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HOUSEHOLD PORTFOLIOS: AN INTERNATIONAL COMPARISON

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Discussion Paper 2000-10

Household Portfolios: An International Comparison[*]

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October 12, 2000

Abstract

This paper presents an overview of the main findings of an international project on Household Portfolios coordinated by the authors. Contributions to the project deal with the state of the art in analytical, computational, and econometric methods of analysis of household portfolio choice, identify stylized facts and trends observed in five major countries, and discuss issues relating to the portfolios of two important population groups, namely the elderly and the rich. In this paper, we integrate the main findings of the project, compare portfolio behavior across countries, and contrast theoretical predictions to empirical findings. This allows us to identify a number of stylized facts and portfolio puzzles that future theoretical and empirical research should attempt to analyze and resolve.

I. Introduction

The past decade has seen radical change both in financial markets and in related academic research. Financial markets have experienced a policy-induced move towards greater international integration and coordination, liberalization, and product innovation. The European Union directives on financial integration, the removal of the remaining capital controls, the privatization of public utilities, and the recent pension reforms in various countries are but a few examples of policies that have had a great impact on financial markets.

Some of the most striking effects are the broadening of the stockholder base, the growth in mutual fund participation, the increasing importance of private pension funds, and the enthusiastic employee response to retirement accounts (such as 401(k) accounts in the United States). On the liability side, there has been fast growth in credit card use and in consumer indebtedness, debt often coexisting with asset holdings offering lower rates of return than loan rates.

In the face of such dramatic changes in portfolio behavior, it is not surprising that academic research has seen a resurgence of interest in macroeconomics and finance. A number of economists with interests in monetary economics, government finance, consumption and saving, public economics, and theory of choice under uncertainty have joined forces to provide a fresh perspective on finance. Their work is shifting attention from the simple consumption-saving choice to the simultaneous determination of spending plans and portfolio composition for households that perceive a richer asset-liability menu. Theoretical modeling in this area has been able to use the solid foundations provided by the theory of choice under uncertainty, but it has been helped considerably by the development of computational techniques to handle models of portfolio choice under non-diversifiable labor income risk. Empirical work in this field is now possible thanks to the development of

extensive, household-level surveys offering information both on portfolio composition and on attitudes towards saving, borrowing, risk-taking, and liquidity.

Despite this happy coincidence of developments in financial markets, in theoretical tools, and in databases, there has been no coordinated effort at bringing the tools and the data to bear upon issues relating to household portfolio behavior. This volume[1] seeks to fill the gap with a comprehensive collection of papers on theory, methodology, policy issues, and household-level data analysis in this exciting new field of research.

The volume has four main objectives: first, to provide an up-to-date account of the status of our theoretical knowledge regarding the structure of household portfolios and to compare its predictions with empirical findings; second, to describe the main tools of analytical, numerical, and econometric analysis, as well as some of the key policy questions; third, to use micro data for in-depth study of portfolio composition of population groups of special policy interest, such as the young, the elderly, and the rich; finally, to offer an original comparative analysis of household portfolios in countries for which detailed data are available.

II. The Current State of Portfolio Theory and Methodology

The study of household portfolios employs analytical methods, computational algorithms, and econometric tools. So far, economic theory has emphasized the decision between consumption and saving much more than household portfolio choices. Finance has emphasized the asset-pricing implications of models such as the capital asset pricing model

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[1] The volume is *Household Porfolios*, to be published by MIT Press. The chapters to which we refer in this paper are listed in the Appendix and are available as working papers from the authors.

(CAPM) and the consumption CAPM, combined with portfolio analysis aimed mainly at guiding institutional investors.

At least three factors contributed to the relative neglect of household portfolios: first, the persistent tendency of most households to hold very simple portfolios until the recent emergence of the *equity culture*, i.e. of the willingness to participate in the stock market; second, the inability of the dominant asset pricing models - the CAPM and CCAPM - to account for household portfolio incompleteness; and third, the lack of detailed databases on household portfolios in many countries until the late eighties or the nineties.

Theoretical analysis of household portfolios has emphasized mostly the choice between risk-free and risky financial assets, at least since the fifties (Markowitz, 1952; Tobin, 1958). Early analysis contributed significantly to our understanding of how risk aversion influences the propensity of households to take financial risk. In the early nineties, portfolio theory also dealt with the way in which uninsurable income risk influences the portfolio share of risky assets, leading to the development of notions such as "prudence" and "temperance".

Chapter 1 (by Christian Gollier) explicates these theoretical developments. It concludes by highlighting a number of theoretical predictions that can be confronted with the data: among them, that under decreasing relative risk aversion wealthier people should invest a larger share of their wealth in risky assets, that younger investors should invest more in risky assets, and that investors with riskier human capital should invest less in risky assets. The chapter also points out that borrowing constraints, transaction costs and information costs should tend to lower the demand for risky assets.

Despite the elegance of the analytical results, two limitations in applying them to the portfolios of households that face earnings risk have become evident. First, analytical results

normally require restrictive assumptions on preferences.[2] Second, studying the age pattern of household portfolios requires multiperiod models, in order to follow investors over their life cycle. With general preference specifications, analytical solution of portfolio models with more than two periods becomes essentially intractable, especially if in addition to earnings risk one also incorporates market frictions such as liquidity constraints and transaction costs. This bottleneck can be overcome by applying computational methods to household portfolio models. Chapter 2 (by Michael Haliassos and Alexander Michaelides) describes calibration and numerical solutions of household portfolio problems in multi-period models with uninsurable income risk. The chapter illustrates the main numerical computation techniques available and provides a host of intertemporal models to isolate the contribution of each major factor affecting portfolio choice (such as age, wealth, information costs and borrowing constraints).

Chapter 3 (by James Poterba) provides an overview of how taxation affects household portfolio structure. Most of the modern theory of portfolio choice was developed without reference to taxes. The chapter begins by summarizing the after-tax capital asset pricing model, then proceeds to outline six margins of portfolio adjustment where taxes can affect investor incentives. These are asset selection, asset allocation, borrowing, asset location in taxable and tax-deferred accounts, asset turnover, and whether to hold assets directly or through financial intermediaries. The analysis considers how ignoring tax considerations may bias estimates of how other variables, such as income or net worth, affect the structure of household portfolios. This chapter also reviews the existing evidence on how taxation affects household portfolio choice. A small but growing empirical literature suggests that taxes have

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[2] Quadratic or exponential utility is often assumed to obtain closed-form solutions. Quadratic utility implies increasing risk aversion with wealth and rules out any precautionary wealth accumulation intended to buffer consumption against earnings shocks. Exponential utility implies precautionary wealth holdings but also zero wealth elasticity of risky investment.

a substantial impact on several aspects of portfolio choice. Further evidence about the importance of taxes is contained in a number of the country studies given here, notably for the U.K. and the Netherlands.

Chapters 1, 2, and 3 highlight a number of theoretical results that are at variance with the data presented in the second part of the volume. For instance, theoretical models and simulation results suggest that even under stringent borrowing constraints and considerable income risk, young people should invest in risky assets to take advantage of the equity premium. Furthermore, conditioning on participation, the share of wealth invested in risky assets should decrease with age. A famous economist once jestingly remarked that we ought not to let reality interfere with an elegant theory. Whatever the merits of this thought, the volume takes a close look at detailed surveys of household portfolios in order to identify stylized facts and confront the theoretical models with observed behavior.

The empirical analysis of portfolio composition cannot do without state-of-the-art econometric techniques, mainly to allow for the fact that not all households participate in certain asset markets. Chapter 4 (by Guglielmo Weber and Raffaele Miniaci) provides an econometric tool-kit for estimating household portfolio models with survey data. Their emphasis is on estimating the decision to invest in risky assets and the conditional demand for risky assets when households are followed through time. The chapter explains how to estimate the effect of time-varying characteristics, such as wealth, income and age on the decision to invest in risky assets. In principle, panel data allow one to disentangle state dependence from unobserved heterogeneity in the participation decision, and to handle serial correlation in shocks. The chapter then describes how, given a specification for the participation equation, an equation relating the risky asset share to household characteristics can be estimated. Estimation methods (both parametric and semiparametric) suitable for both

types of equations are introduced and evaluated. That concludes the methodological part of the volume.

III. Trends and Patterns in Household Portfolios

The second part of the volume looks at household financial portfolios in five countries. Chapter 5 (by Carol Bertaut and Martha Starr-McCluer) covers the United States, Chapter 6 (by James Banks and Sarah Tanner) the United Kingdom, Chapter 7 (by Luigi Guiso and Tullio Jappelli) Italy, Chapter 8 (by Angelika Eymann and Axel Börsch-Supan) Germany, and Chapter 9 (by Rob Alessie, Stefan Hochguertel and Arthur Van Soest) the Netherlands. The volume concludes by examining the portfolio choices of two population groups that warrant closer scrutiny. The behavior of the rich is the object of Chapter 10 (by Chris Carroll), while the analysis of the elderly is taken up in Chapter 11 (by Michael Hurd).

Table 1 lists the household assets and liabilities that each of these chapters attempts to cover as well as groupings of assets by degree of riskiness.[3] The table highlights an initial problem in describing household portfolios, namely definitions. Whereas in theoretical models it is customary to partition assets into risky and risk-free, in practice this is difficult and to some extent arbitrary. The simplest definition of risky assets is *direct stockholding*, but one should consider that many risky assets are held indirectly through mutual funds and retirement accounts (*direct and indirect stockholding*). A third definition that has been used in the empirical chapters is that of *risky financial assets*. In some countries this coincides with direct and indirect stockholding, but in others it also includes foreign assets or long-term government bonds (exposed to exchange rate and interest rate risk, respectively), and

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[3] Where the data available are less detailed, authors report broader aggregates.

excludes defined-benefit pension plans (part of which are invested in stocks, but which are arguably safe assets). An even broader measure of risky assets includes equity in own business and real estate (*total risky assets*).

Table 2 lists the sample surveys used to analyze portfolio behavior in each of the five countries. There is unavoidable variability in reference periods and number of observations. In Germany and the UK, two different surveys are needed to study portfolio decisions. In Italy and the Netherlands, panel data are available but are relatively short. Some surveys collect data only on participation, while others collect data on both participation and amounts; even so, to varying degrees the aggregates computed from survey data tend to understate the aggregate financial accounts, suggesting measurement errors. The special features and problems of each survey are described in detail in the various chapters, and should be kept in mind when trying to compare data across countries.

The empirical findings on the determinants of household portfolio choice fall into two main categories: those on the *participation decision*, i.e. the decision to hold assets of a particular category; and those on the *portfolio shares* either of financial assets or of total assets, financial and non-financial. As we shall see, the empirical findings here point to the importance of fixed costs of entering the stock market, in the form of informational requirements and participation fees. This is a departure from the practice of traditional theoretical portfolio models of ignoring such costs. The empirical chapters take the view that the decision to invest and the decision on how much to invest are distinct, and they use a sample selection approach to disentangle the two empirically. Authors examine how participation choices and portfolio shares depend on various factors, such as wealth, age, education, and demographic characteristics.

The Participation Decision

Arguably, the most dramatic portfolio development in the past decade has been the spread of an equity culture. Table 3 documents that in the countries we examine, the proportion of stockholders (direct and indirect) increased dramatically during the nineties, although as of 1998 there was still no country in the world where the majority of households hold stocks. The U.S. and the U.K. are the countries where the proportion of households that hold stocks directly is highest (about 20 percent). Italy is at the other end of the spectrum, with only 7 percent.

In addition to an increase in direct stockholding, the key to the spread of the equity culture is the growing importance of investment through financial intermediaries, e.g. mutual funds and retirement accounts. Counting such indirect holdings more than doubles the fraction of households investing in stocks in most of the countries we consider. This pattern is observed despite the fact that some forms of indirect holdings, like mutual funds, involve substantial tax costs and other expenses imposed by financial intermediaries (as explained in Chapter 3 on taxation). In addition to facilitating the diversification of risk, mutual funds and other investment accounts considerably lower the informational requirements for asset management, since participation and trading decisions are delegated to professionals. Households also benefit from record-keeping and other services. The relative importance of these considerations in inducing households to participate in indirect asset holding vis-à-vis directly investing in stocks is worth further study.

A related issue, and one with a long tradition in portfolio analysis, is the extent of diversification in household portfolios. The country studies find that the extent of diversification between and within risk categories is typically quite limited. However, the growing popularity of mutual funds and indirect stockholding has certainly helped increase

the degree of intra-category diversification of financial assets. For real assets, such as private businesses, there is a pronounced lack of diversification. The wealthy prefer to own one business rather than to divide up their wealth and own small parts of many businesses (see Chapter 10). Evidently, these real assets involve other features and may provide other services to compensate for this portfolio specialization. There are also other ways in which households are poorly diversified. For example, it is not uncommon for employees to own stock in their own firms, resulting in positive correlation between earnings shocks and financial portfolios. Although this makes no sense in terms of diversification, firms have incentives to promote it, as it can be a good mechanism to induce effort on the part of employees. In this volume, we emphasize portfolio diversification across risk categories, identifying households that hold only risk-free assets, as well as the most popular portfolio combinations.

As noted, Table 3 suggests that an increasing number of households now include risky assets in their portfolios. Byproducts of this tendency are the observed increases in the proportion of households that combine riskless with risky assets, and of those that have complete portfolios combining all risk categories. However, in most countries the vast majority of households still hold only safe assets, despite the return premia expected on risky assets. This "participation puzzle" is studied both theoretically and empirically in this volume. The proportion of households holding only very low-risk assets has come down somewhat in some countries where was quite high, such as Italy and the Netherlands, but has remained relatively stable in others, such as the U.S. (stabilized around 25 percent).

The country studies explore the factors that are most likely to affect the decision to invest in risky assets, and focusing especially on wealth, age, and education. Table 4 reports, for each quartile of the asset or wealth distribution and for the top 5 percent, the fraction of households investing in risky assets. In all countries, participation in the equity market and in

risky assets is strongly correlated with wealth. For instance, in the United States the fraction of investors with direct or indirect stockholding rises from 4.4 percent in the bottom quartile to 86.7 percent in the top quartile, and to over 93 percent in the top 5 percent of the financial wealth distribution. One of the most pronounced differences is the probability of owning a private business, which is substantially higher for the wealthy than for the non-wealthy. It is argued in Chapter 10 that this is likely due to a combination of the financing requirements for setting up a business with the "capitalist spirit" that induces a "love of wealth" for its own sake.

The finding that wealth matters, in determining participation, points to an important reason why the portfolios of wealthy households are not simply scaled-up versions of their less wealthy counterparts, as in the classical portfolio model of Chapter 1. Two important implications arise. First, understanding the relationship between wealth and the decision to hold particular assets provides insights into the likely distributional consequences of taxing particular asset categories. This is discussed at length in Chapter 3. The second implication relates to surveys based on representative population samples. Since the wealthy segment tends to hold most assets but constitutes a very small proportion of the population (and hence of the sample), the only way to obtain a clearer picture of how aggregate holdings of various asset categories are related to household-level characteristics is to oversample wealthy households. Indeed, this is the approach taken in some surveys, notably the US *Survey of Consumer Finances*.

One feature that emerges from Table 4 is that differences in stockholding across countries are essentially due to differences in the propensity to hold stock in the wealthier segments of the population. In all countries, households in the bottom two quartiles of the wealth distribution behave very similarly in terms of ownership of stocks or risky assets.

While in the U.S. and the Netherlands the vast majority of households in the top 5 percent of the wealth distribution hold some risky assets, in Italy and Germany about half of this class of investors have no direct or indirect stock holding. This puzzling difference may be due, in part, to some combination of national differences in these households' background risk and informational and other entry costs. Heaton and Lucas (2000) stress that wealthy households face considerable background risk through holdings of business wealth. Chapter 7 finds that even wealthy Italian households lack information on financial investment opportunities.

A fairly robust finding of these country studies is a hump-shaped age profile of participation in risky assets. This age profile is reported in Table 5.[4] The fraction of investors in risky assets peaks in the 50-59 age bracket and declines during retirement.[5] Interpreting this stylized fact is a challenge, but a plausible story can be told in the context of a model with fixed costs of participating in the stock market (see Chapters 1 and 2). The young typically have a small ratio of accumulated wealth to expected future earnings and should optimally borrow to consume and take advantage of the equity premium. Faced with borrowing constraints and with limited cash on hand, they tend to hold small amounts of assets or none at all. Thus, if stock market participation entails any fixed costs in the form of entry fees, informational requirements, or time, the young will be more likely to abstain. As households age, they accumulate wealth, information, and experience in handling their finances, and they are less likely to be deterred from entering the stock market. What happens after retirement depends on various factors, including the extent to which the elderly decumulate wealth, the

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[4] The age profiles reported in the Table 5 are derived from a single cross-section, and therefore might be contaminated by cohort effects. The issue of disentangling age, cohort, and time effects in asset participation and in portfolio shares is discussed in detail in the individual country chapters, all of them using repeated cross-sectional data or panel data. In general, the authors find that the data are best described by a combination of age and time effects, and that cohort effects in portfolio decisions are not of paramount importance. This implies that the cross-sectional profile reported in Table 5 provides a good approximation also to the individual profile.
[5] Hump-shaped age profiles are not uniformly corroborated by econometric analysis. An increase in participation at early ages appears empirically more robust than a decline in participation after retirement. For example, the

ease with which stocks can be liquidated, and any tax incentives or disincentives for passing accumulated capital gains on to descendants.

Chapter 11 looks closely at the portfolio behavior of the elderly, drawing on US data. A striking finding is that the incidence of stockholding has increased among virtually all age groups even in this segment of the population. Education is highly correlated with the propensity of the elderly to hold stocks, even after controlling for wealth, income, age, marital status and the subjective probability of survival. This finding parallels similar results for the population as a whole and is consistent with the importance of informational considerations in the decision to invest in risky assets.

Is so far as informational considerations are important, we can expect further increases in the percentage of households holding risky assets. Informational requirements are being continually lowered through the proliferation of opportunities for indirect asset holding. Furthermore, knowledge about portfolio management and investment strategies spreads through observation of other household choices and advertising campaigns.

On the liability side, there is a general trend towards borrowing; higher fractions of households have some type of debt. In Italy, , starting from a very low base, this fraction has more than doubled in the nineties. In the Netherlands, the increase in the use of debt results mainly from increases in the percentage of households with mortgages and checking accounts overdrafts. In the United States, where debt ownership was well established earlier, the increase has been smaller and is associated with increased use of mortgages and of credit card liabilities. A recently documented fact is that households often carry debt despite the generally high interest rates on credit card debt and even while they have positive holdings in

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age-participation profile for risky financial assets is positively sloped in the Netherlands, though the profile for total risky assets exhibits a hump shape.

liquid, low-interest accounts. These unexploited arbitrage opportunities form yet another portfolio puzzle in need of resolution.

Portfolio Shares

When comparing portfolio shares across groups of households it is useful to examine them conditional on participation, since unconditional shares would not distinguish the effects of relevant variables on the participation decision from those on the portfolio share given that the asset is held. As we have argued, the two decisions may be determined by distinct factors. Furthermore, many of the theoretical predictions of the classical portfolio theory refer to asset shares, not to participation decisions. An example is the classical prediction that, given preferences characterized by constant relative risk aversion, the portfolio share of risky assets, conditional on holding it, should be independent of the level of wealth.

Table 6 reports portfolio shares of risky assets across the wealth distribution in various countries, conditional on holding such assets. It reveals some common patterns but also significant international differences. In all the countries, the portfolio shares of risky assets are larger for the rich than for the poorer households, in particular with respect to risky total assets. While in principle causality could be running from the household's propensity to hold risky assets to the high wealth levels of successful risk takers, the detailed study of rich households in this volume strongly suggests the converse. However, the positive correlation between the conditional share and wealth is less marked than that between the probability of owning and wealth. Indeed, in some countries, the relation between wealth and the conditional share of risky financial assets in financial wealth is relatively modest. The conclusion that wealth affects mainly the asset ownership decision is further strengthened by regression analysis showing that a large part of the positive correlation between (conditional)

risky asset shares and net worth revealed by simple tabulations tends to disappear when other factors are controlled for. The residual positive correlation is consistent with decreasing relative risk aversion preferences but it is also consistent with decreasing portfolio management costs as the size of the portfolio increases.

The age pattern of risky portfolio shares, so crucial to understanding portfolio behavior over the life cycle, proves to be perhaps the most controversial issue in the empirical chapters of this volume. Table 7 reports the age profile of the conditional share for the various definitions of risky assets. In most countries, while there is a definite hump-shaped profile for the ownership of risky assets, conditional on owning them, the age profile of the share of risky assets is relatively flat. In some countries there does seem to be some moderate rebalancing of the portfolio away from risky securities, but often this tends to disappear when other factors that evolve with age are controlled for. On the whole, a fair summary of the evidence is that over the life cycle most of the action concerns the decision to enter and exit the market for risky assets, not managing the portfolio share. This again suggests that considerable emphasis, in theoretical as well as in empirical research, should be put on ownership decisions. One exception to this pattern is the Netherlands, where both the ownership and the conditional share are increasing at all ages.

The different behavior of participation and of portfolio shares implies that an observed increase in risky assets in proportion to a group's assets does not allow one to distinguish the part due to increased participation from that due to an increase in portfolio shares of those already participating. Thus, whenever possible, one should distinguish between unconditional and conditional portfolio shares. In most countries, the unconditional portfolio share of risky assets increased during the 1990s. These trends reflect partly an increase in the proportion of stockholders (Table 3) and partly an increase in the share of risky assets among holders.

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Calculations done in the country chapters show that in some countries the two increases are equally important.

The chapter on taxation provides some unexpected corroborating evidence for the thesis that there is an element of history in portfolios that prevents households from rebalancing too frequently. It finds that asset selection tends to be more sensitive to taxation of returns than does portfolio composition. As Jim Poterba puts it, 'portfolio rebalancing may be something that investors do less frequently than asking if they are holding the right kind of assets'. If portfolio rebalancing is so infrequent as to render age irrelevant for conditional portfolio shares, then justifying this finding on the basis of either analytical or computational portfolio models will be some challenge indeed. Analytical models (Chapter 1) stress the role of the length of the horizon for optimal choice of portfolio composition. Computational large-scale, finite-life models (Chapter 2) similarly imply policy functions for portfolio shares that are sensitive to age, at least over some range of cash-on-hand. Moreover, professional advisors follow a sort of rule of thumb of encouraging investors to reduce their portfolio share of risky assets as they age. It is unlikely that such portfolio inertia can be explained by transaction costs alone. Perhaps habit persistence or some form of loss aversion with a reference point related to past consumption could contribute to some inertia in portfolio composition.

Even if further scrutiny reveals the age pattern of the conditional risky portfolio share to be hump-shaped in the data, theory will still have difficulty in explaining the low portfolio shares of the young. The gist of the theoretical models is that young savers should choose relatively high shares of risky assets so as to take advantage of the equity premium, even though they may not be able to hold large amounts because of limited cash on hand. Chapter 2 shows that these results hold even when households are not allowed to borrow in any form; and that if they can, households should borrow to invest in risky assets. Perhaps a low

portfolio share in risky financial assets can be justified by lumpy investment in real assets, such as housing, which tends to be made at an early age and may force young households to adopt more conservative financial portfolios as they save towards accumulating a down payment.

IV. The Road Ahead

Theory

The contrast between the implications of present theory and the empirical findings point to a number of fruitful avenues for future theoretical work on household portfolios. On the portfolio choice between risky and risk-free financial assets, both the theoretical and empirical papers in this volume support the thesis that fixed costs of participation in markets for risky assets play a crucial role. The exact nature of these costs and how they affect the decision to enter and exit the stock market need to be understood further, and they are the focus of ongoing research.[6]

The state of knowledge on optimal portfolio composition is less encouraging. It should not be too hard to rationalize the increased propensity of wealthier households to hold more types of assets in the context of models with fixed costs of asset market participation. Theoretical models, however, tend to imply that households with less cash on hand (and correspondingly lower ratios of accumulated financial wealth to labor income) should invest more in risky assets to exploit the wealth-generating potential of the equity premium, while richer ones should be able to sacrifice some of this potential in favor of risk-free assets. Yet this pattern is exactly the opposite of what is observed in the data, with a tendency of poorer households to specialize in risk-free assets and the richer households to add risk. It remains to

be seen whether the ease of risky investment through financial intermediaries, combined with the desire of poorer households to get rich, fueled by the recent success stories in international stock markets, will serve to reverse this pattern.

The apparent invariance with age of the conditional portfolio composition, and the apparent lack of sensitivity to tax treatment, suggest that households may be paying more attention to picking the right assets rather than to getting the right portfolio shares. If this is the case, the attempt to characterize household portfolios by means of models that assume frequent and costless portfolio rebalancing may be doomed to failure. Still, it would be surprising if this apparent neglect of portfolio composition persisted in the future, as entry and adjustment costs are steadily lowered.

Although risky financial assets have recently grown in significance as components of household portfolios without correspondingly clear effects on total risky assets, the interaction between financial and real assets is obviously of interest. This is influenced by liquidity constraints and by events associated with the life cycle. For the young household, the natural desire to own a home is bound to influence their financial portfolio. The elderly who downsize from larger to smaller homes or who move in with their children face the question of allocating their liquid funds, including the proceeds from the sale of the house, among alternative financial assets. At this stage, the taxation of inheritances and inter-vivos transfers may be an important factor. Finally, the rich who own a private business are bound to consider business returns in selecting their financial portfolio. Very little work has been done on such interactions, and much can be learnt from further work that models the contributions of real assets, not only in budget constraints but also in service flows, pride of ownership and power of control.

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[6] A few recent papers study the interaction between adjustment costs and portfolio choices. Vissing-Jorgersen (1999) tries to identify empirically various forms of portfolio adjustment costs. Luttmer (1999) studies the effect

Whether one studies financial or real assets, there are a host of unexplored issues relating to taxation. Dividend and interest taxation, though non-trivial, is likely to be the easiest theoretical topic. Others, such as taxation of capital gains accruing since purchase but paid only on dismissal, challenge the power even of modern computational algorithms. Moreover, the chapter on taxation reveals wide international differences in the treatment of assets and liabilities, which make theoretical generalizations more problematic.

Although this volume is probably the first of its kind on household portfolios, i.e. on asset quantities, a substantial body of literature on asset prices already exists. Since prices are equilibrium outcomes of asset markets, research on household portfolios and on asset pricing should eventually be integrated, in the context of general equilibrium models with portfolio choice. So far, asset pricing models have had limited success in explaining limited asset market participation and portfolio diversification, and have encountered asset pricing puzzles such as the equity premium and interest rate puzzles. Our volume shows that portfolio models also face puzzles with participation and conditional portfolio shares, even when they assume historically given return processes. There is little doubt that the two literatures are destined to merge, but the chances for a successful marriage will be improved if each is given time to solve its own puzzles and ambiguities beforehand.

Empirical Research

Empirical research has revealed significant regularities in how households allocate their savings among assets. Some of the findings appear to be well established, while others need further applied work. Perhaps the most important solid finding is that most households do not diversify but specialize in a few assets, mainly the safest and most liquid. An important

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of adjustment costs on optimal cash holdings.

feature of the data is that few households hold complete portfolios, even among the richest segment of the population. Can this feature be fully accounted for by entry and management costs? Are there other factors impeding diversification, and if so what? One firm conclusion of this volume is that some form of participation costs is essential to understanding portfolio behavior, but more empirical work is needed to determine whether they are sufficient to account for the empirical regularities and how they interact with other factors.

Another area that needs more work is the age-portfolio profile. Overall, the papers in this volume suggest that while the age-ownership profile is hump shaped, the conditional share is poorly correlated with age. One problem with this characterization is that the age-portfolio correlation is essentially identified by the cross-sectional variation, while age may actually be picking up unobserved correlated factors that are. As is pointed out neatly in Chapter 4, to identify the effect of age on the portfolio, fixed-effects models should be used to account for unobserved heterogeneity, which is somewhat problematic in discrete choice models with short panels. The future availability of longer panels will hopefully enable us to better sort out the age effect of unobserved heterogeneity.

There remain a number of important issues that are only touched upon in this volume and that future research should clarify. As theory predicts, households that are more averse to risk should be more reluctant to hold risky assets. Barsky et al. (1997) use survey responses to hypothetical lotteries to construct measures of Arrow-Pratt risk aversion and find that households differ markedly in their willingness to bear risk. Moreover, risk aversion has considerable predictive power on the actually risk-bearing choices of households. This implies that risk aversion may be an important omitted variable, which could bias empirical results.

A related issue is the role of background risk. Recent empirical research supports the theoretical prediction that households in risky environments tend to tilt their portfolios towards safe assets. An interesting question is whether international differences in households' exposure to uninsurable risks could explain the large differences in portfolio holdings documented in Tables 3 and 4. Finally, one important task for future empirical research is to study the joint behavior of saving and portfolio decisions. While theorists have been working on such joint analysis at least since the seminal works of Merton (1969) and Samuelson (1969), empirical research on household savings and on portfolio choice has proceeded separately. It is time to rejoin the issues!

Financial Innovation and Education

A fairly robust finding in this volume regards the relevance of information and education to the participation decision. Better-educated households are more likely to hold diversified portfolios, appear to be better informed about the existence and properties of different assets, and are thus better able to take advantage of investment opportunities. The evidence for Italy and Germany suggests that many households are poorly informed about financial matters and that a large part of the population is actually unaware of the existence of stocks and other basic financial assets. Lack of knowledge of investment opportunities and partial information on return and risk characteristics conflict with the full information hypothesis of most portfolio models. Empirically, it seems that some households cannot hold diversified portfolios simply because they only know a subset of the full menu of assets. Applied work can help determine how important lack of knowledge is to understanding observed household portfolios, and discover how households learn about asset types. The development of theoretical household portfolio models that incorporate partial ignorance,

partial information and learning would shed light on this issue. Lessons from this exercise are likely to be relevant not only to academic research but also to practitioners in the financial industry who are interested in marketing financial products to targeted groups.

V. Concluding Remarks

The broadest message of this volume is that taking the step from understanding saving to understanding portfolio behavior in a world with financial and real assets is not simple but is certainly worthwhile. Economists of different backgrounds, whether in macroeconomics, microeconomics, or econometrics, have a good deal to contribute to household portfolio analysis. This is especially so, since as this volume shows the number of puzzles is still quite high compared to that of stylized facts, and state-of-the-art econometric and computational techniques can be applied to resolve portfolio puzzles. Many doctoral dissertations and research papers are still to be written before these issues are cleared up.

Appendix: List of Chapters in *Household Portfolios*
Part I: Theoretical and Methodological Issues

1. What does Theory Have to Say about Household Portfolios? by Christian Gollier (University of Toulouse).

2. Calibration and Computation of Household Portfolio Models, by Michael Haliassos (University of Cyprus) and Alexander Michaelides (University of Cyprus).

3. Taxation and Portfolio Structure: Issues and Implications, by James M. Poterba (Massachusetts Institute of Technology).

4. Econometric Issues in the Estimation of Household Portfolio Models, by Raffaele Miniaci (University of Padova) and Guglielmo Weber (University of Padova).

Part II: Issues and Trends in Household Portfolios

5. Household Portfolios in the United States, by Carol C. Bertaut (Board of Governors of the Federal Reserve System) and Martha Starr-McCluer (Board of Governors of the Federal Reserve System).

6. Household Portfolios in the United Kingdom, by James Banks (Institute for Fiscal Studies) and Sarah Tanner (Institute for Fiscal Studies).

7. Household Portfolios in Italy, by Luigi Guiso (University of Sassari) and Tullio Jappelli (University of Salerno).

8. Household Portfolios in Germany, by Angelika Eymann (University of Mannheim) and Axel Börsch-Supan (University of Mannheim).

9. Household Portfolios in the Netherlands, by Rob Alessie (Free University of Amsterdam), Stefan Hochguertel (European University Institute and Uppsala University) and Arthur Van Soest (Tilburg University).

10. Portfolios of the Rich, by Chistopher D. Carroll (John Hopkins University)

11. Portfolio Holdings of the Elderly, by Michael D. Hurd (Rand Corporation).

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Table 1
Household Portfolio Components

The first panel lists portfolio components for financial and non-financial assets and liabilities. The second panel groups these components into categories according to the degree of riskiness of the assets.

Types of assets and liabilities in household portfolios	
Financial assets	**Non-financial assets**
Liquid accounts (checking, saving, money market deposit accounts)	Primary residence
Certificates of deposit (time accounts)	Investment real estate (residential and nonresidential)
Government bonds	Business equity (privately owned, with or without management role)
Other bonds (including corporate and foreign bonds)	Other non-financial (mainly vehicles and recreation tools, artwork, antiques, furniture, valuable collections)
Stocks (directly held)	
Mutual funds (excluding money market funds)	**Liabilities**
Retirement accounts (individual and employer-sponsored)	Mortgage and home equity
Cash value of life insurance	Loans for investment real estate
Trusts and other managed assets (including managed investment accounts)	Credit card balances
Other financial assets (e.g. royalties, futures contracts)	Other debt (home improvement loans, student loans, vehicle loans, unsecured credit lines, loans against pension and life insurance policies)

Risky Asset Definitions	
Direct stockholding	Shares held directly.
Direct and indirect stockholding	Shares held directly, mutual funds, investment accounts, retirement accounts. Except for the U.S., information on the specific types of mutual funds and investment accounts is not available, and one cannot disentangle indirect stockholding in mutual funds and managed investment accounts from investment in other financial assets. For this reason the reported figures overestimate the true value of indirect stockholding. In Germany there is no information on pension funds.
Risky financial assets	In the U.S. direct and indirect stockholding, plus corporate, foreign and mortgage-backed bonds. In the U.K. direct and indirect stockholding plus corporate bonds. In the Netherlands direct and indirect stockholding, but excluding defined-benefits pension funds. In Germany direct and indirect stockholding plus foreign bonds. In Italy direct and indirect stockholding plus long-term government bonds and corporate bonds.
Total risky assets	Risky financial assets, business, investment real estate. In Germany there is no information on investment real estate in wave 1983 of the Income and Expenditure Survey, and no information on business property in 1993. In the U.K. there is no information on real assets.

Table 2
Data Sources for International Comparison of Household Portfolios

Country	Data Source	Sample size	Data years
United States	Survey of Consumer Finances (for ownership and amounts)	4,000-4,500	1983, 1989, 1992, 1995, 1998
United Kingdom	Family Expenditure Survey (for ownership only)	7,000	1978-96
	Financial Research Survey (for ownership and amounts)	58,000	1997-98
Netherlands	CentER Savings Survey (for ownership and amounts)	2,000	1993-98
Germany	German Income and Expenditure Survey	44,000	1978, 1983, 1988, 1993
	German Socioeconomic Panel (for ownership only)	5,000	1990-97
	Spiegel-Verlag Survey *Soll und Haben*	4,000-8,500	1980, 1985, 1989, 1995
Italy	Survey of Household Income and Wealth (for ownership and amounts)	7,000-8,000	1989, 1991, 1993, 1995, 1998

Table 3
Proportion of Households Investing in Risky Assets

The table reports the proportion of direct stockholders and of direct or indirect stockholders in each country. All statistics use sample weights. Data for the U.S. are drawn from the Survey of Consumer Finances. Data for the U.K. are drawn from the Family Expenditure Survey. Data for the Netherlands are drawn from the Center Saving Survey. Data for Germany are drawn from the German Income and Expenditure Survey (1983) and from the *Soll und Haben* Survey (1989 and 1995); for comparison with earlier periods, all data refer to West Germany. Data for Italy are drawn from the Survey of Household Income and Wealth.

Year	Direct stockholding					Direct and indirect stockholding				
	U.S.	U.K.	Netherlands	Germany	Italy	U.S.	U.K.	Netherlands	Germany	Italy
1983	19.1	8.9	n.a	9.7	n.a	n.a.	n.a	n.a.	11.2	n.a.
1989	16.8	22.6	n.a	10.3	4.5	31.6	n.a	n.a	12.4	10.5
1995	15.2	23.4	11.5	10.5	4.0	40.4	n.a	29.4	15.6	14.0
1998	19.2	21.6	15.4	n.a	7.3	48.9	31.4	35.1	n.a.	18.7

Year	Risky financial assets					Total risky assets				
	U.S.	U.K.	Netherlands	Germany	Italy	U.S.	U.K.	Netherlands	Germany	Italy
1983	n.a.	n.a.	n.a.	13.7	n.a.	n.a.	n.a.	n.a.	17.8	n.a.
1989	31.9	n.a.	n.a.	17.2	12.0	46.4	n.a.	n.a.	24.1	47.0
1995	40.6	n.a.	21.9	20.2	18.5	51.6	n.a.	28.4	25.2	46.9
1998	49.2	32.4	27.7	n.a.	22.1	56.9	n.a.	32.8	n.a.	43.8

Table 4
Proportion of Households Investing in Risky Assets, by Asset Quartiles

The first three panels report the proportion of investors by gross financial wealth quartiles. The last panel reports the proportion of investors by total asset quartiles. All statistics use sample weights. Data for the U.S. are drawn from the 1998 Survey of Consumer Finances. Data for the U.K. are drawn from the 1997-98 Financial Research Survey. Data for the Netherlands are drawn from the 1997 Center Saving Survey. Data for Germany are drawn from 1995 *Soll und Haben* Survey (unified Germany). Data for Italy are drawn from the 1998 Survey of Household Income and Wealth.

Direct Stockholding

	Quartile I	Quartile II	Quartile III	Quartile IV	Top 5 %	Average
U.S.	1.4	6.9	20.6	47.9	70.1	19.2
U.K.	0.0	4.4	28.3	53.6	67.9	21.6
Netherlands	0.5	3.7	13.0	40.4	77.1	14.4
Germany	2.6	6.6	11.4	19.4	31.9	10.0
Italy	0.5	2.7	5.8	17.5	32.2	7.3

Direct and Indirect Stockholding

	Quartile I	Quartile II	Quartile III	Quartile IV	Top 5 %	Average
U.S.	4.4	38.3	66.0	86.7	93.7	48.9
U.K.	4.9	11.9	37.8	71.1	83.9	31.5
Netherlands	4.4	16.9	36.8	75.9	92.3	33.5
Germany	6.6	17.6	22.1	29.3	41.6	18.9
Italy	3.4	10.8	19.6	38.9	54.6	18.9

Risky Financial Assets

	Quartile I	Quartile II	Quartile III	Quartile IV	Top 5 %	Average
U.S.	4.4	38.6	66.4	87.2	93.8	49.2
U.K.	4.9	12.0	38.5	74.0	86.9	32.4
Netherlands	0.8	8.0	26.0	64.4	87.5	24.8
Germany	8.9	24.1	29.2	38.2	51.4	25.1
Italy	4.4	13.5	24.1	44.2	57.7	22.1

Total Risky Assets

	Quartile I	Quartile II	Quartile III	Quartile IV	Top 5 %	Average
U.S.	15.4	48.0	70.8	93.2	98.8	56.9
U.K.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Netherlands	1.0	25.5	29.7	70.0	96.6	31.5
Germany	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Italy	11.6	35.7	50.0	75.6	94.2	43.8

Table 5
Proportion of Households Investing in Risky Assets, by Age

All statistics use sample weights. Data for the U.S. are drawn from the 1998 Survey of Consumer Finances. Data for the U.K. are drawn from the 1997-98 Financial Research Survey. Data for the Netherlands are drawn from the 1997 Center Saving Survey. Data for Germany are drawn from 1995 *Soll und Haben* Survey (unified Germany). Data for Italy are drawn from the 1998Survey of Household Income and Wealth.

Direct Stockholding

	<30	30-39	40-49	50-59	60-69	≥70	Total
U.S.	11.8	16.0	21.2	24.8	23.7	18.2	19.2
U.K.	10.8	19.6	24.5	28.1	26.2	18.5	21.6
Netherlands	4.7	6.8	13.4	18.4	17.8	21.2	14.4
Germany	8.5	11.3	12.1	11.2	10.1	6.1	10.0
Italy	3.4	9.9	8.4	9.3	6.4	4.2	7.3

Direct and Indirect Stockholding

	<30	30-39	40-49	50-59	60-69	≥70	Total
U.S.	34.3	51.8	58.3	61.4	47.1	32.4	48.9
U.K.	20.4	31.5	37.0	41.2	34.8	21.9	31.5
Netherlands	12.1	25.6	33.7	40.1	38.6	35.9	33.5
Germany	18.6	21.8	22.0	21.0	17.1	11.7	18.9
Italy	11.9	27.5	24.2	23.4	15.8	7.8	18.9

Risky Financial Assets

	<30	30-39	40-49	50-59	60-69	≥70	Total
U.S.	34.5	**51.8**	58.5	61.5	47.9	33.4	49.2
U.K.	20.9	32.0	37.7	42.2	36.4	23.1	32.4
Netherlands	8.7	15.6	21.0	31.1	31.1	35.1	24.8
Germany	23.9	28.2	28.0	27.8	23.1	18.0	25.1
Italy	17.3	30.3	26.9	26.3	20.6	10.3	22.1

Total Risky Assets

	<30	30-39	40-49	50-59	60-69	≥70	Total
U.S.	38.7	*58.6*	67.0	68.4	59.2	42.4	56.9
U.K.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a
Netherlands	12.8	22.9	29.6	41.2	32.8	38.8	31.5
Germany	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Italy	32.4	50.6	50.6	51.7	45.9	26.4	43.8

Table 6

Conditional Asset Shares, by Asset Quartiles

The first three panels report asset shares, conditional on participation, by gross financial wealth quartiles. The last panel reports asset shares, conditional on participation, by total asset quartiles. All statistics use sample weights. Data for the U.S. are drawn from the 1998 Survey of Consumer Finances. Data for the U.K. are drawn from the 1997-98 Financial Research Survey. Data for the Netherlands are drawn from the 1997 Center Saving Survey. Data for Germany are drawn from 1995 *Soll und Haben* Survey (unified Germany). Data for Italy are drawn from the 1998 Survey of Household Income and Wealth. A star indicates that the figure is based on fewer than 20 observations.

Direct stockholding

	Quartile I	Quartile II	Quartile III	Quartile IV	Top 5 %	Average
U.S.	32.9	33.0	25.6	34.9	37.9	34.6
U.K.	–.–	73.1	64.3	28.8	23.3	42.7
Netherlands	68.3*	31.5	34.1	48.2	66.6	47.6
Germany	23.8	16.7	15.8	19.5	22.5	18.6
Italy	23.3*	36.8	21.0	24.1	22.1	23.0

Direct and Indirect Stockholding

	Quartile I	Quartile II	Quartile III	Quartile IV	Top 5 %	Average
U.S.	40.7	45.0	49.0	60.4	64.0	59.6
U.K.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Netherlands	40.3*	32.7	37.3	55.2	66.1	53.6
Germany	26.7	21.9	20.6	22.0	24.5	21.8
Italy	53.4	50.9	50.2	50.0	65.1	57.3

Risky Financial Assets

	Quartile I	Quartile II	Quartile III	Quartile IV	Top 5 %	Average
U.S.	40.7	44.9	49.0	61.3	65.2	60.5
U.K.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Netherlands	48.9*	31.0	36.4	50.6	61.7	49.7
Germany	28.9	25.0	24.8	27.2	30.2	26.3
Italy	51.4	54.2	53.1	56.4	77.1	65.4

Total Risky Assets

	Quartile I	Quartile II	Quartile III	Quartile IV	Top 5 %	Average
U.S.	29.5	24.8	23.4	59.2	69.4	54.4
U.K.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Netherlands	20.9*	38.8	16.8	35.4	47.3	33.1
Germany	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Italy	27.6	33.7	25.9	33.5	57.9	42.9

Table 7
Conditional Asset Shares, by Age

All statistics use sample weights. Data for the U.S. are drawn from the 1998 Survey of Consumer Finances. Data for the U.K. are drawn from the 1997-98 Financial Research Survey. Data for the Netherlands are drawn from the 1997 Center Saving Survey. Data for Germany are drawn from 1995 *Soll und Haben* Survey (unified Germany). Data for Italy are drawn from the 1998 Survey of Household Income and Wealth. A star indicates that the figure is based on fewer than 20 observations.

Direct stockholding

	<30	30-39	40-49	50-59	60-69	≥70	Total
U.S.	22.5	28.3	29.4	32.7	37.5	41.3	34.6
U.K.	57.1	51.3	46.7	38.9	33.0	37.6	42.7
Netherlands	24.2*	48.8	30.2	41.1	57.2	56.3	47.6
Germany	17.0	15.2	15.0	16.6	22.1	27.5	18.6
Italy	18.9*	22.3	23.4	23.7	22.8	22.7	23.0

Direct and Indirect Stockholding

	<30	30-39	40-49	50-59	60-69	≥70	Total
U.S.	52.0	53.4	61.0	61.4	60.8	57.9	59.6
U.K.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a
Netherlands	29.8*	37.5	42.9	54.9	61.6	59.1	53.6
Germany	20.6	19.3	16.9	19.0	26.2	32.6	21.8
Italy	47.9	52.5	52.2	56.2	53.2	59.1	57.3

Risky Financial Assets

	<30	30-39	40-49	50-59	60-69	≥70	Total
U.S.	52.1	*53.7*	61.8	62.1	61.4	59.4	60.5
U.K.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a
Netherlands	32.1*	40.0	37.0	43.2	56.6	64.0	49.7
Germany	24.8	23.2	20.7	22.3	30.2	40.8	26.3
Italy	46.4	58.0	58.3	67.0	71.4	71.1	65.4

Total Risky Assets

	<30	30-39	40-49	50-59	60-69	≥70	Total
U.S.	44.4	**43.0**	52.9	58.8	56.2	56.1	54.4
U.K.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a
Netherlands	24.2*	27.1	28.0	34.8	32.3	44.7	33.1
Germany	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Italy	42.8	43.9	38.6	46.5	44.3	40.5	42.9

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