Foreign Ownership of US Safe Assets: Good or Bad?

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- Raised questions about sustainability of *global imbalances* between demand for and supply of U.S. reserve assets.
- Fueled speculation about economic consequences of a **sell-off** of U.S. debt by foreign governments.
- Are such trends in international capital flows *good or bad for U.S. welfare?*

Academic Debate

- Some say trend in foreign ownership of U.S. assets is optimal/benign (e.g., Dooley et. al '05, Garber '05, Cooper '07, Mendoza et. al. '07 Caballero et. al. 08a').

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- Here: such capital *in*flows *boon for some (by a lot)* ☺☺, *bane for others (by less)* ☹.

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- For **asset prices**: interest rates, house prices, stock prices $\Rightarrow$
- For household **portfolios** $\Rightarrow$
- For **welfare**: who stands to gain or loose and how much?
  - Inter-generational tradeoff: young vs. middle-aged vs. old
  - Poor vs. rich
  - Stock- vs. bond- vs. home-owners

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- Two sources agg. risk: productivity, **shock to foreign holdings**.

Definition

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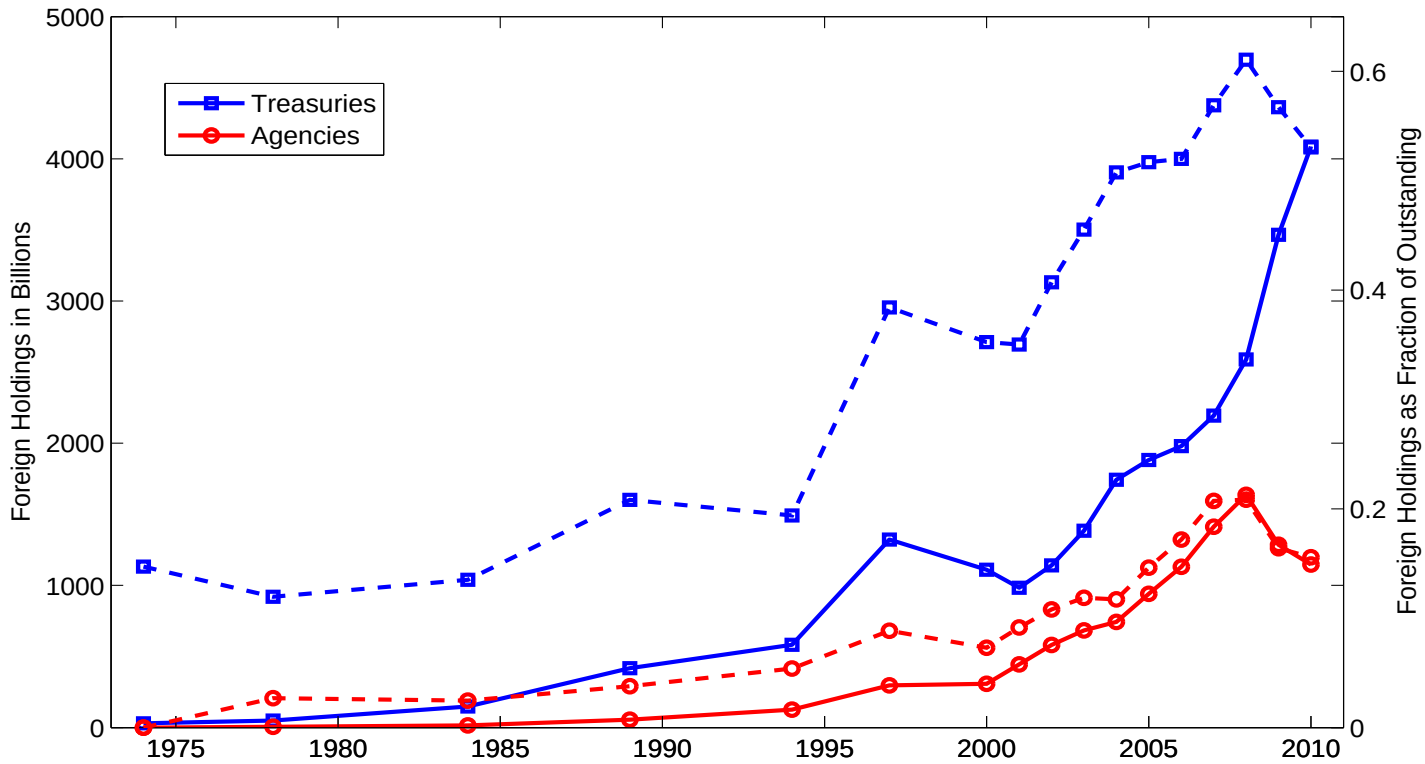
Foreign holdings of U.S. assets minus U.S. holdings of foreign assets is *net foreign holdings* of U.S. assets, or U.S. *net liability position*.

- Because model is silent on (net) FDI, we focus on the position in *securities* rather than *assets*; stylized facts for assets are similar

Foreign Holdings of U.S. Treasuries and Agencies

- Treasury holdings increased from $1.1trn in 1994 to $4.1trn in 2010



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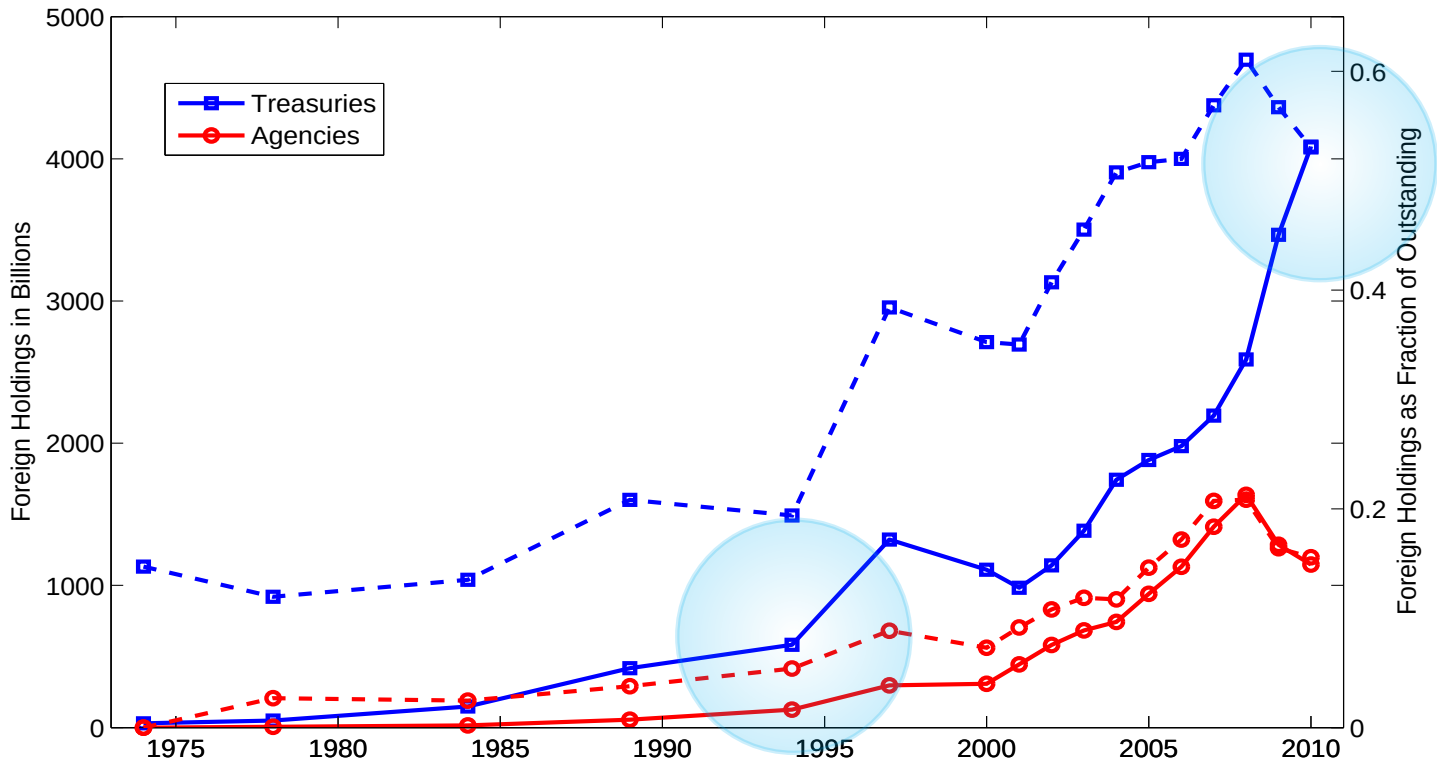

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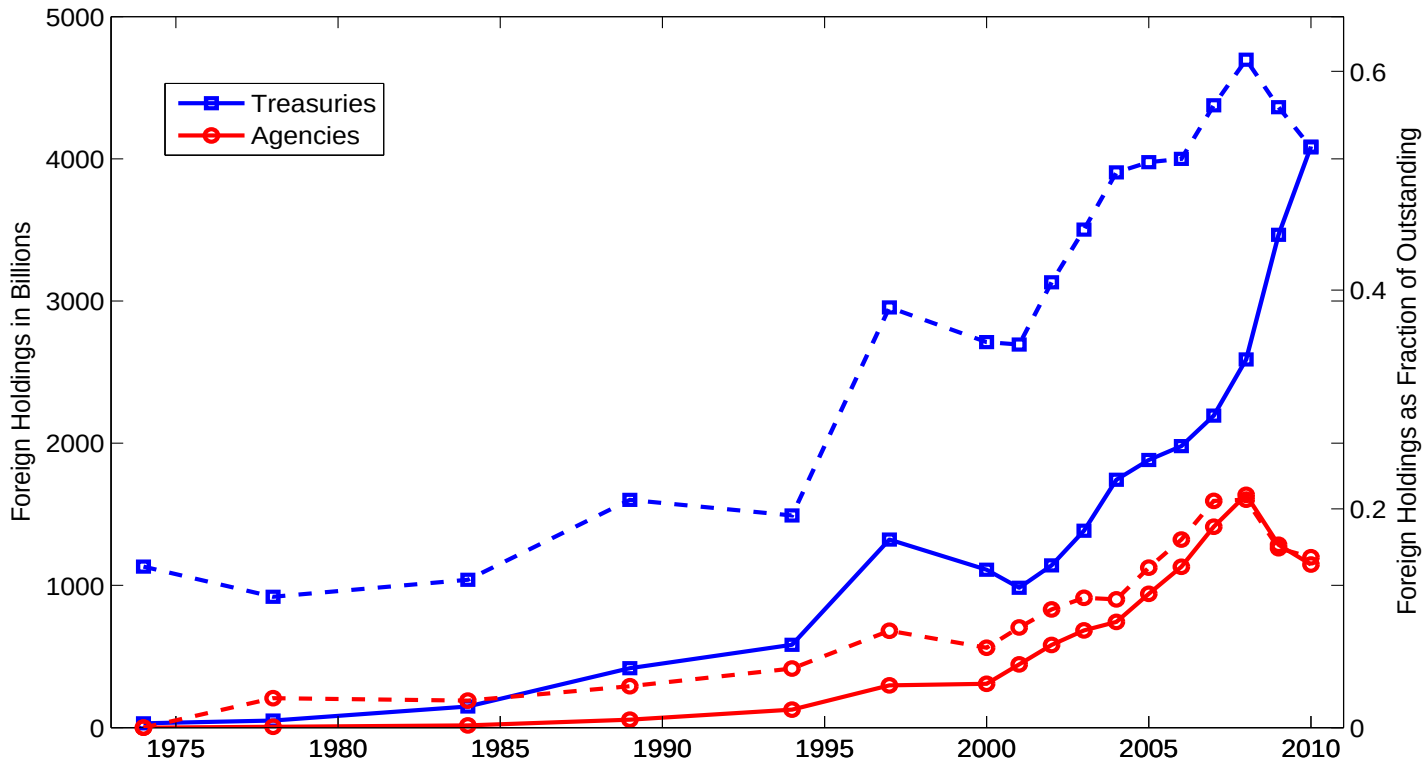

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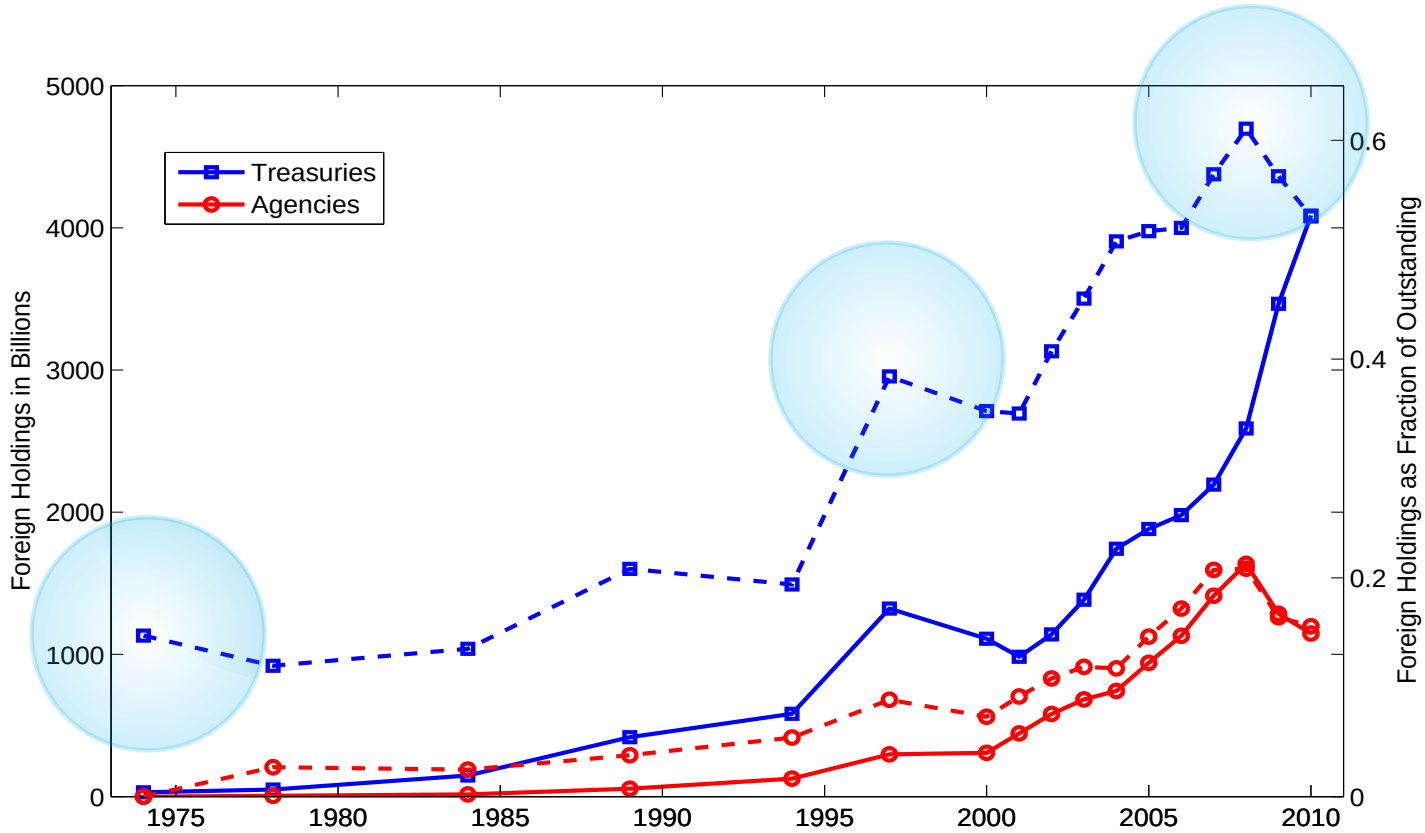

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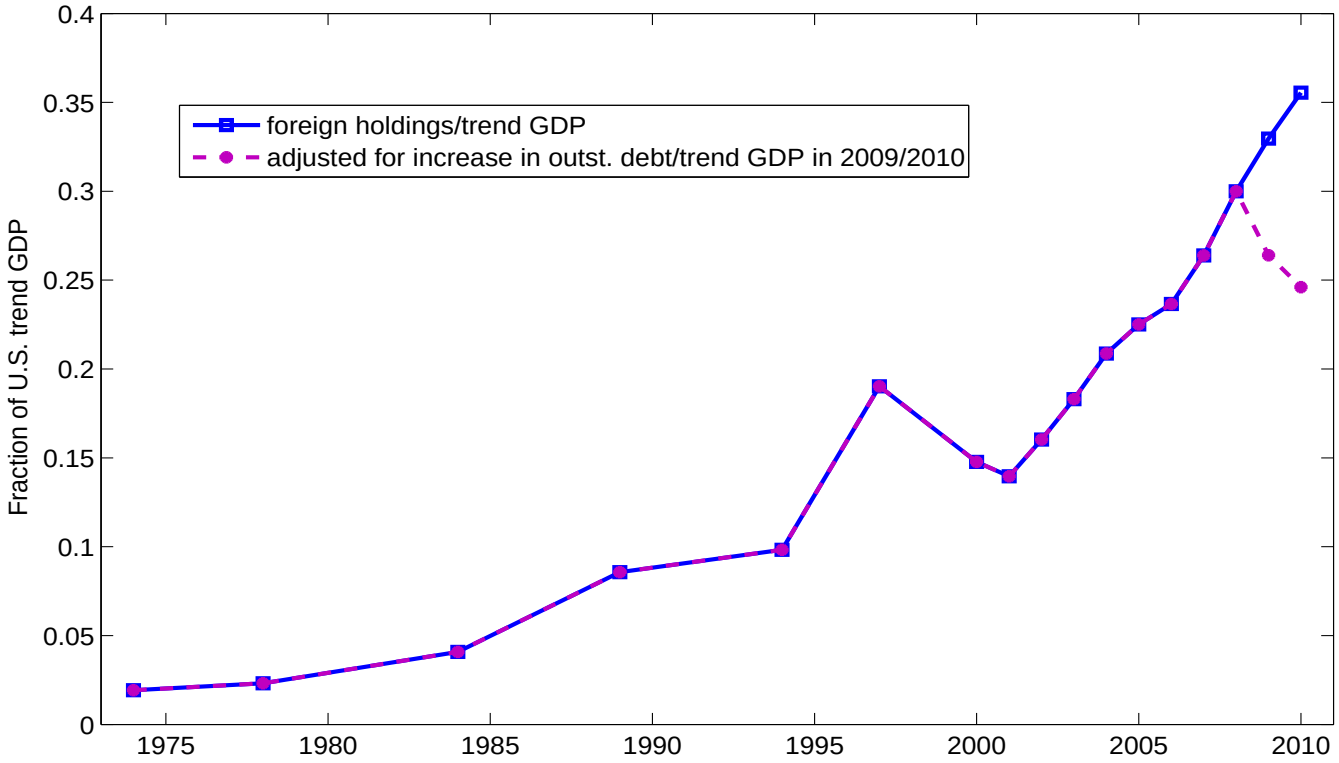

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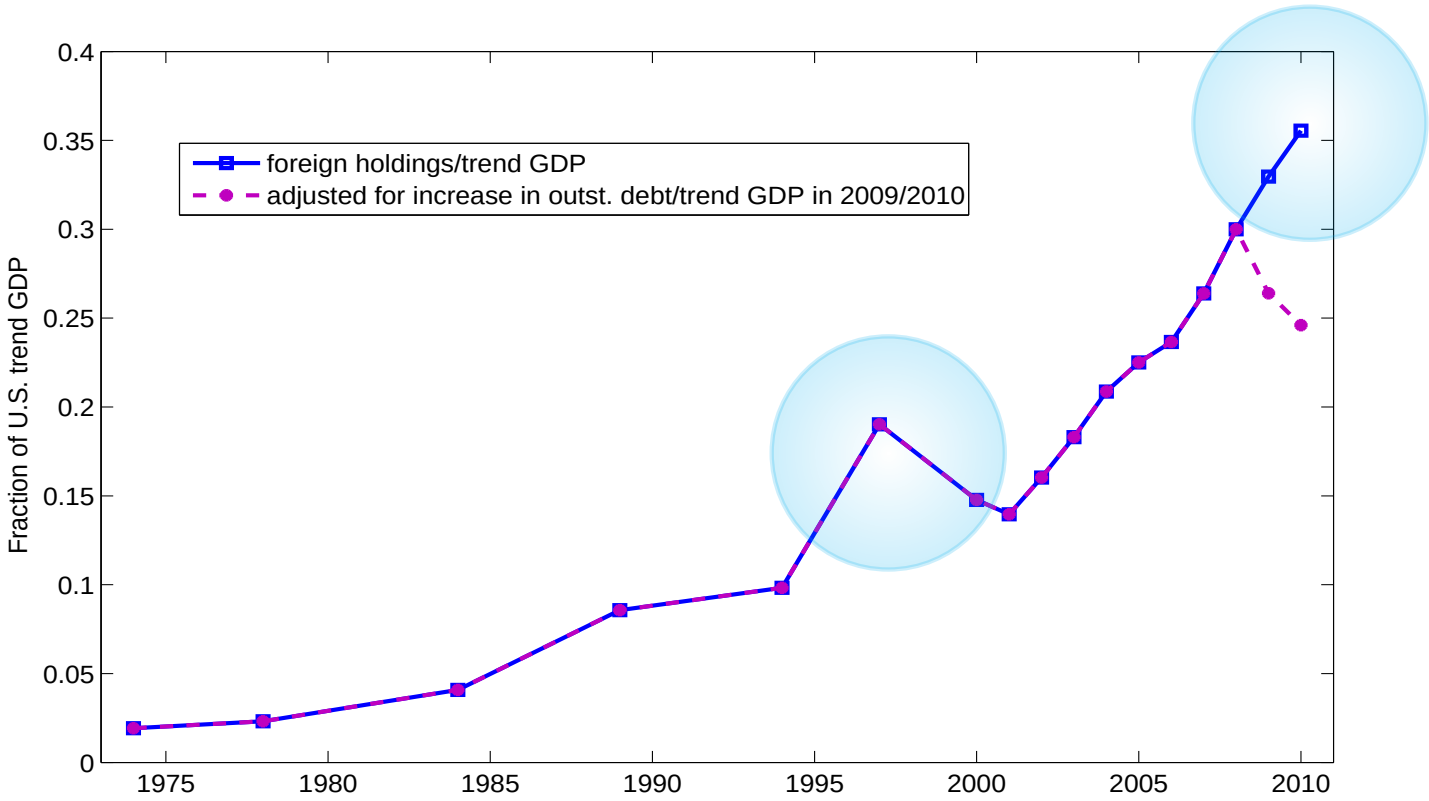
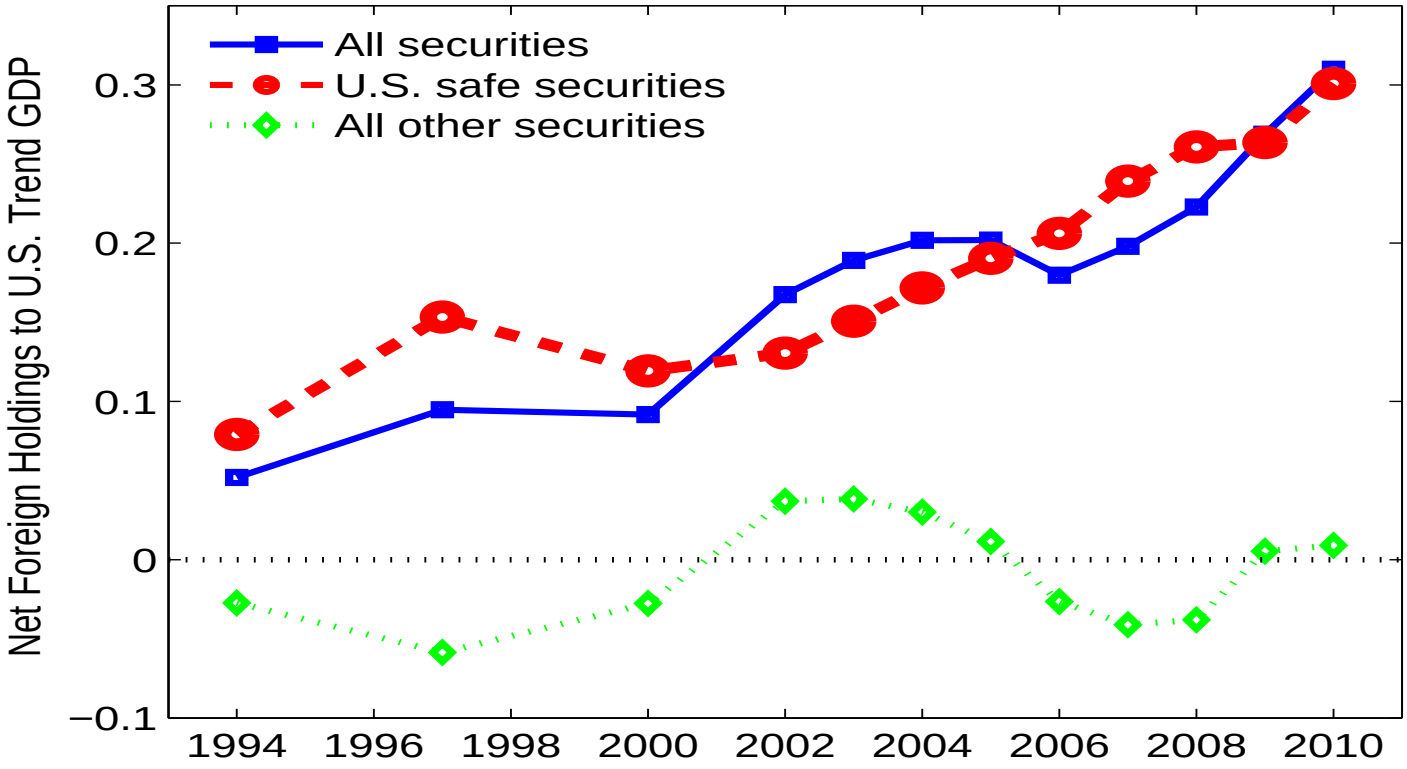


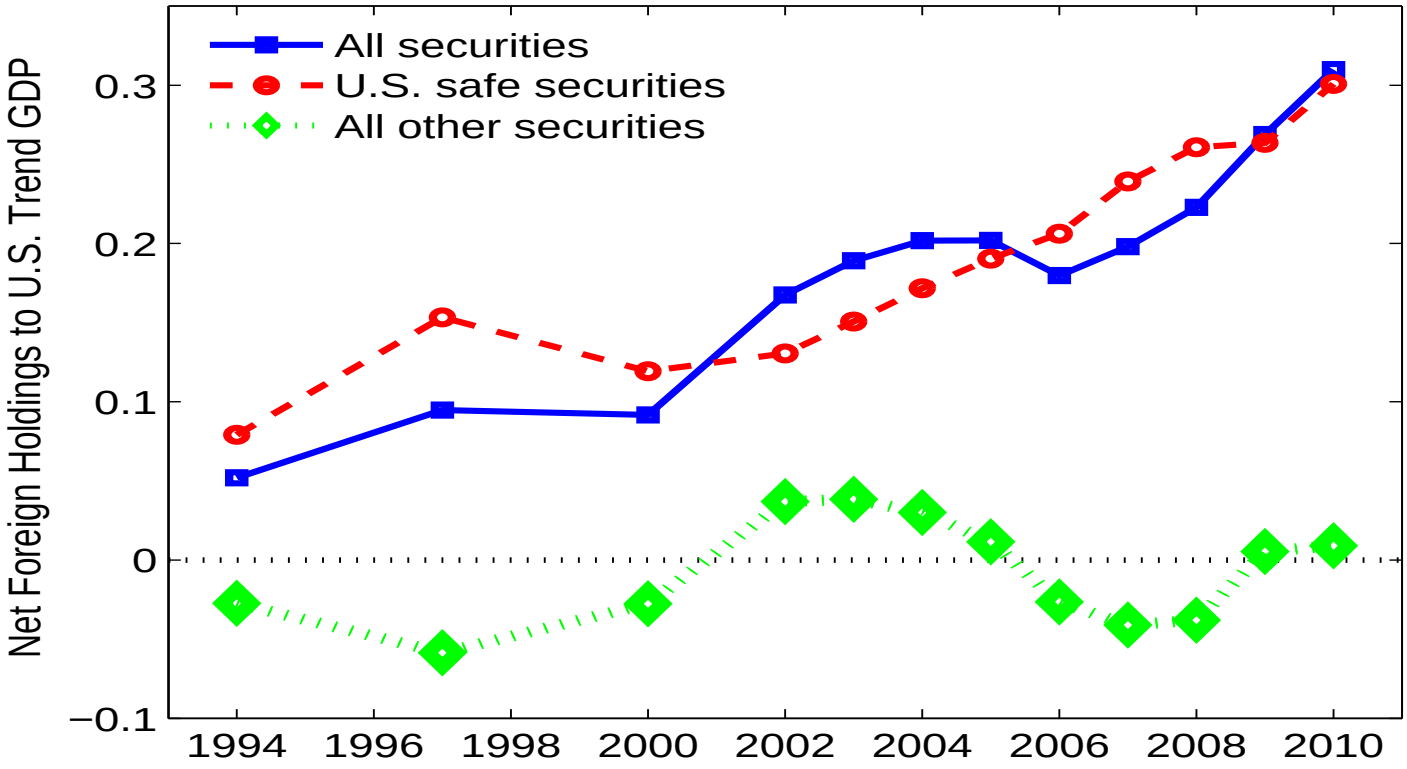
Trends Driven By Net Flows into U.S. *Safe* Assets

- We study changes in net foreign holdings of "**safe**"assets.



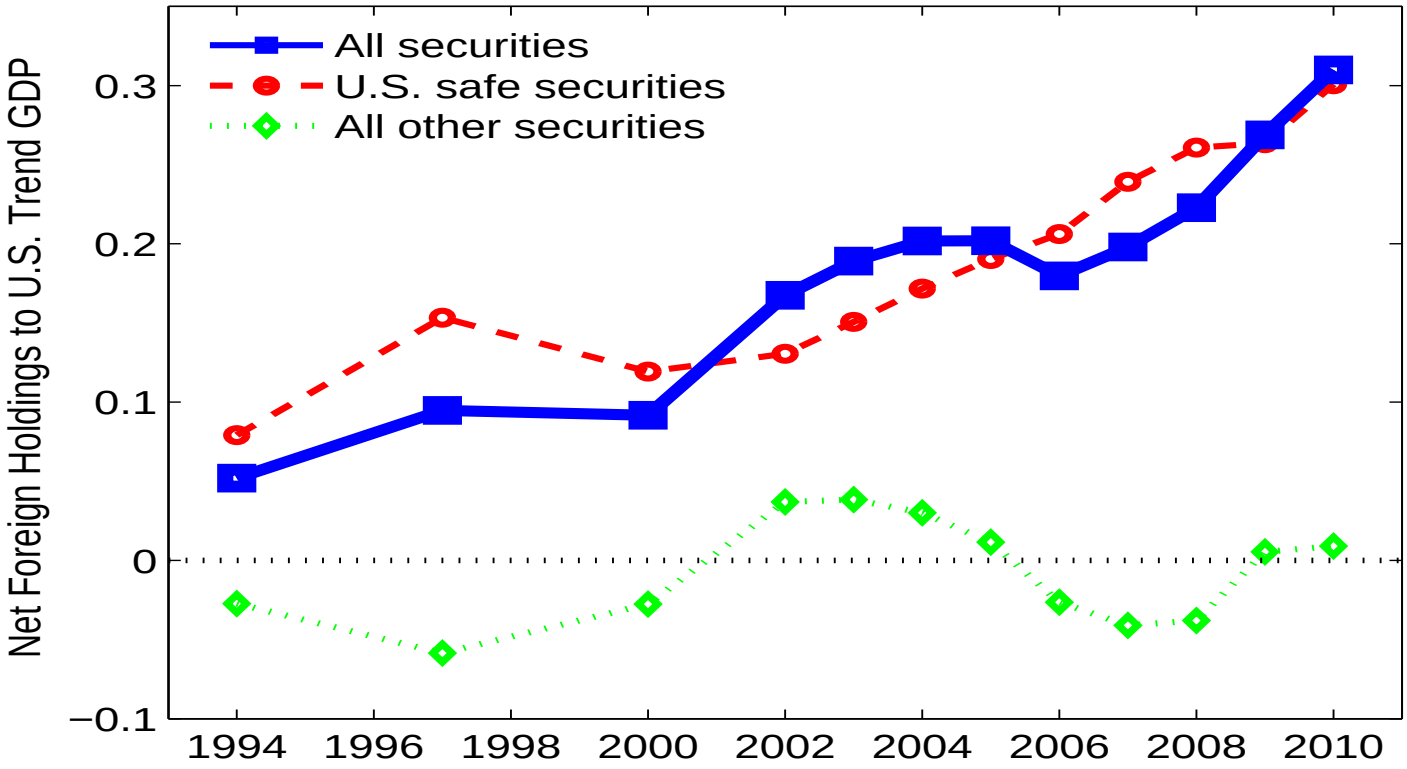
Trends Driven By Net Flows into U.S. *Safe* Assets

- Net foreign holdings of **other securities** as fraction of U.S. trend GDP have hovered close to zero since 1994.



Trends Driven By Net Flows into U.S. *Safe* Assets

- *All* of trend in U.S. NFL is result of upward trend in net foreign holdings of *safe assets*.



Foreign Official Holdings

- Model foreign asset holdings as owned by **governmental holders**
  - June 2010: **75%** of foreign Treasury holdings are by **Foreign Official Institutions (FOI)** according to TIC
  - 75% is an *underestimate* (Warnock and Warnock '09)
  - FOI holdings account for **81% of increase** in foreign holdings of U.S. Treasuries from March 2000-June 2010.

Foreign Official Holdings

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- FOI have inelastic demand for U.S. safe securities
  - Krishnamurty and Vissing-Jorgensen '10: demand for U.S. safe assets by FOI displays **zero price elasticity**.
  - Large effects on real interest rates (Warnock and Warnock '09, Bernanke '11)

Foreign Official Holdings

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- FOI have inelastic demand for U.S. safe securities
- FOI have objective function not well described by behavior of optimizing private investors
  - Regulatory/reserve currency motives (Kohn '02)
  - Cross-country evidence in Alfaro et al. '11: argue that "official flows main driver of uphill capital flows;" not well described by neoclassical model; (private flows are, but they go downhill)

Related Literature

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- We view these studies as complementary to ours.

Foreign Bond Purchases in Model

- Time is discrete, a period equals one year
- **Foreign bond holdings** $B_{F,t}$ owned by governmental holders who inelastically place all funds in riskless bond.
- Take **observed changes** in net capital flows as **equilibrium outcomes**, calibrate a process to match U.S. data.

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- $b_{F,t} \equiv B_{F,t} / \bar{Y}_t$ evolves according to:

$$b_{F,t+1} = (1 - \rho_b)\bar{b} + \rho_b b_{F,t} + \sigma_b \eta_{t+1}.$$

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- η_{t+1} shock to foreign holdings we estimate.

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- **Foreign bond holdings** $B_{F,t}$ enter **market clearing condition** alongside domestic household demand; equilibrium interest rate clears bond market.

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- $b_{F,t}$ reverts to a mean, $\bar{b}$ $=>$ while some amt of debt is expected to be refinanced in perpetuity, amounts above mean cannot.

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- As long as specification of capital flows is good description of data, equilibrium allocations are identical to those from model where the same flows arose endogenously from primitive shocks governing mechanics of trade adjustment.

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  - Very little explanatory power of lagged GDP or lagged TFP for foreign capital flows (low R^2)
- Despite independence of shocks, model endogenously generates mild positive contemporaneous correlation between capital inflows and GDP, commensurate with the data

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- Resource constraint: non-housing output = non-housing consumption (inclusive of F_t) + G_t + Inv. (gross of adj. costs) less change in value of net foreign holdings:

$$Y_{C,t} = C_t + F_t + G_t + I_{C,t} + \phi_C\left(\frac{I_{C,t}}{K_{C,t}}\right)K_{C,t} + I_{H,t} + \phi_H\left(\frac{I_{H,t}}{K_{H,t}}\right)K_{H,t} \underbrace{-\left(B_{F,t+1}q(\mu_t, Z_t) - B_{F,t}\right)}_{\textit{Trade Balance}}$$

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- Trade balance $\equiv$ current account + net financial income from abroad $\Leftrightarrow$
- Current account $\equiv$ $-$change in value of net foreign holdings = $-(B_{F,t+1} - B_{F,t})q_t$, q_t = bond price.

Effect of Capital Flows on Quantities

- Capital **inflow** finances domestic spending, acts like a **positive economic shock**.

		Mean		
		All	Δb_F - High Inflows	Δb_F - Low Inflows
Output	Y	2.23	2.24	2.22
Total Cons.	C_T	1.59	1.60	1.57
Non-housing Cons.	C	1.11	1.12	1.10
Housing Cons.	C_H	0.48	0.48	0.47
Total Inv.	I_T	0.64	0.68	0.60
Business Inv.	I	0.55	0.58	0.52
Residential Inv.	$p^H Y_H$	0.09	0.10	0.08

Detrended levels of aggregate quantities, high and low inflow states.

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		All	Δb_F - High Inflows	Δb_F - Low Inflows
Output	Y	2.23	2.24	2.22
Total Cons.	C_T	1.59	1.60	1.57
Non-housing Cons.	C	1.11	1.12	1.10
Housing Cons.	C_H	0.48	0.48	0.47
Total Inv.	I_T	0.64	0.68	0.60
Business Inv.	I	0.55	0.58	0.52
Residential Inv.	$p^H Y_H$	0.09	0.10	0.08

Detrended levels of aggregate quantities, high and low inflow states.

Effect of Capital Flows on Quantities

- Capital **inflow** stimulates *business investment*

		Mean		
		All	Δb_F - High Inflows	Δb_F - Low Inflows
Output	Y	2.23	2.24	2.22
Total Cons.	C_T	1.59	1.60	1.57
Non-housing Cons.	C	1.11	1.12	1.10
Housing Cons.	C_H	0.48	0.48	0.47
Total Inv.	I_T	0.64	0.68	0.60
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Residential Inv.	$p^H Y_H$	0.09	0.10	0.08

Detrended levels of aggregate quantities, high and low inflow states.

Effect of Capital Flows on Quantities

- Capital **inflow** stimulates *residential investment*

		Mean		
		All	Δb_F - High Inflows	Δb_F - Low Inflows
Output	Y	2.23	2.24	2.22
Total Cons.	C_T	1.59	1.60	1.57
Non-housing Cons.	C	1.11	1.12	1.10
Housing Cons.	C_H	0.48	0.48	0.47
Total Inv.	I_T	0.64	0.68	0.60
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Residential Inv.	$p^H Y_H$	0.09	0.10	0.08

Detrended levels of aggregate quantities, high and low inflow states.

Effect of Capital Flows on Quantities

- Capital **inflow** stimulates *wage growth*

		Mean		
		All	Δb_F - High Inflows	Δb_F - Low Inflows
Output	Y	2.23	2.24	2.22
Total Cons.	C_T	1.59	1.60	1.57
Non-housing Cons.	C	1.11	1.12	1.10
Housing Cons.	C_H	0.48	0.48	0.47
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Detrended levels of aggregate quantities, high and low inflow states.

Effect of Capital Flows on Quantities

- **Procyclicality** consistent with U.S. data: correlation between **4-qtr change log GDP** and *4-qtr change in foreign stock safe assets* (1984:Q4-2010:Q2) is **27%**

		Mean		
		All	Δb_F - High Inflows	Δb_F - Low Inflows
Output	Y	2.23	2.24	2.22
Total Cons.	C_T	1.59	1.60	1.57
Non-housing Cons.	C	1.11	1.12	1.10
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Detrended levels of aggregate quantities, high and low inflow states.

Effect of Capital Flows on Asset Prices

- **Inflows** have large effects on asset prices.

	data 1	data 2	All	Δb_F - High Inflows	Δb_F - Low Inflows
$E[R_f]$	1.86	2.29	0.55	-3.43	4.60
$Std[R_f]$	2.06	2.28	5.19	3.39	3.18
$E[R_S]$	8.73	9.35	6.05	3.53	8.61
$Std[R_S]$	18.78	17.38	9.15	8.51	9.09
$E[R_S - R_f]$	6.87	7.06	5.50	6.96	4.01
$SR[R_S]$	0.37	0.41	0.62	0.78	0.46
$E[R_H]$	11.20	9.83	12.88	9.23	16.61
$Std[R_H]$	5.82	7.55	7.74	6.53	7.05
$E[R_H - R_f]$	9.35	7.54	12.32	12.65	12.01
$SR[R_H]$	1.55	0.94	1.91	1.98	1.86
$\Delta\left(p^H/\mathcal{R}\right)$			$--$	2.60	-2.64
$\Delta\left(p^S/D\right)$			$--$	47.76	-48.42

Notes: R_H is housing return, R_S is stock return, R_f is risk-free rate, $p^H/\mathcal{R}$ is house price-rent ratio, p^S/D is stock market price-dividend ratio.

Effect of Capital Flows on Asset Prices

- **Inflow** $\Rightarrow$ large decline in *real interest rate* and in *expected return* on equity, housing

	data 1	data 2	All	Δb_F - High Inflows	Δb_F - Low Inflows
$E[R_f]$	1.86	2.29	0.55	-3.43	4.60
$Std[R_f]$	2.06	2.28	5.19	3.39	3.18
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Effect of Capital Flows on Asset Prices

- **Equity premium rises**; SR in high Δb_F is 70% higher than low Δb_F.

	data 1	data 2	All	Δb_F - High Inflows	Δb_F - Low Inflows
$E[R_f]$	1.86	2.29	0.55	-3.43	4.60
$Std[R_f]$	2.06	2.28	5.19	3.39	3.18
$E[R_S]$	8.73	9.35	6.05	3.53	8.61
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Notes: R_H is housing return, R_S is stock return, R_f is risk-free rate, $p^H/\mathcal{R}$ is house price-rent ratio, p^S/D is stock market price-dividend ratio.

Effect of Capital Flows on Asset Prices

- Despite rise in risk, **valuations are higher** because inflow is met with *lower discount rates* and *higher expected dividend growth*.

	data 1	data 2	All	Δb_F - High Inflows	Δb_F - Low Inflows
$E[R_f]$	1.86	2.29	0.55	-3.43	4.60
$Std[R_f]$	2.06	2.28	5.19	3.39	3.18
$E[R_S]$	8.73	9.35	6.05	3.53	8.61
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$\Delta\left(p^H/\mathcal{R}\right)$			$--$	2.60	-2.64
$\Delta\left(p^S/D\right)$			$--$	47.76	-48.42

Notes: R_H is housing return, R_S is stock return, R_f is risk-free rate, $p^H/\mathcal{R}$ is house price-rent ratio, p^S/D is stock market price-dividend ratio.

Effect of Capital Flows on Asset Prices

- Despite rise in risk, **valuations are higher** because inflow is met with *lower discount rates* and *higher expected dividend growth*.
  - p^S/D in high Δb_F is 48% higher than average

	data 1	data 2	All	Δb_F - High Inflows	Δb_F - Low Inflows
$E[R_f]$	1.86	2.29	0.55	-3.43	4.60
$Std[R_f]$	2.06	2.28	5.19	3.39	3.18
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$SR[R_H]$	1.55	0.94	1.91	1.98	1.86
$\Delta\left(p^H/\mathcal{R}\right)$			– –	2.60	-2.64
$\Delta\left(p^S/D\right)$			– –	47.76	-48.42

Notes: R_H is housing return, R_S is stock return, R_f is risk-free rate, $p^H/\mathcal{R}$ is house price-rent ratio, p^S/D is stock market price-dividend ratio.

Effect of Capital Flows on Asset Prices

- **Housing risk premium rises**; SR on housing in high Δb_F is 6% higher than low Δb_F.

	data 1	data 2	All	Δb_F - High Inflows	Δb_F - Low Inflows
$E[R_f]$	1.86	2.29	0.55	-3.43	4.60
$Std[R_f]$	2.06	2.28	5.19	3.39	3.18
$E[R_S]$	8.73	9.35	6.05	3.53	8.61
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$SR[R_H]$	1.55	0.94	1.91	1.98	1.86
$\Delta\left(p^H/\mathcal{R}\right)$			$--$	2.60	-2.64
$\Delta\left(p^S/D\right)$			$--$	47.76	-48.42

Notes: R_H is housing return, R_S is stock return, R_f is risk-free rate, $p^H/\mathcal{R}$ is house price-rent ratio, p^S/D is stock market price-dividend ratio.

Effect of Capital Flows on Asset Prices

- Lower discount rates $\Rightarrow\uparrow$ in p^H/R, but *effect is small* (2.60% higher than average)

	data 1	data 2	All	Δb_F - High Inflows	Δb_F - Low Inflows
$E[R_f]$	1.86	2.29	0.55	-3.43	4.60
$Std[R_f]$	2.06	2.28	5.19	3.39	3.18
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Notes: R_H is housing return, R_S is stock return, R_f is risk-free rate, $p^H/\mathcal{R}$ is house price-rent ratio, p^S/D is stock market price-dividend ratio.

Effect of Capital Flows on Asset Prices

- Lower discount rates $\Rightarrow\uparrow$ in p^H/R, but *effect is small* (2.60% higher than average)
  - Expected rental growth *falls*: $\Uparrow$ res. inv. $\Rightarrow$ expectation of higher future housing stock.

	data 1	data 2	All	Δb_F - High Inflows	Δb_F - Low Inflows
$E[R_f]$	1.86	2.29	0.55	-3.43	4.60
$Std[R_f]$	2.06	2.28	5.19	3.39	3.18
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Effect of Capital Flows on Asset Prices

- Lower discount rates $\Rightarrow\uparrow$ in p^H/R, but *effect is small* (2.60% higher than average)
  - Risk premia *rise*

	data 1	data 2	All	Δb_F - High Inflows	Δb_F - Low Inflows
$E[R_f]$	1.86	2.29	0.55	-3.43	4.60
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Effect of Capital Flows on Asset Prices

- Lower discount rates $\Rightarrow\uparrow$ in p^H/R, but *effect is small* (2.60% higher than average)
  - Both of these *offset effect of lower interest rates* from inflow.

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Endogenous Response of Risk Premia

- Response of risk premia to capital inflow worthy of emphasis.
- Higher capital inflows *raise* **risk premia**, rather than lower them.
- Runs contrary to arguments of some (e.g., Geithner, Jan. 11, 2007) that free flow of capital across borders lowers risk premia.
- Here foreign purchases of safe asset make *equity and housing more risky*:
  - Domestic savers *crowded out* of safe bond market by governmental holders $\rightarrow$
  - **Reduces effective supply** of safe assets available to domestic investors.
  - Domestic investors *more exposed* to systematic risk in equity and housing markets.

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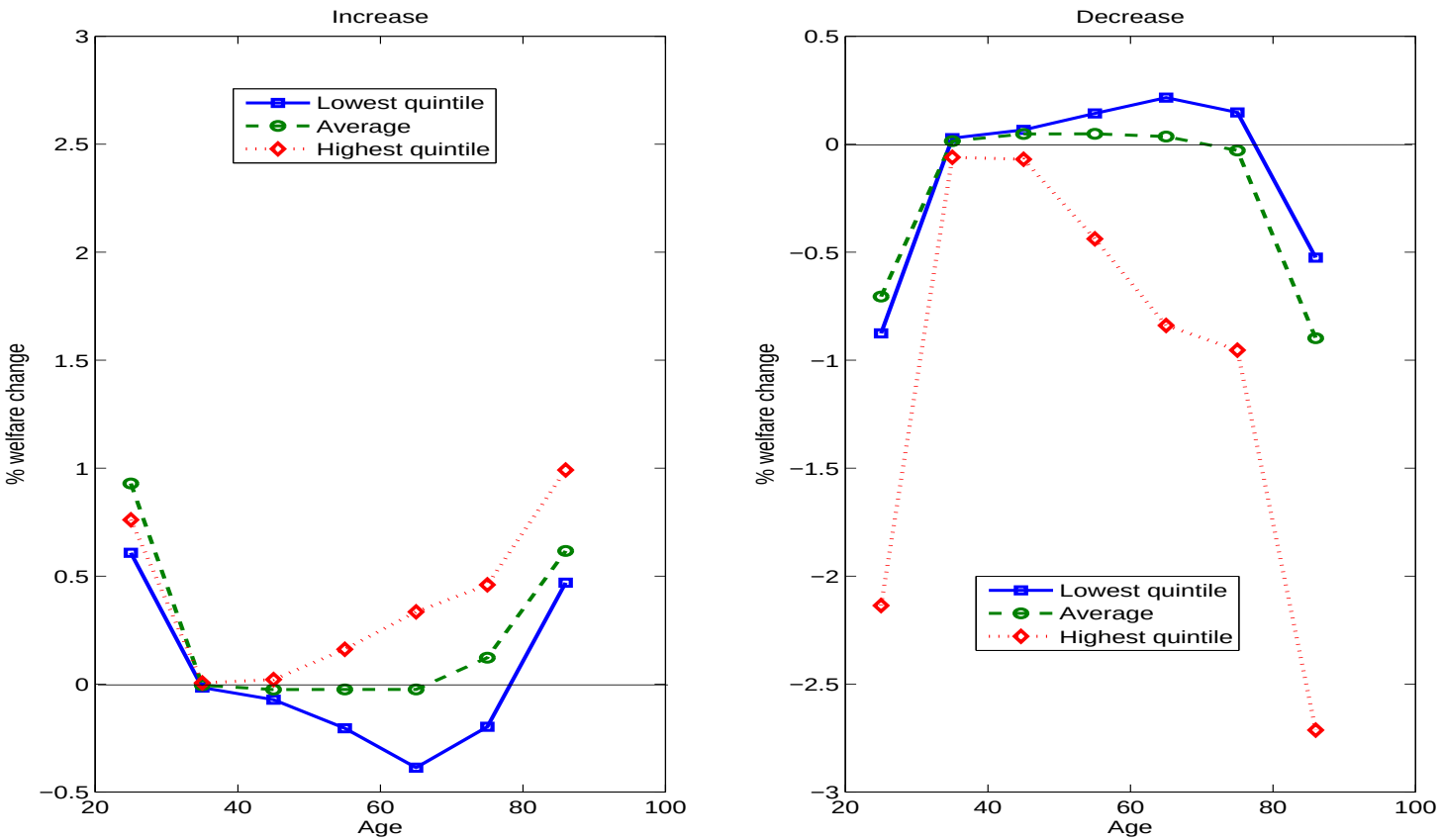
- Multiply by 100 to express as %.
- Positive numbers $\rightarrow$ welfare *gain* from transitioning, negative numbers imply welfare *loss*.
- Calibrate Δ to equal a **one st.dev. innovation** in $b_{F,t+1}$ (η_{t+1}).
- Calculation for newborns: measure *under veil of ignorance*.

Welfare by Age

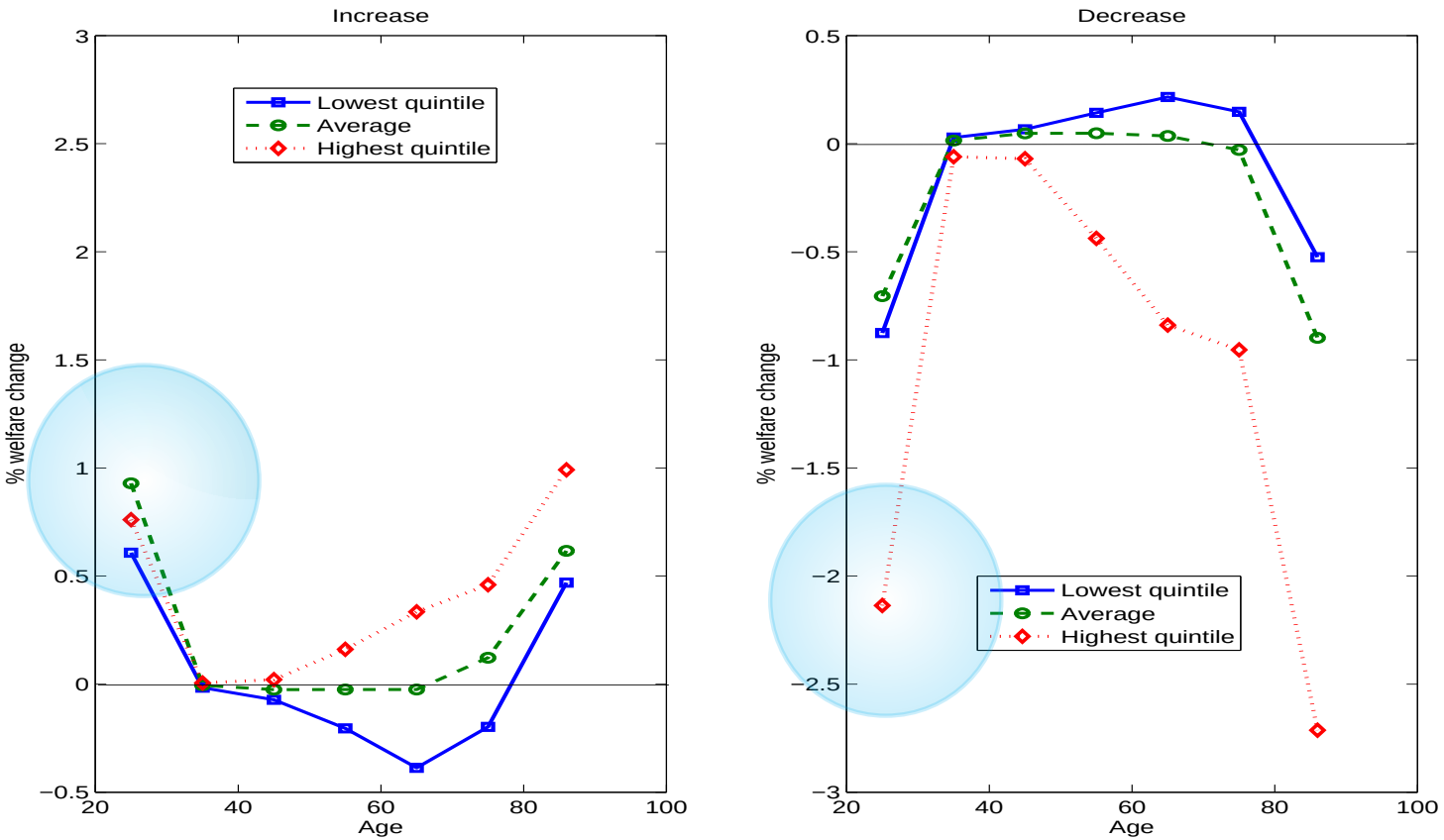
- Positive numbers $\Rightarrow$ welfare *gain*



Welfare change by age and by quintile of external leverage.

Welfare by Age

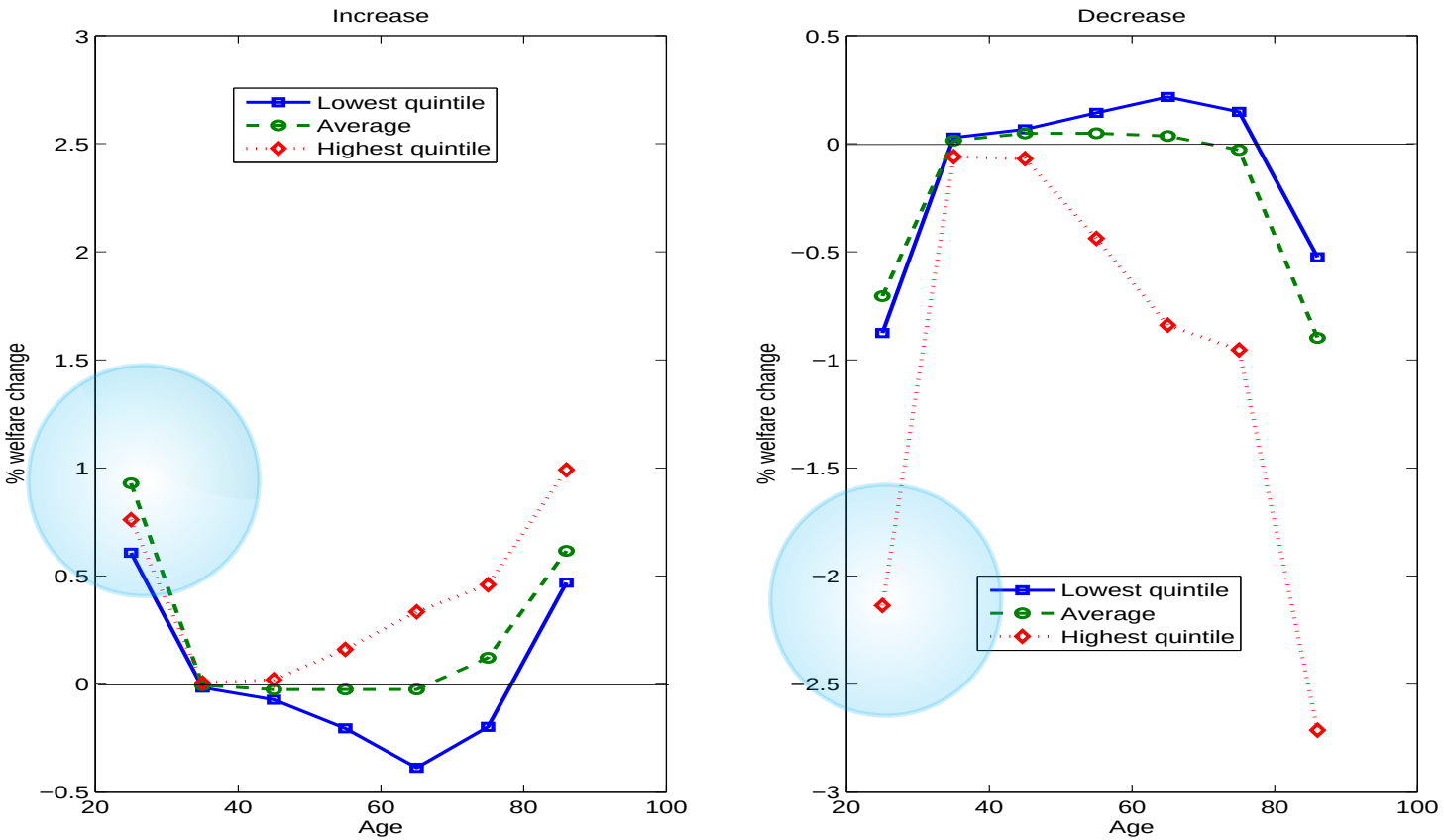
- **Young benefit** from **inflow** (1% EV) and are **hurt** by **outflow** (-2%).



Welfare change by age and by quintile of external leverage.

Welfare by Age

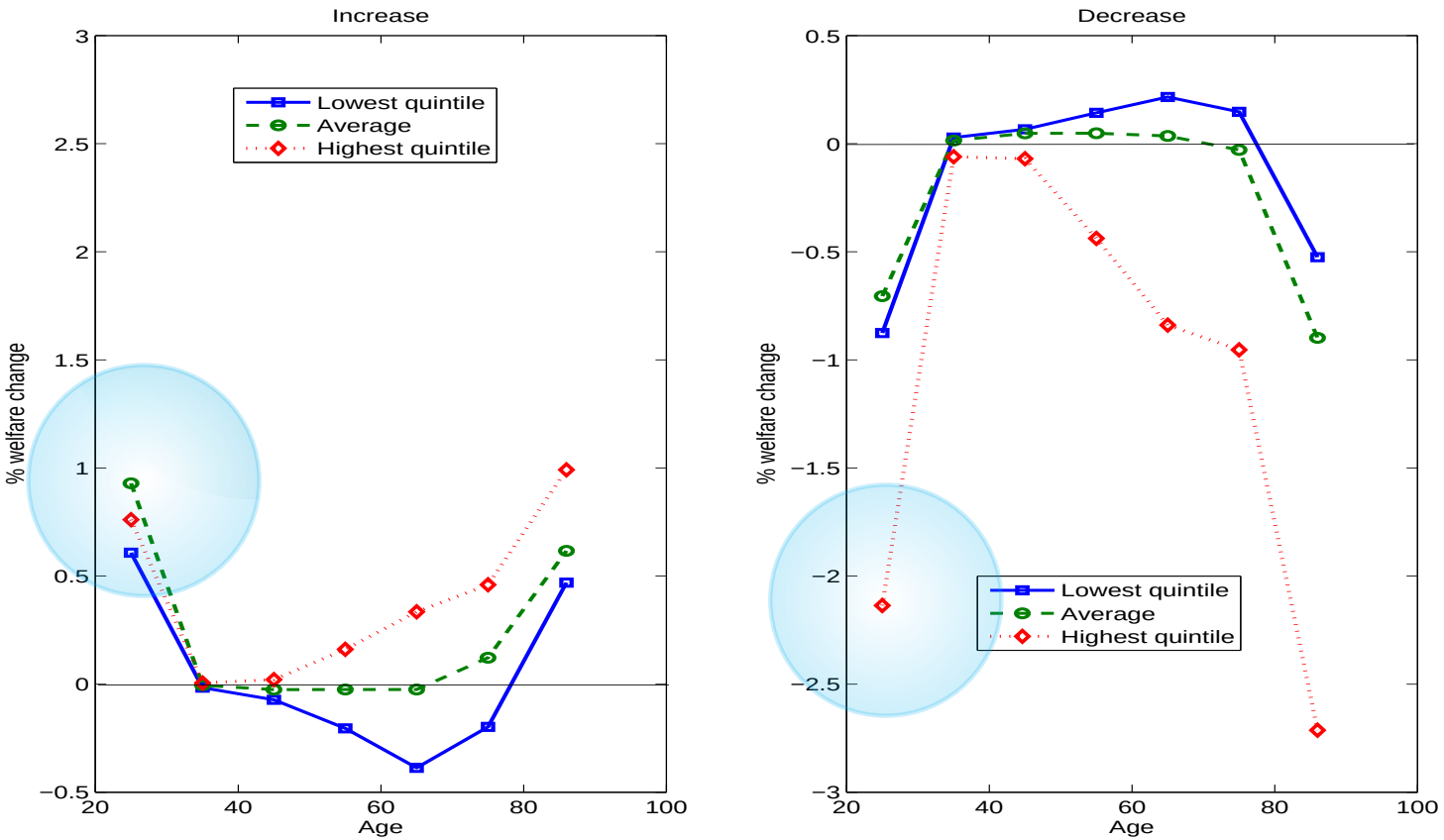
- **Young benefit** from **inflow** (1% EV) and are **hurt** by **outflow** (-2%).
  - Inflow *raises* collateral values, *relaxes* borrowing constraints, *expands* risk-sharing/insurance opportunities for young



Welfare change by age and by quintile of external leverage.

Welfare by Age

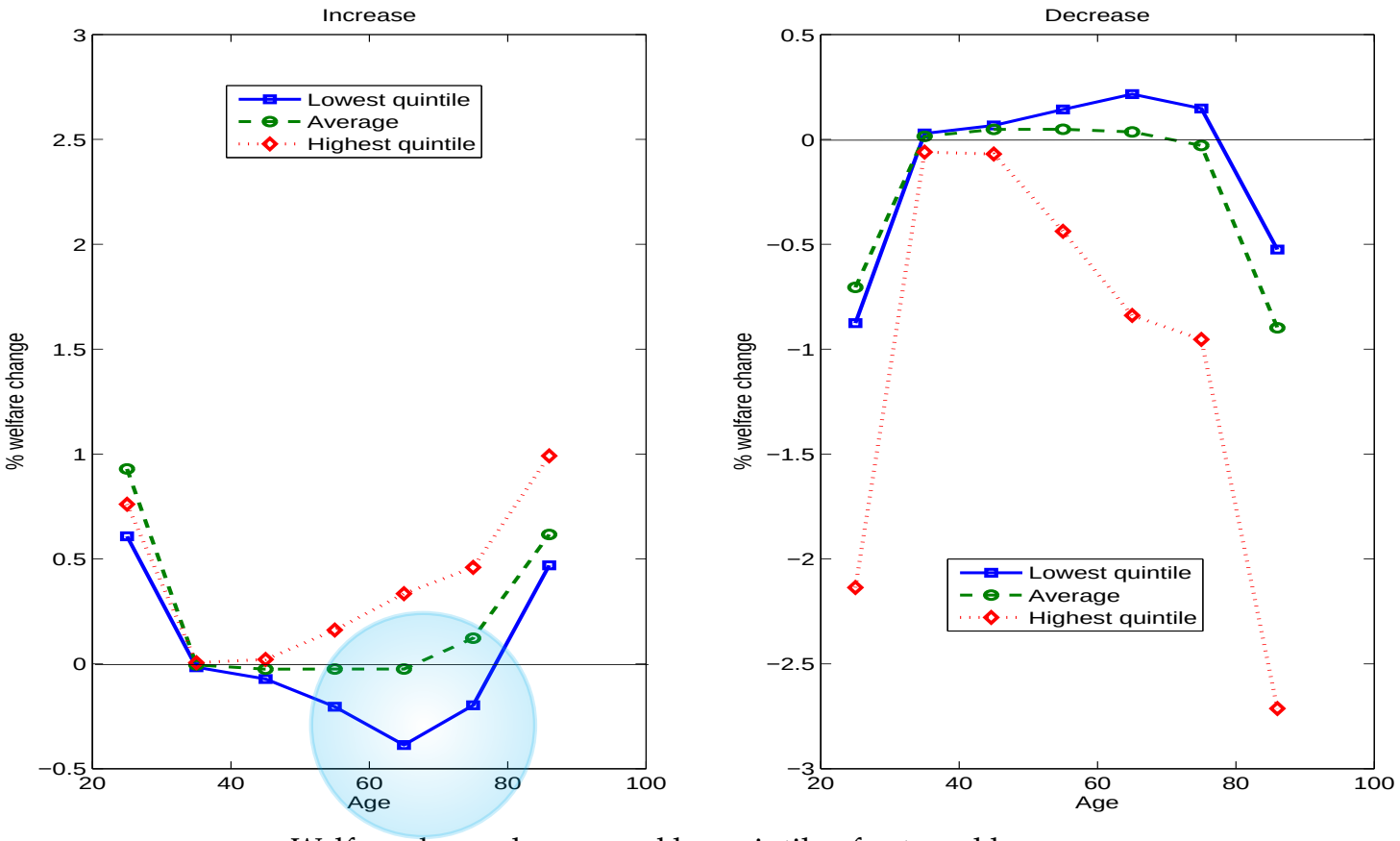
- **Young benefit** from **inflow** (1% EV) and are **hurt** by **outflow** (-2%).
  - Inflow *raises wages, lowers borrowing costs*



Welfare change by age and by quintile of external leverage.

Welfare by Age

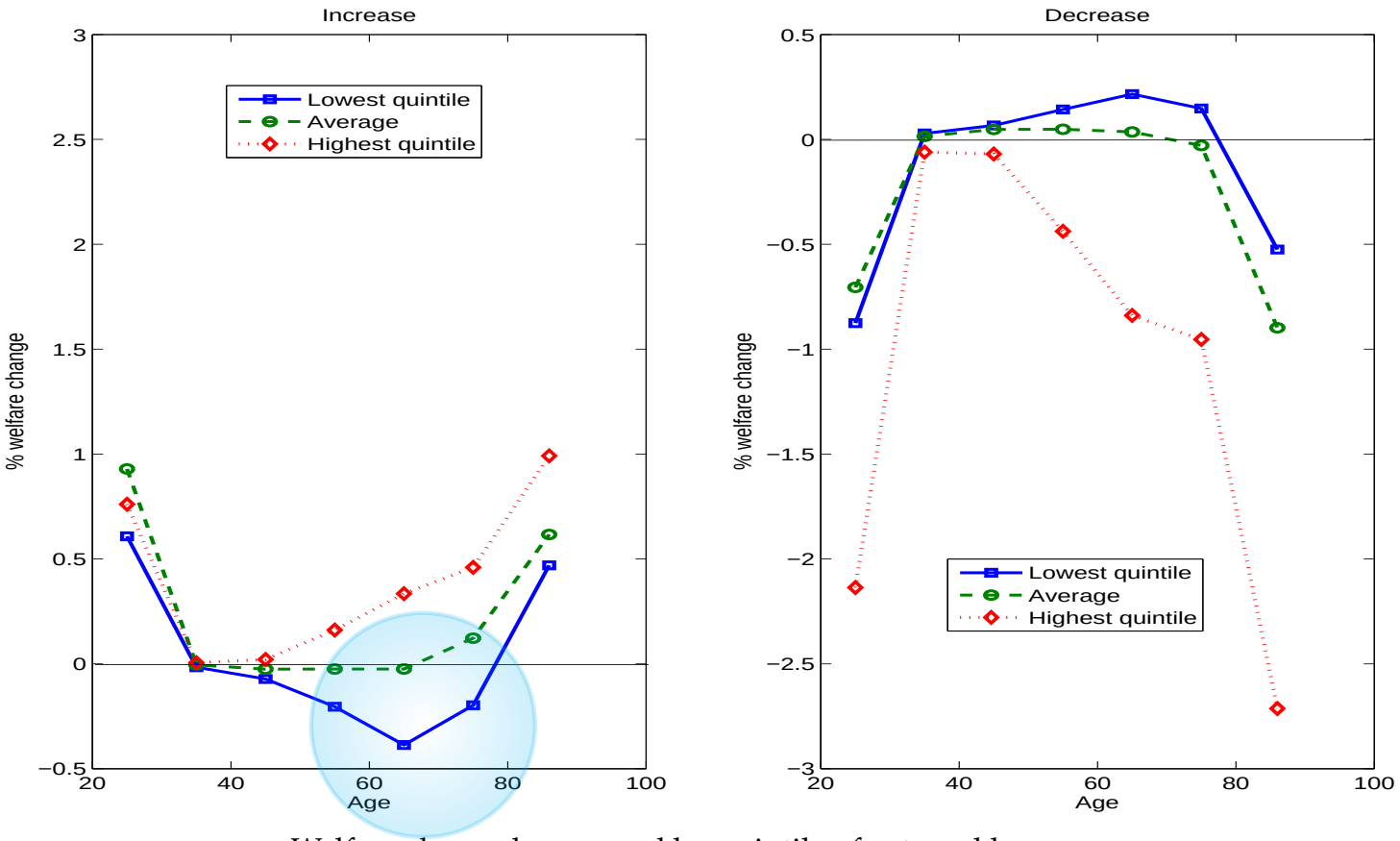
- **Middle-aged are hurt** by inflow though effect is smaller



Welfare change by age and by quintile of external leverage.

Welfare by Age

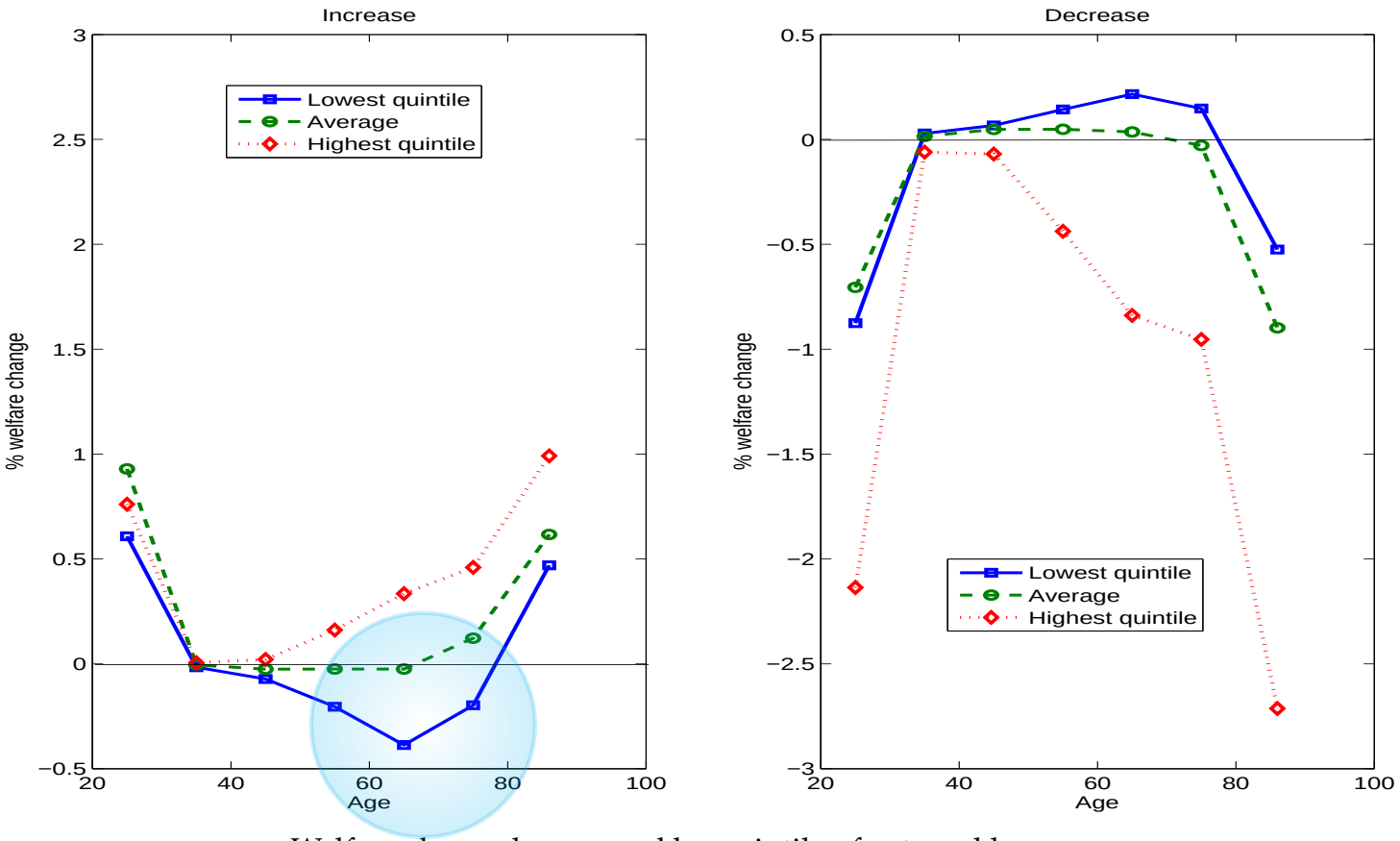
- **Middle-aged are hurt** by inflow though effect is smaller
  - **Benefit** from *higher wages* and asset *valuations*



Welfare change by age and by quintile of external leverage.

Welfare by Age

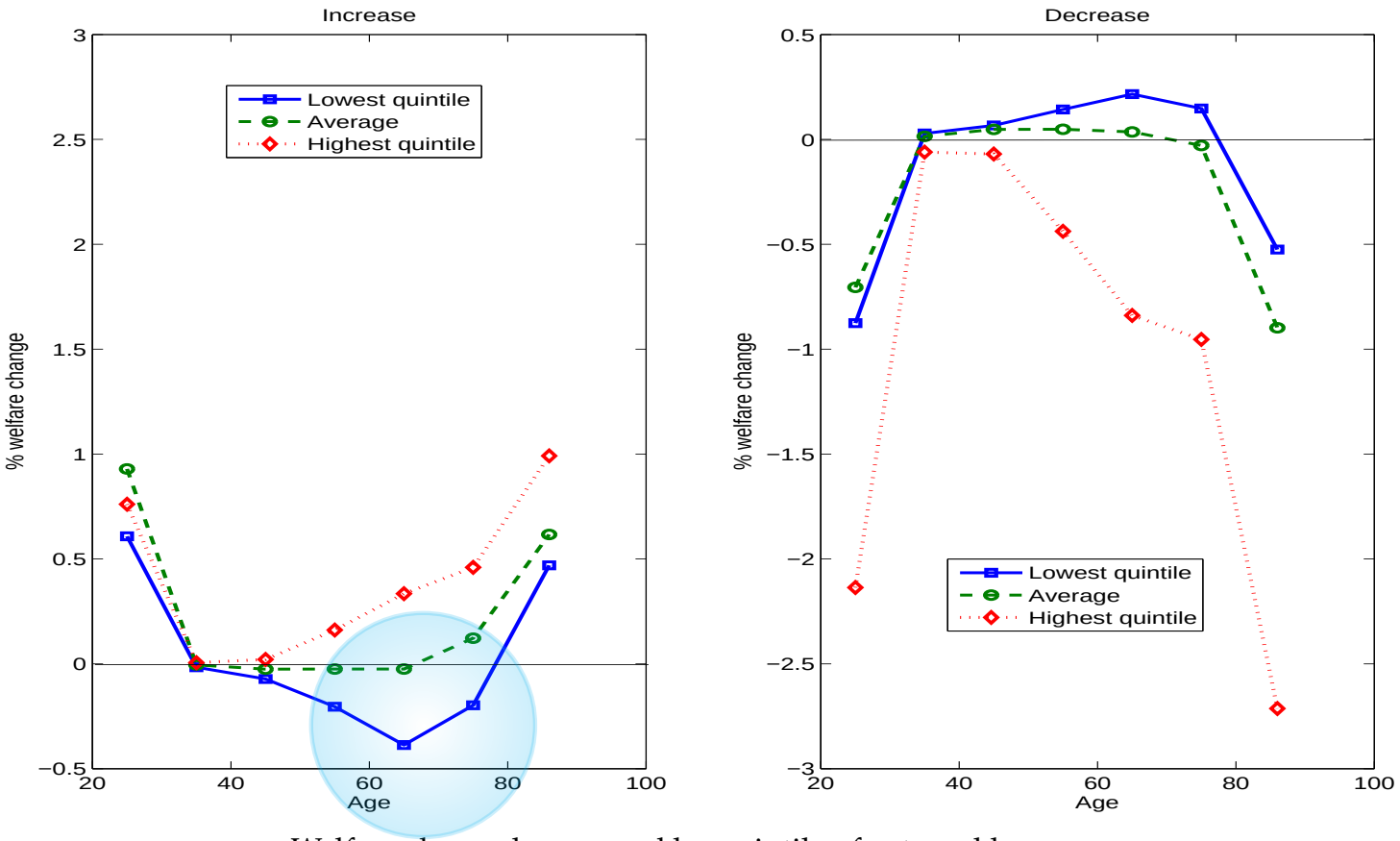
- **Middle-aged are hurt** by inflow though effect is smaller
  - **Hurt** because saving for retirement, they earn *lower expected returns* on assets



Welfare change by age and by quintile of external leverage.

Welfare by Age

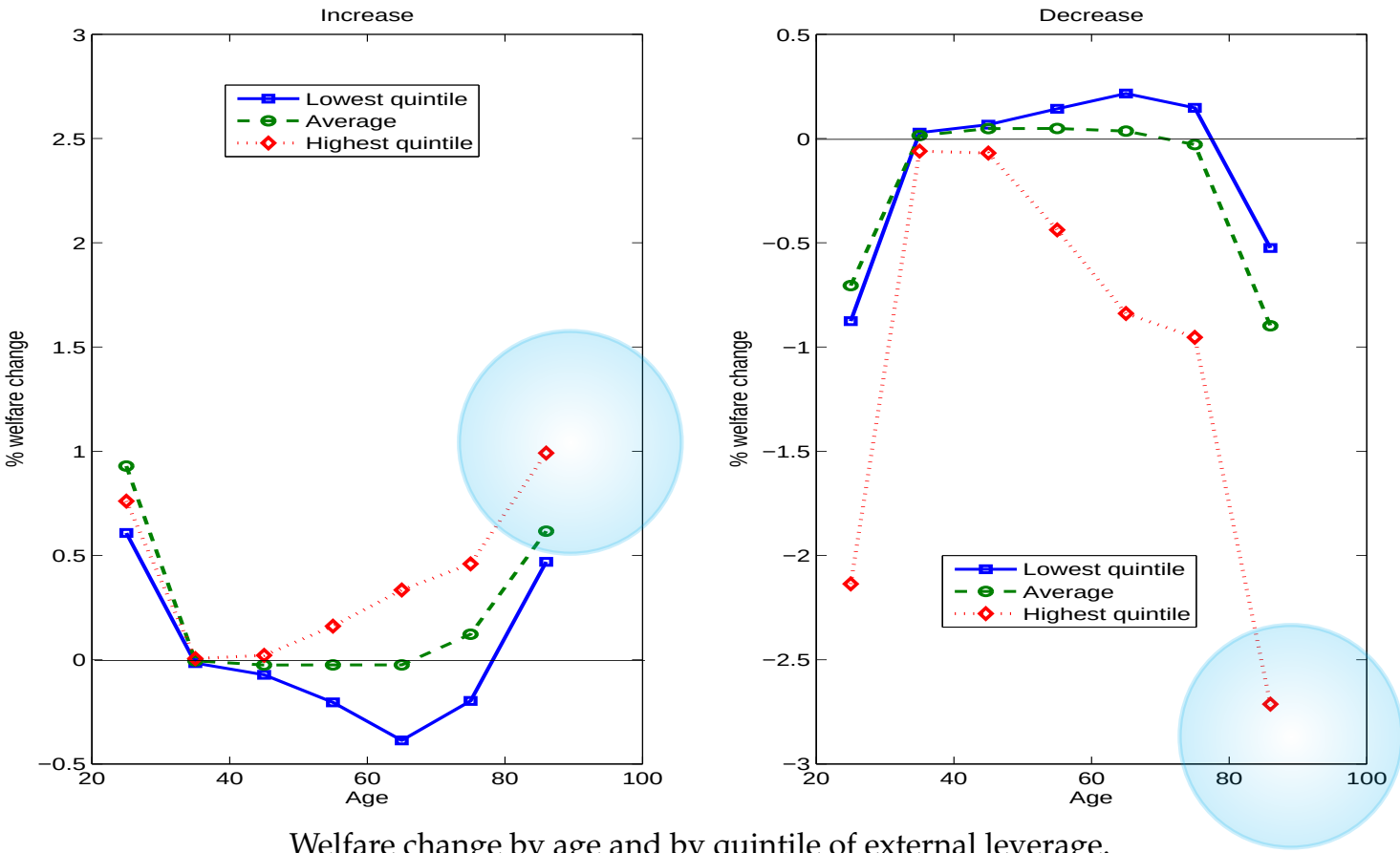
- **Middle-aged are hurt** by inflow though effect is smaller
  - As savers, *exposed to more systematic risk*, hence higher risk premia



Welfare change by age and by quintile of external leverage.

Welfare by Age

- **Old benefit** from an inflow (1% EV) and would forego up to 2.8% of lifetime consumption to avoid outflow.



Welfare change by age and by quintile of external leverage.

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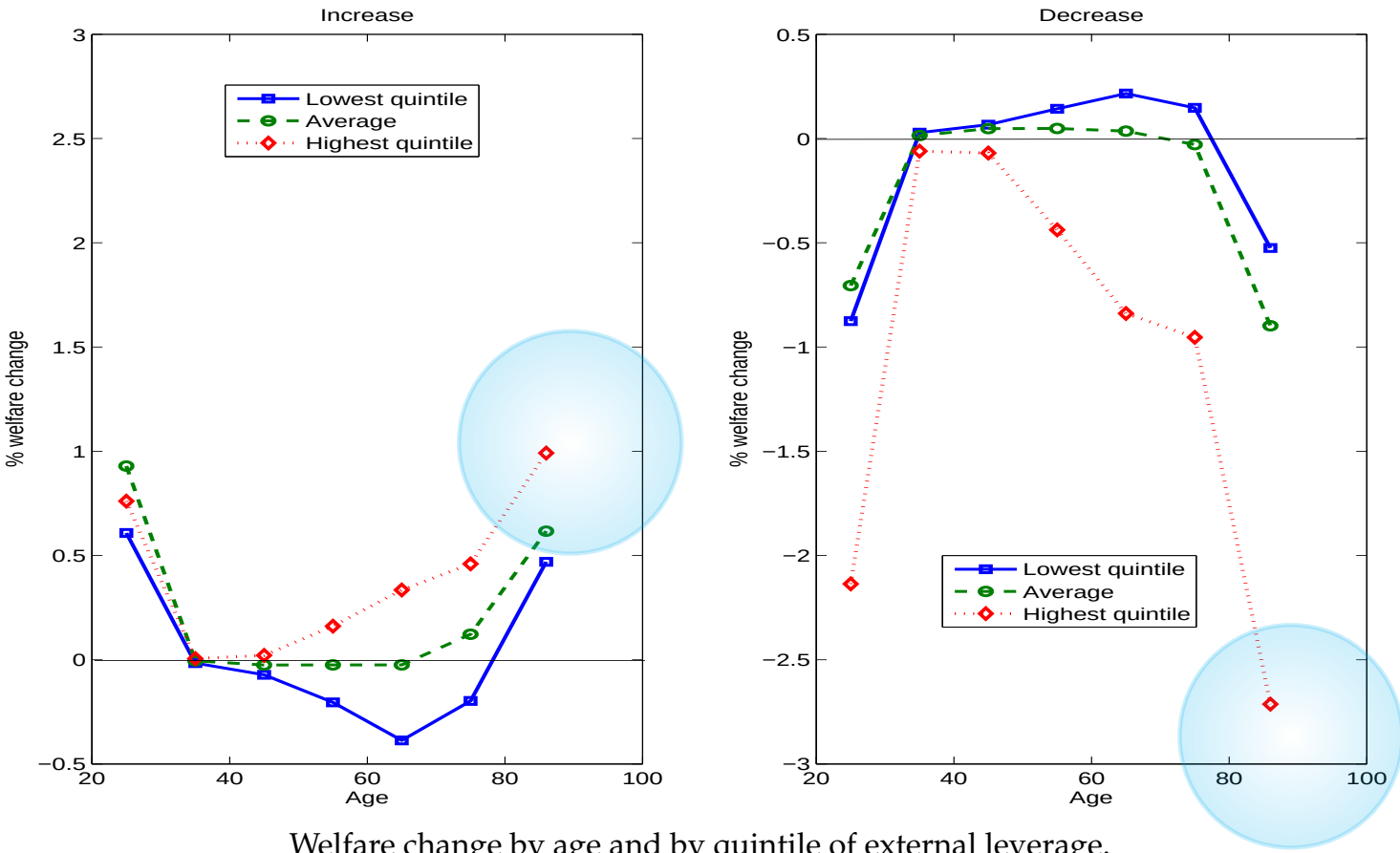
- **Old benefit** from an inflow (1% EV) and would forego up to 2.8% of lifetime consumption to avoid outflow.
  - Their *horizon is short* so they are unaffected by lower exp asset returns



Welfare change by age and by quintile of external leverage.

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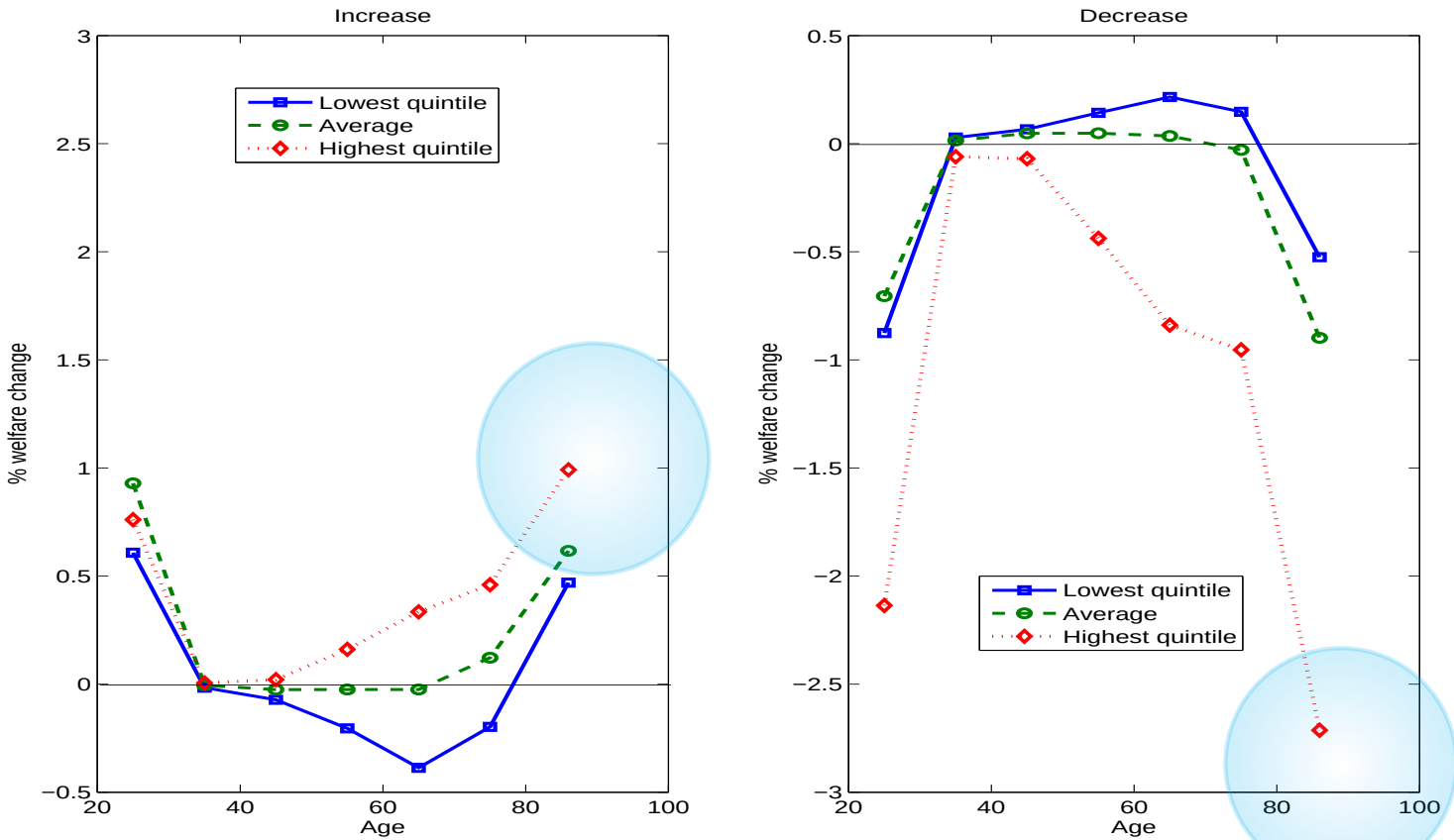
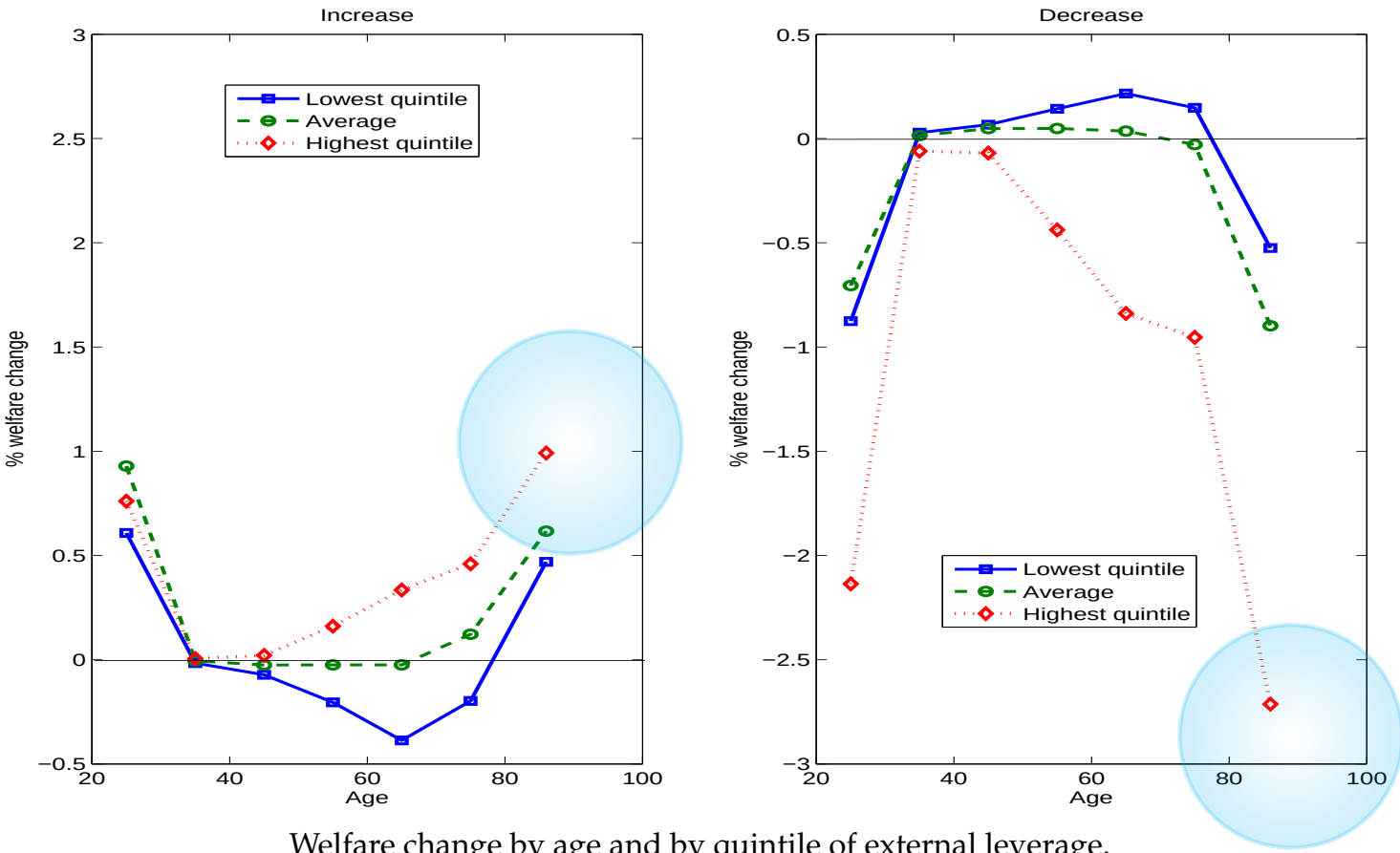
- **Old benefit** from an inflow (1% EV) and would forego up to 2.8% of lifetime consumption to avoid outflow.
  - *Higher asset values* allow to increase consumption today



Welfare change by age and by quintile of external leverage.

Welfare by Age

- **Old benefit** from an inflow (1% EV) and would forego up to 2.8% of lifetime consumption to avoid outflow.
  - *Less concerned with* higher systematic *risk* because they earn pensions



Welfare change by age and by quintile of external leverage.

Welfare Magnitudes are Potentially Large

- **Youngest** require 1 percent more *lifetime consumption* to make them as well off as they would be transitioning to state where external leverage is higher for *one year* by the *typical annual increment* in Foreign holdings.

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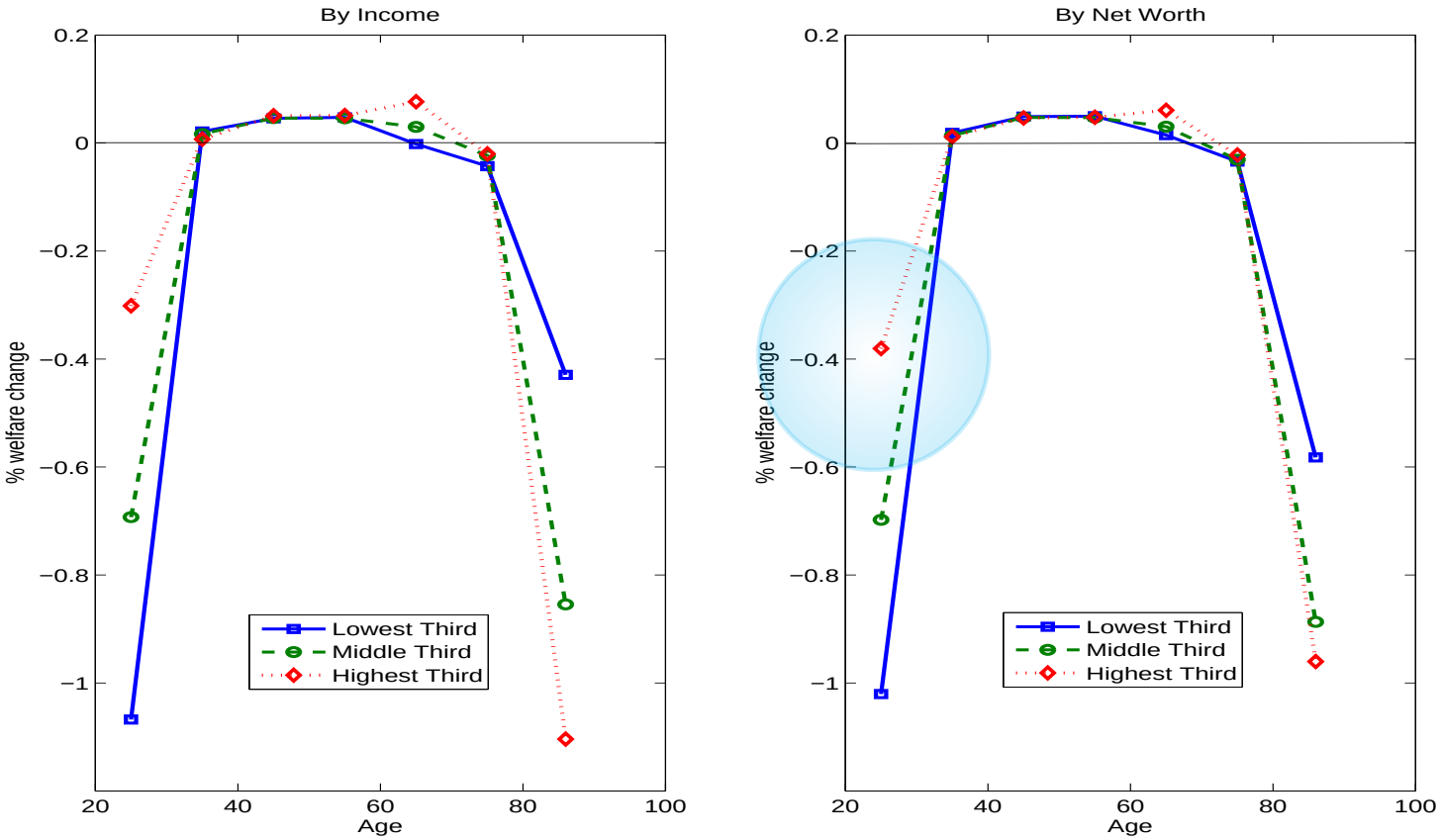
- Effect could be several times larger for *greater-than-typical* decline or for *series* of annual *declines*.
- **Middle-aged**: Gain from **outflow** but abs. value of EV measure for sixty year-olds is 10 times smaller.

Welfare Effects of *Outflow* by Wealth and Income

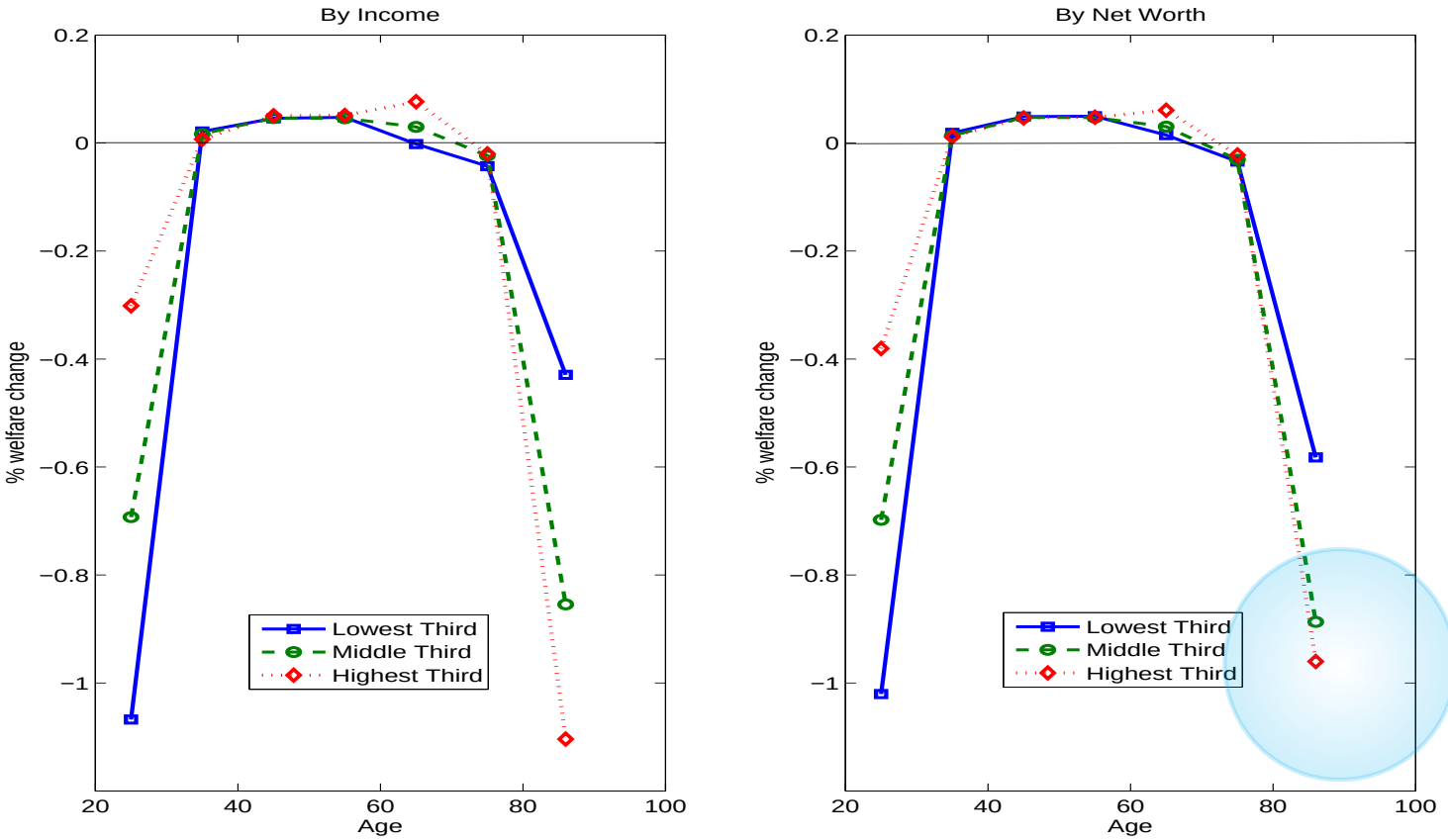
- The **wealthy young** are able to self insure without benefit of easier borrowing terms ⇒ they **suffer least**



Welfare change by age and by income (left) or net worth (right).

Welfare Effects of *Outflow* by Wealth and Income

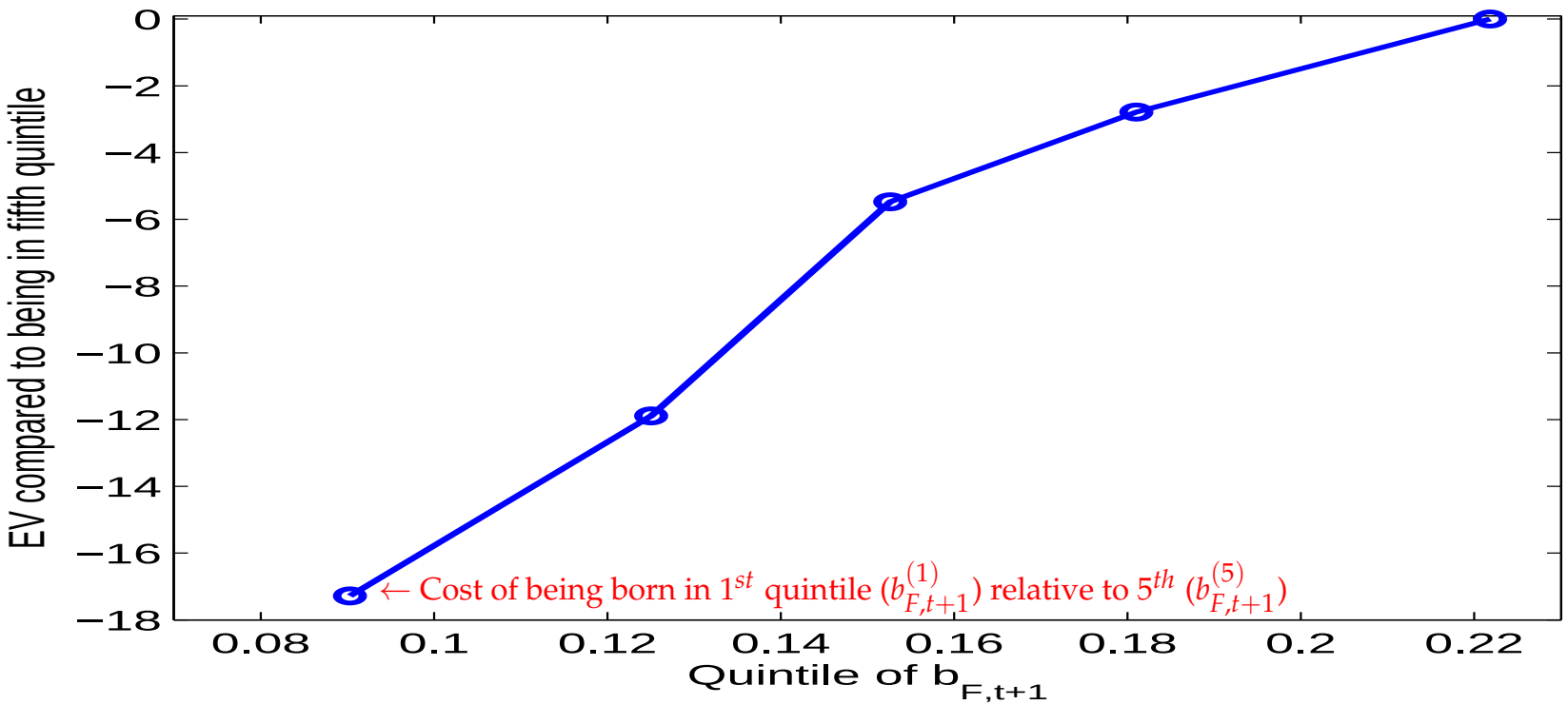
- The **wealthy old suffer most** b/c asset values drop; they have more to lose than least wealthy.



Welfare change by age and by income (left) or net worth (right).

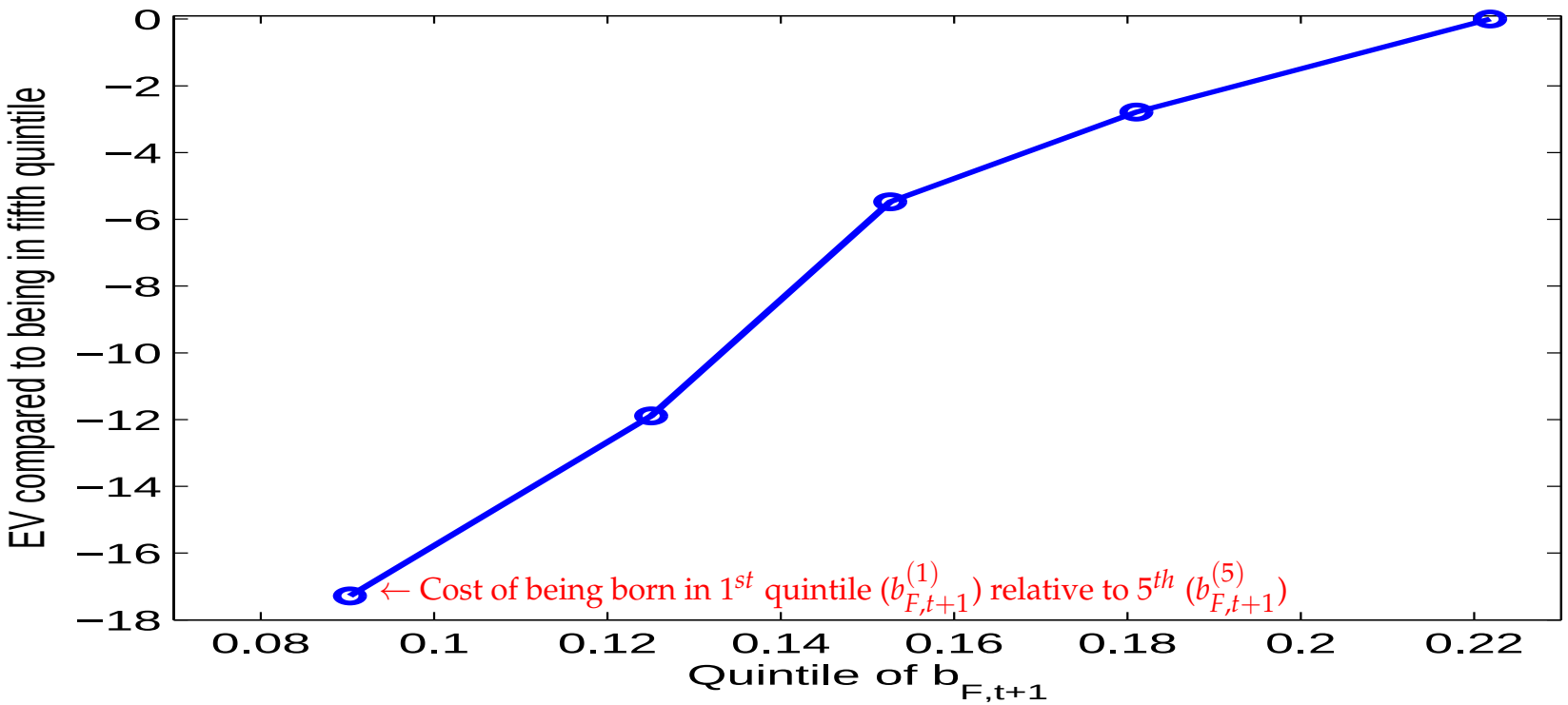
Welfare Under Veil of Ignorance (Newborns)

- Provides one way of summarizing the expected welfare **effects over the life cycle**



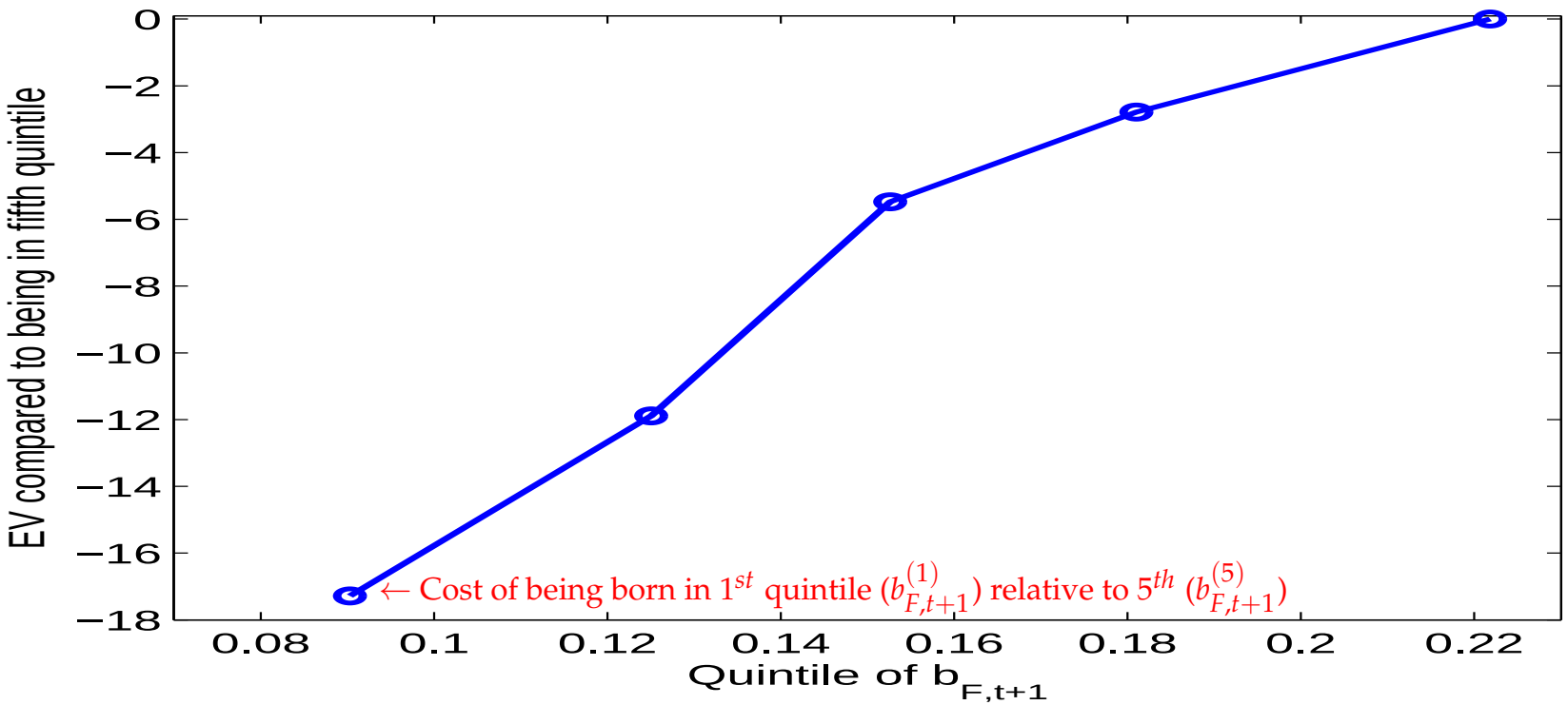
Welfare Under Veil of Ignorance (Newborns)

- Computed using value function at **start of life**



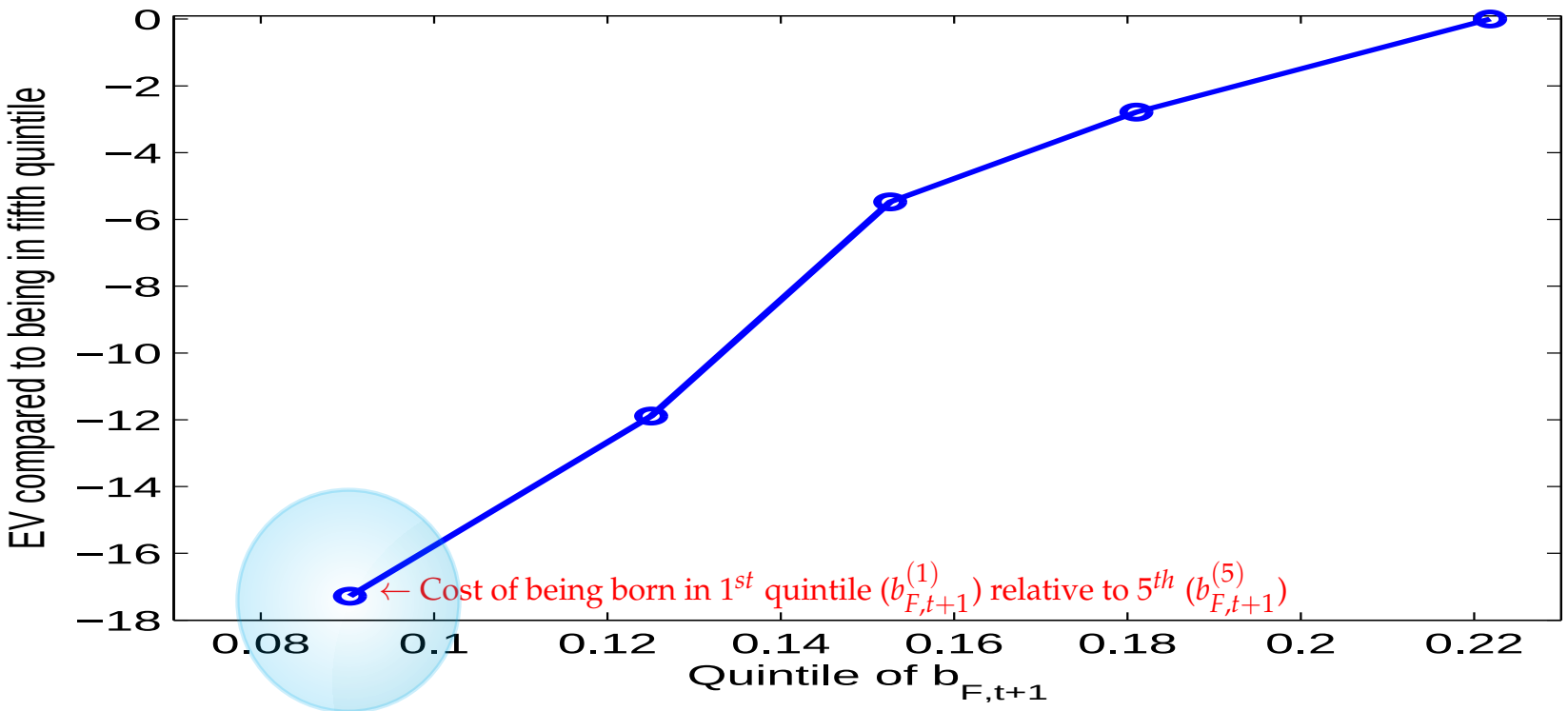
Welfare Under Veil of Ignorance (Newborns)

- Incorporates agent's expectation of lifetime utility *over all possible aggregate, idiosyncratic shocks*.



Welfare Under Veil of Ignorance (Newborns)

- Individual born into **5th quintile** of $b_{F,t+1}$ (but with *same* $b_{F,t}$) would be *willing to forego 18%* lifetime consumption to avoid being born into **1st quintile** $b_{F,t+1}$.



Conclusion

- Foreign Official purchases of U.S. safe assets have surged in past 20 years.
- Foreign inflows are **stimulative**: raise output, consumption, investment, wages, and valuations. They **lower interest rates** and expected asset returns but *raise risk premia*.
- Low real interest rates are a **boon** to **young households** who can purchase a (larger) home earlier, and to **older households** who enjoy capital gains
- **Reduction in foreign holdings** from a high level would hurt average household but especially the young and old; **middle-aged savers might benefit**
- **Under veil of ignorance**:

Better to be born into world where *foreigners buy lots of domestic debt*

Appendix

Government

- Inelastically supplies bonds in quantity $B_t^G = b^G Y_t^{TR}$
- Government debt to trend GDP, b^G, assumed fixed at observed 0.30 value (1984-2008)

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- Inelastically supplies bonds in quantity $B_t^G = b^G \Upsilon_t^{TR}$
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- Government uses taxes/transfers to keep debt-trend GDP constant:

$$p_t^L \mathcal{L}_t = T_t + \Upsilon_t^{TR} b^G (q_t e^g - 1)$$

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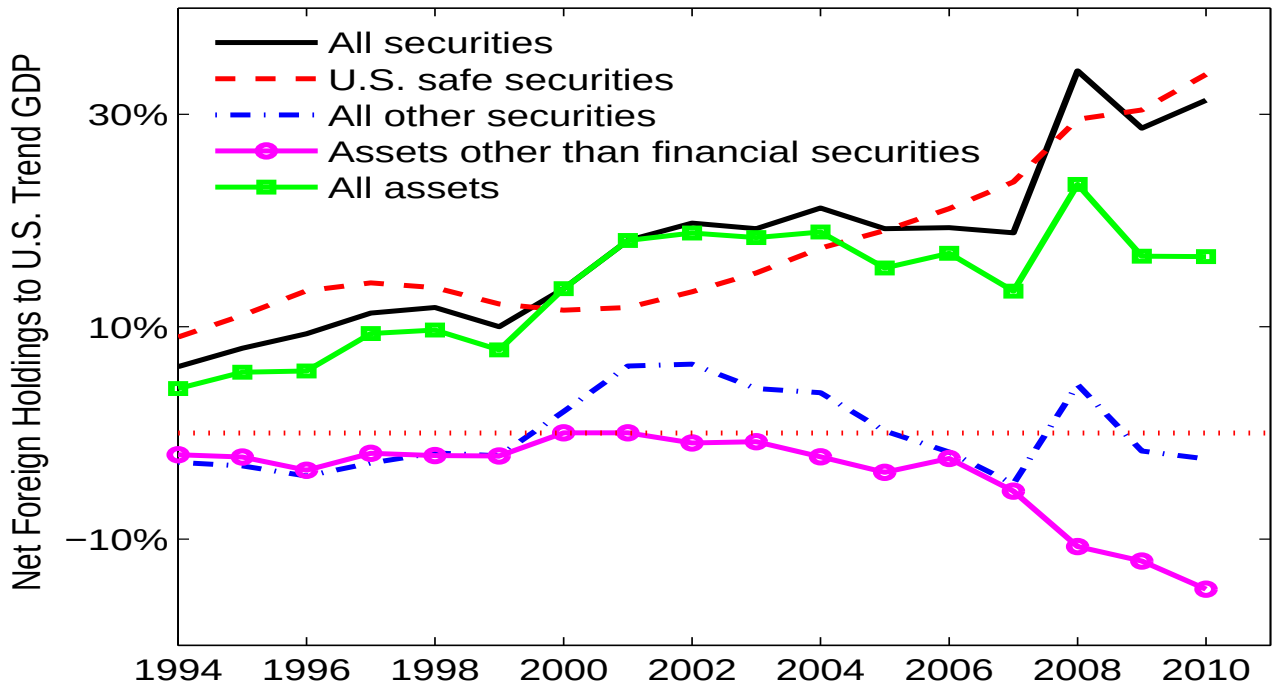
$$p_t^L \mathcal{L}_t = T_t + \Upsilon_t^{TR} b^G (q_t e^g - 1)$$

- If land revenues are insufficient to pay interest on the debt, the government taxes households (lump-sum): $T_t < 0$.

U.S. Net Debtor Position by Asset Class

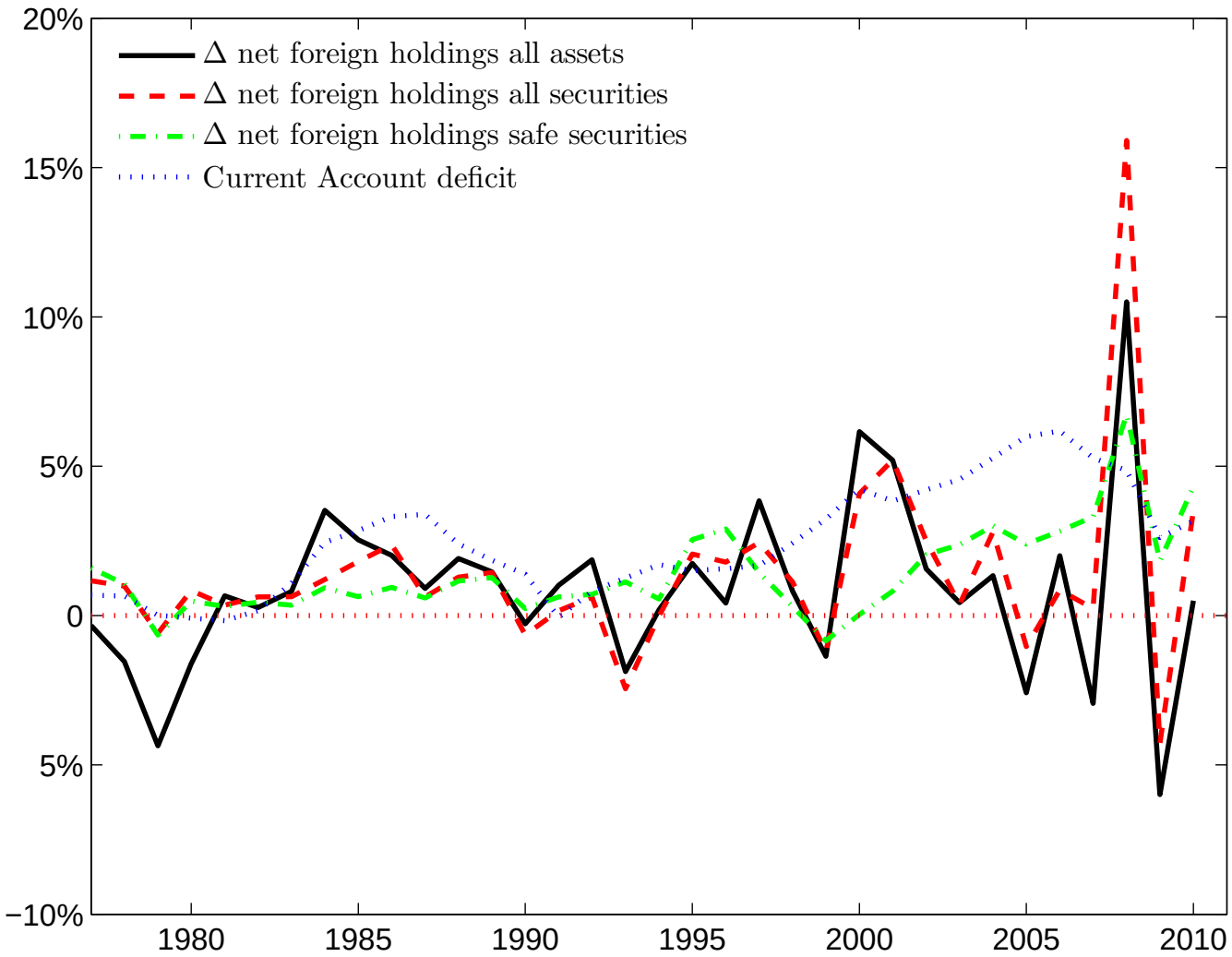
- All of upward trend in U.S. net debtor position due to the upward trend in foreign purchases of U.S. safe assets.



Foreign holdings of U.S. Assets minus U.S. holdings of foreign assets, relative to U.S. Trend GDP. Source: U.S. Department of Commerce, Bureau of Economic Analysis. The sample is annual, 1994-2010.

U.S. Capital Flows

- Comments



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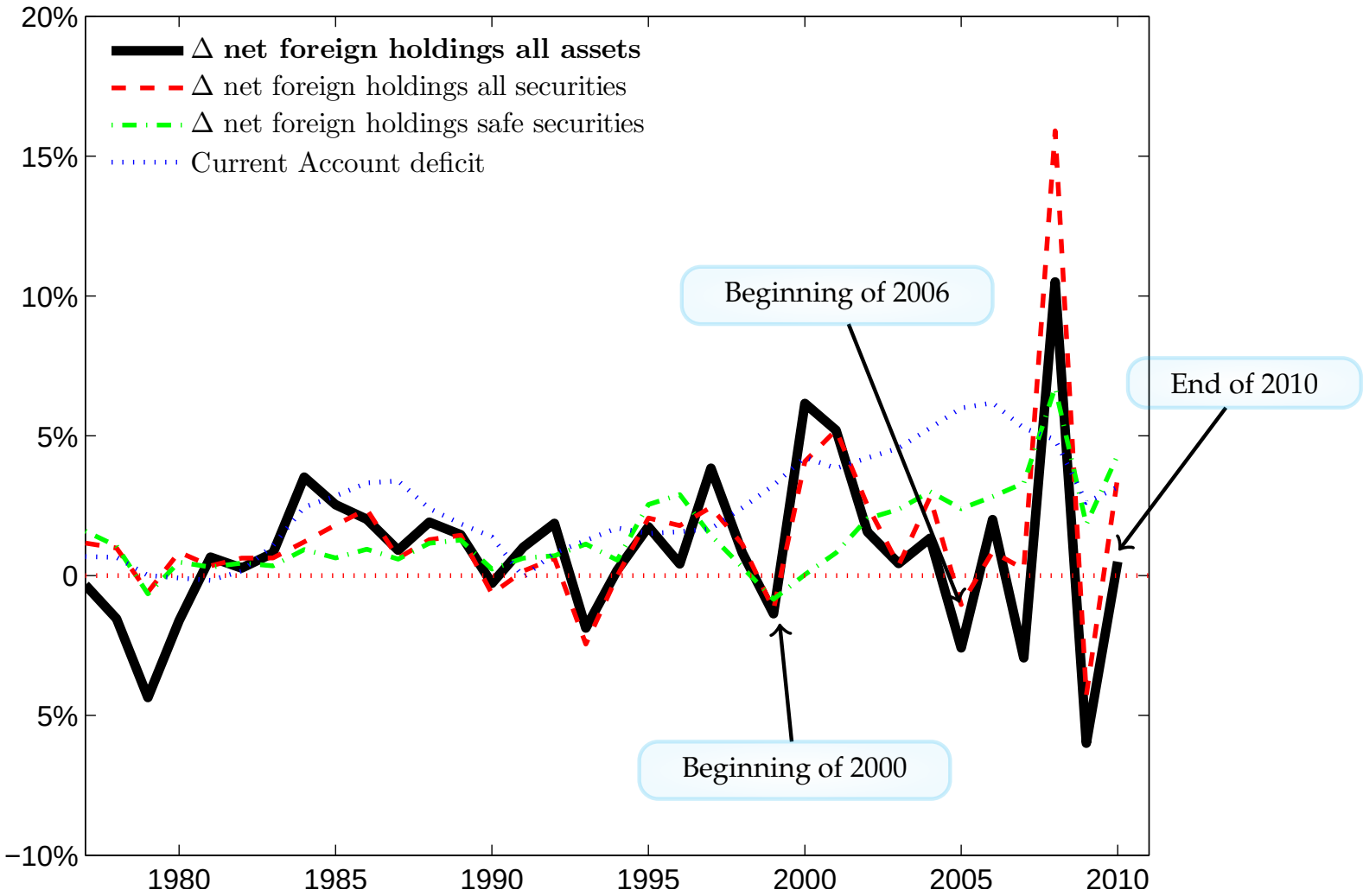

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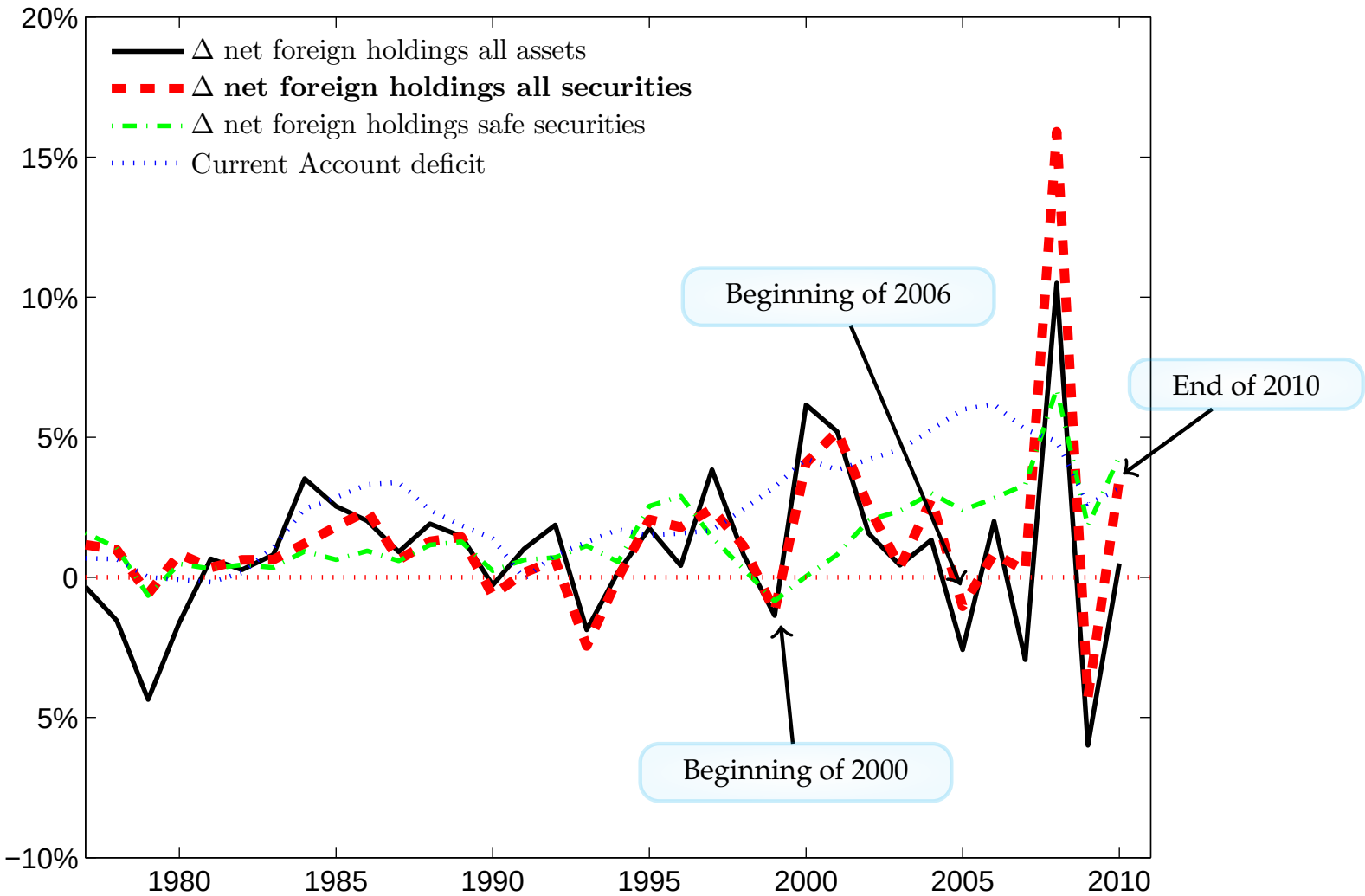

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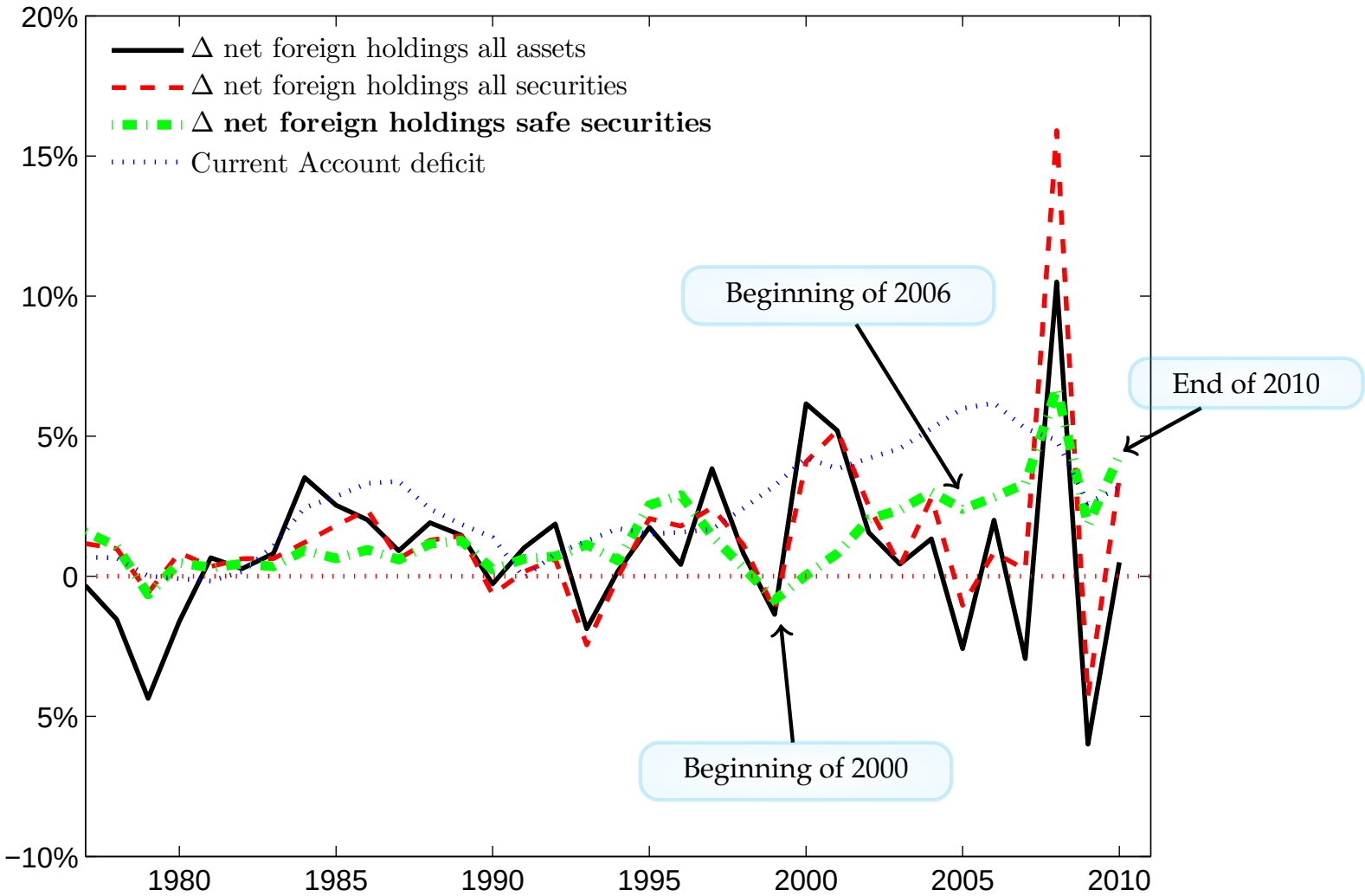
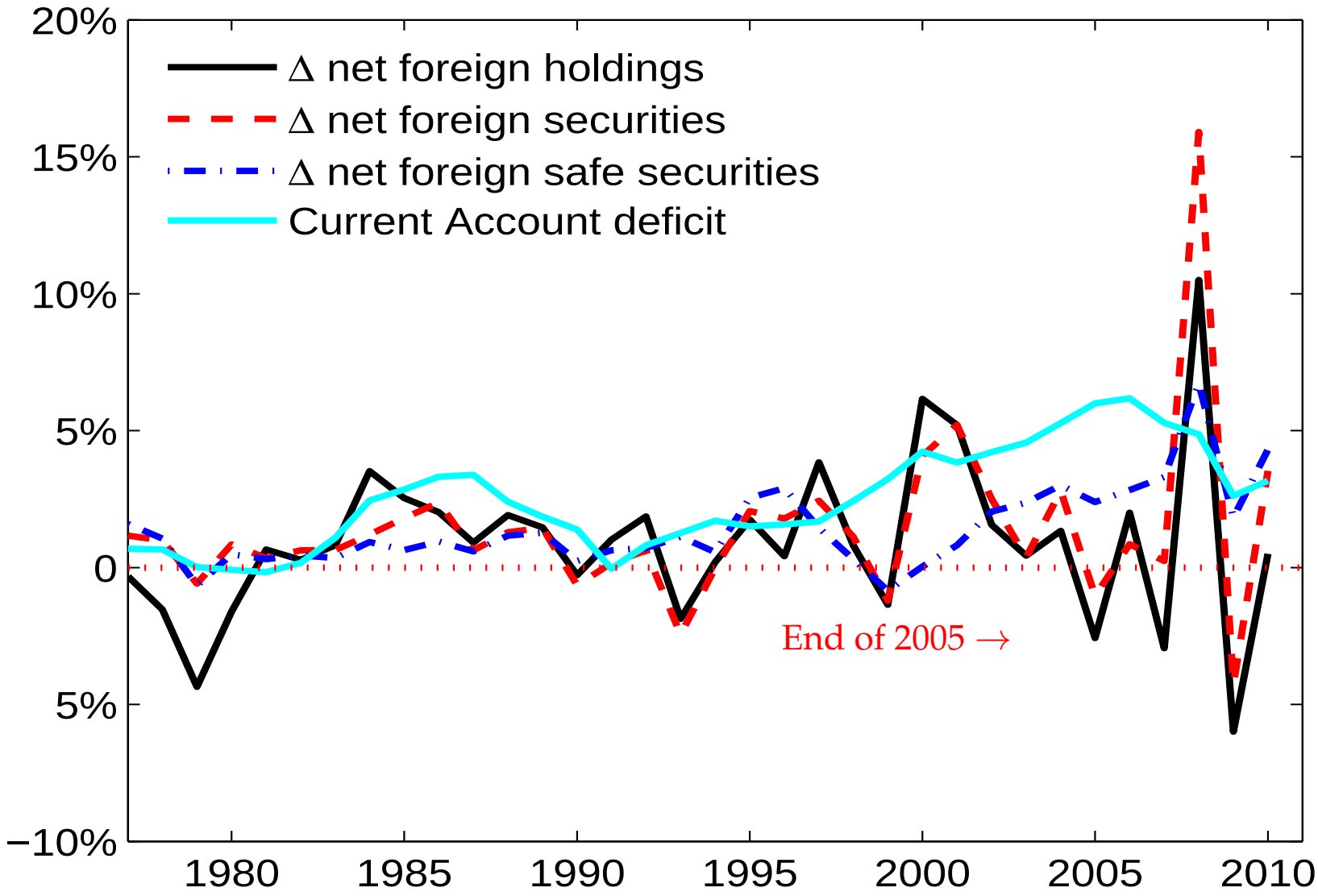


Measures of U.S. Capital Flows



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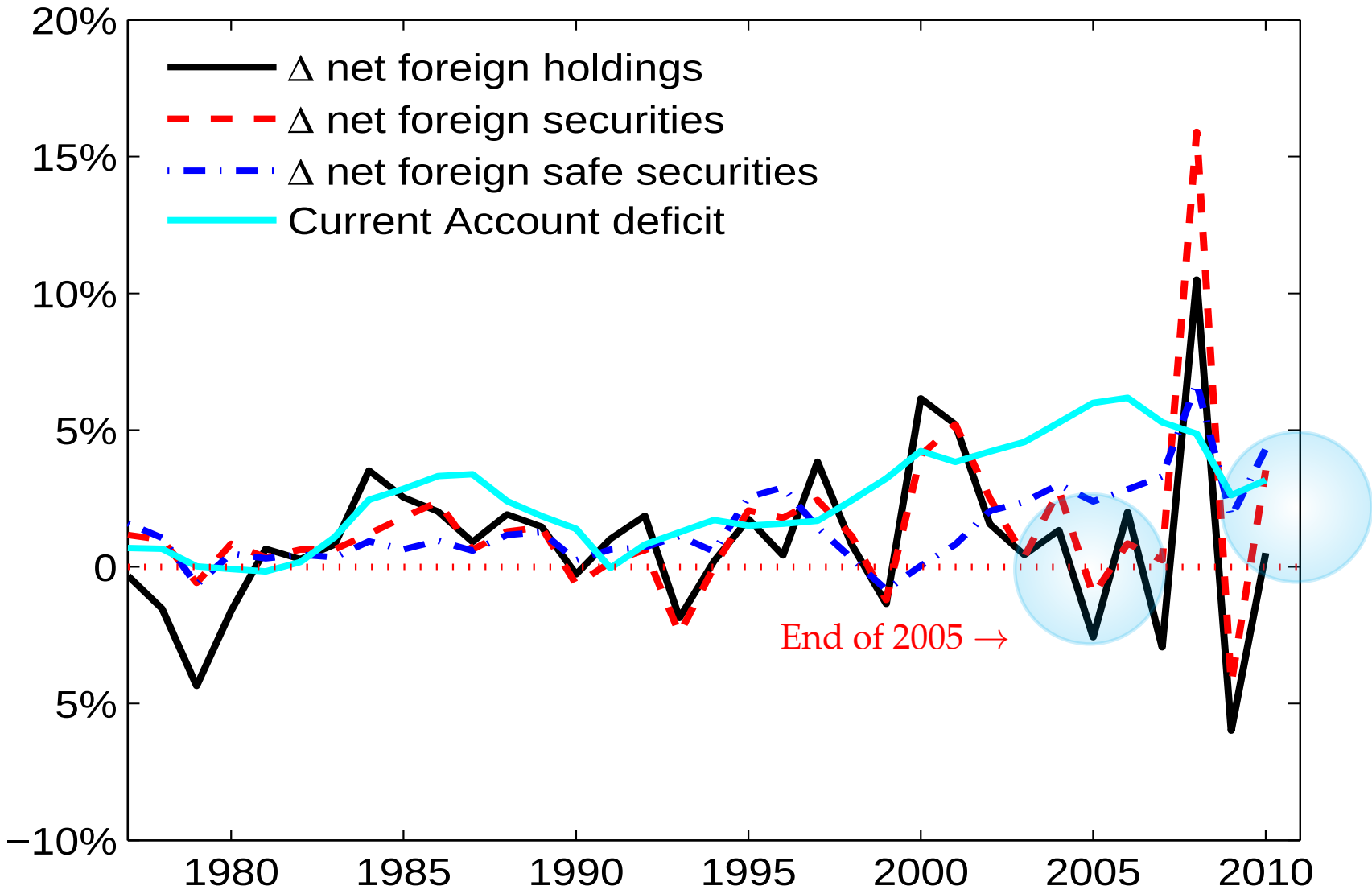

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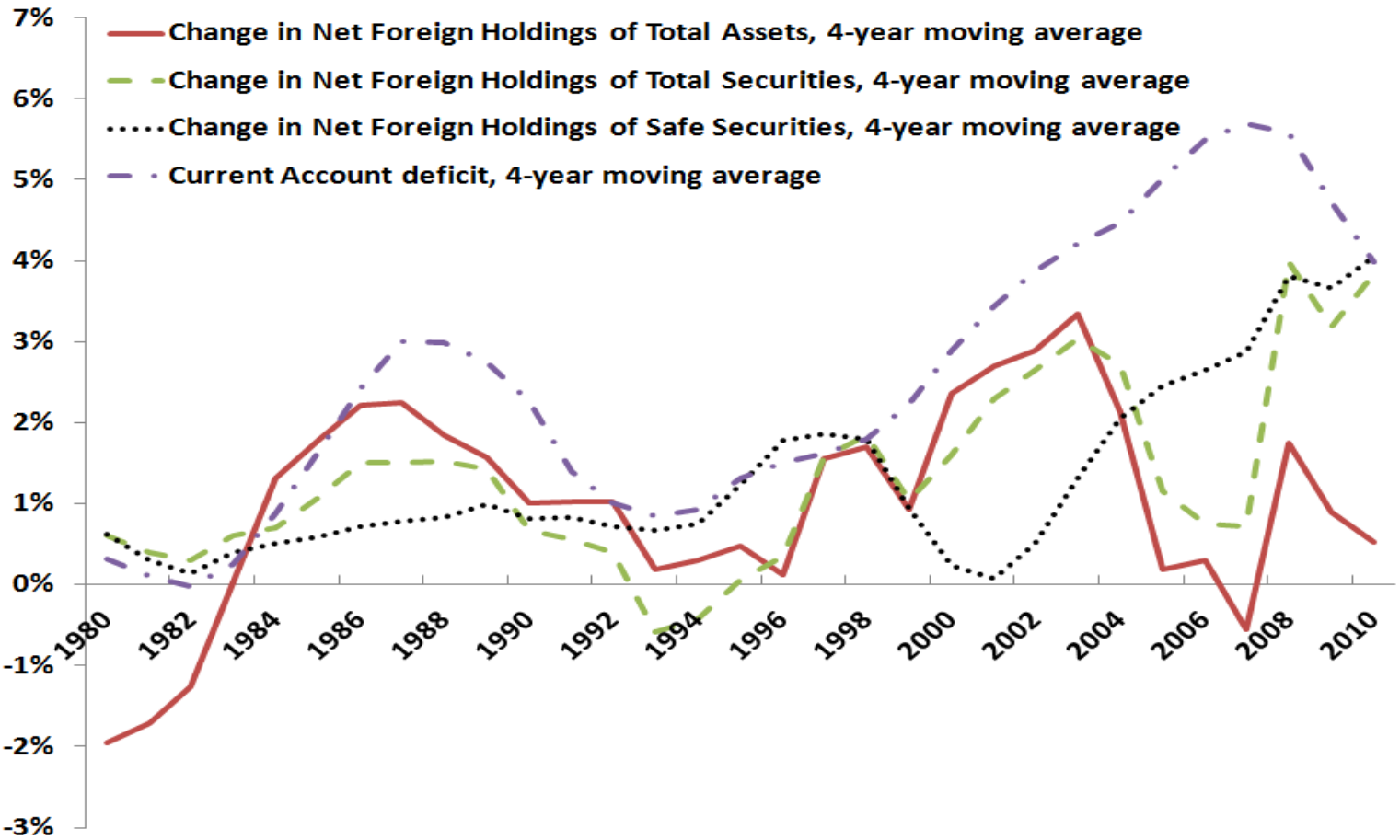

Related Literature

- Incomplete markets and equity pricing
  - Aiyagari and Gertler '91; Telmer '93; Lucas '94, Heaton and Lucas '96; Basak and Cocco '98; Luttmer '99; Lustig and Van Nieuwerburgh '05; Storesletten et. al '07; Gomes and Michaelides '08; Favilukis '08, Krueger and Lustig '09, Chien, Cole, and Lustig '10.

Related Literature

- Incomplete markets and equity pricing

- Incomplete markets and housing
  - Fernandez-Villaverde and Krueger '05; Rios-Rull and Marcos '06; Peterson '06; Ortalo-Magne and Rady '06; Lustig and Van Nieuwerburgh '07 '08; Piazzesi and Schneider '08; Kiyotaki et. al., '08; Corbae and Quintin '09, Favilukis, Ludvigson, and Van Nieuwerburgh '10.

Related Literature

- Incomplete markets and equity pricing
- Incomplete markets and housing
- Global imbalances and sudden stops
  - Mendoza, Quadrini, and Rios-Rull '07, Caballero, Farhi, and Gourichas '08 (a,b), Obstfeld and Rogoff '09, Caballero '11, Farhi, Gourinchas, and Rey '11
  - Calvo '98; Caballero and Krishnamurty '01; Martin and Rey '06; Gertler, Gilchrist, Natalucci '07; Mendoza '10.

Cumulative Loan-Value Ratios, LA County

- CLTV ratio at time of home purchase; percentage all home purchases.