivial effect on second mortgage probabilities (a ten thousand dollar increase in housing equity lowers the chance of obtaining a second mortgage during 1985 by below one tenth of one percent, when the average risk of acquiring a mortgage was 6.5%). In contrast, the accrued stock of capital gains has an important and statistically significant effect on borrowing probabilities. A ten thousand dollar housing capital gain raises the one-year borrowing probability by .007. The other variables have plausible signs - households with more non-housing wealth are less likely to obtain new second mortgages, with one thousand dollars of net worth predicted to reduce the chance of obtaining a second mortgage by half as much as one thousand dollars of capital gain raises it. Households with higher incomes are more likely to obtain second mortgages; this may in part reflect their ability to qualify for such borrowing.

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<sup>21</sup> Complete results for the probit estimation are available from the authors or are included in the data appendix deposited at ICPSR.

## 6. Conclusion

Our findings suggest a significant negative correlation between a household's stock of second mortgage debt and its net worth. On average, each additional dollar of second mortgage borrowing is associated with a seventy-five cent reduction in household net worth. These results are consistent with the view that the rise in second mortgage borrowing during the 1980s has financed higher levels of personal consumption and depressed private saving. Our results do not provide definitive evidence in support of this view, however, because it is difficult to isolate exogenous variation in mortgage borrowing. Conclusions on the potential effects of tighter limits on second mortgage borrowing or of restrictions on interest tax deductibility must await a structural model of the borrowing decision.

Our analysis of the second mortgage market has considered only one channel by which these instruments affect capital formation. A central question for future work is how the rise of HELs and second mortgages has altered incentives for residential capital formation. The U.S. tax code encourages investment in owner-occupied housing rather than nonresidential capital; the relative illiquidity of housing investments partly counteracts these tax incentives. The evolution of new institutions that facilitate borrowing against housing equity may ultimately encourage resource allocation toward the housing sector. Increased housing liquidity may also affect housing market dynamics. The increased availability of second mortgage borrow-



ing may reduce household mobility, both because the incidence of distress sales may fall and because households will find it easier to borrow and expand their existing homes instead of moving. This may affect the set of homes which "trickle down" from one set of homeowners to another, with unclear welfare effects. Recent tax rules that treat acquisition debt more favorably than subsequent borrowing may have an opposite effect, however, and raise turnover. These issues warrant investigation in future work.

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