Does the United States Still Overinvest In Housing?

Lori L. Taylor
Senior Economist and Policy Advisor
Federal Reserve Bank of Dallas

The risk-adjusted social rate of return remains substantially lower for housing than for other types of investment.

Savvy investors allocate their resources across different types of investment to maximize their returns; savvy societies do likewise. Just as with the private sector, society's returns are maximized when risk-adjusted social rates of return equalize across all types of investment (Auerbach 1983; Hendershott 1987). After all, if these rates of return are not equal, society could increase its income by shifting resources from low-return investments into those with a higher return.

Unfortunately, while market arbitrage ensures that risk-adjusted private rates of return equalize, no similar mechanism exists to guarantee that social rates of return do the same. Thus, society may invest relatively too much in some types of capital and relatively too little in others.

History suggests that the United States overinvests in housing. Estimates of the social rate of return are substantially lower for housing than for other types of investment. Mills (1989) finds the social rate of return to housing was only 20 percent of that to nonhousing fixed capital, on average, over the period 1929–86. McMahon (1991) extends the scope of Mills' analysis to find that the social rate of return to housing was also substantially lower than that to education over the period 1967–86. Researchers have concluded from this type of evidence—together with evidence on the relative risk of housing investments—that the United States overinvested in housing before 1986 (for example, Mills 1989; McMahon 1991; and Hendershott 1989).[1]

Much has changed in the U.S. housing market since 1986, however. For example, the Tax Reform Act of 1986 (TRA 86) greatly reduced the tax benefits of owner-occupied housing (Follain, Hendershott, and Ling 1991, 1992; Hoyt 1992). Changes in tax depreciation and passive loss provisions under TRA 86 also increased the effective tax on rental housing (Follain, Hendershott, and Ling 1987). Furthermore, declining inflation rates have made housing less valuable as a hedge against inflation and reduced the effective tax on capital gains. All these changes could have altered the relative social rate of return to housing.

In this article, I extend Mills' and McMahon's analyses to examine the case for overinvestment in housing in the post-1986 period. I examine the social rates of return for investments in housing, nonhousing fixed capital, and education over the period 1975–95 and find no evidence that the relative social rate of return to housing has risen since 1986. I then examine the appropriate risk adjustment for each type of investment and derive risk-adjusted social rates of return. While the evidence suggests that previous analyses may have overstated the relative riskiness of investment in housing, I cannot reject the hypothesis that the risk-adjusted social rate of return remains substantially lower for housing than for other types of investment. Therefore, the evidence suggests that despite substantial reform, the United States continues to overinvest in housing.

SOCIAL RATES OF RETURN

The social rate of return to any investment is the interest rate at which the present value of social benefits from an investment exactly equals the present value of its social costs. The social benefits and costs equal the private benefits and costs plus any benefits or costs to society in general. For example, public high school students do not pay tuition or for books, so their private cost of education is essentially the opportunity cost of their time. However, the government does pay the teachers and buy the books, so the social cost of an investment in high school education equals the private cost of the students' time plus the government's expenditures. Similarly, while students might count their after-tax income gains as the only benefit of additional schooling, the social benefits include any gains in tax revenue.

Social Rate of Return to Housing

The social return to housing describes the total benefits to society from an investment in housing capital. Mills (1989) estimates the social rate of return to housing in the United States (R_h) using data on aggregate rents and capital gains as his measures of benefits and data on the housing stock as his measure of housing capital. Formally,

$$(1) \qquad R_h = \frac{H}{K_h \bar{p}} + p_{h,t+1} - p_{h,t},$$

where H is net housing product (total payments to housing net of depreciation but gross of taxes) in period t, K_h is the real housing stock in period t (net of depreciation), $\bar{p}$ is the net national product deflator, and $p_{h,t}$ is the housing stock's constant-dollar price per unit in period t.[2]

If aggregate rents and capital gains reflect *all* the social benefits to investment in housing capital, and *only* those benefits, Mills' strategy generates good estimates of the social rate of return to housing. However, if rents and capital gains do not capture all the benefits to housing investment, his approach underestimates the social rate of return to housing. Similarly, if rents reflect more than the returns to housing capital, his approach overestimates the social rate of return to housing. Mills' estimation strategy is undoubtedly vulnerable to both types of measurement error.

Consider first the possibility that aggregate rents and capital gains fail to capture all the benefits to housing investment. While all the private benefits to housing investment should be reflected in rents and capital gains, many have argued that one type of housing investment—home ownership—generates positive externalities (see the discussions in Rosen 1985 and Green and White 1997).[3] Homeowners clearly have more incentive than renters to keep their property from becoming an eyesore and to resolve neighborhood problems. In addition, Green and White (1997) find that, compared with the children of renters, the children of homeowners are less likely to drop out of school or become teenage mothers.[4] However, because the lion's share of the benefits to continuation in school accrue to the person receiving the education, only a fraction of the benefits Green and White identify can be considered *externality* benefits to home ownership.[5] More important, any externalities to home ownership that enhance neighborhood conditions are likely to be capitalized into neighborhood property values. To the extent that the externality benefits of home ownership are capitalized into residential property values, they will be reflected in aggregate measures of residential rents and capital gains. Therefore, it is unlikely there are substantial unmeasured benefits from investment in housing.

The case is much stronger for the proposition that rents reflect more than the returns to housing capital. Economists have long recognized that locational characteristics—like air quality or the proximity to a central business district—can be capitalized into the prices people pay for housing. Thus, the rent a person pays for housing equals the sum of the rent paid for the characteristics of the structure (for example, the square footage or the number of bathrooms), plus the rent paid for the characteristics of the location (for example, the distance to downtown or the beach). Payments for structural characteristics are returns to housing capital; payments for locational characteristics (other than housing externalities) are not. To the extent that residential rents include payments for locational characteristics, they overstate the returns to housing capital (structures). Conventional wisdom suggests that payments for locational characteristics are a significant part of residential rents.

In sum, there is only weak evidence that positive externalities cause market rents to significantly underestimate the social returns to housing capital. There is relatively strong evidence that locational rents cause market rents to significantly overestimate the social returns to housing capital. Therefore, it is highly likely that Mills' estimation strategy overestimates the social rate of return to housing capital.

Fortunately, a simple modification to Mills' strategy can correct for the overestimation. Recognizing that net housing product includes payments to land as well as payments to housing capital and assuming the social rate of return to housing capital equals the social rate of return to residential land, Equation 1 becomes

$$(2) \qquad R_h = \frac{H}{K_h \bar{p} + A_h \bar{p}} + p_{h,t+1} - p_{h,t},$$

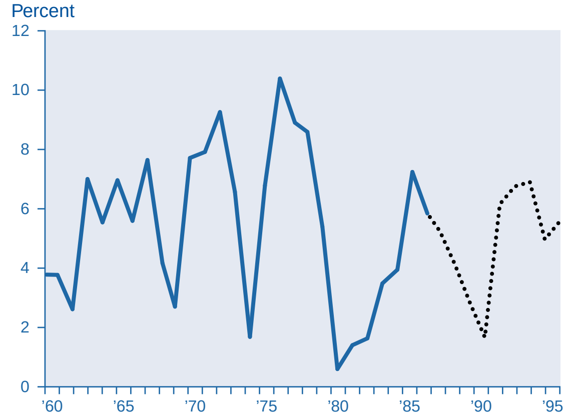
where A_h is the value of residential land.

I use Equation 2 and revised versions of Mills' data sources to estimate the social rate of return to housing for the period 1960–95. The net housing product data, which come from the national income and product accounts, include space rents for all types of housing except transient hotels, motels, clubs, schools, and other group housing (U.S. Bureau of Economic Analysis, 1997a). The net housing stock data, which come from the estimates of fixed reproducible tangible wealth, include the value of structures but not the value of any residential land (U.S. Bureau of Economic Analysis, 1997b).[6] Because Ibbotson and Siegel (1984) argue that estimates of the housing stock should be increased by 20 percent to account for the value of land, I assume $A_h = 0.20K_h$.

Interestingly, despite the many changes that should have reduced private investment in housing, I find no evidence the social rate of return to housing has risen since 1986.[7] The aggregate annual return to housing averaged 5.4 percent between 1960 and 1986 and has averaged a statistically equivalent 4.9 percent since 1986 (*Figure 1*).

Although the social rate of return to housing may not have changed significantly since 1986, two other dimensions need investigating before we can conclude that the United States continues to overinvest in housing. First, we need to consider possible changes in the social rates of return to nonhousing fixed capital and education. Second, we need to consider the relative risks associated with housing and other investments. Only with this additional information can we conclude that the risk-adjusted social rate of return to housing remains significantly below that to other types of investment.

Figure 1
Social Rate of Return to Housing in the U.S.



Social Rate of Return to Nonhousing Fixed Capital

The social rate of return to nonhousing fixed capital describes the total social return to an investment in equipment and nonhousing structures. Observing that net national income can be decomposed into payments to labor and payments to capital (disregarding payments to land), and that payments to capital can be further decomposed into payments to housing capital and to nonhousing capital, Mills estimates the social rate of return to nonhousing fixed capital as

$$(3) \qquad R_k = \frac{\hat{Y} - \overline{W}N - H}{K_k \bar{p}} + p_{k,t+1} - p_{k,t},$$

where $\hat{Y}$ is net national product, $\overline{W}N$ is total labor compensation, K_k is the real nonhousing fixed capital stock in period t (net of depreciation), and $p_{k,t}$ is the constant-dollar price per unit of the nonhousing fixed capital stock in period t. As with housing, Mills' estimation technique yields good estimates of the social rate of return to nonhousing fixed capital if nonhousing product (net national product excluding net housing product and labor compensation) captures *all* the returns to nonhousing fixed capital, and *only* those returns.

There is reason to believe this condition does not hold. A number of researchers posit externality benefits from investment in nonhousing capital, although few find empirical evidence of significant effects (see De Long and Summers 1991, 1994; Auerbach, Hassett, and Oliner 1994;

and the discussion in Summers 1990). To the extent that there are externality benefits from investments in nonhousing fixed capital, the aggregate rate of return would understate the social rate of return.

Furthermore, nonhousing product undoubtedly exceeds the actual returns to nonhousing fixed capital. As with housing product, nonhousing product includes commercial rents that represent payments for locational as well as structural characteristics. Similarly, the agricultural and mining components of nonhousing product include returns to natural resources as well as industry capital. To the extent that nonhousing product includes returns to land rather than capital, the aggregate rate of return would overstate the social rate of return to nonhousing fixed capital.

More pervasively, Mills' measure of nonhousing product includes proprietors' income that largely reflects returns to the labor and entrepreneurial efforts of business owners. Unfortunately, the extent to which proprietors' income reflects labor compensation rather than returns to the private capital of proprietors is unknown.[8] Aggregate returns to nonhousing fixed capital that include proprietors' income probably overstate the social rate of return, whereas aggregate returns excluding this income probably understate it.

Again, I modify Mills' analysis to estimate the social rate of return to nonhousing fixed capital. Assuming that the rate of return to nonresidential land is the same as that to nonhousing capital, Equation 3 becomes

$$(4)\quad R_k = \frac{\hat{Y} - \overline{W}N - H - (1-\alpha)I}{K_{ke}\overline{p} + K_{ks}\overline{p} + A_k\overline{p}} + p_{k,t+1} - p_{k,t},$$

where I is proprietors' income, α is the fraction of proprietors' income that is a return to capital, A_k is the value of nonresidential land, K_{ke} is the value of nonhousing equipment, K_{ks} is the value of nonhousing structures, and $K_{ke} + K_{ks} = K_k$. As with housing, I assume that $A_k = 0.20K_{ks}$. To bias the analysis against a finding of overinvestment in housing, I also assume that none of the proprietors' income represents a return to capital ($\alpha = 0$).

Figure 2 compares the social rates of return to nonhousing fixed capital and housing. Clearly, between 1975 and 1995 the social rate of return to nonhousing fixed capital greatly exceeded the social rate of return to housing capital. At no time since 1975 has the rate of return to housing capital been within 5 percentage points of the rate of return to nonhousing fixed capital.

Furthermore, as is the case with housing, the aggregate social rate of return to nonhousing fixed capital has not changed significantly since 1986. The average since 1986 (12.99 percent) is statistically equivalent to the average from 1975 through 1986 (13.65 percent).

Social Rate of Return to Education

The social rate of return to education describes the total benefit to society of an investment in human capital. The two methods commonly employed to estimate the rate of return to investment in education—the internal rate of return method and the earnings function method—yield similar estimates for the United States (Taylor 1994). However, the internal rate of return method is better suited to generating annual estimates. Therefore, as in McMahon (1991), the internal rate of return method is used here.

This method involves directly calculating the interest rate at which the present value of the expected social benefits from education equals the present value of the expected social costs. In general, economists use earnings differentials at age t (E_t) to measure the expected social benefits. Per pupil expenditures plus the opportunity cost of student time constitute the expected social costs (C_t). Therefore, the social rate of return is the interest rate (r) that solves Equation 5,

$$(5)\quad \sum_{t=1}^{T-1} \frac{E_t}{(1+r)^t} = \sum_{t=1}^{T-1} \frac{C_t}{(1+r)^t},$$

where T is age at retirement (65).[9]

The internal rate of return to education is a good estimate of the social rate of return if wages reflect *all* the benefits to education, and

Figure 2
Social Rates of Return to Housing and Nonhousing Fixed Capital

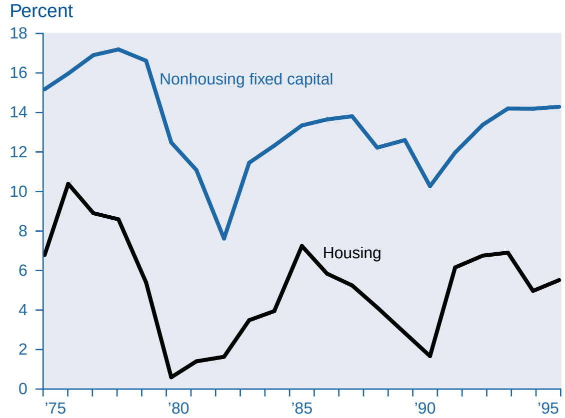


Table 1
Volatility of Rates of Return

	Housing	Nonhousing fixed capital (excluding proprietors' income)	High school education	College education
1975–95				
Mean (percent)	5.31	13.37	10.82	8.50
Standard deviation	2.46	2.32	.88	.73
CV	46.35	17.34	8.14	8.57
1975–86				
Mean (percent)	5.35	13.65	10.72	8.12
Standard deviation	3.19	2.87	.70	.72
CV	59.60	21.02	6.57	8.90
1987–95				
Mean (percent)	4.91	12.99	10.96	9.00
Standard deviation	1.76	1.35	1.11	.32
CV	35.89	10.40	10.09	3.61

only the benefits to education. Researchers have identified a number of probable nonwage benefits to education (McMahon 1987a,b; Taylor 1992; and Behrman and Stacey 1997), but no consensus has developed about their magnitude. If there are significant nonwage benefits, the internal rate of return to education will underestimate the social rate of return. On the other hand, if the wage increases associated with more education reflect greater innate abilities in addition to school effects, the internal rate of return will overestimate.[10] Earnings function estimates, which can better control for innate student characteristics (but not for nonwage benefits), suggest that the internal rate of return method modestly overestimates the social rate of return.

I calculate the internal rate of return to high school and college education for U.S. males using data on annual expenditures per full-time-equivalent student in the United States (U.S. Department of Education 1996a,b) and data on average annual earnings according to education levels and age groups (U.S. Bureau of the Census, annuals 1975–96).[11,12]

As Figure 3 illustrates, the internal rate of return to high school exceeded that to college in the United States over the period 1975–95.[13] The internal rates of return averaged 10.8 percent for a high school education and 8.5 percent for a college education. Furthermore, except for the high inflation period of 1975–78, both rates exceeded the social rate of return to housing.

Interestingly, while the internal rate of return to high school has remained statistically stable since 1975, the rate of return to college has been drifting upward. The internal rate of return to college averaged 8 percent from 1975 to 1986, but increased to an average of 9 percent from 1987 to 1995.[14] Relative to the rate of return to housing, however, the increase is insignificant.

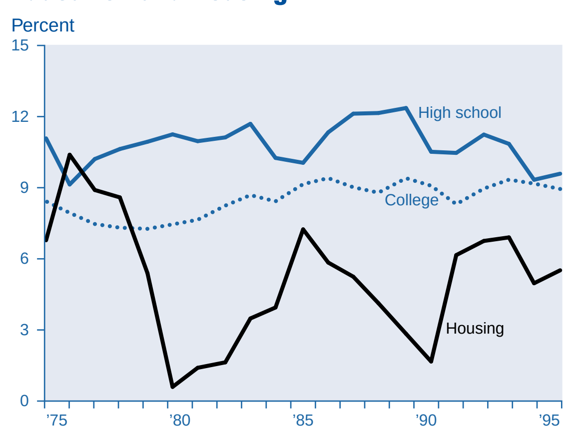
RISK ADJUSTMENTS

Risk-averse investors require that a risky investment earn a higher rate of return than a certain investment. The additional return, or risk premium, compensates them for the risk of holding the uncertain asset. Thus, to estimate the risk-adjusted rate of return to an investment, one subtracts the appropriate risk premium from the market rate of return. Similarly, to estimate the risk-adjusted social rate of return to an investment, one subtracts the appropriate risk premium from the social rate of return.

As a rough cut at the comparative risk premium for housing, Mills (1989) examines the volatility of aggregate returns. Because the coefficient of variation (CV) for housing greatly exceeds the CV for nonhousing fixed capital (*Table 1*), Mills concludes that the risk premium for housing should exceed that for nonhousing fixed capital.[15] Applying the same logic, the risk premium for housing should also exceed the risk premiums for education.

By this criterion, the relative risk premium for housing has grown since 1986. The variances for a college education and nonhousing fixed capital have fallen significantly, while their mean returns have either increased (college) or remained unchanged (nonhousing fixed capital).[16] Meanwhile, both the variances and the means for housing and high school education have remained unchanged.[17] Thus, investment in nonhousing fixed capital and college education

Figure 3
Social Rates of Return to Education and Housing



appears to have become less risky, while investment in housing and high school education appears no less risky.

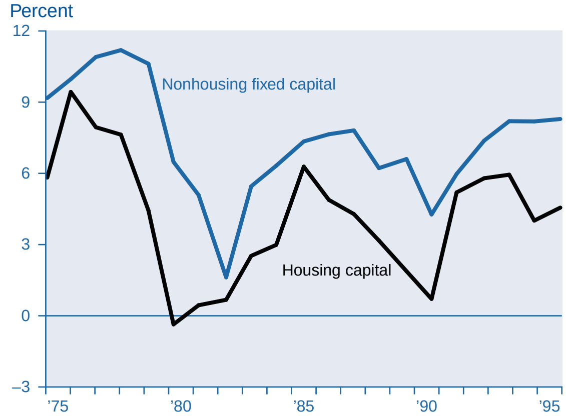
However, Mills' CV-based conclusions about the relative riskiness of housing investment are inconsistent with much of the relevant literature. Other researchers estimate that real estate risk is about half that of stocks (see the discussions in Chinloy 1992). Hendershott (1989) calculates that over the period 1946–82, the average ex post risk premium for housing was 40 percent of the average ex post risk premium for common stocks and only 25 percent of the average ex post risk premium for over-the-counter stocks. Chinloy's estimates of stock market betas imply that residential real estate is only 16 percent to 26 percent as risky as stocks (Chinloy 1991, 1992).[18]

In Mills' defense, stock market risk probably overstates the risk to investment in nonhousing fixed capital. Commercial real estate is a significant component of nonhousing fixed capital, and historically it has been less risky than equities. Furthermore, leverage makes equity returns more volatile than capital returns. Hendershott argues that "assuming no correlation between debt and equity returns and a one-third debt-to-capital ratio, a five-percentage-point change in capital value would translate into a seven-and-one-half change in equity value."[19] On the other hand, equity risk premiums decline as firm size increases (Campbell 1996), and small firms tend to be underrepresented in the data used to estimate stock market risk.

If housing commands a smaller risk premium than other types of investment, one cannot know whether the risk-adjusted social rate of return to housing is lower than that to other investments without estimating the magnitude of those risk premiums. To stack the deck in favor of housing, I use the equity premium to measure the risk premium for nonhousing fixed capital and 16 percent of the equity premium to measure the risk premium for housing capital. Estimates of the risk premium for education come directly from the education literature.

The equity premium is the difference between the rate of return on a portfolio of stocks and the rate of return on a benchmark U.S. Treasury instrument like the one-month Treasury bill (for example, Campbell 1996) or the five-year Treasury bond (for example, Blanchard 1993). Campbell (1996) calculates that the annualized equity premium averaged between 5 and 7 percentage points over the period 1952–90. Blanchard (1993) argues that the expected equity premium peaked at well over 10 percentage points in the late 1940s and—except for a run-up coinciding with the high-inflation periods of the late 1970s—generally declined until the mid-1980s. By Blanchard's estimation, the equity premium was less than 6 percentage points during the latter half of the 1970s, turned negative during much of the 1980s, and ranged between 2 and 3 percentage points in the early 1990s.[20]

Figure 4
Risk-Adjusted Social Rates with a 6 Percentage Point Equity Premium



Given the social rate of return estimates in Figure 2 and assuming that the risk premium for housing is 16 percent of the equity premium, any equity premium of less than 8 percentage points implies that the average risk-adjusted social rate of return to housing was less than the average risk-adjusted social rate of return to nonhousing fixed capital over the period 1975–95. Assuming an equity premium of 6 percentage points (the midpoint of Campbell's range and the upper bound on Blanchard's estimates for 1975–95), the risk-adjusted social rate of return to nonhousing fixed capital has averaged more than 75 percent higher than that to housing capital since 1975 (*Figure 4*).[21] Assuming a smaller equity premium, or a larger stock market beta for housing, would increase this ratio. While one could argue that the equity premium has either widened or narrowed since 1987 (depending on the point of reference), the evidence clearly suggests that the risk-adjusted social rate of return to nonhousing fixed capital continues to greatly exceed that to housing.

The evidence also suggests that the risk-adjusted social rate of return to a high school education exceeds that to housing. Groot and Oosterbeek (1992) estimate that the educational risk premium for U.S. males is less than 2 percentage points. Campbell's (1996) analysis implies an educational risk premium of 2.4 percentage points.[22] Low and Ormiston's (1991) preferred specification for risk aversion implies an educational risk premium for males of 3.5 percentage points. Assuming the residential risk premium is 1 percentage point (an assumption consistent with an equity premium of 6 percentage points and a housing premium equal to 16 percent of the equity premium), an educational risk premium of less than 5.25 percentage points implies the risk-adjusted social rate of return to a high school education is significantly greater than that to housing. Of course, if the residential risk premium exceeds 1 percentage point, then the case for relative overinvestment in housing is even stronger.

By contrast, the evidence suggests that the risk-adjusted social rates of return to a college education and housing may be similar. Again assuming that the residential risk premium is 1 percentage point, an educational risk premium less than or equal to 3 percentage points implies the risk-adjusted social rate of return to housing is lower than that to college. An educational risk premium between 3 and 5.5 percentage points implies that housing and college earn equivalent risk-adjusted social rates of return, while an educational risk premium above 5.5 percentage points implies that housing earns a higher risk-adjusted social rate of return than does a college education.[23] Thus plausible estimates of the educational risk premium give conflicting signals, and any conclusion about the relative, risk-adjusted rates of return to college and housing depends strongly on the assumptions about the educational (and residential) risk premiums.

CONCLUSIONS AND POLICY IMPLICATIONS

The evidence for the period 1975–95 indicates that the risk-adjusted social rate of return to housing is comparable to the risk-adjusted social rate of return to a college education, and is significantly lower than the risk-adjusted social rates of return to nonhousing fixed capital and to a high school education. Furthermore, despite major changes in the tax treatment of investment and the inflationary environment, there is no evidence the differential between housing and other types of investment has narrowed since 1986. Therefore, one is led to the conclusion that the United States continues to overinvest in housing.

Of course, it could be argued that the evidence does not capture all of the externality benefits of investments in housing, nonhousing fixed capital, and education. If the unmeasured benefits of housing investment are large enough relative to the unmeasured benefits of other types of investment, the amount of U.S. investment in housing might be allocatively efficient. However, the unmeasured benefits to housing would have to nearly equal its measured benefits before one could reach such a conclusion. Assuming the unmeasured benefits to nonhousing fixed capital are negligible, the unmeasured benefit to housing investment would have to top $220 billion per year (or $300 per month for each owner-occupied home) to support the current allocation of resources.

Absent such large unmeasured benefits from investment in housing, the evidence suggests the U.S. economy could grow faster if society shifted more of its resources away from housing and into high school education and, especially, nonhousing fixed capital. Therefore, given that the government has other mechanisms through which it can redistribute income to achieve its equity goals, policies that encourage such a shift would be socially desirable. Possible candidates for such reform would include the inflation indexing of nonhousing capital gains or the expansion of investment tax credits. Policies that reduce the favorable tax treatment of housing could also enhance social welfare by making these lower return investments less attractive. Conversely, policies that increase the relative attractiveness of investments in housing could reduce social welfare by inducing investors to shift resources away from nonhousing fixed capital.

NOTES

Thanks to Steve Brown, Steve Prowse, and Mine Yücel for helpful discussions, and to Victor Rozenblits for research assistance.

1 Other researchers have followed alternative routes to the same conclusions. See, for example, Hendershott (1987); Mills (1987); Rosen (1985); or Alm, Follain, and Beeman (1985).

2 Because estimates of gross stocks of fixed capital are no longer available, I cannot extend Mills' analysis of gross rates of return.

3 Positive externalities are social benefits that do not accrue to the participants in a market transaction.

4 Green and White consider and reject the possibility that these results arise from selection bias.

5 Green and White also do not consider the costs associated with continuation in school.

6 These data incorporate improved estimates of depreciation and as such are not as vulnerable to criticism as the estimates Mills (1989) uses. While the earlier estimates of the net capital stock presume straight-line

depreciation, the estimates I use presume a geometric pattern of depreciation (for a discussion of the new depreciation estimates, see Katz and Herman 1997). Compared with the estimates available to Mills, these data show much slower depreciation of structures and thus much larger estimates of the net capital stock.

7 This conclusion is consistent with Follain, Leavens, and Velz (1993), who also find no evidence that tax reform had reduced the returns to rental housing.

8 Summers attributes two-thirds of proprietors' income to labor rather than capital when calculating social returns to capital (Summers 1990, 118).

9 For a further discussion, see McMahon (1991).

10 For a further discussion of potential biases in estimates of the rate of return to education, see Weale (1993).

11 For a more complete discussion of the data and methodology, see Taylor (1994).

12 The use of such aggregate data undoubtedly introduces measurement error. It is used here for consistency with McMahon's analysis comparing the returns to housing and education prior to 1986. Cohn and Hughes (1994) find that, at the college level, controlling for individual characteristics and self-selection biases leads to substantially higher estimates of the internal rate of return to education.

13 I reject the hypothesis that the means are equal at the 1 percent level.

14 The difference in means is significant at the 1 percent level.

15 The coefficient of variation is the standard deviation divided by the mean (and multiplied by 100 for ease of exposition).

16 The hypothesis that the variances are equal across the two periods is rejected at the 5 percent level.

17 The hypothesis that the variances are equal across the two periods is not rejected at the 10 percent level.

18 Although Ibbotson and Siegel (1984) found evidence of substantial non-beta risk to U.S. real estate over the period 1947–82, Chinloy's estimation results are mixed. His study of the California real estate market between 1979 and 1989 suggests potentially significant non-beta risk, but his study of the San Francisco market between 1976 and 1986 finds no such effect.

19 Hendershott (1989, 215).

20 Blanchard (1993, 97).

21 Assuming that the equity premium is 6 percentage points and the residential risk premium is 16 percent of the equity premium, the hypothesis that the means of the two risk-adjusted rates of return are equal is rejected at the 1 percent level.

22 The risk premium for human capital is calculated from Campbell's annual data assuming that the coefficient of relative risk aversion is 5.3 and the ratio of human wealth to total wealth is 0.66. My thanks to John Campbell for his assistance with these calculations.

23 Assuming a 6 percentage point equity premium, any of these plausible estimates of the educational risk premium imply that the risk-adjusted social rate of return to college is significantly below the risk-adjusted social rate of return to either nonhousing fixed capital or high school.

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