Why Have U.S. Households Increasingly Relied on Mutual Funds to Own Equity?

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Research Department
Working Paper 0403

Federal Reserve Bank of Dallas

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May 2004

Abstract

Since the early 1990s, U.S. households have increasingly used mutual funds to own equity assets. Results indicate that this owes to two developments over the period 1970-2002 that are broadly consistent with the implications of Heaton and Lucas' (2000) model of equity participation. In that model, lower asset transfer costs and lower income risk can induce equity investing by less wealthy households, who—in practice and owing to diversification considerations—are more apt to indirectly hold stocks through mutual funds. The first factor is a pronounced decline in equity mutual fund loads, which are highly negatively correlated with the overall stock ownership rate, which has doubled owing to a rising percentage of households that own stocks only through mutual funds. The second is a general improvement since the 1970s in household expectations about future family financial conditions that may have induced households at the margin to become shareholders.

JEL Classification Codes: G11, G23, E44

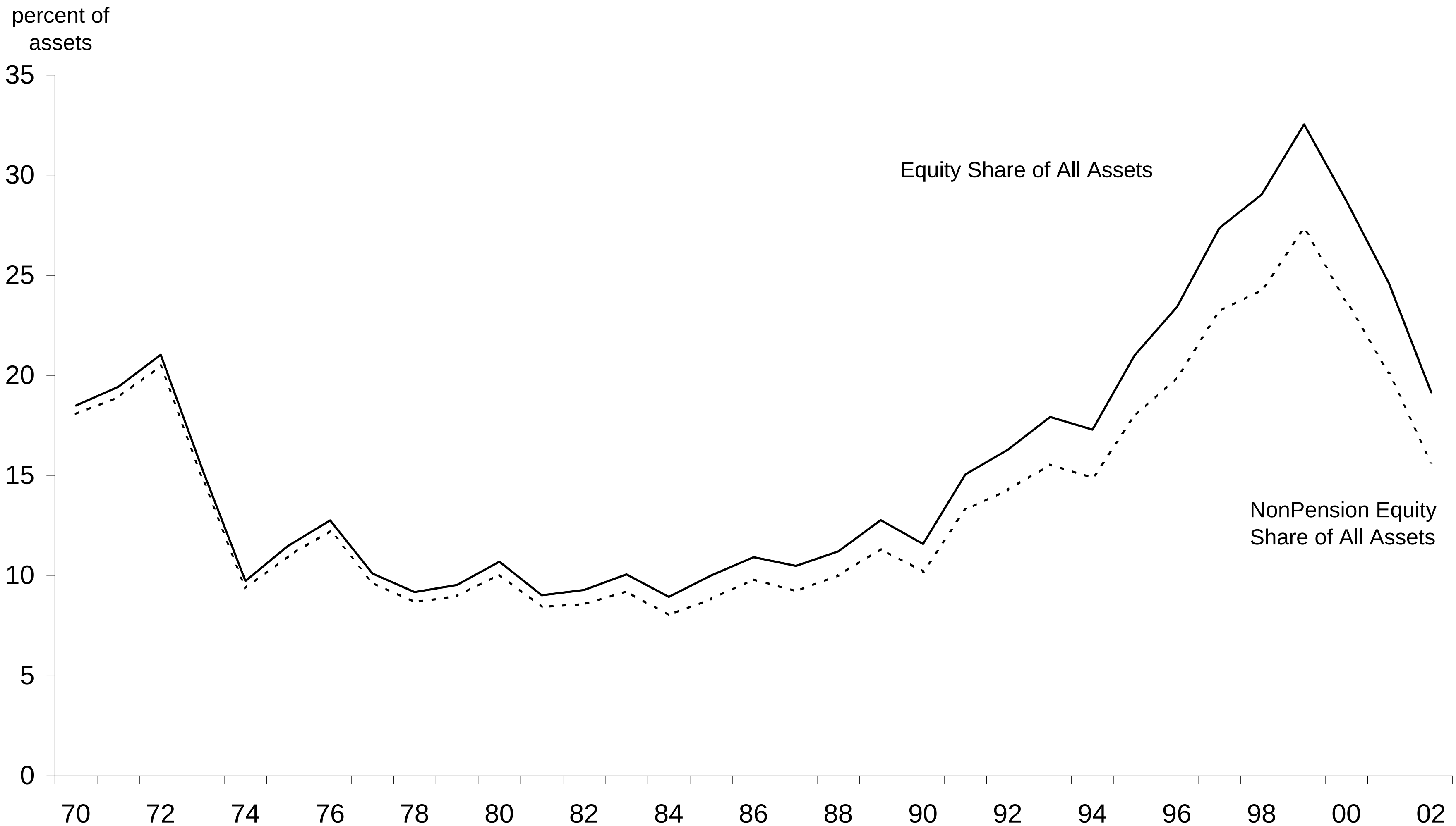
*I would like to thank an anonymous referee, Jennifer Afflerbach, Nathan Balke, Ricardo Llaudes, Leonard Nakamura, David Simon and Alan Viard for making helpful suggestions. The paper also benefited from what I have learned about mutual funds from John Rea, Brian Reid, and Sean Collins. I thank Jamie Lee, Ricardo Llaudes, and Dan Wolk for providing excellent research assistance. I especially thank the Investment Company Institute for providing some of the data used and numerous people at various mutual funds who provided historical data on the equity funds in my sample. The views expressed are those of the author and do not necessarily reflect those of the Federal Reserve Bank of Dallas or the Federal Reserve System. Any remaining errors are my own.

The exposure of U.S. household portfolios to stock prices has risen substantially since the 1990s, with equity increasing from 11.6 percent of household assets in 1990 to a peak of 32.9 percent in 1999, before ebbing to 22 percent in 2003.[1] Even excluding stocks in individual retirement accounts (IRAs) and defined contribution pensions (e.g., 401(k) plans), the non-pension equity share of assets rose from 10 percent in 1990 to 15 percent in 2002 (Figure 1). These increases mainly reflected increases in mutual fund holdings of stock, with large increases in both pension-related (defined contribution pensions and IRAs) and other equity holdings.

While these portfolio shifts partly reflect capital gains, greater equity exposure has been accompanied by a rise in stock ownership rates that began in the 1980s. Indeed, stock ownership rates jumped from under 25 percent in the 1960s and 1970s to over 50 percent by 2001, owing to a rising percentage of families that only indirectly owned stock, mainly through mutual funds. With an eye toward understanding why households are more invested in stocks, this study investigates the long-run factors behind the rising relative use of mutual funds to own equity.

This is a significant development because the portfolio shift into stocks has potentially important ramifications for consumption, portfolio behavior, and labor markets. For example, higher equity ownership rates could imply that household spending is more sensitive to stock price fluctuations, as suggested by pooled cross section evidence from Dynan and Maki (2001) that stock price movements affect the consumption of shareholders, but not of non-shareholders.[2] Consistent with their study, Duca (2004) finds that falling stock mutual fund loads are associated with an underlying increase in the stock wealth elasticity of consumption, which could reflect either that more households are exposed to stocks via the doubling of the equity ownership rate or that the transaction costs of tapping stock wealth to finance spending have fallen (as implied by Davis and Norman's (1990) theoretical model). Duca (2004) also finds that accounting for

Figure 1: U.S. Household Portfolios Become More Exposed to Stocks



Note: both series exclude equity in defined benefit pension plans in their numerators. Nonpension equity excludes equity in defined contribution and IRAs. Source: Flow of Funds, Investment Company Institute, and author's calculations.

equity fund loads yields stable long-run stock wealth and income coefficients in time series models of consumption, in contrast to a more conventional model that is plagued by coefficient instability as in Ludvigson and Steindel (2001).[3]

Greater stock ownership may have also raised the sensitivity of U.S. money demand to stock wealth. Prior evidence about whether stock wealth affects money demand has been mixed, likely reflecting opposing positively signed wealth effects on money demand and negative substitution effects associated with relative rates of return. The vast bulk of M2 balances are held by middle-income families, who posted the largest sized increases in stock ownership rates during the 1990s (see Kennickell, et al. 2000). Duca (2003) found that M2's sensitivity to stock prices has risen as equity mutual fund loads have fallen, suggesting that the negative substitution effects have become stronger in that stock price declines are associated with falling inflows into stock mutual funds and larger inflows into money market mutual fund and money market deposit accounts in M2. This heightened sensitivity complicates how to interpret M2 growth in periods of asset market turbulence and may reflect that more middle class households own equity mutual fund and M2 assets, and that the costs of shifting between them has fallen.

Retirement decisions may have also become more sensitive to stock wealth (see Cheng and French, 2000, and Coronado and Perozek, 2003). Indeed, the sharp rise in stock wealth relative to consumption or income during the bull market from 1995 to 1999 was accompanied by a sharp decline in labor force participation rates among men 55 and older. This pattern has reversed some since the bear market of the early 2000's, even though labor force participation rates tend to fall—not rise—when job growth is slow. These developments also imply that swings in stock wealth could have notable impacts on labor and thereby consumption decisions.

There are also public choice implications. For example, the rise of an “investor class” could affect public support for keeping inflation low or cutting capital gains taxes (Nadler 1999). Higher stock ownership rates may also affect voting, as suggested by Duca and Saving (2001), who find that the rise in the Republican share of the popular vote in House of Representatives elections since the 1980s is cointegrated with stock fund loads—a good proxy for stock ownership rates.[4] Greater experience with mutual funds might affect attitudes toward privatizing Social Security. On the one hand, experience with choosing mutual funds for thrift, IRA, and other investments may have boosted the appeal of privatizing social security. On the other hand, the stock market bust of 2000-02 may have increased the appeal of the inter-generational risk-sharing attributes of the current social security system. Given these potential implications and the role of mutual funds behind the rise stocks in household portfolios, it is important to understand why U.S. households have increasingly used mutual funds to own equity.

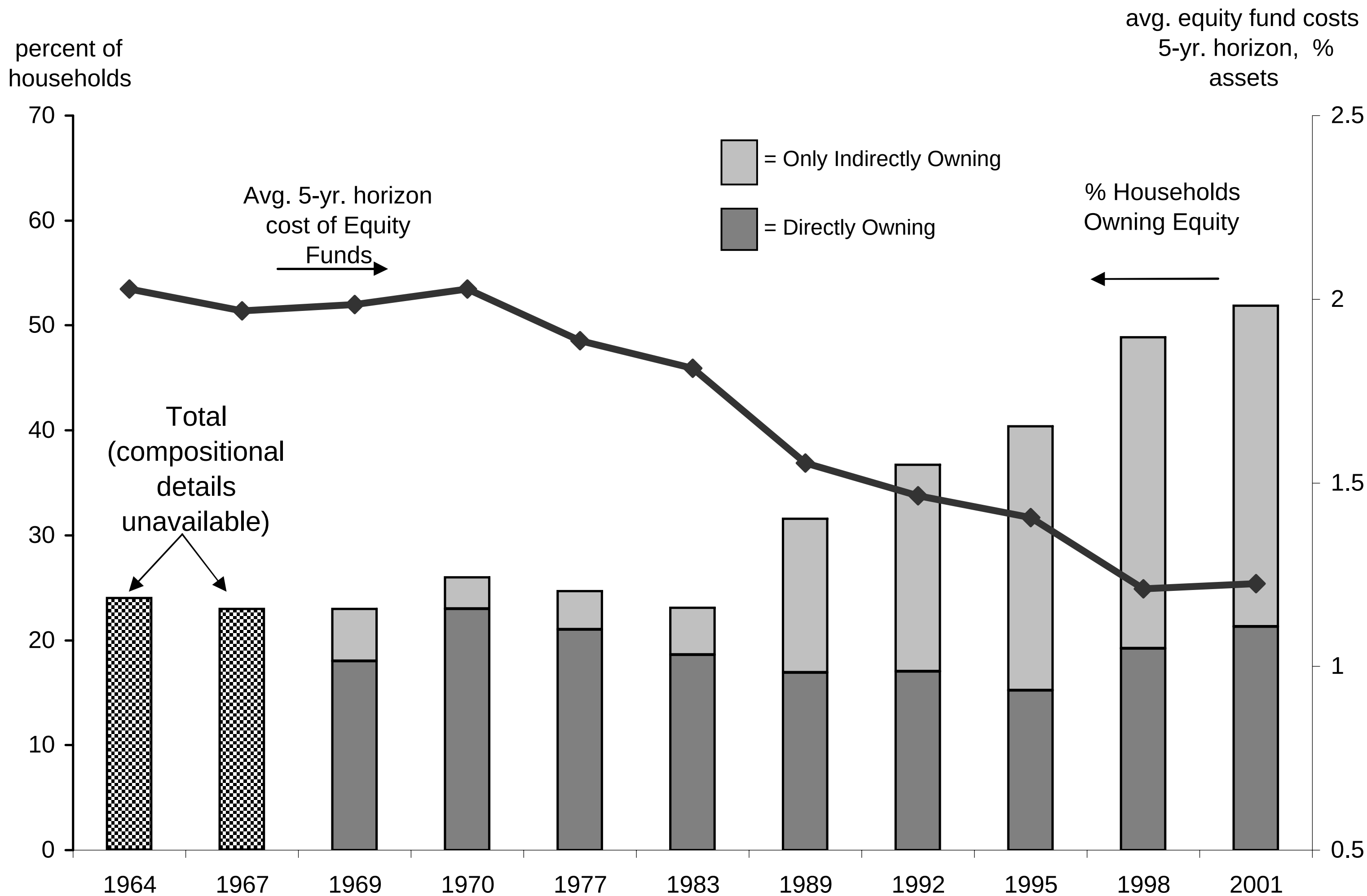
Since 1982, equity in mutual funds has risen as a percent of directly held stocks plus equity in mutual fund, from 4 percent 1982 to nearly 25 percent by 2002 (Figure 2). Much, but not most, of this growth occurred in IRAs. Excluding IRAs, mutual fund use rises from under 4 percent in 1982 to 16 percent of equity assets in 2002. Mutual fund use was likely aided by lower costs of buying equity mutual funds (Figure 3) in two ways. First, these declines raised the relative attractiveness of using mutual funds for those who already directly owned stock.

Second, falling mutual fund costs likely spurred many middle-income families to start owning equity. Owing to limited wealth, such families are plausibly more apt to acquire a diversified stock portfolio by buying mutual fund shares rather than by directly buying stocks, consistent with Figure 3, which shows increases in stock ownership rates (from Surveys of Consumer Finances, SCF) accompanying large declines in mutual fund costs as tracked by front-

Figure 2: Equity Mutual Fund Assets Rise as a Percent of Directly and Mutual Fund Held, Household Equity Assets

Note: both series exclude equity in defined benefit pension plans and defined contribution plans (e.g, 401k/403b) in their numerators and denominators.

Figure 3: Equity Fund Costs Fall and Stock Ownership Rates Rise



end and back-end equity fund loads over a 5-year horizon plus expense ratios (see Duca, 2001).[5] Details within the bars in Figure 3 also show that the rise in overall ownership rates occurred in indirect forms and that indirect ownership is negatively correlated with equity fund loads. In particular, the correlation of equity fund loads with overall ownership rates is –0.94 and that between equity fund loads and the percent of families who only indirectly owned stock is similar–0.94. As discussed below, these patterns accord with the impact of lower transaction costs in models of household portfolio choice by Heaton and Lucas (2000) and Saito (1995).

Results indicate that lower mutual fund costs and greater confidence have boosted the relative use of mutual funds as a means of owning stock. To establish these findings, the paper is organized as follows. Section I presents theoretical rationales behind the factors investigated. Section II describes the data, and Section III presents the empirical results, including tests showing long-run movements in equity fund loads lead changes in the relative use of equity funds. Conclusions are drawn in Section IV.

I. Explanations for the Increased Use of Mutual Funds

Several reasons for the increased relative use of equity funds are suggested by studies of equity participation, behavioral finance, demographics, and changes in pension laws, including effects from transactions costs, higher confidence, demographics, and IRA/thrift plans.

A. Transaction Costs

Lower mutual fund fees can boost the relative use of mutual funds to own equity via substitution and equity participation effects. The former reflects shifts by existing shareholders toward mutual funds as the cost of mutual funds falls, consistent with Investment Company Institute (ICI) and Federal Reserve data showing big net purchases of equity mutual funds and net sales of directly held stocks by households during much of the 1990s (Reid and Millar 1999).

Lower fund fees may also boost mutual fund use by spurring more families to become shareholders. Because of limited wealth and broker fees, some households are more apt to obtain a diversified equity portfolio by buying mutual fund shares, thereby boosting equity mutual fund assets as a share of all household equity assets. Theoretically, transaction fees can be barriers to entry, especially under uncertainty, as Dixit (1989) shows. With respect to stocks, loads may have been a barrier for many middle-class families who could only feasibly obtain a diversified portfolio via mutual funds. In the dynamic optimization models of Heaton and Lucas (2000) and Saito (1995), utility functions characterized by habit formation imply that transaction costs can deter many families from investing in stocks. In calibration exercises, large declines in transaction costs can induce a large rise in equity participation rates. The higher fees of the 1970s and early 1980s may thus account for a greater reluctance of many households to own stocks before the late 1990s that was analyzed by Aiyagari and Gertler (1991) and Haliassos and Bertaut (1995).[6] Consistent with a participation effect on equity funds, SCF data show that U.S. equity ownership rates rose in the 1990s, mainly reflecting greater ownership of mutual funds.[7]

B. High Excess Returns or High Confidence

One reason for the increased use of mutual funds as a means of owning stocks is higher investor confidence, perhaps stemming from large equity returns since the early 1980s that partly reflect the lower frequency of recession in this period. Lower downside risk may also reduce labor income risk, which has been shown in calibration models to boost stock ownership among households (see Heaton and Lucas, 2000). For these reasons, greater confidence could induce equity purchases by middle-income households, who for diversification reasons, are more apt to purchase shares in mutual funds rather than individual stocks. As a result, greater investor confidence could plausibly boost the relative use of mutual funds as a means of owning equity.

One reason why confidence rose between the 1970s and late 1990s appears to be a pronounced decline in the downside risk to stocks associated with a more stable business cycle since the Volcker disinflation. This is consistent with the declines in the standard deviation of GDP growth (see McConnell and Quiros, 2000) and the number of months during which the U.S. economy was in recession since 1983. Greater macroeconomic stability may also boost stock investment by lowering the downside risk to labor income. If household utility is characterized by habit formation, lower labor income risk boosts households' tolerance of a given amount of asset risk and thereby, the percent of households investing in risky assets like stocks [Heaton and Lucas (2000) and Saito (1995)]. These factors raising confidence may have increased peoples' tolerance of risk, contributing to a further fall in the equity premium after 1980 (Blanchard 1993). The decline in this premium may also reflect increased recognition of the high historical equity premium (Mehra and Prescott 1985) which encouraged more investment in stocks (Siegel 1994), or increased longevity that may have lengthened investment horizons.[8]

Alternatively, high equity returns in the 1990s may have induced greater stock ownership out of myopia or fad behavior, as suggested by behavioral finance studies (Bernartzi and Thaler, 1995; DeBondt and Thaler, 1985; and Shiller, 1984 and 1990). Swings in confidence may have also induced shifts into stocks by small investors who are more apt to own mutual funds. Such shifts may not be well tracked by excess returns or Sharpe ratios, perhaps owing to other factors affecting the perceived longevity of an economic expansion or magnitude of downside risk.

C. Possible Demographic Factors

The life-cycle theory suggests that two demographic factors may have boosted stock ownership. One is the aging of the baby boom that has raised the share of the population preparing for retirement (Morgan 1994). Because the marginal new investor tends to be less wealthy than traditional shareholders, diversification motives induce new investors to buy mutual funds rather than individual stocks. Through the combination of these effects, the aging of the baby boom generation could boost the mutual fund share of equity holdings. This possible demographic channel implies a higher demand for stocks either because of a greater need to save or due to a longer investment horizon arising from retirement motives for saving. The latter accords with a greater tolerance for risk as suggested by a drop in the equity premium since the early 1980s and a rise in the equity share of household assets. While the fall of the personal saving rate in the 1990s seems inconsistent with the first effect, the decline in the saving rate may reflect the wealth effects of the dramatic stock appreciation during this period.

Possible demographic effects may arise from greater longevity, whose impact on saving is theoretically ambiguous because the need to fund a longer retirement could be offset by a longer work life. In practice, social security penalties on earnings of senior citizens reduce the latter offset. However, by increasing investment horizons, greater longevity may boost the demand for equity, consistent with a decline in the equity premium and rapid stock appreciation through early 1999 that occurred despite the late-1990's rise in stock price volatility.

However, data indicate that demographic shifts do not explain the rising use of mutual funds. Laderman (1997) finds that demographic shifts account for little of the rise in the mutual fund share of household portfolios and that most of this rise reflects increases in the mutual fund portfolio share in each age group. More recent data in Kennickell, et al. (2000) show a similar pattern. These studies imply that the rising use of mutual funds stems from some factor common to households, such as falling mutual fund costs. Another fact against demographic effects is that the population and labor force shares of the over-34 year-old cohort in the mid-1990s were near those of the early 1970s, when equity fund use was lower. These factors may explain why demographic factors were insignificant in tests as discussed in the Appendix.[9]

D. IRAs and Thrift (401k/403b) Plans

Mutual fund use for non-pension investments (also excluding IRAs) has likely been boosted by changes in IRA regulations and the shift from defined benefit to defined contribution pensions.[10] For example, laws effectively favor the use of third parties, such as mutual funds, to manage IRA assets. Fiduciary responsibilities also encourage firms to offer employees a menu containing third-party managed mutual funds in defined contribution pension plans. The rise of IRAs and defined contribution plans likely induced moderate income families to incur the one-time costs to learn about mutual fund investing. Partly based on cross-section correlations between investment behavior and education, Haliassos and Bertaut (1995) argue that learning costs can be a barrier to equity participation. Overcoming information barriers for mutual funds is relevant for middle-income families, for whom diversification makes owning mutual funds preferable to directly owning stocks. Also, because IRA assets count toward the minimum balances for avoiding maintenance fees and opening asset management accounts with many mutual funds, IRA mutual fund assets can lower the costs of owning nonIRA mutual fund assets. Thus, the rise of IRAs plausibly boosted mutual fund share of non-retirement household equity oldings by lowering barriers to equity participation associated with scale and information.

II. Data and Variables

Several types of variables are used to model the relative use of mutual funds as a means of owning equity. These include measures of the mutual fund share of household equity assets, IRA regulations, equity mutual fund costs, and household expectations.

A. The Mutual Fund Share of Household Equity Assets

The mutual fund share of household stock holdings focuses on equity assets over which households have reasonable control and is based on equity mutual fund assets and directly held corporate equity from the "Household and Non-Profit Organization Sector" in the Flow of Funds accounts. The latter include individual stocks and equity in closed-end funds. Equity holdings in mutual funds (with or without IRAs) are based on Flow of Funds estimates of equity in mutual funds, which exclude equity held in defined contribution pension plans (e.g., 401k and 403b plans), but which include equity in IRAs. The broadest measure of the mutual fund share of household equity (TMF) is equity in mutual funds (including IRAs) divided by itself plus directly held corporate stock (second and third right-most column entries in line 11 in Table 1).

The other series (MF) measuring the relative use of mutual funds as a way of holding equity excludes estimated holdings in IRAs. Specifically, ICI estimates of IRA assets in equity mutual funds up through 1995 are subtracted from the Flow of Funds series to produce a non-IRA measure of equity held through mutual funds (MFEXIRA). Using data from the ICI (various issues), IRA-like assets include IRA and self-employed retirement stock fund assets before 1986, and overall IRA-like assets in stock funds (IRAs, self-employed retirement plans and, since 1997, "simple IRA" plans) afterward, reflecting revised ICI data categories. From 1996-2002, IRA adjustments equal all IRA assets in domestic equity plus international equity funds multiplied by the percent of equity fund assets not held in short-term liquid, non-equity assets plus 60 percent of IRA assets in hybrid funds (such funds usually are 60 percent invested in equities and 40 percent invested in fixed income assets). The mixing of ICI and Flow of Funds data is not problematic mainly because the Flow of Funds estimates of mutual fund holdings are largely derived from ICI data.

Total non-retirement tradable equity equals directly held stocks plus non-IRA mutual fund holdings (MFEXIRA). The relative use of mutual funds to own non-IRA equity (MF) is defined as the ratio of MFEXIRA to non-retirement tradable equity (second and third right-most column entries in line 13 in Table 1). Data for constructing MF are consistently available since 1970. Yearend IRA/Keogh data are available from ICI since 1970 and since 1969, Flow of Funds data on direct stock holdings exclude equity in trusts and estates, and in other categories.

Certain types of equity are excluded from the construction of MF and TMF. Non-traded equity in partnerships and sole proprietorships is excluded, partly because the data on them are not based on observed market prices and partly because the owners of such equity also derive labor income from that equity, which raises a host of complications. (Partly for these reasons, the Flow of Funds system classifies these assets as a category separate from directly held corporate stocks.) Stocks held in trusts, estates, and through life insurance are also excluded because legal and tax considerations limit the flexibility households have over these assets and because most life insurance liabilities are pension annuities. Stocks held in pension (including thrift) plans are also excluded because of factors that greatly complicate any time series analysis.

An important source of difficulty is that household exposure to stock prices through retirement assets has changed over time, with the shift from defined benefit to defined contribution pensions (401(k) and 403(b) plans) and IRAs. This shift raises several problems for using retirement assets. First, because defined benefit plans expose firms but not households to stock prices, equities in such pension plans are typically excluded from measures of household equity wealth, such as in some measures listed in the Federal Reserve's Flow of Funds accounts. However, if one excludes defined benefit assets, then the shift from defined benefit to defined contribution pensions raises difficulties for including thrift plan assets when measuring the relative use of mutual funds to own equity. Such a measure would be distorted by an ongoing compositional shift in pensions that has arisen largely because of regulatory rulings and new laws, which effectively introduce regime shifts in the middle of the sample period examined.[11]

As with thrift plans, including IRA assets also raises time series complications from including these retirement assets in measuring relative mutual fund use. First, IRAs were not available throughout the sample (1970-02) because Congress created IRAs in 1980. Second, even after 1980, IRAs were offered in several different types of regulatory regimes. In fact, Congress liberalized deductibility and eligibility requirements in 1982 that effectively offered IRAs to most taxpayers. Then, in 1987, eligibility was restricted, based on income and whether an employee had a company pension plan. Not surprisingly, IRA assets grew rapidly over 1982-86, and then grew more slowly starting in 1987. Finally, Roth IRAs became available in 1998, which helped boost the growth of equities held in IRAs relative to other equity holdings.

These time series concerns with including IRA assets are manifested in unit root tests. Excluding IRA assets from total and mutual fund equity holdings, the mutual fund share of equity assets has a unit root, with the first difference being stationary at the 99 percent confidence level over 1970-2002 when one includes a constant and a time trend. Including IRA assets, evidence of a unit root is not quite as strong, with the first difference being stationary at the 95 percent confidence level over 1970-2002 when one includes a constant and a time trend. This study analyzes relative mutual fund use with and without IRAs as a robustness check, but nevertheless focuses on non-retirement assets because of the strong possibility that regime shifts affecting pension assets may affect relative mutual fund use in ways that are hard to model.

B. IRA Regulations

To test whether changes in IRA regulations are important, some regressions include dummies for IRA regulations. IRA8286 equals 1 during the first years (1982-86) when IRAs were available to all households, while IRA8700 equals 1 over 1987-2000 reflecting that the Tax Reform Act of 1986 largely limited new IRA contributions were to households that did not have a defined benefit pension plan or whose income did not exceed a specified cutoff level.[12]

C. Equity Mutual Fund Costs

Two sources on equity fund costs are available. One is ICI, which has estimated mutual fund costs as a share of assets based on expense ratios, loads, and other fees using all open-end equity funds (Rea, Reid, and Lee 1999). [For more on fees, see Tufano and Sevick (1997).] Using redemption data, this series annuitizes the front- and back-end loads over a fifteen-year holding period. The advantage of ICI's series is that it covers all equity fund costs and all equity funds. The primary disadvantage of the series is that it starts in 1980, which limits the sample in terms of the number of observations (23) and the number of business cycles covered.

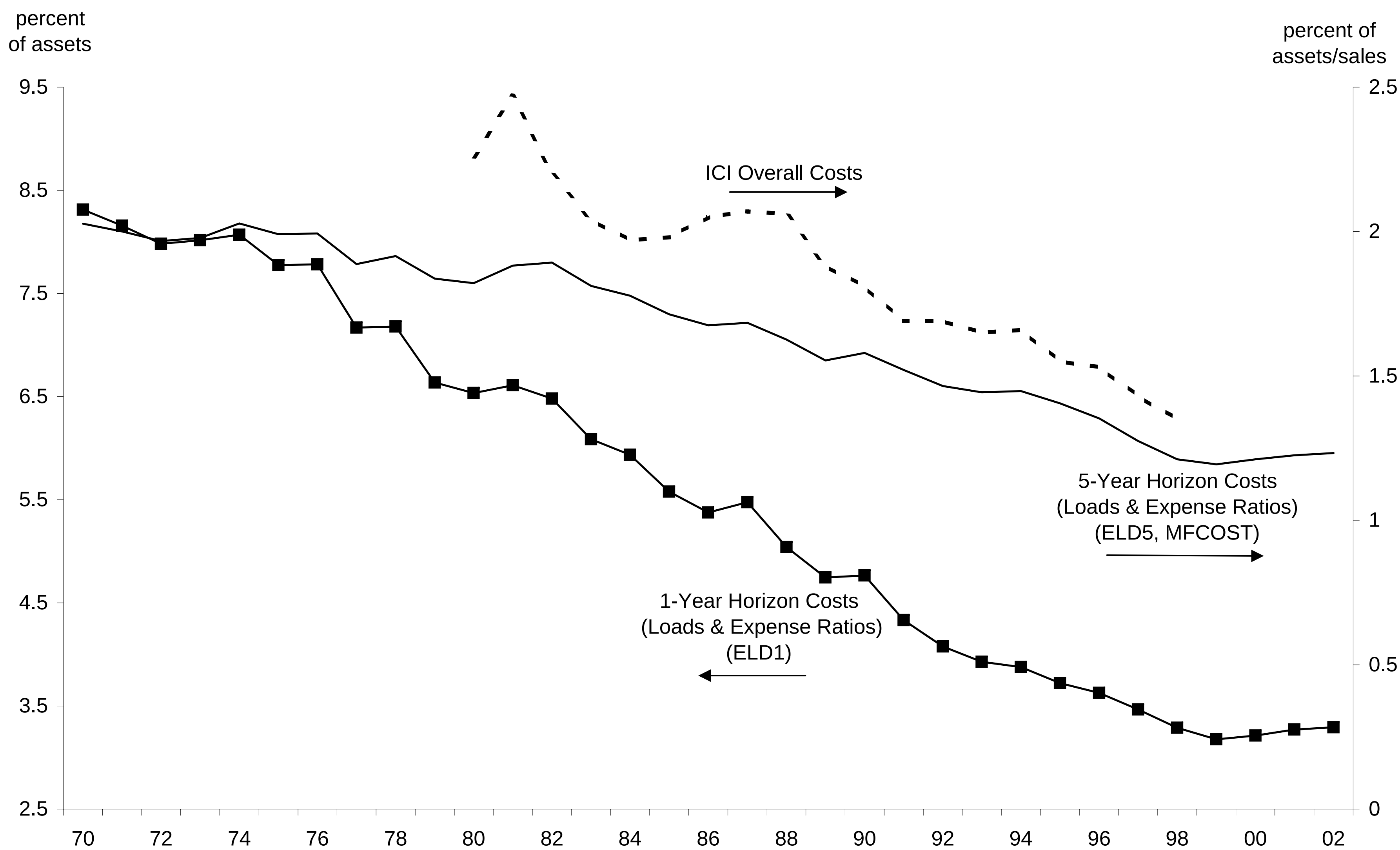
Another source is Duca's (2004) sample of large equity funds developed to analyze the missing M2 of the early 1990s (see Duca 2000). Relative to the ICI data, his data cover a longer sample (1970-2002) with 11 more observations spanning three more business cycles and bear markets. This feature makes the cointegration results more credible given the large differences in the reliance on equity mutual funds in the 1970s and the two most recent decades. These differences are important for identifying the factors driving the use of equity funds over the long run. Another advantage is that unlike ICI data, the panel excludes institutional funds that tend to have lower costs than non-institutional funds because the latter handle more numerous, smaller household accounts. In addition, the ICI series combine transaction costs (loads) with expenses using a long horizon, whereas Duca's (2004) data allow one to use transaction costs measured over either a short-run or medium-term horizon. The latter are more consistent with the implications of the new literature on stock ownership and toll costs, in which equity participation is more closely linked to transaction costs [e.g., Dixit (1989) or Heaton and Lucas (1999)]. These aspects make the panel series better for analyzing long-run trends in the use of mutual funds.

On the other hand, the panel series omits some mutual fund costs and is from a sample of 127 large equity funds that is a subset of that used in the ICI series. However, this disadvantage is likely minor since the assets in these funds have accounted for over half of all equity fund assets in each year since 1970. Another difference is the panel series use weighted average data with weights based on fund assets, while the ICI series use weights based on annual sales data.

Despite these differences, it is reassuring that the panel load series and ICI cost series move together during the 1980s and 1990s (Figure 4).[13] This likely explains why tests not shown yield similar results over 1980-97 using these series. Nevertheless, this study presents results using the panel data because they cover the 1970s, which differed greatly from the 1980s and 1990s, and because the degrees of freedom are severely restricted by the use of annual data.

Details on equity cost variables from Duca (2004) are as follows. One measure, LD1, tracks load fees using the weighted average front-end and back-end load (as a percent of asset transfers), where the back-end load is for withdrawals within a year of investment and fund weights are the ratios of each fund's assets to those of all funds sampled. LD1 assumes investors have a short time horizon for assessing equity fund costs. An alternative, LD5, is constructed using a five-year horizon (expressed on an annual basis) using front-end loads divided by five and back-end loads for withdrawals after five years from the initial investment (divided by five). The correlations between the overall stock ownership rate and each of these equity fund load

Figure 4: Measures of Equity Mutual Fund Costs



variables are nearly identical (about –0.89), as are the correlations between each of these equity fund load variables and the percent of families that only indirectly own stock (about –0.93).

One concern about LD1 and LD5 is that their movements may be distorted by shifts in the extent to which mutual funds may substitute annual expenses for lower loads. For these reasons, the variables ELD1 and ELD5 were constructed, which add the expense ratio as a percent of assets to LD1 and LD5, respectively, on an asset-weighted basis. Using quarterly estimates from 1954-2002, all four variables have a unit root according to standard tests. However, using annual data from the shorter 1970-02 sample, evidence of a unit root was significant for only the broadest measure of mutual fund costs ELD5. Accordingly, ELD5 is used in the cointegration analysis and is simply denoted MFCOST in the tables. (Results were similar using the other three mutual fund cost measures, reflecting their high correlations with one another.) The broad cost series (ELD5) and ICI's cost series move similarly over the post-1980 ICI sample, consistent with Rea, Reid, and Lee (1999), who show that overall equity fund costs fell in the late 1990s as a large decline in loads offset a slight up-tick in expense ratios. Rea, et al. Lee (1999) find that half of the fall in equity fund costs owed to individual mutual funds cutting loads and the other half to households shifting from higher to lower cost funds.

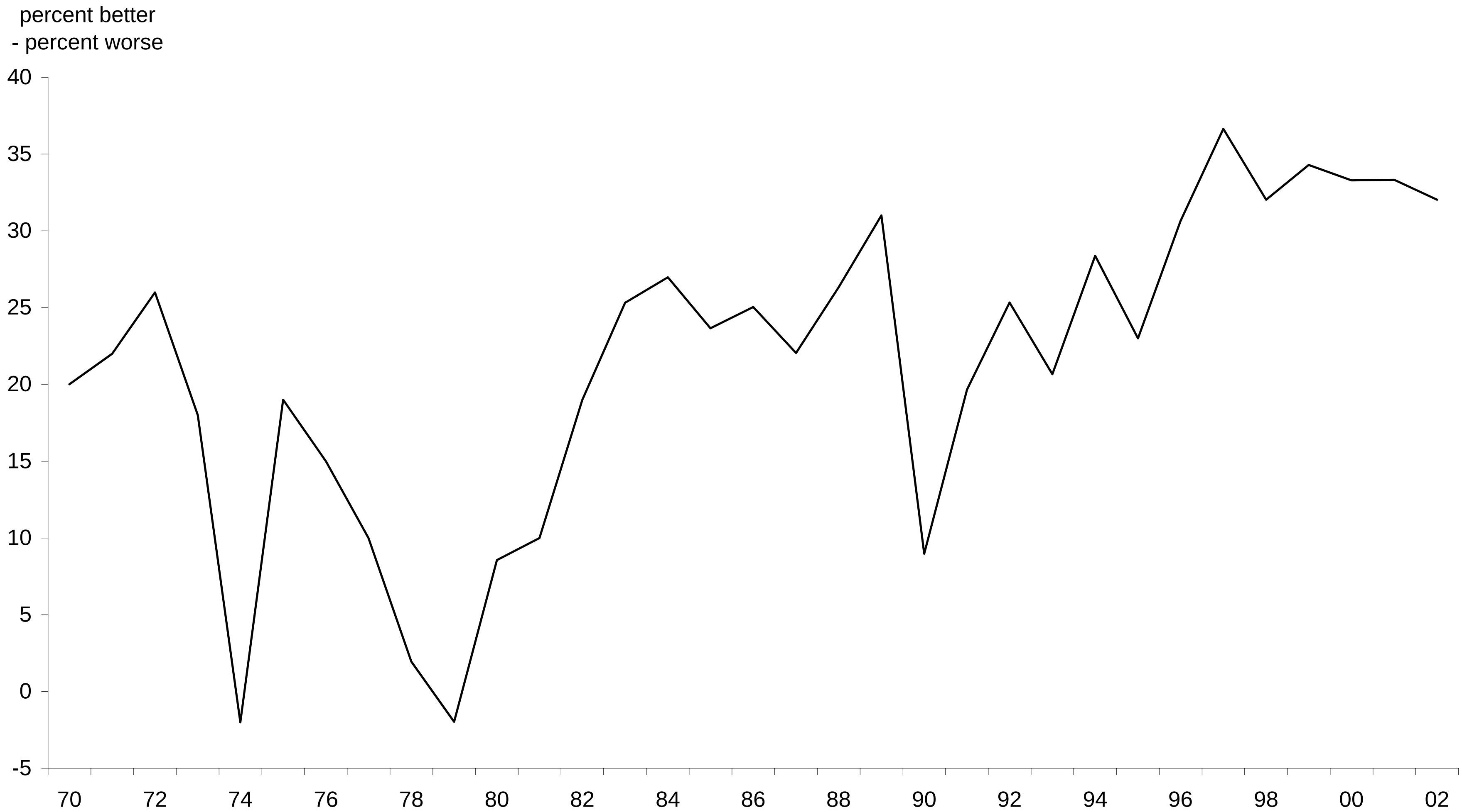
Because data before the mid 1980s are sketchy and incomplete, mutual fund costs were constructed from a sample of 127 large equity funds using data from several sources, including the funds sampled and publications from CDA/Wiesenberger, IBC/Donoghue, and Morningstar. A list of panel members is available from the author. Funds were included if their assets exceeded one of the following criteria: if assets exceeded $1 billion at year-end 1991 if the fund existed before the mid-1980s, exceeded $2 billion at year-end 1994 if the fund began after 1983, exceeded $5 billion at year-end 2003, or exceeded $250 million at year-end 1975. The first criterion reflects whether a fund was big in the early 1990s before equity funds grew rapidly and the second, whether a growing but new fund was large in the mid-1990s. Given stock gains in the 1990s, the hurdle for newer funds was higher for the 1994 and 2003 cutoff dates to keep data-gathering costs from exploding. The fourth criterion avoids omitting funds that were relatively large in 1975 from distorting cost measures when few funds existed. Funds are excluded if they were closed-end or only open to employees of a specific firm. One exception, the Windsor Fund, is included because it became closed-end when its open-end cousin (Windsor II) began and because both funds are large. The other exception was the large Magellan fund.

To some extent, possible economies of scale in mutual funds imply potential interaction between mutual fund use and costs. The cointegration analysis performed does not rule out or depend on costs being exogenous to the mutual fund share of household equity holdings because evidence of cointegration only shows that variables are related in the long run. Nevertheless, granger causality results are presented later which imply that the relative use of mutual funds to own equity (MF) does not lead movements in mutual fund costs, while financial technology in the form of bank sector productivity does lead movements in mutual fund costs.

D. Confidence

For several reasons, investor confidence is measured using household expectations of future finances (EXPFIN), defined as the percent of households who expect their financial situations to get better over the next twelve months minus the percent seeing their financial situation as worsening in the Michigan survey of confidence (Figure 5).[14] First, EXPFIN reflects expectations and portfolio behavior is largely based on expectations. Second, EXPFIN may reflect the combination of expected future returns and risk attitudes that affect household

Figure 5: Net Expectations of Family Financial Conditions Twelve Months Ahead



Note: measures percent households expecting their financial situation to improve in twelve months minus the percent expecting their financial condition to worsen.

investment behavior.[15] Third, unlike the overall Michigan index and many of its components, the net financial expectations index (EXPFIN) has a unit root according to standard tests.

EXPFIN can also be seen as measuring investor sentiment that could capture entry effects. This is in contrast to the average discount on closed-end equity funds, which Warther (1995) finds is insignificant in explaining short-term movements in mutual fund inflows. It is plausible that, relative to confidence about future finances, the closed-end discount reflects the sentiment of more experienced investors and households are generally less informed about closed-end funds and the closed-end discount anomaly. Warther (1995, p.233) also questions the relevance of this discount to investment flows into open-end funds on two grounds. First, it may not be a valid measure of investor sentiment in general. Second, the discount may reflect a different aspect of investor sentiment that may not be relevant to investment in open-end funds.

In addition to EXPFIN, some regressions also included a dummy (OILDUM) equal to 1 for years (1973, 1979, 1981, and 1990) when real oil prices surged by more than 10 percent and to levels outside the range seen over the prior 5 years. This variable was included in some vector error-correction models to see if investment uncertainty (outside of expectations about the financial condition of ones family as tracked by EXPFIN) surrounding major oil shocks affected estimates of long-run determinants of mutual fund use, as well as to assess any short-run effects.

III. Empirical Findings

This section begins with cointegration tests to assess the long run shifts in the relative use of equity funds. Then, causality tests, which take into account cointegration results, are presented. Finally, two-stage error-correction models are used to investigate short-run movements in the relative reliance on equity funds.

A. Cointegration Results

To assess long-run trends in mutual fund use, cointegration tests were run using net expectations about future financial conditions and equity fund costs measured over a 5-year horizon (MFCOST). As Engle and Granger (1987) argue, cointegration analysis should be used to detect long run relationships among nonstationary variables; and when they exist, information from long-run relationships should be used to model short-run movements (e.g., first differences) because only using first differenced data omits information and can lead to misspecification bias. Using cointegration analysis is appropriate and desirable because the portfolio share, equity fund costs, and investor confidence variables are nonstationary in levels or logs, but are stationary in first differences. This is indicated by the augmented-Dickey-Fuller statistics at the top of Table 2 which are insignificant for the levels and significant for the first differences of each variable. Variables are in natural logs (except the financial conditions variable which has some negative values), denoted with a capital letter "L" in front of variable names in levels.

For each measure of mutual fund use (MF or TMF), tests found only one cointegrating vector significant at the 5 percent level using Johansen-Juselius's (1990) rank significance criterion under various statistical assumptions (Table 2).[16] In each case, vectors minimizing the Akaike information statistic (from vectors estimated using assumptions regarding whether variables had a deterministic trend—none, a linear trend, or a quadratic trend; and whether the vector should be estimated with or without a constant) favored including a constant but not a time trend in the vector and allowing the individual variables to have time trends (this is consistent with the unit root tests which found significant time trends for each variable).[17] The significant trace statistics shown in Table 2 reject the hypothesis of no cointegrating (long-run) relationship and the insignificant trace statistics (not shown to conserve space) do not reject the hypothesis that one long-run (cointegrating) relationship exists.

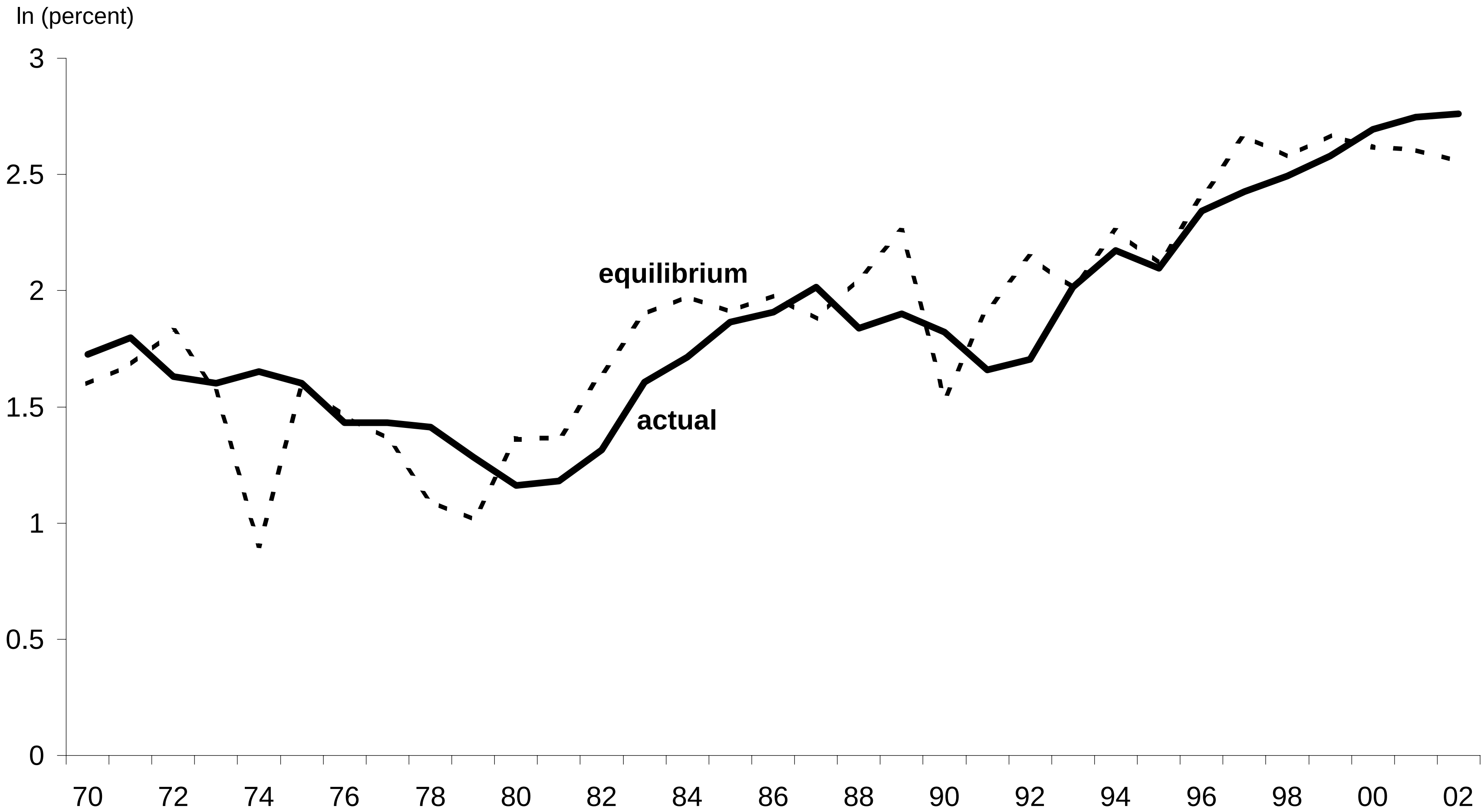
In addition to vectors 1 and 4, vector error-correction models (VECMs) were also estimated under similar statistical assumptions, but also included the two IRA dummies and/or the oil dummy variable. The long-run relationships estimated with both IRA dummies are listed as vectors 2 and 4 for mutual fund use excluding IRAs and including IRAs, respectively. In addition, for the mutual fund use variable MF (which excludes IRAs), the long-run relationship from the VECM including the statistically significant short-run oil shock dummy is also shown (vector number 3). Since the IRA and oil dummies are both at least marginally significant for the broader mutual fund use measure (TMF), the long-run relationship from the VECM including all three dummy variables is also shown in Table 2 (vector number 6).

Several interesting patterns emerge from the results in Table 2. Note that because the cointegrating vectors are shown, the economic relationships from the implied equilibrium relationships can be inferred by flipping the signs from the estimated cointegrating vector (see the last note in Table 2). First, equity fund costs are significantly and negatively correlated with equity fund usage in the long run. Second, the net expectation of future family financial conditions has a statistically significant and positive relationship with the relative use of equity funds, as expected. Third, the equilibrium levels of equity fund usage implied by the vectors track actual mutual fund use well, as illustrated in Figure 6 which plots the estimated equilibrium along with actual levels (both in logs) for mutual fund use excluding IRAs.

B. Causality Test Results

It is possible that improvements in information technology could drive down mutual fund costs and thereby boost the relative use of mutual funds as an investment vehicle. However, in

Figure 6: Equity Mutual Fund Assets As a Share of Directly and Mutual Fund Held, Household Equity Assets



Logs of portfolio shares excluding IRA and pension plan assets. Equilibrium from vector 1 (Table 2), using 5-year horizon equity fund loads adjusted for expense ratios and an index of household expectations of their year-ahead financial condition.

principle, it is unclear whether shifts in the relative use of mutual funds could drive changes in mutual fund costs because there could be sufficiently large economies of scale in operating mutual funds. For example, increased use of mutual funds might lower marginal costs and thereby drive down mutual fund loads. To address this issue, causality tests were run.

Because equity fund use, mutual fund costs, and confidence are cointegrated, causality tests need to include a lagged error-correction term. Accordingly, an additional condition for the absence of Granger causality from variable X to variable Y is that lags of ΔX and the error-correction term are jointly significant (see Enders, 1995, p. 367 and pp. 371-72). The first two panels of Table 3 show causality test results using an optimal lag length on first difference terms of one-quarter (using the Akaike and Schwartz lag-length criteria) and using error-correction terms from the corresponding, cointegrating vectors 1 and 4. Results indicate that lagged error-correction terms lead changes in the share of household equities held in mutual funds but do not lead changes in mutual fund costs. In addition, lagged first differences of mutual fund costs were not significant in explaining short-run changes in equity fund use and lagged first differences of equity fund use were insignificant in regressions of percent changes in mutual fund costs. These findings imply that long-run movements in loads lead short-run movements in the relative use of equity funds, with joint tests of the first difference and error-correction terms indicating unidirectional causality running from mutual fund costs to mutual fund use. Joint F-tests also point to unidirectional causality from financial confidence to mutual fund use.

Other results indicate that mutual fund costs are linked to financial technology, as tracked by commercial bank productivity (BPROD), which grew faster than non-farm business productivity since the early 1980s. Using logs and Johansen's criterion, MFCOST is cointegrated with banking sector productivity (available over 1967-99)—meaning that mutual fund costs are related to a measure of financial sector productivity—and the equilibrium equity fund costs implied by the cointegrating vector closely track actual equity fund costs (Figure 7).[18]

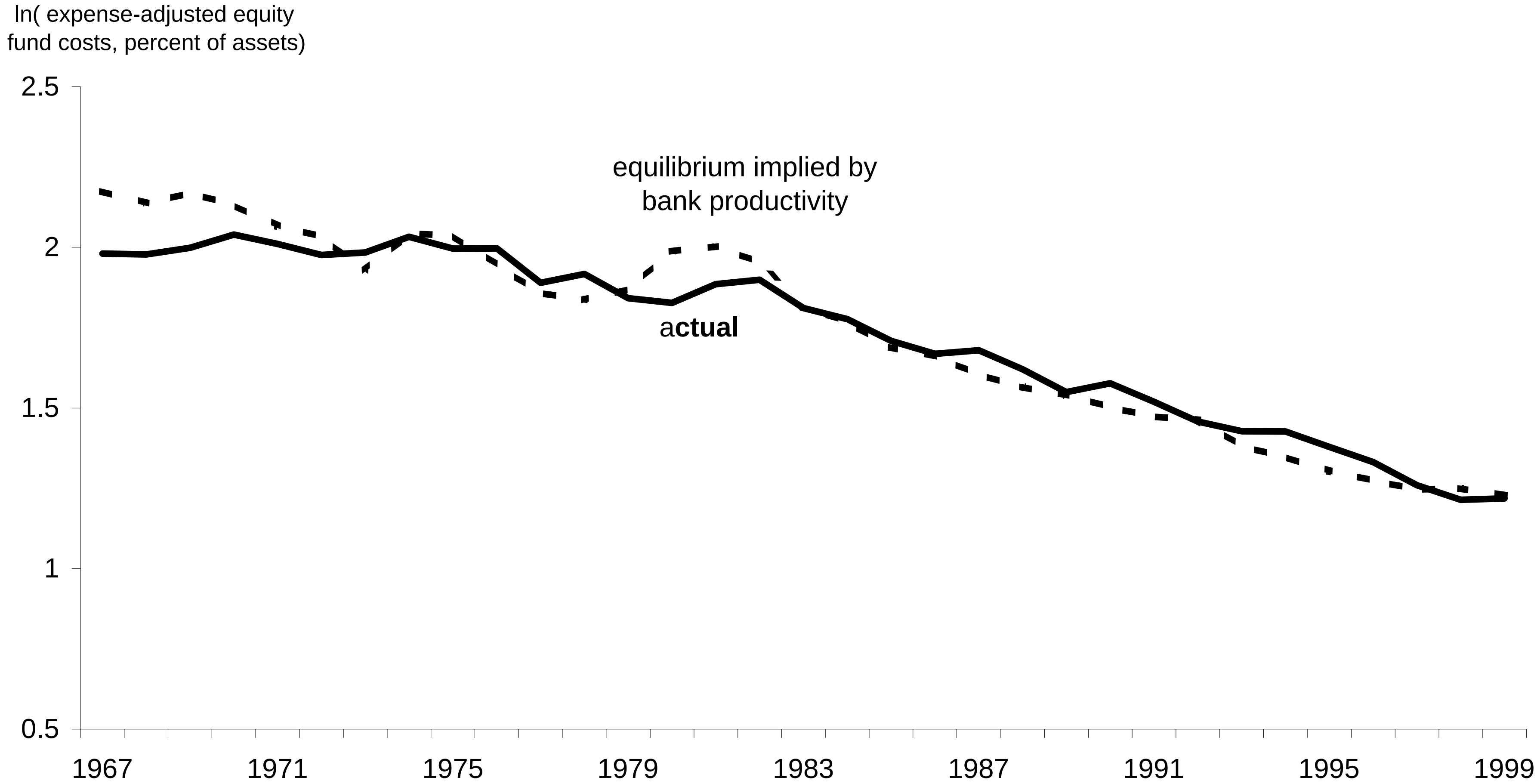
The timing of movements between bank productivity and MFCOST is assessed using the causality test approach employed above. Results indicate that the lagged error-correction term leads changes in equity fund costs but do not lead changes in bank productivity (bottom-panel, Table 3). In addition, lagged first differences of productivity were not significant in explaining short-run changes in loads and lagged first differences of loads were insignificant in accounting for growth in bank productivity. These findings indicate that long-run movements in financial sector productivity lead short-run movements in broadly defined equity mutual fund costs.

C. Results for Explaining Short-Run Movements in the Relative Use of Equity Funds

Short-run changes in mutual fund use are analyzed using vector error-correction models (VECMs) in which error-correction terms are from corresponding cointegrating vectors in Table 3. Each VECM contains short-run factors affecting changes in the relative use of equity funds, by including changes in mutual fund costs and confidence, along with the lagged dependent variable. To test whether changes in IRA regulations or oil shocks have affected short-run equity fund use, some models (2, 3, 5, and 6) include different combinations of these variables. For the broader measure of mutual fund use (TMF), results are shown for VECMs including both IRA variables (model 5) and the IRA and oil shock variables (model 6). After illustrating that IRA variables are insignificant for mutual fund use excluding IRA assets in model 2, model 3 presents results from a VECM that only adds the short-run oil shock term.

The results in Table 3 display several interesting and important patterns. First, the error-correction coefficients are significant with the expected negative sign, implying that the long-run factors affecting mutual fund use are also important in explaining short-run movements. Because

Figure 7: Equity Mutual Fund Costs Move In Line With Bank Productivity



Equilibrium from the cointegrating vector at the bottom of Table 3, using 5-year horizon equity fund loads adjusted for expense ratios and bank productivity data.

the error-correction term is equals the actual log level minus its equilibrium log level, these results imply that mutual funds use tends to fall when actual reliance exceeds its equilibrium level. Because equity fund costs are negatively related to mutual fund use over the long-run, this result also implies that a persistent decline in mutual fund costs will boost mutual fund use in the short-run. Second, the magnitude of the error-correction coefficients indicates that the gap between actual and equilibrium relative use of mutual funds closes at reasonable speeds ranging from roughly 25 to 50 percent a year. Third, IRA regulations had marginally significant positive effects on the use of mutual funds inclusive of IRAs (TMF, models 5 and 6), with a larger coefficient on the more liberal rules of 1982-86 in each model. Fourth, the IRA variables were insignificant in modeling nonIRA mutual fund use (MF, model 2). Fifth, the oil dummy had negative effects which were statistically significant for nonIRA mutual fund use (MF, model 3), and marginally significant for the broader measure of mutual fund use (TMF, model 6). Sixth, lagged changes of long-run variables (ΔMFCOST, ΔEXPFIN, ΔMF, and ΔTMF) were generally insignificant. Finally, in most models and the best performing ones (model 3 for MF and model 6 for TMF) the error-correction term was usually the most significant variable, consistent with the view that household portfolio movements are largely driven by longer-run considerations.

IV. Conclusion

This study finds that long-run movements in the mutual fund share of household non-IRA equity assets are negatively correlated with mutual fund costs and positively correlated with confidence in future family financial conditions. In particular, these results are consistent with the Heaton and Lucas (2000) framework which implies that declines in mutual fund costs and income risk can induce higher stock ownership rates among middle-income families, for whom equity mutual funds are a more feasible way of owning a diversified stock portfolio than are direct stock holdings. Error-correction models indicate that short-run changes in mutual fund use are negatively correlated with the gap between actual and equilibrium levels of mutual fund use, where equilibrium levels reflect the long-run impact of mutual fund costs and confidence.

Other findings suggest that mutual fund costs have fallen primarily owing to greater financial sector productivity. In particular, mutual fund costs are cointegrated with the best available measure of financial sector productivity (bank productivity), with causality results implying that long-run movements in bank productivity lead short-run movements in mutual fund costs, while long-run or short-run movements in mutual fund costs do not lead movements in bank productivity. Furthermore, long-run movements in mutual fund costs lead short-run movements in the relative use of equity funds, while long-run or short-run movements in the relative use of equity funds do not lead movements in costs. These findings suggest that declines in mutual fund costs owe more to general improvements in financial sector productivity rather than to economies of scale associated with an increased popularity of mutual funds.

While confidence or perceived labor income risk will likely swing over time, sharp declines in the costs of owning stocks via mutual funds are more likely to persist, as implied by the tight correlation of broad measures of mutual fund costs and banking sector productivity. Thus, on the one hand, the empirical results imply that the decline in future expectations about family financial conditions likely restrained the relative use of mutual funds in the early 2000s. But, on the other hand, findings imply that the historically low range of mutual fund costs likely buttressed the relative use of mutual funds to own equity in recent years. Evidence suggests that the latter effect slightly outweighed the former, with a more muted rise in the relative use of mutual funds to own equity since 1999 (Figure 2) that is also consistent with a more muted rise in stock ownership rates between 1998 and 2001 than had occurred between 1995 and 1998 (Figure 3).

Of course, there are other innovations that are gaining popularity, such as investing in exchange-traded funds and customized electronic portfolios, which are substitutes for mutual funds and may further transform household investment and economic behavior. Nevertheless, these innovations will also likely lower the costs and barriers to stock ownership, which the empirical results in this paper suggest will further induce more long-term exposure to equities. Thus even with these caveats, much—if not most—of the upward shifts in stock ownership and exposure to stock wealth fluctuations during the 1990s are likely to persist, along with their potential implications for other aspects of economic and political behavior.

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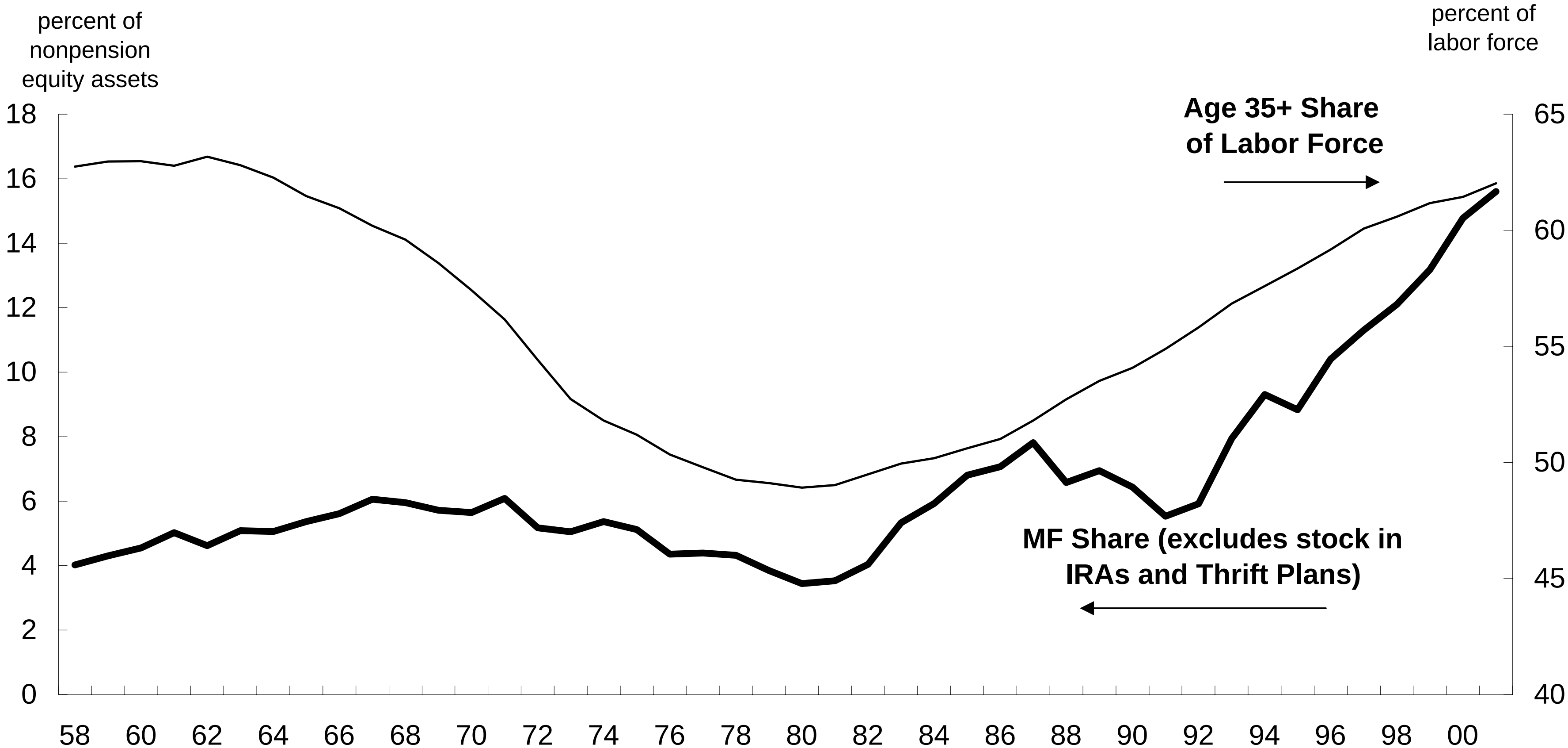
Appendix: Why Demographic Shifts Do Not Account for Shifts in Mutual Fund Use

This appendix reviews why time series data on demographic shifts, as measured by share of the labor force ages 35 and over (AGE35+), have not significantly affected the use of mutual funds to own nonpension equity assets. First, the mutual fund share of non-pension assets has roughly tripled since the early 1970s, whereas recent levels of AGE35+ are near those of the early 1970s (Figure 8). In contrast, the flat pattern of mutual fund costs from 1970 to the early 1980s is consistent with the flat and low level of relative mutual fund use of that period. This pattern also holds when extending the measure of mutual fund use prior to 1969 (see Figure 9).[19]

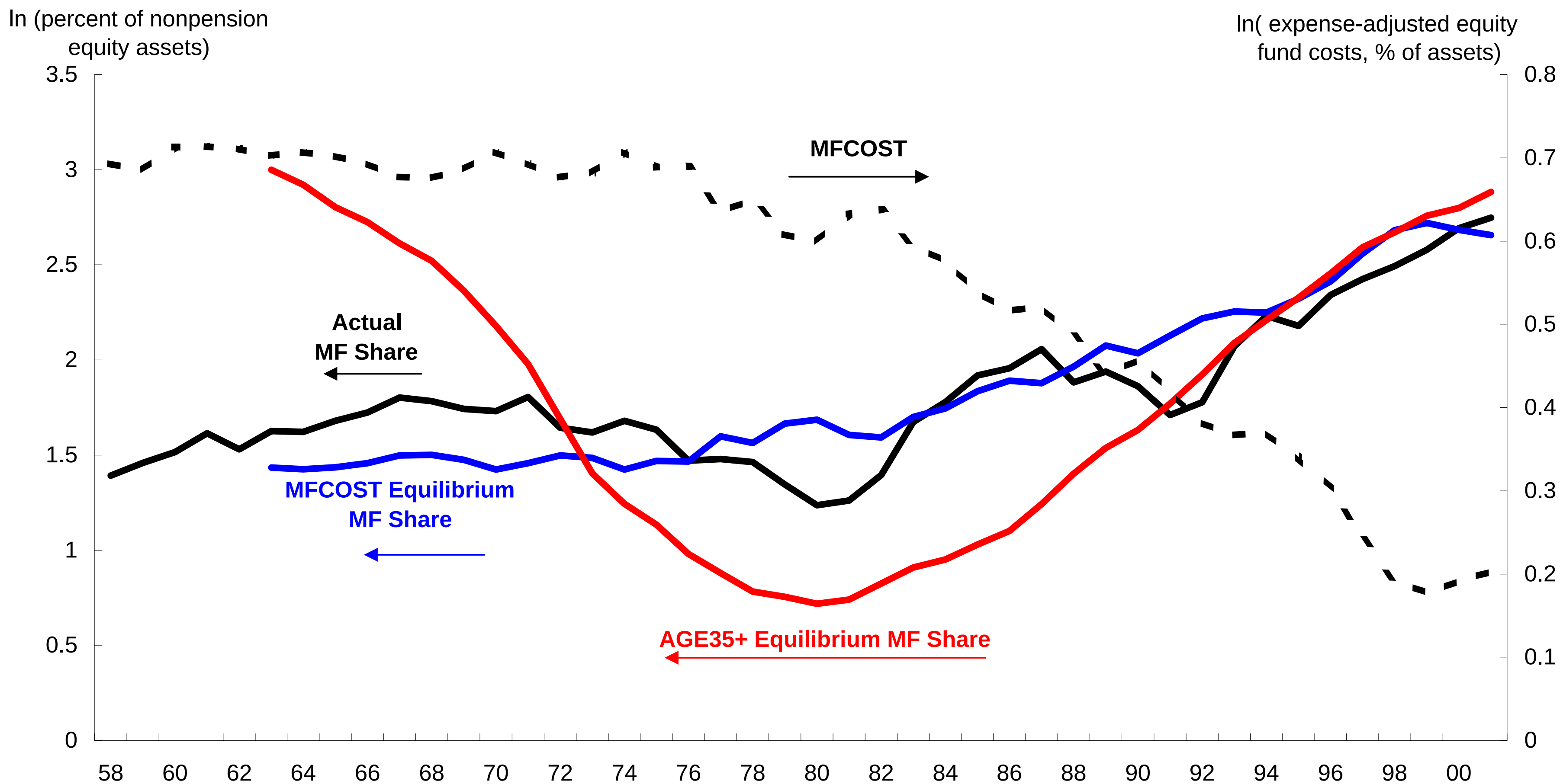
There is more formal evidence against a role for AGE35+. First, AGE35+ does not have a unit root (table 5) over 1970-02 and 1958-02. Second, the log of AGE35+ is not cointegrated with the log of mutual fund used (LMF) in bivariate tests over 1970-02, in contrast to the log of MFCOST (vectors 6 and 7, table 5). Over a covering 1958-02, there is evidence of bivariate cointegration for both variables with LMF (vectors 1 and 4, table 5), but the implied equilibrium from AGE35+ deviates greatly from the actual whereas the equilibrium implied using MFCOST tracks LMF reasonably well (see Figure 9). Third, when ln(AGE35+) replaces EXPFIN in vectors containing ln(MFCOST), the variables are not cointegrated and in the vectors minimizing the AIC statistic, the demographic variable is either statistically insignificant (1970-02) or marginally significant with a counter-intuitive sign (1958-02), implying that mutual fund use was lower the older was the labor force (vectors 5 and 8, table 5). In contrast, vectors using EXPFIN, yield sensible results (see vectors 2 and 3 in table 5 for tests using 1958-02 data; note EXPFIN is available since 1958), which imply equilibrium relationships that trend closely with mutual fund use (see Figure 10 which contrasts the equilibrium shares implied by vector 1 in

Figure 8: Age Composition Not Simply Related to Relative Mutual Fund Use



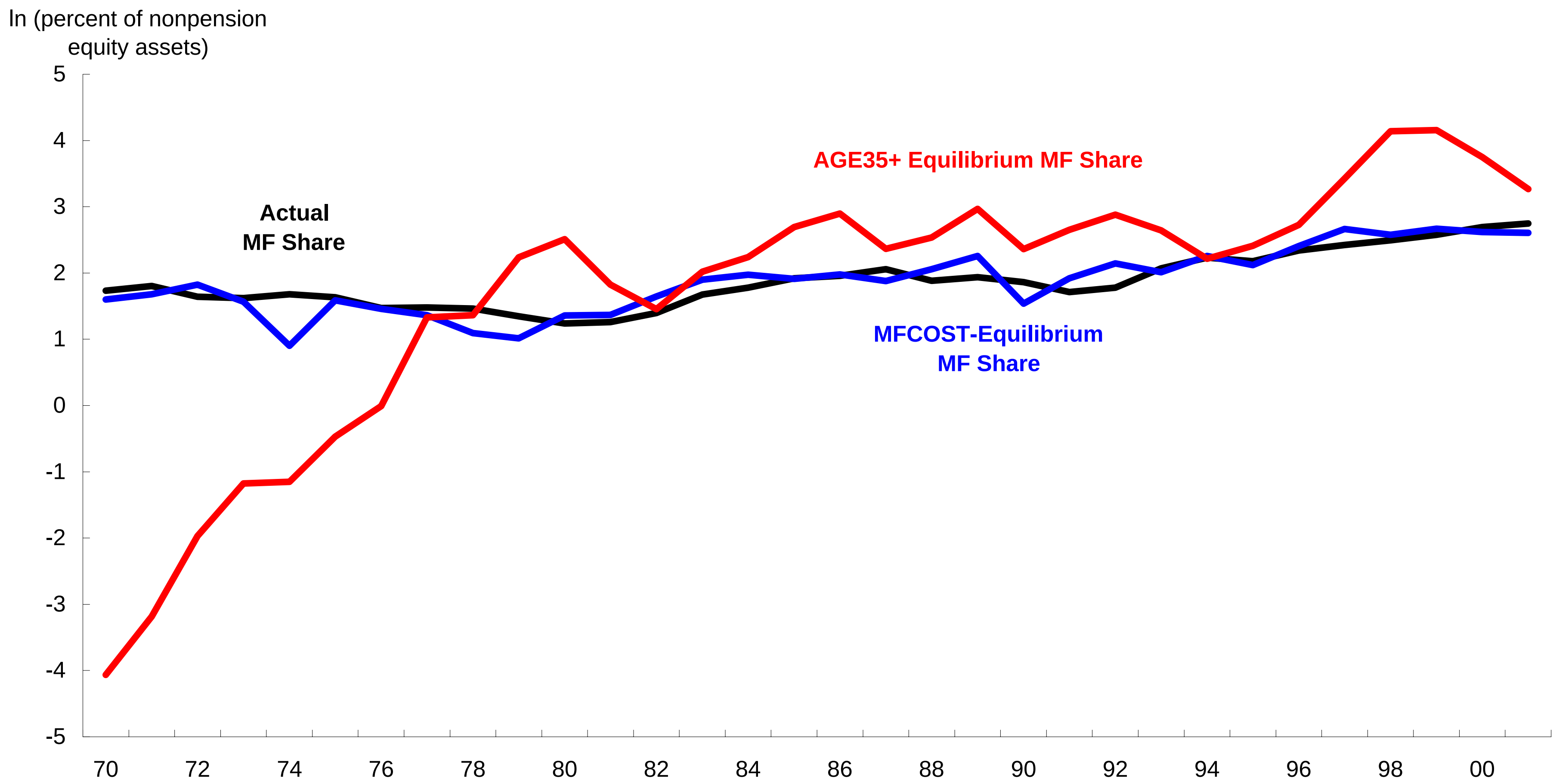
Pre-1969 data on MF share is based on Flow of Funds data that were break-adjusted by the author.

Figure 9: Actual and Two-Variable Equilibrium Equity Mutual Fund Assets As a Share of Directly and Mutual Fund Held, Household Equity Assets



Logs of portfolio shares excluding IRA and pension plan assets. Equilibria from vectors 1 and 4 in table 5 which do not contain EXPFIN. Pre-1969 data on MF share is based on break-adjusted Flow of Funds data.

Figure 10: Actual and Two-Variable Equilibrium Equity Mutual Fund Assets As a Share of Directly and Mutual Fund Held, Household Equity Assets



Logs of portfolio shares excluding IRA and pension plan assets. Equilibria based on vector 1 in Table 2 and vector 5 in table 5.

Table 2 with vector 8 from Table 5). These results indicate that demographic shifts do not appear to have significantly affected how households own equity in *non*-pension accounts.

However, it is important to note that the findings do *not* imply that demographic time series trends are not linked to how households own stocks in pension accounts. As discussed in the text, non-pension behavior is analyzed here because the shift from defined benefit to defined contribution pensions introduces regime shifts that are difficult to empirically handle—especially since employers and the Pension Benefit Guarantee Corporation bear most of the risk from investing defined benefit pension assets in stocks, whereas employees bear the risks of equity invested in defined contribution (401(k)) plans.

Endnotes

[1] The numerators exclude equity in defined benefit pensions, which do not generally expose households to risk.

[2] One concern about the stock wealth effect on consumption is whether the high concentration of stock holdings among the wealthy implies that stock wealth has little direct effect on spending.

[3] Future research will likely address whether the wealth sensitivity of spending is more or less sensitive if equity is held in pension-related assets.

[4] They find that the cointegrating relationship between voting and mutual fund costs adds information in error-correction models of the change in the Republican share of the House popular vote.

[5] Ownership rates are not fully consistent over time. First, SCFs treat all mutual fund assets as stock before 1989, but only equity funds afterwards. Second, SCFs treat stock in IRA or 401(k) plans as indirect ownership since 1989. Third, some early SCFs treat non-traded equity as stock, while others do not. 1986 data are omitted because unlike other SCFs, the 1986 SCF did not ask about stock in employers or investment clubs. Also, the quality of this SCF is suspect because it was done by phone without edit checks and may be biased by selection effects from movers since it re-contacted 1983 respondents. Ownership data are from Aizcorbe, et al. (2003), Kennickell, et al. (2000), Katona, et al. (1968, 1970, 1971), and Durkin and Elliehausen (1978). Mutual fund costs are from Duca (2004).

[6] Haliassos and Bertaut's (1995) find that investment minimums at mutual funds are too low to explain why most households do not own equity, but this does not rule out that mutual fund fees were an important barrier.

[7] This is implied by three SCF findings in Kennickell, Starr-McCluer, and Sunden (1997, tables 4 and 6). First, stocks rose from 31.7 to 41.1 percent of household financial assets between 1989

and 1995. Second, the share of families directly or indirectly owning stocks rose from 26.3 to 40.4 percent, with the biggest rises among middle-income families and the smallest among families with incomes above $100,000. Third, the share of household financial assets in bond and equity mutual funds jumped, whereas that of directly held bonds and stocks dipped.

[8] Warther's (1995, 1998) finding that short-run equity fund inflows are unaffected by prior short-run changes in stock returns does not preclude that stock returns affect how families own stocks over the long-run.

[9] Because the population and labor force shares of those over 34 years old are not I(1), but rather I(2), the first differences of these shares were used in cointegration tests, where they proved to be statistically insignificant.

[10] Gustman and Steinmeier (1992) and Ippolito (1995) attribute half the rise in defined contribution plans as a share of primary pensions to job shifts away from unionized, larger firms that favored defined benefit plans. Ippolito (1995) attributes the other half to tax changes that favored defined contribution plans.

[11] 401k plans arose after a firm's attempt to exploit a loophole in ERISA was upheld. Thrift equity includes mutual fund equity and stock in an employer acquired under favorable terms or company bonuses or pension contributions.

[12] Roth IRAs have been available since 1998, subject to income limits. Table 3 does not report runs adding a separate dummy for Roth IRAs to conserve space and the use of dummy variables.

[13] The ICI series exceeded ELD5 by .2 percentage points in 1997. This small difference likely reflects that ICI series covers other costs and includes small funds having higher costs than the larger funds in Duca's (2004) sample.

[14] To correspond with yearend data on mutual fund use and costs, the fourth quarter average of monthly observations is used to reduce monthly noise (since 1978). In other cointegration tests not shown to conserve space, two I(1) excess stock return variables were generally insignificant. Both compound over five years the quarterly return on the S&P 500 index (capital gains and dividends) and subtract off either the 3-month Treasury bill rate or the 10-year Treasury yield. Similar results arose using real returns on the S&P 500 index deflated by the consumer price index or median price of existing homes. Reasons why confidence outperformed these alternatives are that confidence may better reflect expectations than lagged returns and may better reflect perceptions of future economic risks. In testing for cointegration between portfolio behavior and returns, these long-run tests differ from those of Warther (1995, 1998), who assesses the short-run interplay between mutual fund inflows and security prices.

[15] In other tests not shown, the expectation component of the overall Michigan sentiment index outperformed the overall sentiment index, which also reflects household assessments of current conditions. The Conference Board survey of confidence is not used because it starts in 1975, which limits the small number of annual observations.

[16] If more than one vector were found, the Johansen-Juselius procedure would not definitively yield a useful long-run relationship among the variables tested—a problem not encountered here.

[17] Allowing for each variable to have a time trend seems sensible, and not including a time trend in the cointegrating vectors avoids the non-intuitive inclusion of including a time trend in the long-run relationship across variables, which can sometimes arise because the empirical framework is misspecified or omits important economic factors. The Schwartz information criterion (SIC), which balances fit against degrees of freedom, favored including a constant but not a time trend in the vector and not allowing the variables to have time trends. However,

restricting the possible statistical assumptions to allow for a time trend in each variable—consistent with other evidence, the SIC favors including a constant but not a time trend in the vector and allowing variables to have time trends.

[18] Vector estimated using assumptions indicated by the Akaike crtiterion: a lag length of 2, assuming that there is a constant but not a time trend in the cointegrating vector and allowing each variable to have a possible time trend.

[19] Prior to 1969, Flow of Funds estimates of directly held stocks included stocks held through bank trusts and estates. The denominator of the ratio used to measure mutual fund use equals non-pension related mutual fund stock holdings plus adjusted direct stock holdings, where pre-1969 readings on the latter are downwardly adjusted by a percent (roughly 13.6 percent equal to the 1969 ratio of stocks in bank trusts and estates to stocks directly held and in bank trusts and estates. Data on mutual fund costs are available from Duca (2004) since 1954.

Table 1: Measuring the Relative Use of Mutual Funds as a Means of Owning Equity

	Billions Current Dollars 1990	Billions Current Dollars 2002	Percent all Equity 1990	Percent all Equity 2002	Percent all Equity Change	% NonPension/Trust Equity[1] 1990	% NonPension/Trust Equity[1] 2002	% NonPension/Trust Equity[1] Change
1. Total Assets	24,120	48,575						
2. Total Equity Assets	3,136	10,039	100	100				
						% Direct + nonIRA Mutual Fund Equity (=100-MF)[1]		
3. Directly Held Corporate Stock	1,781	4,602	57	46	-11	94%	84%	-10
4. Indirectly Held	1,354	5,438	43	54	+11			
5. Bank Personal Trusts & Estates	214	385	7	4	-3			
6. Life Insurance Co.	58	693	2	7	+5			
7. Defined Benefit Pensions	344	733	11	8	-3			
8. Defined Contribution Pensions	278	1,050	9	10	+1			
9. State & Local Gov't. Retirement	284	1,002	9	10	+1			
10. Federal Gov't. Retirement	0.3	49	0	0.5	+1			
						% Direct + Mut. Fd. Equity (TMF)[1]		
11. Mutual Funds (excludes #8)	175	1,527	6	16	+10	9%	25%	+16
12. IRA equity in mutual funds	53	662	2	6	+4			
						% Direct + nonIRA Mutual Fund Equity (MF)[1]		
13. mutual funds ex. IRAs	152	864	4	9	+5	6%	16%	+10
14. Pension Assets (6 + 7 + 8 + 9 + 10 + 12)	1,018	4,188	32	42	+10			

1. Right-most columns of line 3 based on dollar entries in line 3 divided by the sum of dollar entries in lines 3 and 13. Right-columns of line 11 based on dollar entries in line 11 divided by the sum of dollar entries in lines 3 and 11. Right- columns of line 13 based on dollar entries in line 13 divided by the sum of dollar entries in lines 3 and 13. Equity in line 11 excludes thrift plan equity in line 9.

Table 2: Cointegration Results, 1970-02

Unit Root Test Statistics Using 1970-2002 Data: Augmented Dickey-Fuller Statistics (constant with trend)

Variable	*Level (modified AIC/SIC lag)*	*5% Critical level for lag*	*1% Critical level for lag*	*First Difference (modified AIC/SIC lags)*	*5% Critical level for lag*	*1% Critical level for lag*	*Degree of Integration*
LMF	1.706088 (0)	-3.557759	-4.273277	-4.556055** (0)	-3.562882	-4.284580	1
LTMF	1.961096 (0)	-3.557759	-4.273277	-4.050911* (0)	-3.562882	-4.284580	1
LMFCOST	2.206449 (0)	-3.557759	-4.273277	-4.835324** (0)	-3.562882	-4.284580	1
EXPFIN	3.199469 (2)	-3.562882	-4.273277	-7.201965** (0)	-3.557759	-4.273277	1

Vec. #	**Cointegrating Vector**	**Eigenvalue 0 vectors**	**Eigenvalue 1 vector**	**Trace Statistic (no vector)**
	Equity Fund Share of Directly and Mutual Fund Held Equity Assets Excluding IRAs			
1	$LMF_t + 1.154668MFCOST_t^{**} - 0.031800EXPFIN_t^{**} - 1.780184$ (5.21) (-7.47)	0.576986	0.266687	36.32081**
2	$LMF_t + 1.300634MFCOST_t^{**} - 0.034700EXPFIN_t^{**} - 1.790827$ (5.04) (-10.08)	*VECM Estimates with both IRA Variables Present*		
3	$LMF_t + 1.208334MFCOST_t^{**} - 0.030267EXPFIN_t^{**} - 1.838776$ (5.39) (-7.11)	*VECM Estimates with Oil Shock Dummy Present*		
	Equity Fund Share of Directly and Mutual Fund Held Equity Assets Including IRAs			
4	$LTMF_t + 2.117888MFCOST_t^{**} - 0.032647EXPFIN_t^{**} - 2.441096$ (10.21) (-8.17)	0.610789	0.283832	35.65**
5	$LTMF_t + 1.852821MFCOST_t^{**} - 0.035509EXPFIN_t^{**} - 2.250800$ (6.80) (-9.71)	*VECM Estimates with both IRA Variables Present*		
6	$LTMF_t + 1.938631MFCOST_t^{**} - 0.034003EXPFIN_t^{**} - 2.324584$ (6.95) (-9.02)	*VECM Estimates with both IRA and the Oil Shock Variables Present*		

Notes: t-statistics in parentheses. Vectors 1 and 4 selected using the Johansen-Juselius criterion, for which E-Views lists eigenvalues and trace statistics. MF and TMF exclude equity in defined benefit pensions (which do not expose households to price risk and over which they have little control) and exclude equity in defined contribution pensions (e.g., 401k and 403b plans). The Akaike information criteria indicated a lag length of 1 for estimating all cointegrating vectors and estimating the vectors with a constant and no time trend in the vector, but allowing the variables to have time trends. Equilibrium relationships involve flipping the signs in the cointegrating vector. Thus, vector 1 implies that in equilibrium, $LMF = 1.780184 - 1.154668MFCOST_t + 0.031800EXPFIN_t$.

Table 3: Causality Tests

Basic Specification: $\Delta\log(Y)_t$ = constant + EC_{t-1} + $\log(X)_{t-1}$ + $\log(Y)_{t-1}$

Direction of Causality	Lags of Δlog MFCOST & MF			Lags Δlog MFCOST, Δlog MF, & ΔEXPFIN		
	F-Test $EC_{t-1}=0$	F-Test $\Delta\log(X)_{t-1}=0$	F-Test $EC_{t-1}=\Delta\log(X)_{t-1}=0$	F-Test $EC_{t-1}=0$	F-Test $\Delta\log(X)_{t-1}=0$	F-Test $EC_{t-1}=\Delta\log(X)_{t-1}=0$
MFCOST and the Equity Fund Share of Directly and Mutual Fund Held Equity Assets Excluding IRAs (MF)						
MFCOST => MF	10.488^{**}	0.303	5.866^{**}	14.490^{**}	0.284	7.583^{*}
MF => MFCOST	0.068	0.034	0.046	0.012	0.024	0.021
MFCOST and the Equity Fund Share of Directly and Mutual Fund Held Equity Assets Including IRAs (TMF)						
MFCOST => TMF	11.971^{**}	0.978	6.237^{**}	14.205^{**}	0.971	7.142^{*}
TMF => MFCOST	1.172	0.253	0.676	0.920	0.257	0.549
MFCOST and Banking Sector Productivity (BPROD)						
BPROD => MFCOST	9.457^{**}	0.238	6.604^{**}			
MFCOST => BPROD	0.016	0.227	0.139			

Cointegrating Vector	**Eigenvalue 0 vectors**	**Eigenvalue 1 vector**	**Likelihood Ratio (1 vector)**
$LMFCOST_t + 0.981619BPROD_t^{**} + 4.990909$ (11.53)	0.331922	0.104953	15.42689^{*}

Notes: t-statistics in parentheses. *(**,$^{+}$) denotes significance at the 5- (1-, 10-) percent level. The one-quarter lag lengths on the Δlog(X) and Δlog(Y) terms are optimal according to the Akaike and Schwartz criteria. Samples: for MFCOST and equity fund tests, data used span 1970-2002; for MFCOST and bank productivity tests, the data used span 1970-02. EC term for MF and MFCOST tests is based on vector number 1 in Table 2; and the EC term for TMF and MFCOST tests is based on vector number 4 in Table 2.

Table 4: Models of the Change in the Equity Fund Share of Directly and Mutual Fund Held Equity Assets (1972-02)

Variable	*Share Excluding IRA Equity Assets*			*Share With IRA Equity Assets*		
	Model 1	**Model 2**	**Model 3**	**Model 4**	**Model 5**	**Model 6**
constant	0.034	0.017	0.050^{*}	0.043^{*}	-0.028	0.002
	(1.56)	(0.37)	(2.36)	(2.03)	(-0.80)	(0.06)
EC_{t-1}	-0.441^{**}	-0.330^{*}	-0.493^{**}	-0.419^{**}	-0.243^{*}	-0.329^{**}
	(-3.91)	(-2.45)	(-4.61)	(-3.88)	(-2.03)	(-2.69)
$\Delta MFCOST_{t-1}$	0.567	0.330	0.668	0.641	0.214	0.387
	(0.72)	(0.39)	(0.92)	(0.86)	(0.28)	(0.53)
$\Delta EFIN_{t-1}$	-0.005^{+}	-0.004	-0.006^{*}	-0.005^{+}	-0.003^{*}	-0.004
	(-1.80)	(-1.35)	(-2.18)	(-1.77)	(-1.09)	(-1.56)
ΔLMF_{t-1}	0.240^{+}	0.103	0.184	0.311^{*}	0.024	0.032
	(1.66)	(0.57)	(1.36)	(2.19)	(0.13)	(0.18)
$IRA8286_t$		0.079			0.163^{*}	0.123^{+}
		(1.02)			(2.18)	(1.67)
$IRA8798_t$		0.009			0.098^{*}	0.077^{+}
		(0.174)			(2.22)	(1.78)
$OILDUM_t$			-0.123^{*}			-0.101^{+}
			(-2.26)			(-1.80)
$\bar{R}^2$	.373	.339	.475	.400	.428	.487
D.W.	1.88	1.84	2.07	1.94	1.86	1.99
LM(1)	0.05	0.42	0.65	0.12	0.20	0.22
LM(2)	0.06	0.42	0.88	0.14	0.23	0.22
Q(16)	5.21	5.09	12.05	5.88	8.63	12.98

(t-statistics in parentheses.) EC terms in each model are from vectors with the corresponding (same) numbers in table 2.

Table 5: Demographic and Longer Sample Period Findings

Unit Root Test Statistics for ln(AGE35+): Augmented Dickey-Fuller Statistics (constant with trend)

Sample Period	*Level (AIC lag in parentheses)*	*5% Critical level for lag*	*10% Critical level for lag*	*First Difference (AIC lag in parentheses)*	*5% Critical level for lag*	*10% Critical level for lag*	*Degree of Integation*
1970-02	2.428624 (4)	-3.580623	-3.225334	-1.007829 (9)	-3.632896	-3.254671	2
1958-02	2.017964 (1)	-3.518090	-3.189732	-2.198800 (0)	-3.518090	-3.189732	3

Vec. #	**Lag Length**	**Cointegrating Vector**	**Eigenvalue 0 vectors**	**Eigenvalue 1 vector**	**Trace Statistic (no vector)**
		1958-2002			
1	4	$LMF_t + 2.444346MFCOST_t^{**} - 3.152339$ (6.57)	0.371100	0.004764	18.74235*
2	4	$LMF_t + 2.083959MFCOST_t^{**} - 0.004735EXPFIN_t - 2.854880$ (6.96) (-1.15)	0.447982	0.168813	32.41679**
3	1	$LMF_t + 1.696152MFCOST_t^{**} - 0.021699EXPFIN_t^{**} - 2.264219$ (7.57) (-4.95)	(oil dummy present in VEC model)		
4	4	$LMF_t - 9.1207434LAGE35+_t^{**} + 34.76154$ (5.0557)	0.427121 (implied equilibrium poorly tracks actual)	0.073552	25.33911**
5	1	$LMF_t + 2.613217MFCOST_t^{**} - 0.140175AGE35+_t – 2.688054$ (7.98) (-0.30)	0.295423	0.259620 NOT COINTEGRATED	28.25306
		1970-2002			
6	4	$LMF_t + 2.612766MFCOST_t^{**} - 3.087953$ (8.10)	0.513595	0.005492	20.33419**
7	2	$LMF_t - 9.1207434LAGE35+_t^{**} - 19.17609$ (5.0557)	0.247835	0.017762 NOT COINTEGRATED	9.081649
8	1	$LMF_t + 18.90583MFCOST_t^{**} + 28.38046AGE35+_t^{**} – 124.2474$ (5.03) (4.35)	0.479161	0.229590 NOT COINTEGRATED	29.43844

*(**) denotes significant at the 95% (99%) level. t-statistics in parentheses. Cointegration tests use lag lengths minimizing the AIC criterion and allow for time trends within the variables (consistent with unit root tests), but not within the cointegrating relationship.