Household Finance

"Household Finance", *JF* August 2006

"Down or Out: Assessing the Welfare Costs of Household Investment Mistakes", with Laurent Calvet and Paolo Sodini, *JPE* October 2007

"Fight or Flight? Rebalancing Behavior of Individual Investors", with Calvet and Sodini, *QJE* February 2009

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Household Finance

- A field with much interesting research but still lacking in definition and status.

- How do households use financial instruments to attain their objectives?

- Unlike asset pricing, no special status for wealthy or risk-tolerant households.

Positive vs. Normative

- **Positive household finance:**
  - How **do** households invest?
  - Hard to measure.
- **Normative household finance:**
  - How **should** households invest?
  - Hard to model.
- **Can they be different?**
  - Revealed preference.
  - Investment mistakes.

Investment Mistakes

- Some decisions are inconsistent with
  - a broad range of standard models, and
  - the advice commonly given by financial planners.
- I will interpret these as investment mistakes.
- Households may make them, but can learn to avoid them.
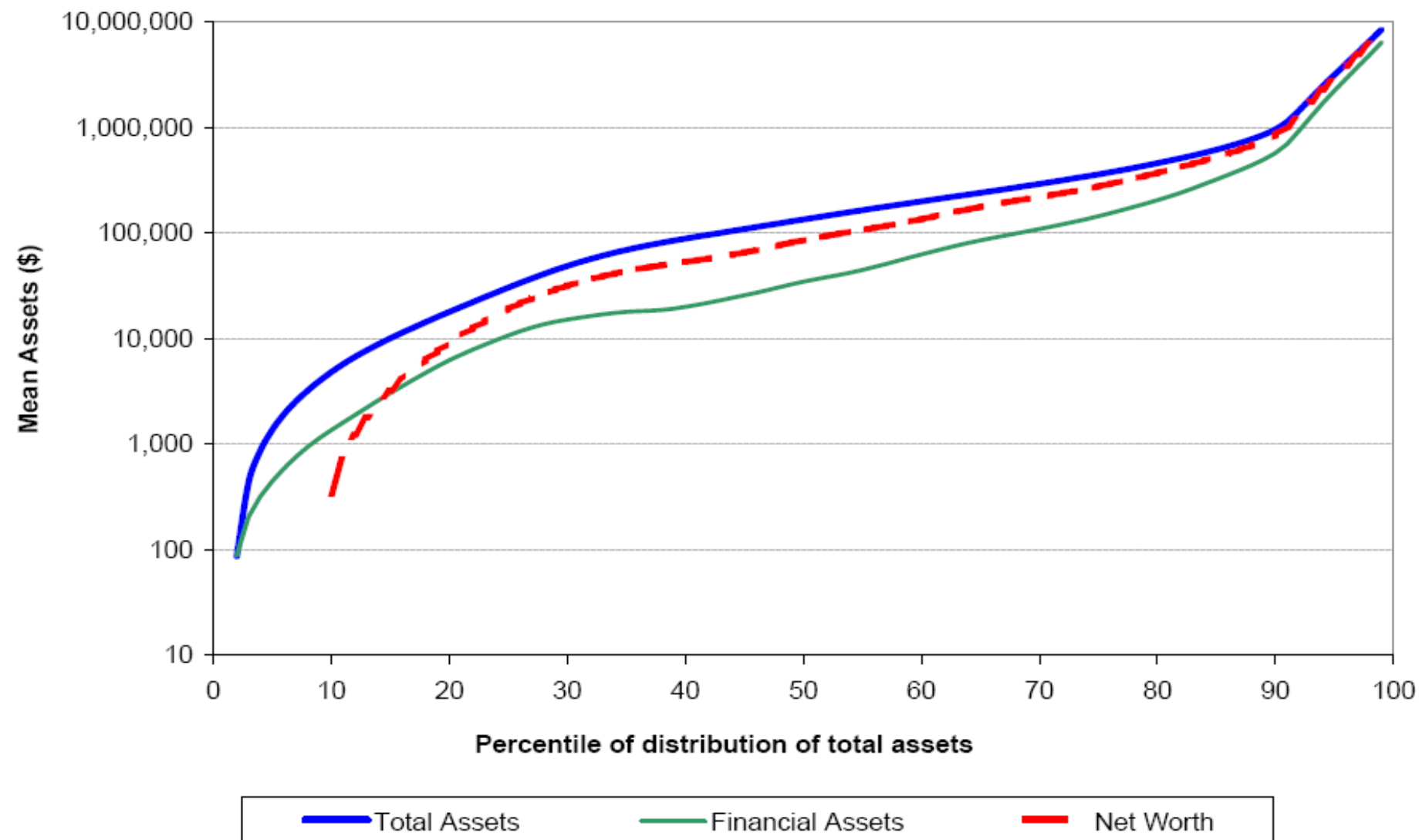
Investment Mistakes

- **Who makes them?**

- **What are the welfare costs?**

- **Does financial innovation help?**

- **How can we help?**

Four Examples

- **Mistake 1:** Failure to participate.

- **Mistake 2:** Failure to diversify.

- **Mistake 3:** Risky share inertia.
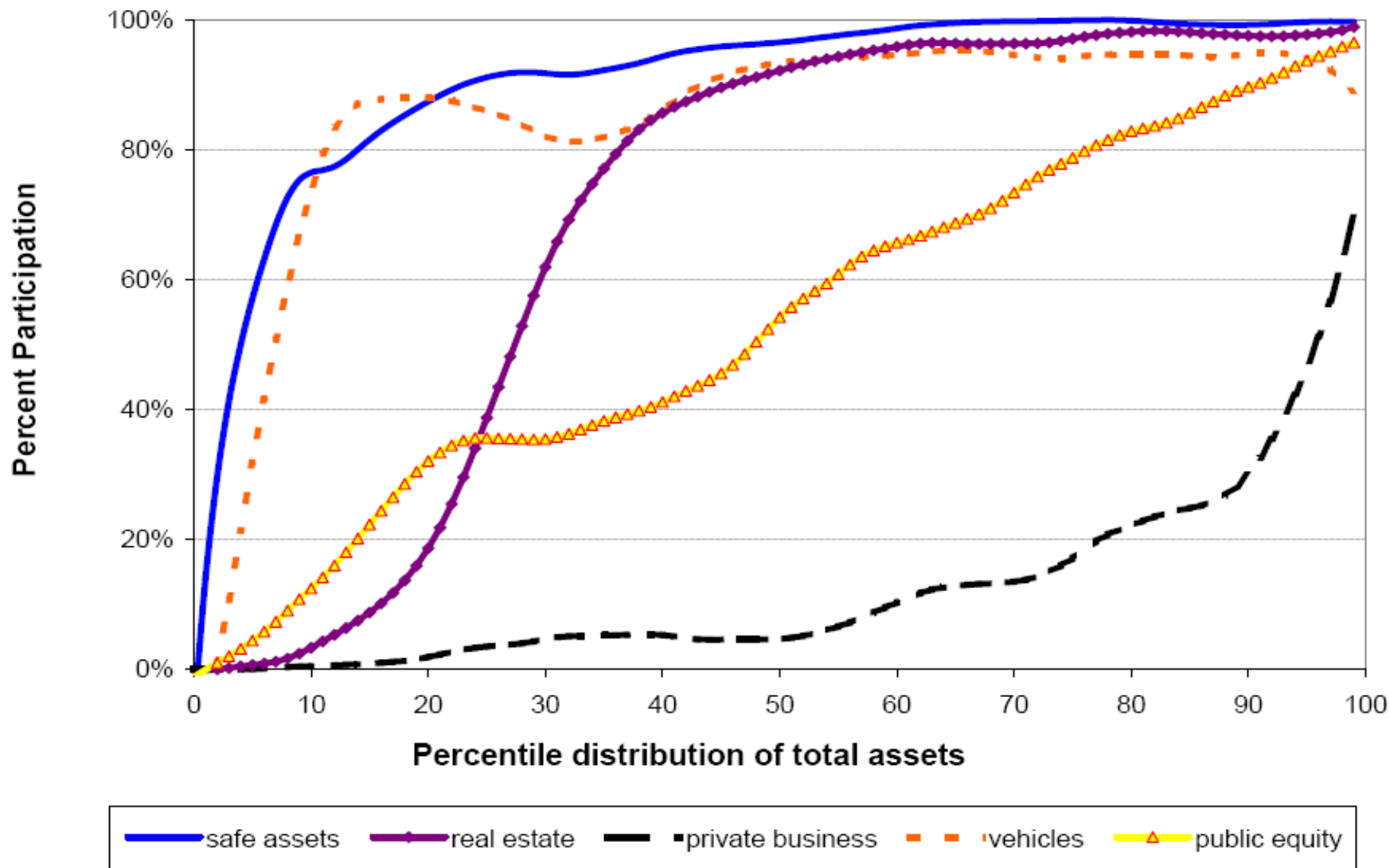
- **Mistake 4:** Mortgage refinancing inertia.

Mistake 1:
Failure to Participate

Figure 1: The US Wealth Distribution
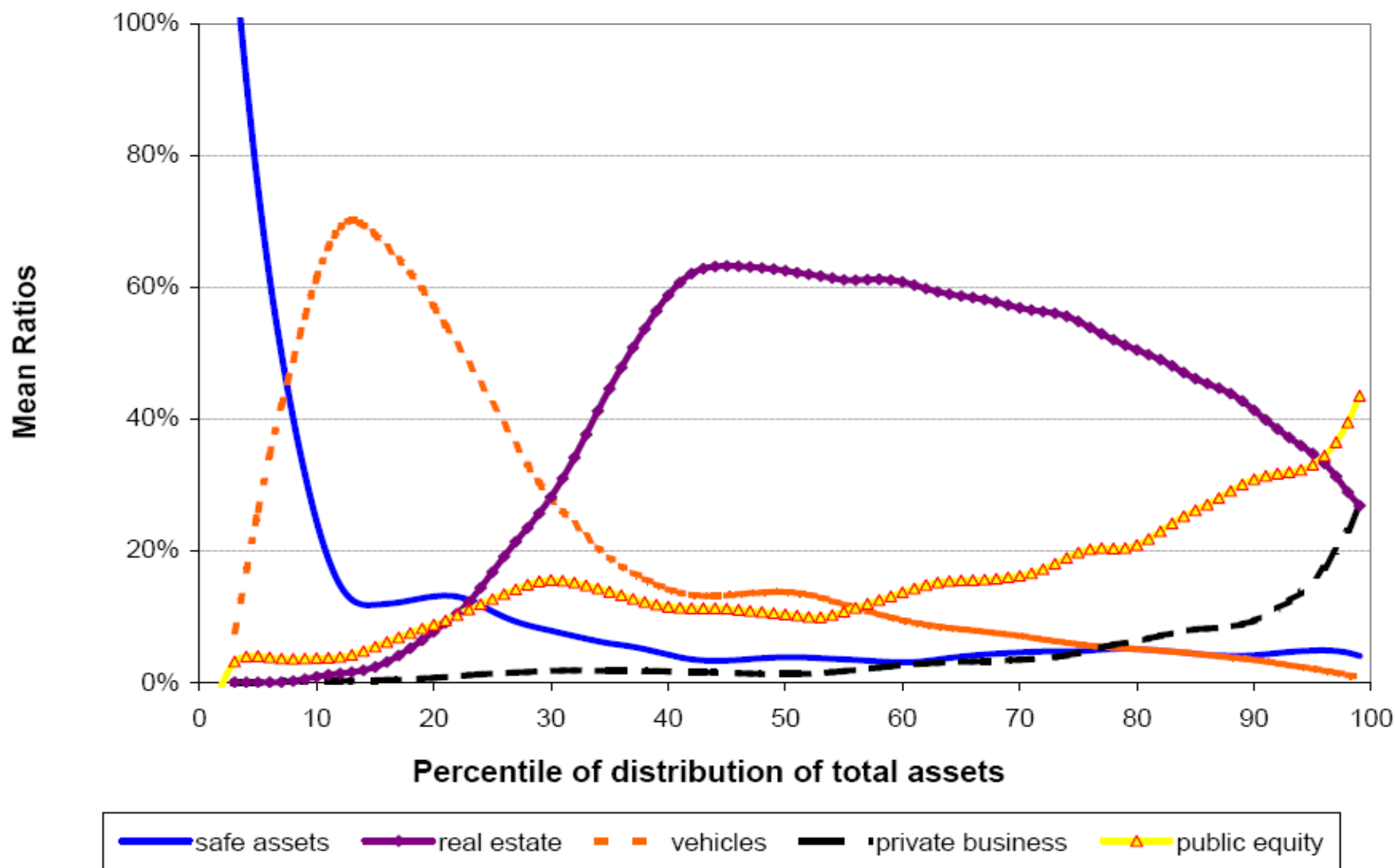
Figure 2: Participation Rates by Asset Class

Percent Participation

Percentile distribution of total assets

safe assets — real estate — private business — vehicles — public equity

Figure 3: Asset Class Shares in Household Portfolios

Mean Ratios

Percentile of distribution of total assets

safe assets — real estate — vehicles — private business — public equity

Who Participates?

2001 Survey of Consumer Finances

Reference	57% participation
High school	**15% increase**
College	**28% increase**
Income +1σ	**17% increase**
Wealth +1σ	**37% increase**

Is This A Mistake?

- Fixed costs may justify nonparticipation.

- But the effect of education suggests that this is not just a rational response to fixed costs.

- We will see similar patterns in other financial decisions that are harder to explain using fixed costs.

Mistake 2:
Failure to Diversify

The Measurement Challenge

- Surveys do not generally go down to the individual asset level.

- Brokerage account data do not show a household's complete portfolio.

- Calvet, Campbell, and Sodini (*JPE* 2007) use Swedish government data:

  - collected because Sweden has a wealth tax.

  - details of each citizen's portfolio at the end of each year.

Household M-V Analysis

- Historical average returns are noisy estimates of mean returns, especially in short samples.

- Accordingly CCS impose an asset pricing model and use it to infer mean returns.

- Base case: international CAPM where the hedged world index is mean-variance efficient.

- Alternative case: Fama-French three-factor model with market, size, and value factors.

- CCS assess mean-variance efficiency of the portfolios held by households at the end of 2002.

CCS Scatter Plots of Household Portfolios

Stock Portfolios
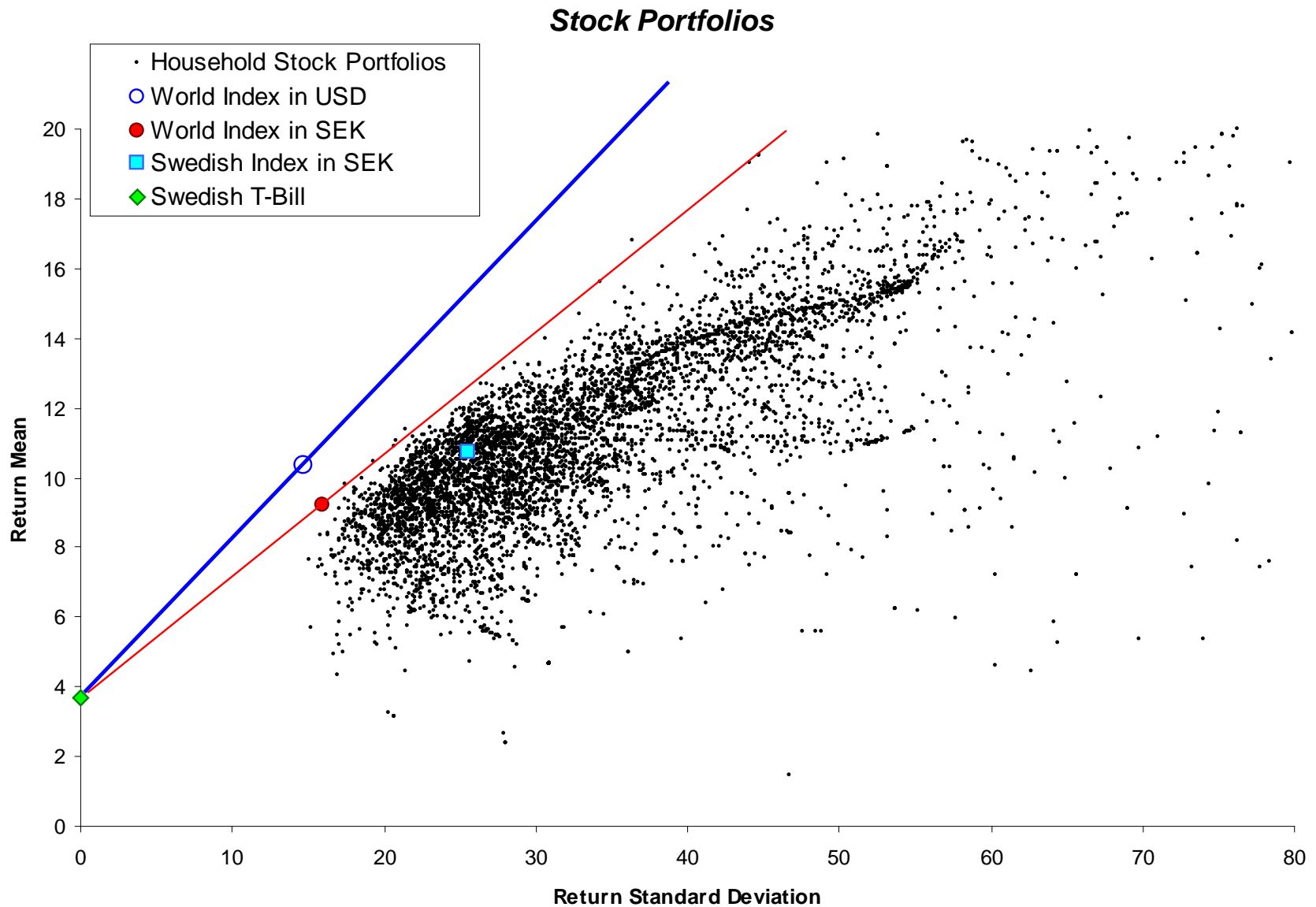
Complete Portfolios
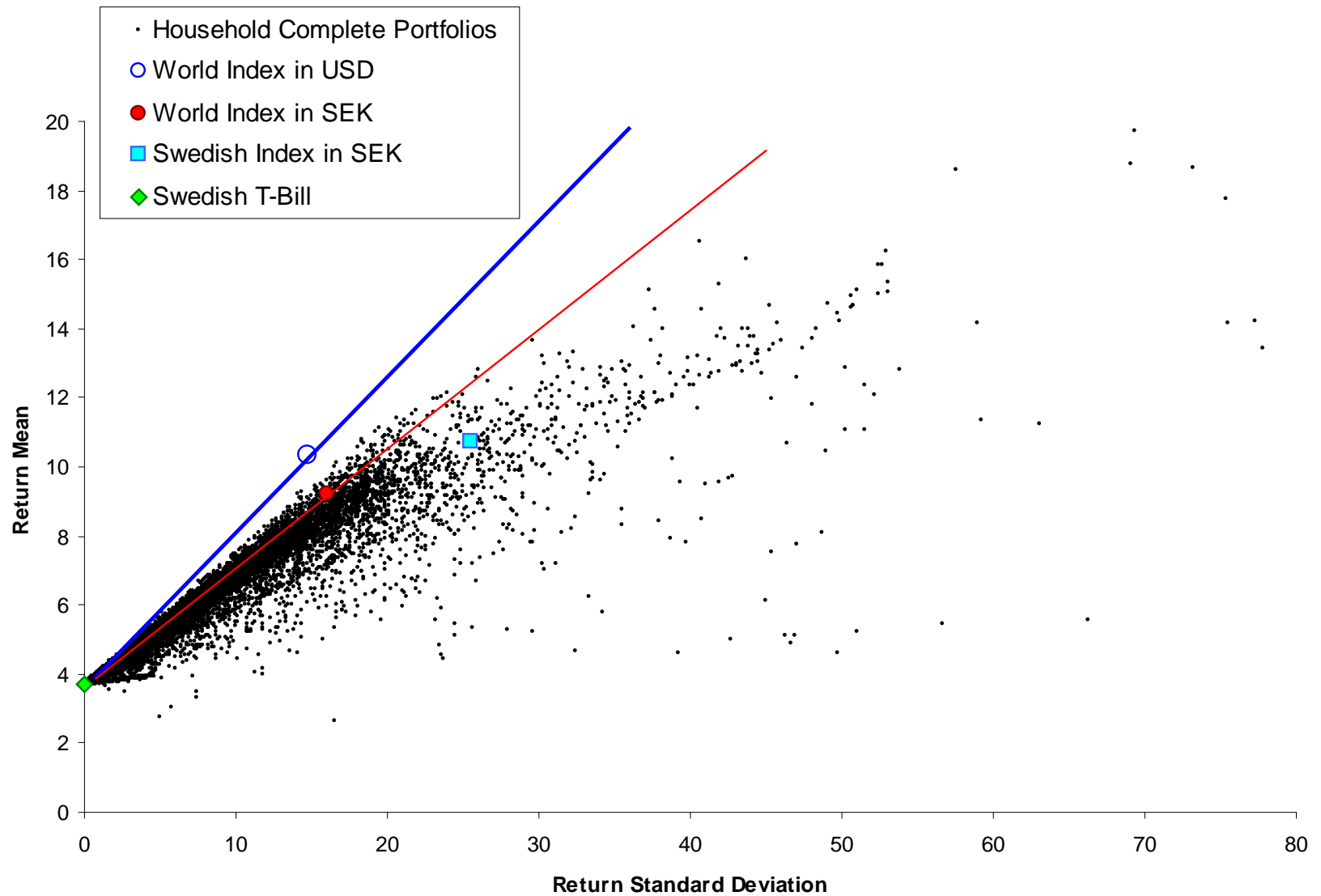
Measuring Diversification

- Household Sharpe ratio $S_h = \dfrac{\mu_h}{\sigma_h}$

- Relative Sharpe ratio loss wrt benchmark S_B

$$RSRL_h = 1 - \frac{S_h}{S_B}$$

- Return loss (vertical distance to the efficient frontier)
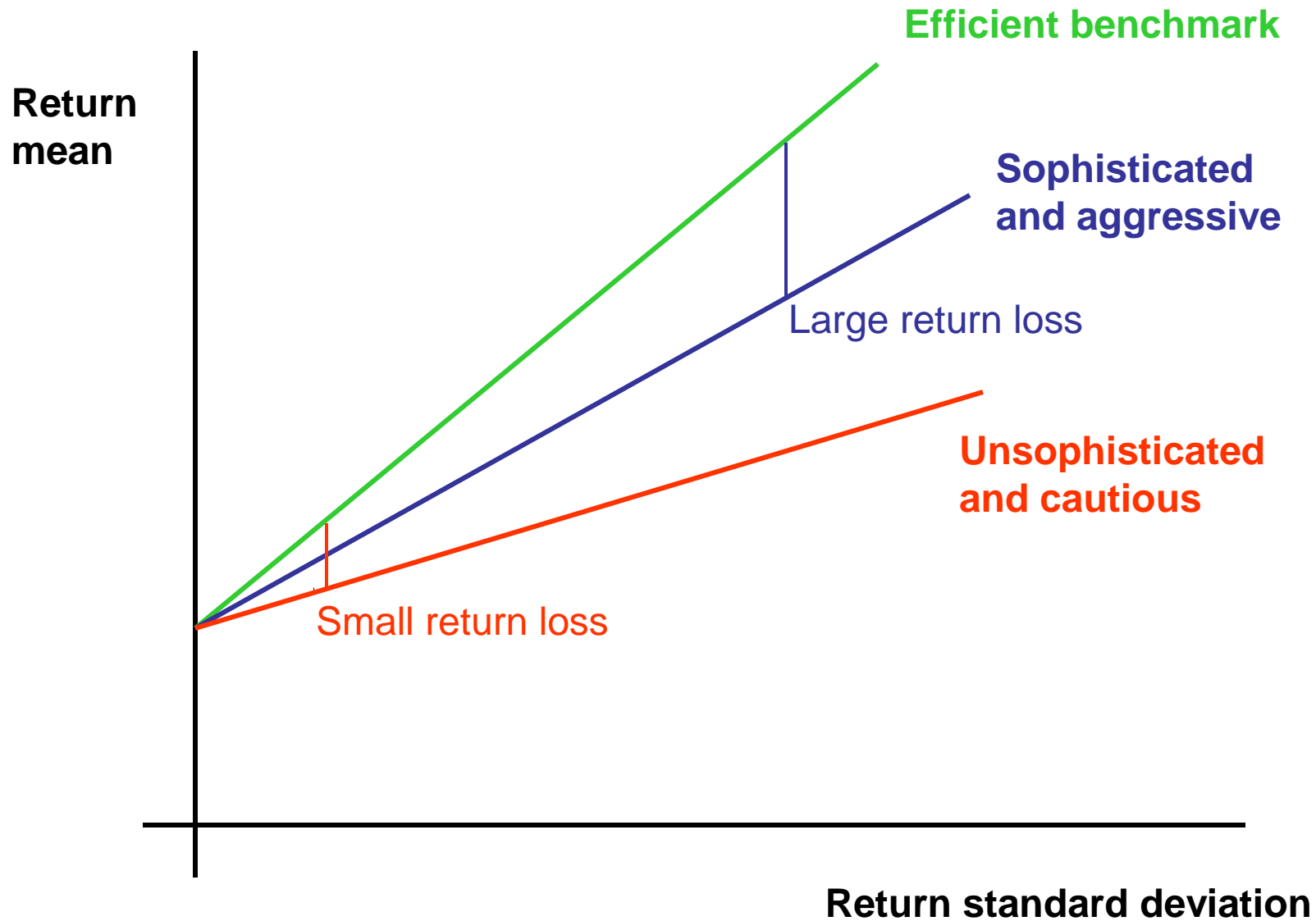
$$RL_h = S_B \sigma_h - \mu_h$$

Return Loss

- Median return loss is 1.17% ($131 per year) relative to hedged world index and only 0.30% ($33) relative to unhedged world index.

- These numbers are modest even though median share of idiosyncratic variance in total variance is quite large at 56%.

- At the 95th percentile, return losses are much larger: 5.04% ($2,204) and 2.65% ($851).

Who Incurs Return Loss?

- Financially sophisticated households (rich, educated, with complementary financial markets experience) invest efficiently but take more risk.
- Retired and unemployed households invest inefficiently and take less risk.
- Entrepreneurs and larger households invest conservatively.
- Overall, financially sophisticated non-entrepreneurial households have the greatest return losses.
- Consistent with the idea that people know their limitations.

Return mean

Efficient benchmark

Sophisticated and aggressive

Large return loss

Unsophisticated and cautious

Small return loss

Return standard deviation

Conclusions of *JPE* Paper

- Many Swedish households are well diversified, but there is significant cross-sectional variation in household portfolio returns

- Mutual funds play a vital role in diversification.

- A minority of households are undiversified.

- Financial sophistication improves portfolio efficiency but also increases risk-taking.

- The welfare cost of nonparticipation is smaller when we consider that nonparticipants would be likely to invest cautiously and inefficiently.

Missing Fees

- CCS analysis ignores mutual fund fees
- Treats mutual funds as if they obey the CAPM, like individual stocks
- Results are fairly similar assuming a flat fee across all funds except the top ten, for which fees are directly measured
- But it would be very interesting to see if less sophisticated households pay higher fees

Mistake 3:
Risky Share Inertia

Basic Facts 1999-2002

- High stock returns 1999, then bear market 2000-2002

- Household participation rate increased in 2000, then fell only very slightly

- But the share of risky assets in the portfolios of participating households declined substantially

- Our estimate of portfolio standard deviation moves closely with the risky share, so we focus on the risky share as a convenient summary measure of risktaking

- At first we look only at continuing participants

TABLE 1. SUMMARY STATISTICS

B. Participation and Average Risky Share

	1999	2000	2001	2002
Rate of participation	61.5%	66.3%	65.9%	64.8%
Average risky share (equal weighted)	56.5%	56.6%	52.3%	45.2%
Average risky share (wealth weighted)	74.9%	73.7%	66.1%	54.7%

C. Asset Returns

	1999	2000	2001	2002
Interest rate	3.1%	3.9%	4.1%	4.1%
MSCI Sweden index	79.2%	-18.0%	-26.8%	-48.6%
Pooled index (equal weighted)	NA	-4.3%	-11.1%	-32.1%
Pooled index (value weighted)	NA	-6.1%	-11.6%	-32.2%
MSCI World index (in Swedish Krona)	27.2%	-7.1%	-11.3%	-37.9%
MSCI World index (in US dollars)	19.0%	-18.5%	-20.7%	-22.4%

What Drives the Risky Share?

- Why did the aggregate risky share decline?
  - Inertia
  - A decline in the desired risky share
- We cannot tell using aggregate data
  - Small aggregate flows are consistent with either explanation
  - In closed-economy general equilibrium, desired and actual risky share must coincide
- We use cross-sectional variation to get extra information
  - Variation in the initial risky share
  - Variation in portfolios and thus in realized returns

Passive Risky Share

- Our dataset gives us the unique ability to calculate the passive share, the risky share that will result from risky asset returns if a household trades no assets.

- The passive share is U-shaped in initial risky share if risky returns are negative, and hump-shaped if they are positive.

- Portfolio inertia implies that a household's actual risky share will closely track its passive share.

Passive Risky Share

$$w^p_{h,t+1} = \omega^p(w_{h,t}; r_{h,t+1}),$$

$$\omega^p(w; r) \equiv \frac{w(1 + r)}{w(1 + r) + (1 - w)(1 + r_f)}.$$

$$P_{h,t+1} = w^p_{h,t+1} - w_{h,t}$$
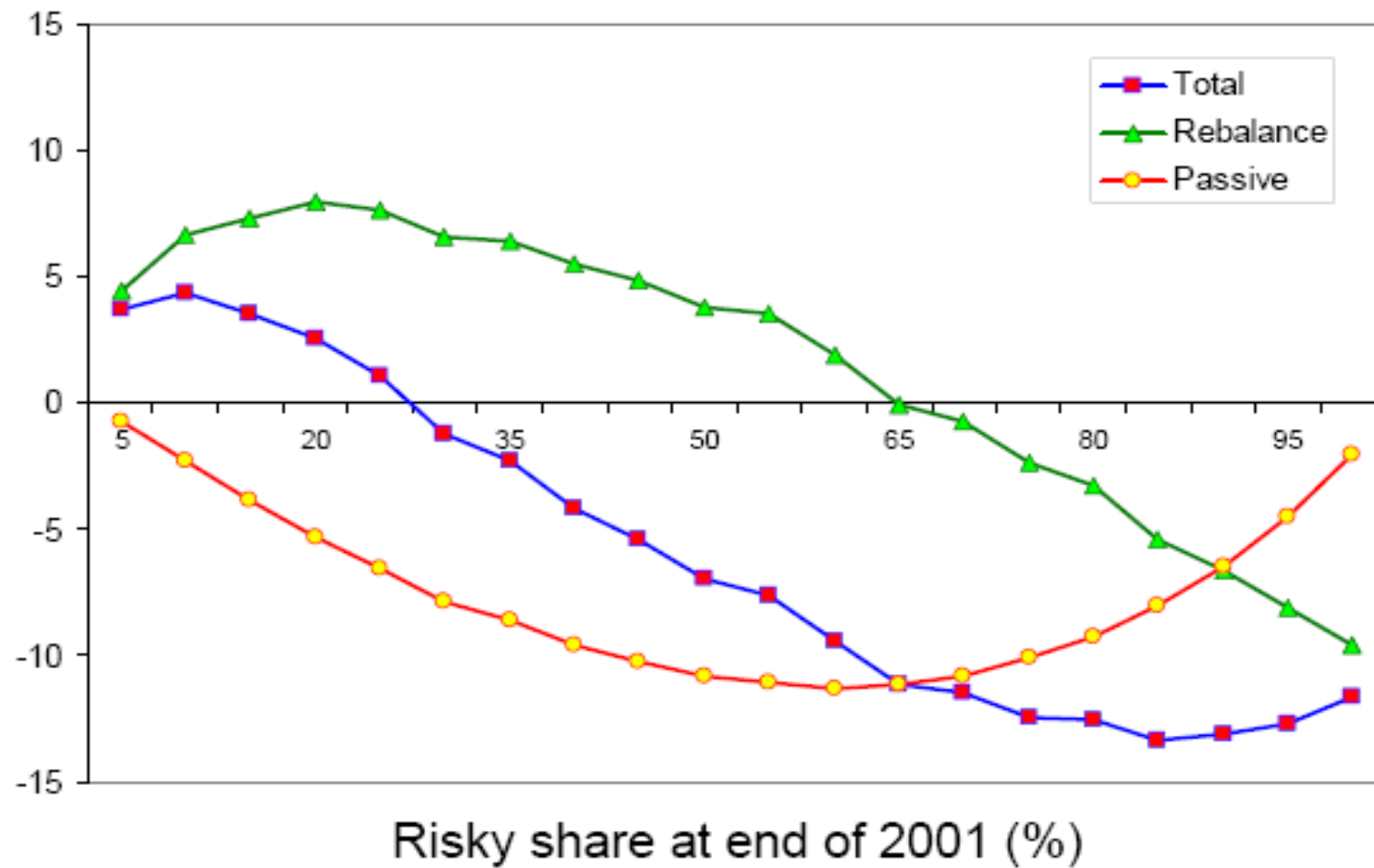
Active and Passive Shares

$$A_{h,t+1} = w_{h,t+1} - w^p_{h,t+1}$$

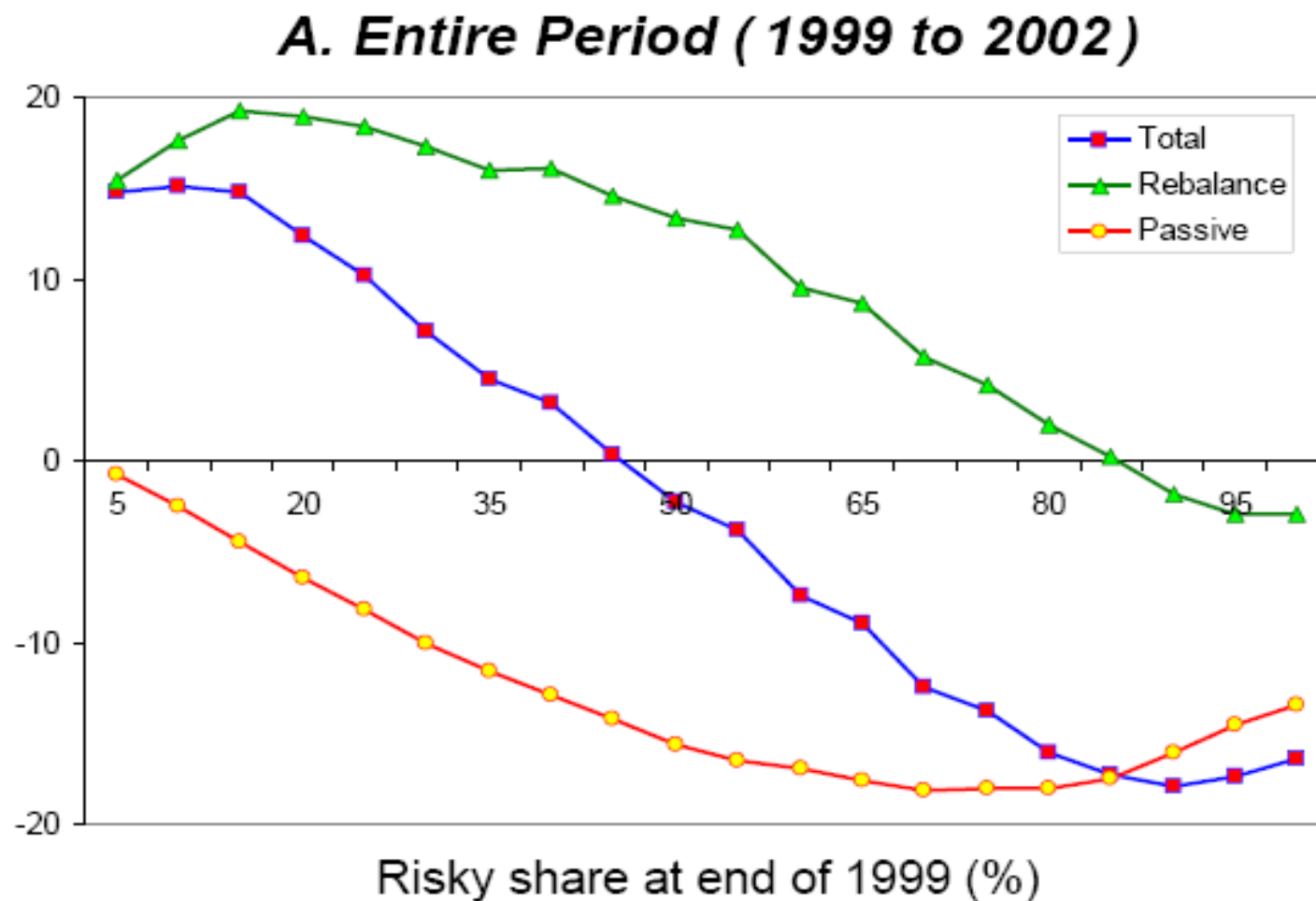$$w_{h,t+1} - w_{h,t} = P_{h,t+1} + A_{h,t+1}.$$

$$\ln(w_{h,t+1}) - \ln(w_{h,t}) = p_{h,t+1} + a_{h,t+1},$$

Figure 3

D. 2001 to 2002

Risky share at end of 2001 (%)

Figure 3

A. Entire Period (1999 to 2002)

Risky share at end of 1999 (%)

Rebalancing and Mean-Reversion

- These figures suggest that households rebalance (active hump shape offsetting passive U shape).

- They also suggest mean-reversion in portfolio share (downward slope in active change).

- But there is limited information in the data aggregated this way.

Identifying Rebalancing

- Because households are imperfectly diversified, their risky portfolio returns vary cross-sectionally.

  – Our earlier paper found a 56% median share of idiosyncratic variance in total variance.

- This enables us to estimate rebalancing propensity more precisely.

- Overall, rebalancing offsets more than half the passive variation in the risky share.

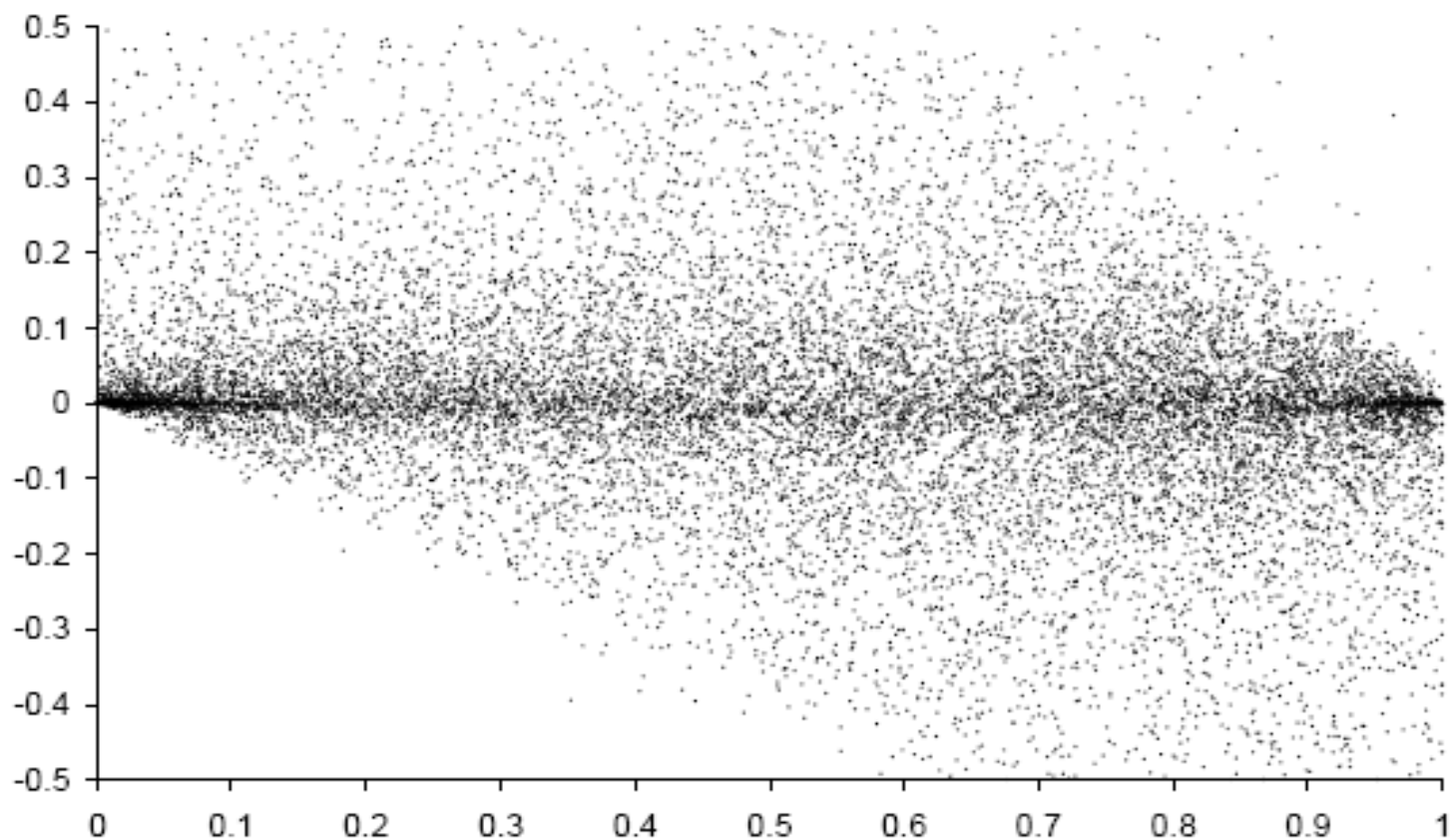- More sophisticated households have a stronger tendency to rebalance.

Figure 2

A. Passive Change
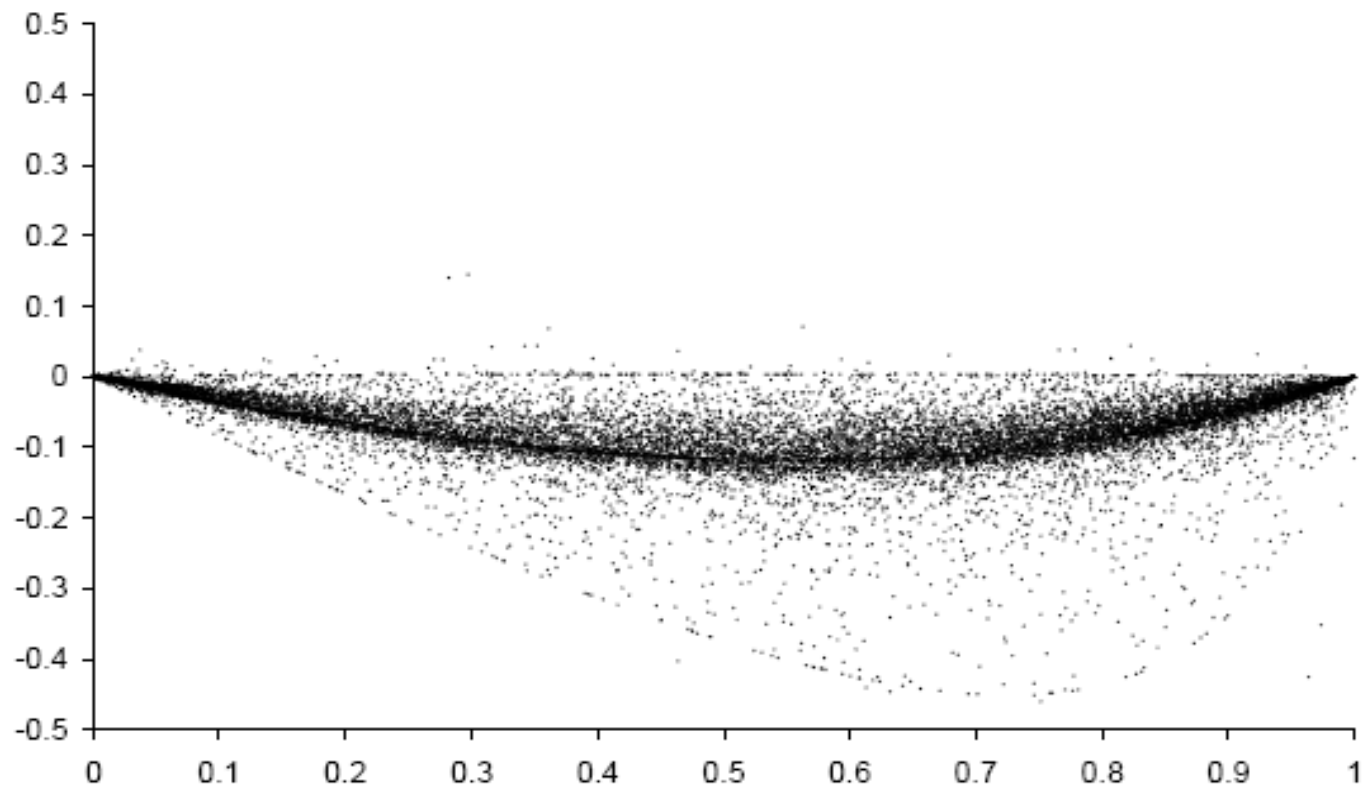
Figure 2

B. Active Change

TABLE 2. REGRESSION OF ACTIVE CHANGE ON PASSIVE CHANGE

A. In Levels

	All years		2000		2001		2002	
	Estimate	t-stat	Estimate	t-stat	Estimate	t-stat	Estimate	t-stat
Passive change	-0.498	-51.80	-0.632	-27.50	-0.618	-29.00	-0.431	-34.00
Initial share (demeaned)	-0.186	-144.00	-0.194	-87.90	-0.176	-82.30	-0.190	-79.10
Intercept			0.025	33.60	-0.032	-37.40	-0.023	-19.80
1999 dummy	0.027	39.00						
2000 dummy	-0.029	-40.60						
2001 dummy	-0.028	-28.90						
Adjusted R^2	0.12		0.12		0.10		0.10	
Number of observations	187,780		60,341		64,119		63,320	

B. In Logs

	All years		2000		2001		2002	
	Estimate	t-stat	Estimate	t-stat	Estimate	t-stat	Estimate	t-stat
Passive change in logs	-0.461	-47.50	-0.776	-38.00	-0.583	-26.70	-0.425	-30.40
Log of risky share (demeaned)	-0.195	-136.00	-0.273	-123.00	-0.148	-62.10	-0.158	-55.90
Intercept			0.094	37.20	-0.075	-26.10	-0.075	-17.50
1999 dummy	0.107	41.00						
2000 dummy	-0.066	-25.40						
2001 dummy	-0.083	-24.50						
Adjusted R^2	0.14		0.23		0.09		0.10	
Number of observations	187,780		60,341		64,119		63,320	

Notes: We filtered out households with a risky share in the lowest 1% of the sample. All household characteristics are demeaned. The passive and active changes are expressed in percentages.

A Partial Adjustment Model

Target share   Passive share

$$\ln(w_{h,t+1}) = \phi_h \ln(w^d_{h,t+1}) + (1 - \phi_h) \ln(w^p_{h,t+1}) + \varepsilon_{h,t+1}.$$

$$\phi_h = \varphi_0 + \varphi' x_{h,t},$$

$$\Delta \ln(w^d_{h,t+1}) = \delta_{0,t+1} + \delta' x_{h,t}.$$

Adjustment speed   Change in the target

An Econometric Problem

- To handle household fixed effects in the target risky share, one must difference the model

- The error term in the regression is then MA(1) and correlated with the change in the passive risky share.

- A positive shock between t-1 and t raises the risky share at t, which influences the passive share at t+1.

- Solution: create an instrument for the change in the passive share that removes this effect.

An Instrument

- The zero-rebalancing passive change at *t*+1 is the passive change that would be observed if the household did not rebalance at *t*.

$$\ln \omega^P(w_{h,t}^p; r_{h,t+1}) - \ln(w_{h,t}^p)$$

- Because rebalancing is limited, this is correlated with the actual passive change.

- But it is uncorrelated with the MA(1) error term in the regression.

TABLE 4. ADJUSTMENT MODEL WITHOUT CHARACTERISTICS

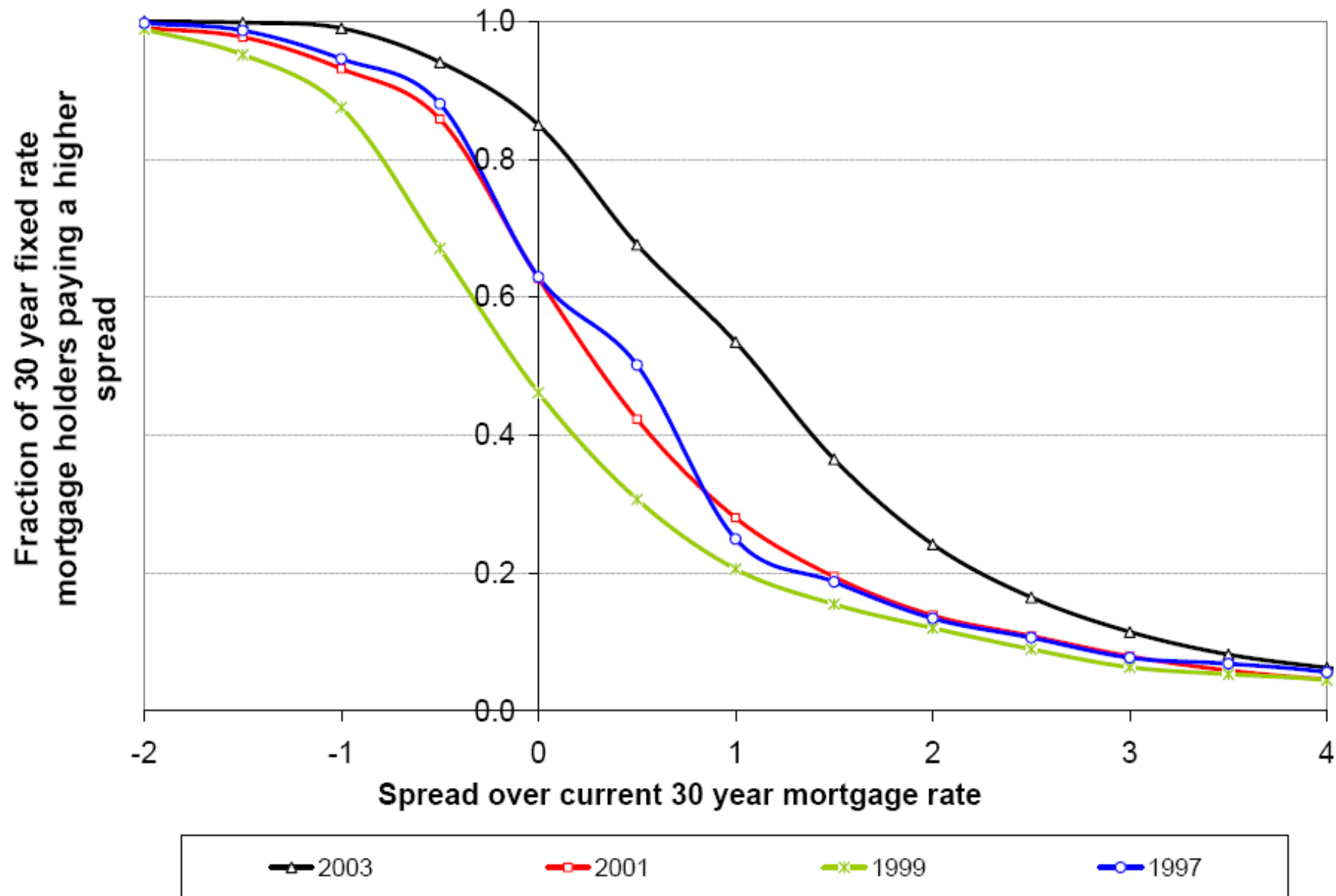|	OLS		IV	
	Estimate	**t-stat**	**Estimate**	**t-stat**
Reduced Form Estimates				
Change in log passive share	-0.122	-44.20	0.361	38.70
Intercept 2001	-0.111	-41.90	-0.140	-46.50
Intercept 2002	-0.245	-92.10	-0.121	-32.30
Structural Parameters				
Adjustment speed φ_0	1.122	408.00	0.640	68.70
Target change $\delta_{0,2001}$	-0.099	-41.40	-0.219	-35.60
Target change $\delta_{0,2002}$	-0.219	-95.40	-0.189	-41.00
Adjusted R^2	0.08			
Number of observations	120,067		120,067	

Who Rebalances?

- Financially sophisticated households (with greater wealth, income, and education) rebalance faster

- Wealthy households have a target share that declines less in the bear market

- An increase in financial wealth increases the target share
  - Suggests DRRA, could result from habit formation
  - Effect depends on IV, but controls for inertia
  - Compare with Brunnermeier-Nagel (*AER* 2007)

Mistake 4:
Mortgage Refinancing Inertia

The US Mortgage Market

- The mortgage is the largest financial contract for a typical household.

- In the US, nominal fixed-rate mortgages predominate.

- These mortgages carry a valuable option to refinance.

- In the past, some households have refinanced slowly and have paid high rates on old mortgages.

Figure 5: Distribution of Mortgage Spreads

Vertical axis: Fraction of 30 year fixed rate mortgage holders paying a higher spread

Horizontal axis: Spread over current 30 year mortgage rate

Legend: 2003, 2001, 1999, 1997

Who Refinances?

American Housing Survey 2001-03

Reference	28%
High school	**5% increase**
College	**9% increase**
Income +1σ	**1% increase**
Home val. +1σ	**7% increase**
Age +1σ	**4% decrease**

Who Moves?

American Housing Survey 2001-03

Reference	5% confirmed
High school	**4% increase**
College	**5% increase**
Income +1σ	**1% increase**
Home val. +1σ	**0% decrease**
Age +1σ	**2% decrease**

Who Misstates Their Rate?

American Housing Survey 2001

Reference	1.3%
High school	**0.6% decrease**
College	**0.5% decrease**
Income +1σ	**0.3% decrease**
Home val. +1σ	**0.1% increase**
Age +1σ	**0.1% decrease**

Mortgages in the Credit Boom

- During the credit boom, there was financial innovation in the subprime lending market.

- People with poor credit took out adjustable-rate mortgages (ARMs) with low initial rates and large potential for upside adjustments.

- ARMs could only be refinanced with rising house prices. House price declines and upward rate adjustments have driven up defaults and foreclosures.

- Did people understand the risks of these ARMs?

Equilibrium
Household Finance

Equilibrium Household Finance

- Household investment problems are inherently complex.

- Often, contracts do not make them easier.

- It may not be surprising that households make investment mistakes.

- But why don't easier-to-manage contracts evolve?

Barriers to Financial Innovation

- **General barriers:**
  - Costs of reaching households.
  - Lack of effective patent protection.

- **Specific barrier to simplifying innovation:**
  - Complex products create cross-subsidy from naïve to sophisticated households.
  - Example: mortgage refinancing option.

Cross-Subsidy and Equilibrium

- Cross-subsidy permits "shrouded equilibrium" (Gabaix and Laibson, *QJE* 2006).

- Naïve households do not adopt a new product because they do not understand it.

- Sophisticated households lose cross-subsidy if they switch to the new product.

- Innovators do not gain by educating households.

- How important is cross-subsidy in practice?

Cross-Subsidy in Mortgages

- In the US, fixed mortgage rates have been lower because of sluggish refinancing:

  – Total payments made in AHS exceeding current rate + 1%: 53bp in 1997, 43 bp in 1999, 66bp in 2001, and 107bp in 2003.

- This inhibits the development of automatically refinancing or inflation-adjusted mortgages.

Cross-Subsidy in Mortgages

- Miles Report on UK mortgage finance
- UK adjustable mortgages offer
  - low teaser rate (roughly LIBOR).
  - high standard rate (LIBOR + 175bp).
  - no refinancing penalty.
- This is possible only because of sluggish refinancing
  - almost 1/3 of borrowers paid standard rate in 2003.
- It inhibits the use of fixed-rate mortgages.

Conclusion

Investment Mistakes

- **Who makes them?**
  - Poorer and less educated households.

- **What are the welfare costs?**
  - Modest for many, substantial for some.
  - Interactions across mistakes.

Investment Mistakes

- **Does financial innovation help?**
  - Often proceeds slowly in retail markets.
  - The problem of cross-subsidy.
  - The problem of innovation to exploit confusion.
  - IT allows cheap customization.

- **How can we help?**
  - Basic financial literacy.
  - Disclosures, default options, and product design: household financial engineering.