The Rate of Return on Everything, 1870–2015

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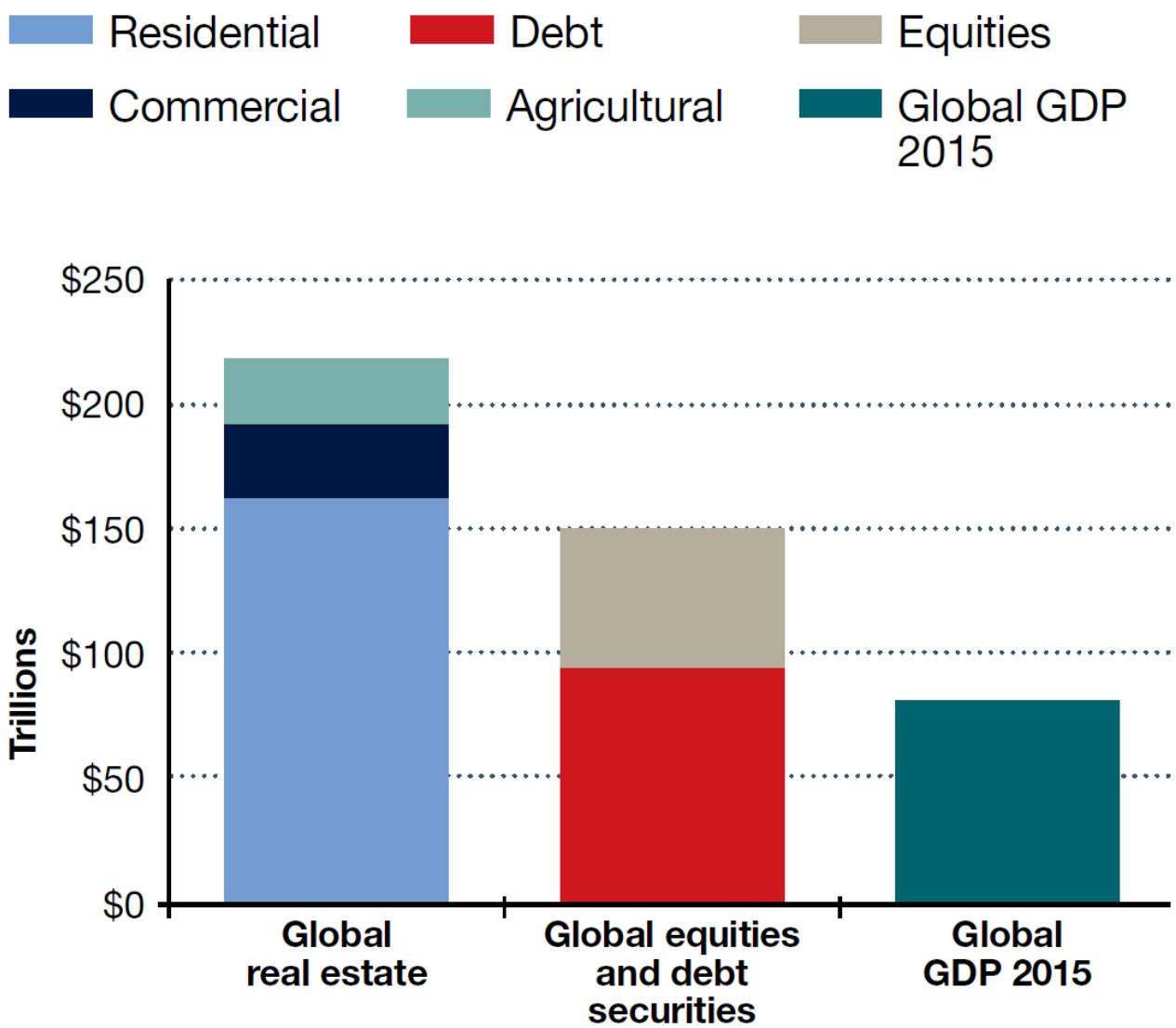
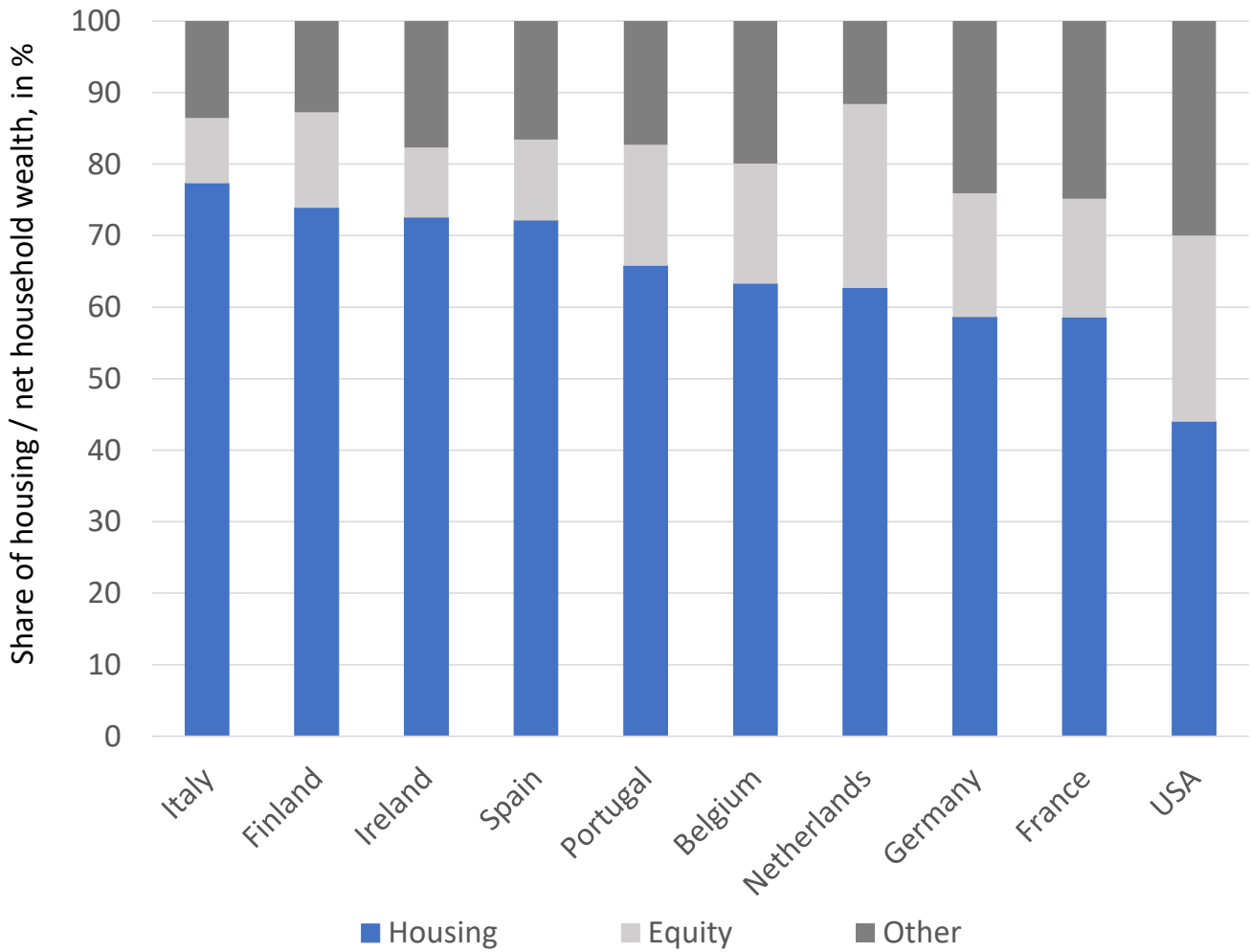
Real estate is the largest asset class



Source: Savills Research

Betting the house

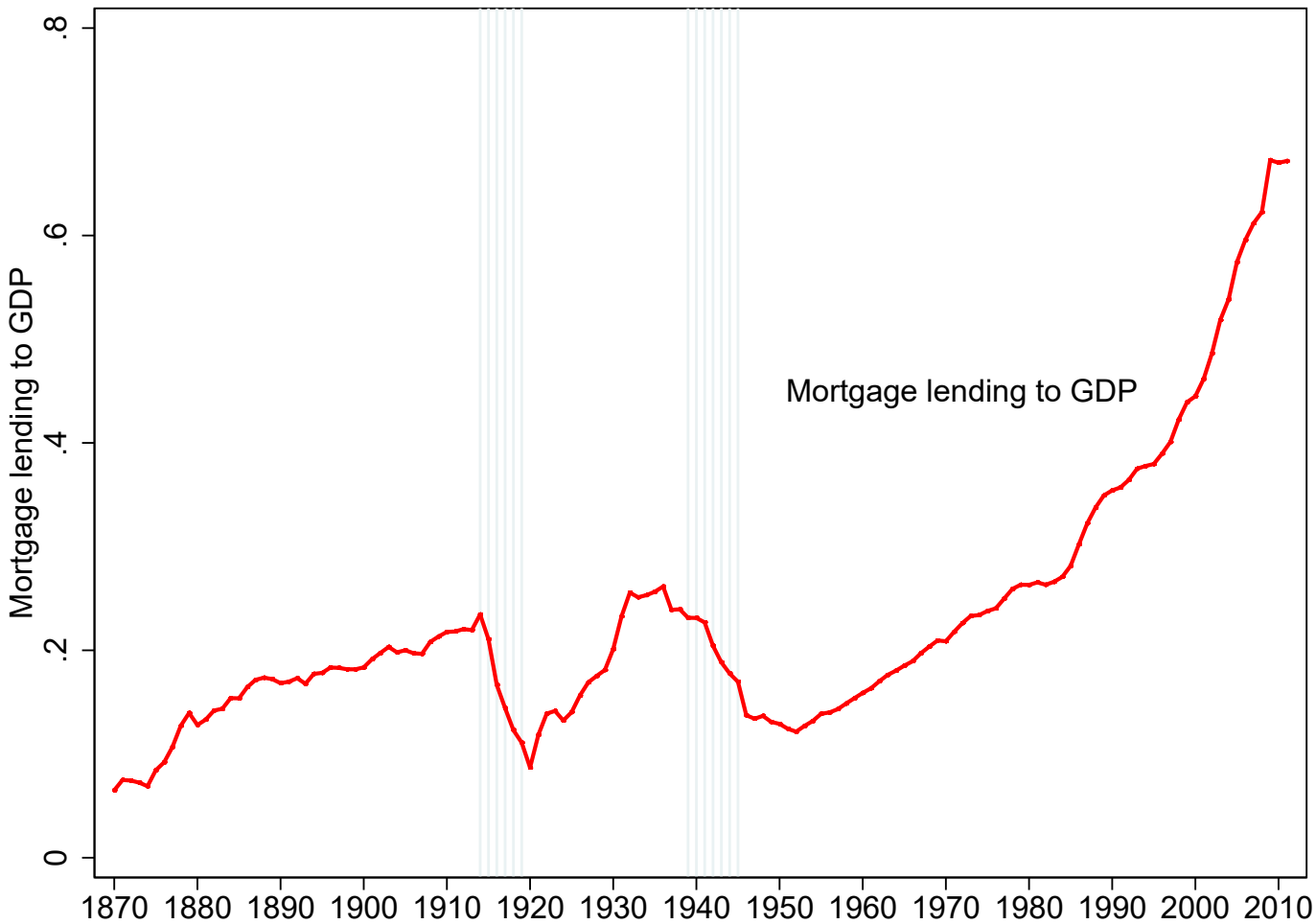
Housing is the most important household asset.



Source: ECB Household Portfolio Survey, Flow of Funds.

The great mortgaging

Housing loans are the main asset of the financial system.



Source: Jorda, Schularick, Taylor, JME 2015

Residential real estate

Housing is the asset that matters most, but it is the asset we know least about.

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- The long-run equity risk premium is 6% (Mehra and Prescott 1985)

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- What is the housing risk premium?

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- The long-run equity risk premium is 6%
  (Mehra and Prescott 1985)
- What is the housing risk premium?
- How do housing returns vary over time and across space?

Residential real estate

Housing is the asset that matters most, but it is the asset we know least about.

A prominent example:

- The long-run equity risk premium is 6% (Mehra and Prescott 1985)
- What is the housing risk premium?
- How do housing returns vary over time and across space?
- Except for a few studies (Giglio et al. 2015, Favilukis et al. 2017), we know very little.

Core contribution

This paper presents:

1. Long-run returns on the main household asset: residential real estate.
2. More comprehensive and accurate long-run return data for stocks and risk-free rates.
3. Constructs economy-wide returns on wealth.

What we find

1. $r_{housing} \approx r_{equities}$ but $r_{housing}$ less volatile,less correlated internationally
2. r_{safe} relatively volatile (ex post): today no lower than in other eras, 1980s high
3. $r_{wealth} >> g$ across countries and over time . . .

New data on global returns

Largest ever dataset on total returns in 16 economies over 145 years

Country	Gov. Bills	Gov. Bonds	Equities	Housing
Australia	1870–2015	1900–2015	1870–2015	1901–2015
Belgium	1870–2015	1870–2015	1870–2015	1890–2015
Denmark	1875–2015	1870–2015	1893–2015	1876–2015
Finland	1870–2015	1870–2015	1896–2015	1920–2015
France	1870–2015	1870–2015	1870–2015	1871–2015
Germany	1870–2015	1870–2015	1870–2015	1871–2015
Italy	1870–2015	1870–2015	1870–2015	1928–2015
Japan	1876–2015	1881–2015	1886–2015	1931–2015
Netherlands	1870–2015	1870–2015	1900–2015	1871–2015
Norway	1870–2015	1870–2015	1881–2015	1871–2015
Portugal	1880–2015	1871–2015	1871–2015	1948–2015
Spain	1870–2015	1900–2015	1900–2015	1901–2015
Sweden	1870–2015	1871–2015	1871–2015	1883–2015
Switzerland	1870–2015	1900–2015	1900–2015	1902–2015
UK	1870–2015	1870–2015	1871–2015	1900–2015
USA	1870–2015	1871–2015	1872–2015	1891–2015

Statement of the obvious: It took years, lots of work. . .
. . .but it gets <1 minute here today

What's new?

- **New: Housing total returns, prices and rental yields**
  Before: scattered rents/returns for short periods, house prices from Knoll, Schularick, Steger (AER 2017)
- **New: Equity total returns, prices and dividend yields**
  Before: commercial providers, dividends and documentation scarce, new prices and dividends here
- **New: Govt. bond total returns and yields, bill yields**
  Before: yields existed, returns from commercial providers

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- **New: Govt. bond total returns and yields, bill yields**
  Before: yields existed, returns from commercial providers
- **Thanks to everyone who helped!**
  It will all be here as a public good:

www.macrohistory.net/data/

JORDÀ-SCHULARICK-TAYLOR MACROHISTORY DATABASE

The ***Jordà-Schularick-Taylor Macrohistory Database*** is the result of an extensive data collection effort over several years. In one place it brings together macroeconomic data that previously had been dispersed across a variety of sources. On this website we provide convenient no-cost open access under a license to the most extensive long-run macro-financial dataset to date. Commercial data providers are strictly forbidden to integrate all or parts of the dataset into their services or sell the data (see Terms of Use and Licence Terms below).

The database covers 17 advanced economies since 1870 on an annual basis. It comprises 25 real and nominal variables. Among these, there are time series that had been hitherto unavailable to researchers, among them financial variables such as bank credit to the non-financial private sector, mortgage lending and long-term house prices. The database captures the near-universe of advanced-country macroeconomic and asset price dynamics, covering on average over 90 percent of advanced-economy output and over 50 percent of world output.

Assembling the database, we relied on the input from colleagues, coauthors and doctoral students in many countries, and consulted a broad range of historical sources and various publications of statistical offices and central banks. For some countries we extended existing data series, for others we relied on recent data collection efforts by others. Yet in a non-negligible number of cases we had to go back to archival sources including documents from governments, central banks, and private banks. Typically, we combined information from various sources and spliced series to create long-run datasets spanning the entire 1870–2014 period for the first time. The table below lists the available series.

Download Data ▼ | Documentation ▼ | How to Cite ▼ | Research ▼

Long-run returns

Return calculation

- **Total real return:** $r = (1 + \overbrace{\{\Delta P/P + Y\}}^{R})/(1 + \pi) - 1$
- **Extensive sensitivity checks:**
  Taxes, transaction costs, weighting, survivorship bias, rental yield benchmarks, stock market closures, leverage, location effects, compare to REITS, etc.

The rent-price approach

Rental yields (*RI* is rent index, *HPI* is house price index):

$$\frac{RI_{t+1}}{HPI_{t+1}} = \left[\frac{(RI_{t+1}/RI_t)}{(HPI_{t+1}/HPI_t)}\right]\frac{RI_t}{HPI_t}$$

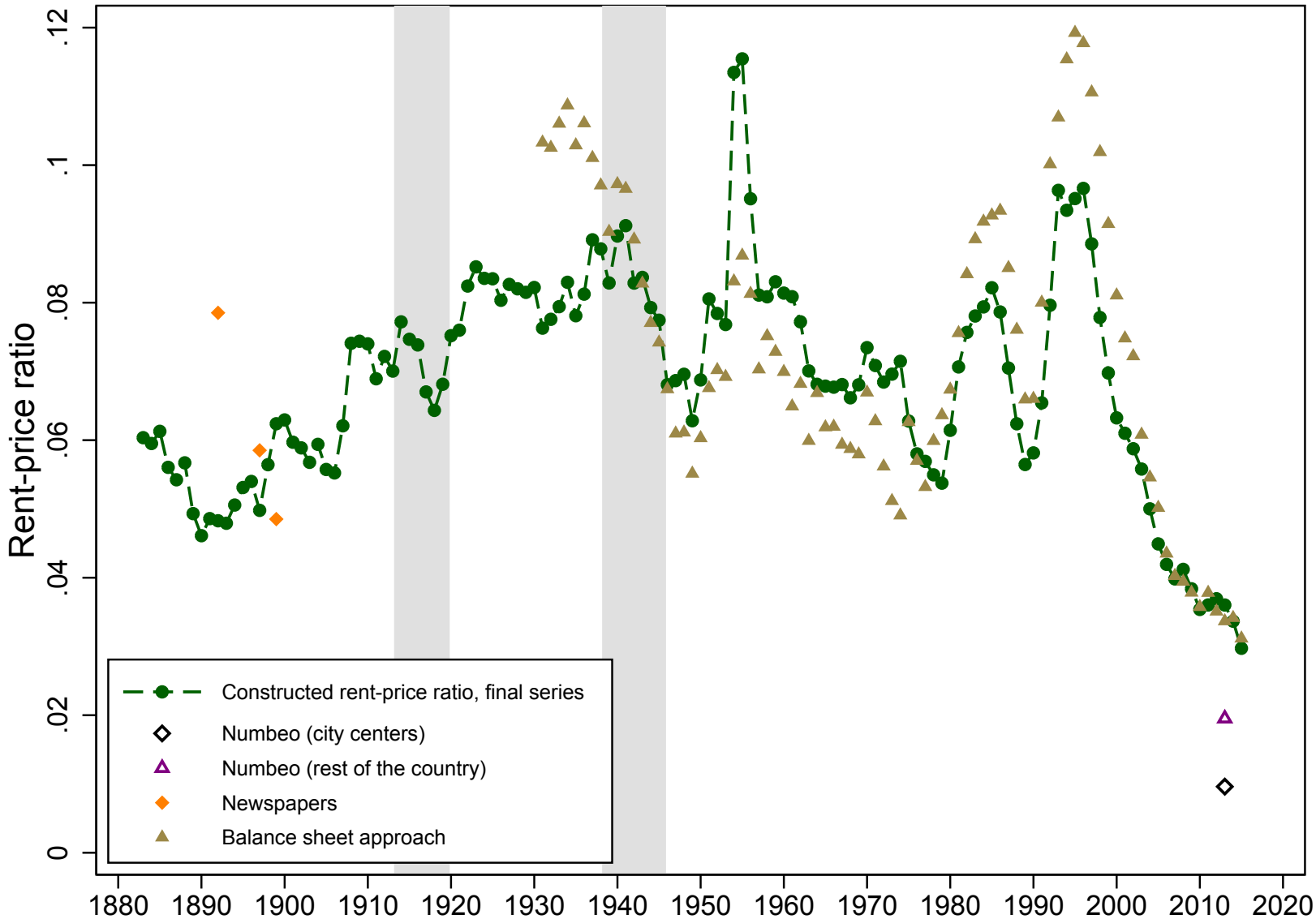
Total returns:

$$R_{h,t+1} = \frac{RI_{t+1}}{HPI_t} + \frac{HPI_{t+1} - HPI_t}{HPI_t}$$

- Basic intuition: start with diversified **net** rent-price ratio (excludes maintenance, management, etc.)
- Iterate forward/backward using **rent growth** and **constant-quality house prices**
- Corroborate using **balance sheet approach** and **historical rental yield** data

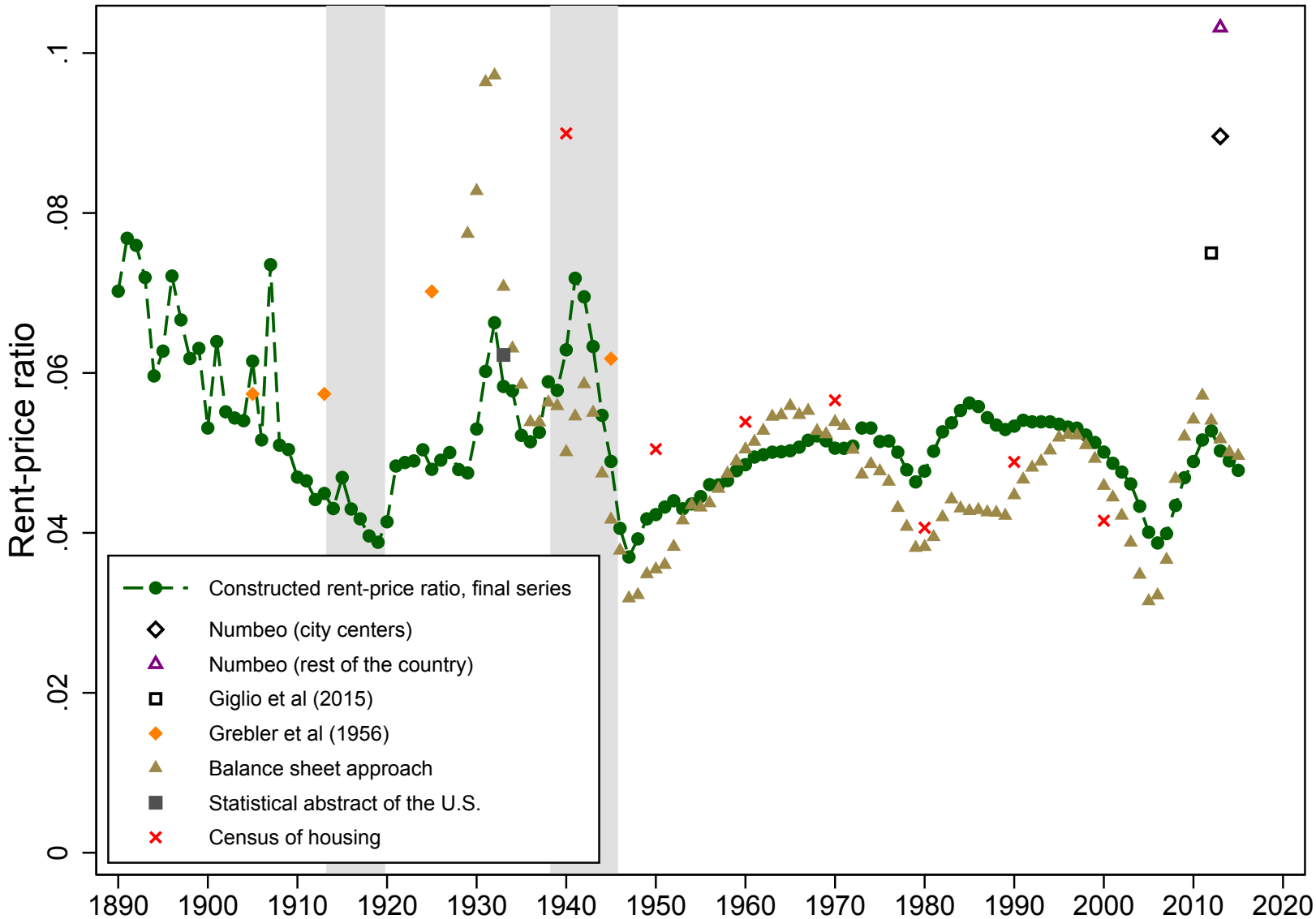
Reconciling multiple sources

Example: Sweden

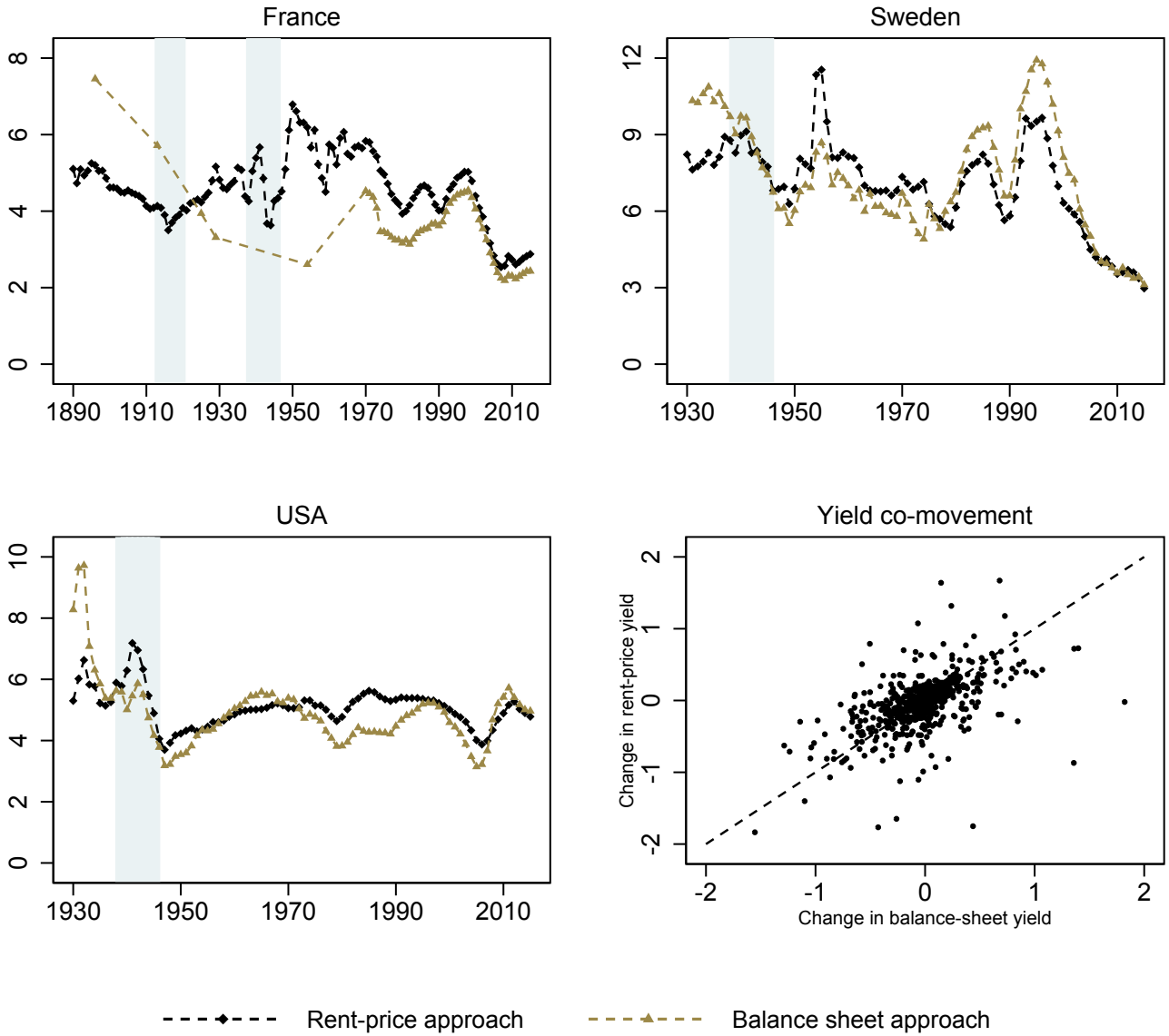


Reconciling multiple sources

Example: USA



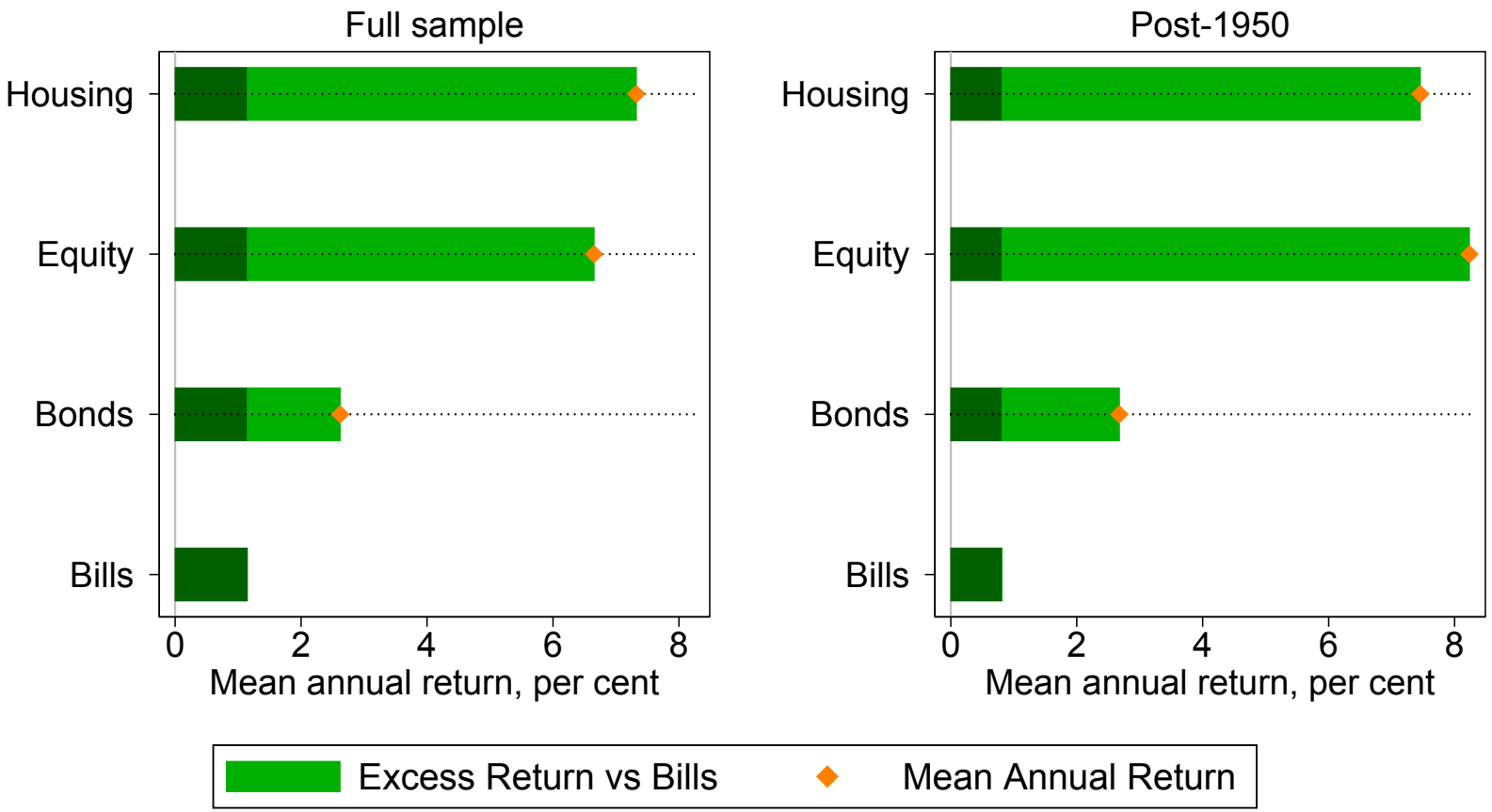
Market yield vs. balance-sheet approach



Aggregate trends

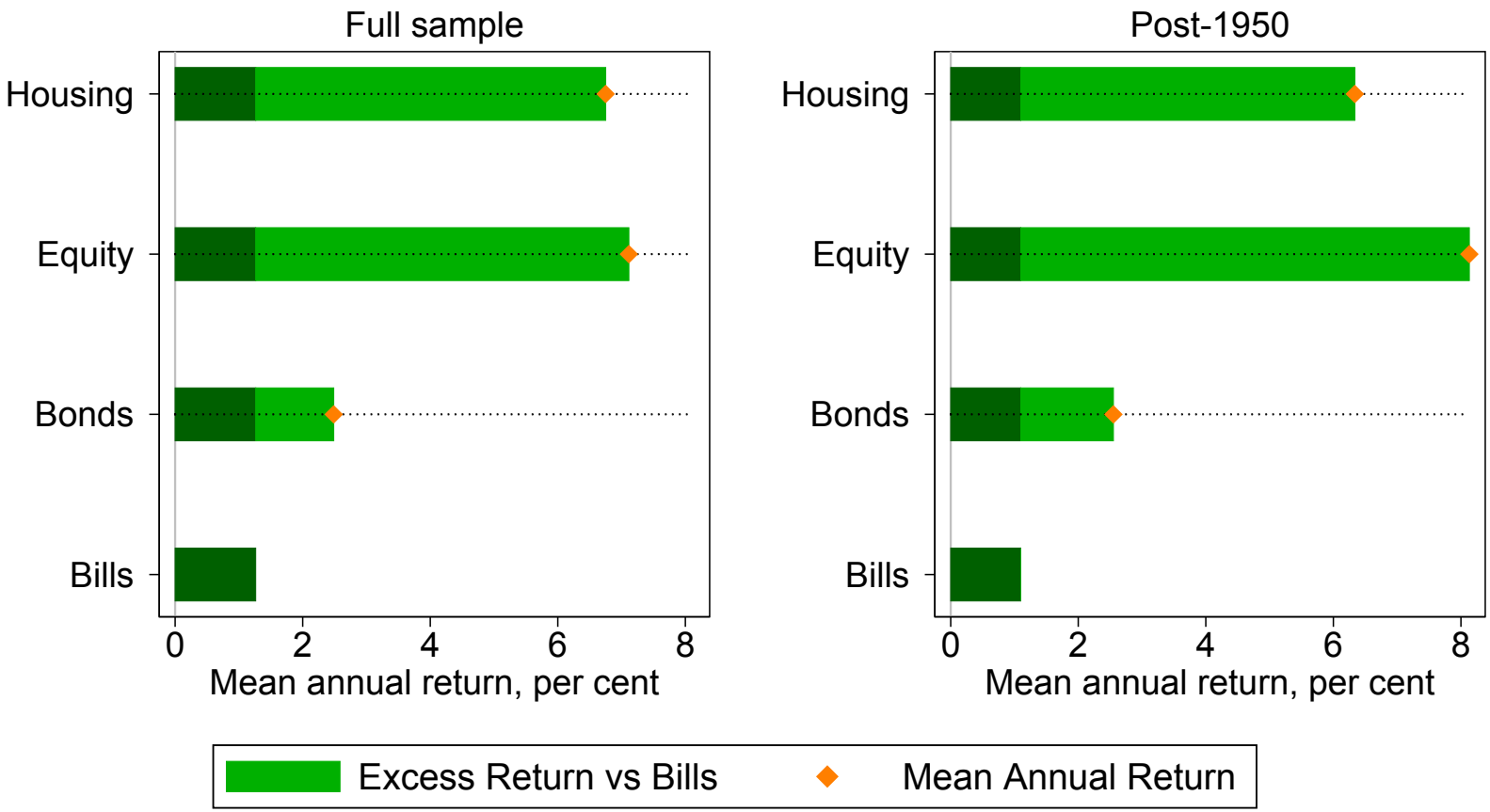
Global returns

equal weights



Global returns

GDP weights



Total returns since 1870

	Real returns				Nominal Returns			
	Bills	Bonds	Equity	Housing	Bills	Bonds	Equity	Housing
Full sample:								
Mean return p.a.	0.98	2.50	**6.89**	**7.05**	4.60	6.10	10.75	11.06
Std.dev.	6.01	10.74	21.94	9.98	3.33	8.91	22.78	10.70
Geometric mean	0.78	1.94	**4.64**	**6.61**	4.55	5.74	8.55	10.59
Mean excess return p.a.	.	1.53	5.91	6.07				
Std.dev.	.	8.38	21.43	9.86				
Geometric mean	.	1.19	3.81	5.64				
Observations	1739	1739	1739	1739	1739	1739	1739	1739
Post-1950:								
Mean return p.a.	0.87	2.77	**8.28**	**7.44**	5.40	7.31	12.99	12.31
Std.dev.	3.43	9.94	24.20	8.88	4.04	9.80	25.09	10.15
Geometric mean	0.81	2.30	5.54	7.10	5.33	6.89	10.28	11.90
Mean excess return p.a.	.	1.91	7.41	6.57				
Std.dev.	.	9.20	23.77	9.19				
Geometric mean	.	1.51	4.79	6.21				
Observations	1016	1016	1016	1016	1016	1016	1016	1016

Note: Annual global returns in 16 countries, equally weighted. Period coverage differs across countries. Consistent coverage within countries. Excess returns are computed relative to bills.

Alternative benchmarks and approaches

	Equity	Housing				
		Baseline	Low initial	High initial	Hist. sources	Balance sheet
Mean return p.a.	**6.89**	**7.05**	6.27	7.89	6.83	**6.30**
Std.dev.	21.94	9.98	9.95	10.09	9.99	10.01
Geometric mean	**4.65**	**6.61**	5.83	7.44	6.38	5.85
Observations	1739	1739	1739	1739	1739	1739

Note: Total real returns across 16 countries, equally weighted.

More checks

- Compare to REITS
- Compare to Piketty/Zucman
- Taxation
- Effect of leverage

La Fourmi immobiliere

TABLEAU 1 **Les acquisitions d'immeubles parisiens par La Fourmi Immobilière de 1899 à 1913**

ADRESSE	Date Achat	Année Construction	Surface en m^2	Prix Achat en 1000 F courants	Prix Achat en 1000 F 1995	Valeur 1995 en millions de F	Revenu brut annuel (1) %
11, chaussée d'Antin – 16e	1899	1897	2.391	1.194,9	22.807,9	64,0	
16, rue de Lubeck – 16e	1901	1890	1.170	555,0	10.593,8	34,0	6,0
34, rue Pierre-Sémard – 9e	1902	1900	1.111	332,7	6.351,3	22,0	6,3
80, rue du Rocher – 8e	1903	1900	1.995	780,0	14.888,6	40,0	6,5
5, rue du 4-Septembre – 2e	1904	1870	2.167	750,0	14.316,0	31,0	
4, rue Léon-Cosnard – 17e	1905	1903	1.257	408,0	7.787,9	27,5	7,0
17, rue de Longchamp – 16e	1906	1900	1.543	382,5	7.909,7	36,0	6,6
25, rue du Colonel Moll – 17e	1906	1900	1.017	595,0	12.304,0	27,0	7,0
32, boulevard Poissonnière – 9e	1907	1900	1.138	1.045,0	19.947,0	19,0	6,0 (net)
63bis, rue Danrémont – 18e	1908	1906	1.584	420,0	8.017,0	30,0	7,8
21, rue Poncelet – 17e	1909	1900	1.603	330,0	6.299,0	31,0	
40, rue des Abbesses – 18e	1909	1907	1.966	560,0	10.689,3	34,0	
121, rue de Courcelles – 17e	1910	1900	1.156	500,0	9.544,0	27,0	
7, rue Saint-Senoch – 17e	1911	1904	1.934	737,0	12.192,2	43,0	7,1
16, rue Pérignon – 7e	1913	1900	1.902	598,0	9.892,7	46,0	7,4
TOTAL			23.934	9.570,6	173 540,4	511,5	

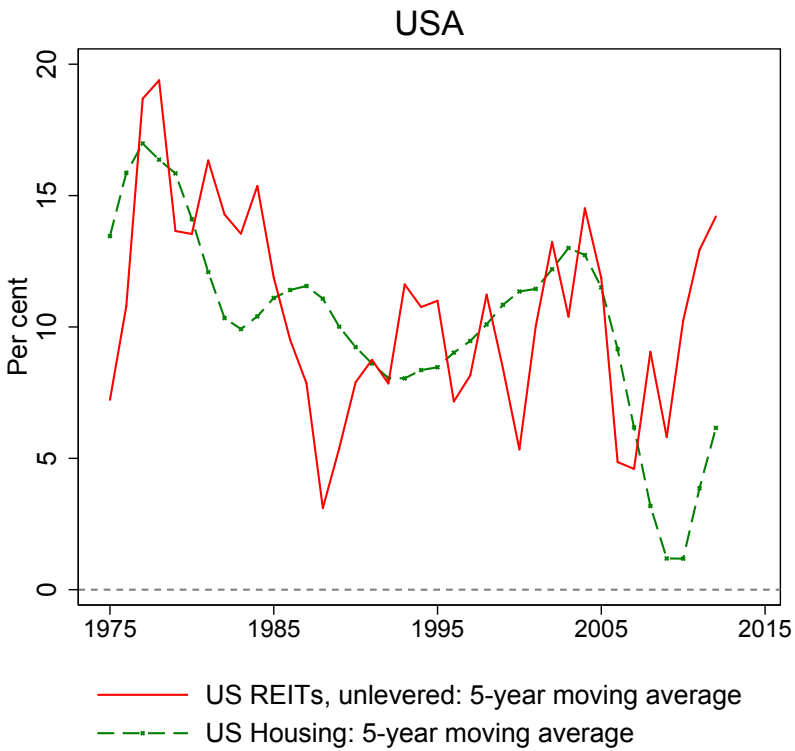
(1) Revenu brut annuel au moment de l'acquisition (qui est souvent précisé dans le *Rapport annuel* de l'année suivante, qui décrit l'opération d'achat.)

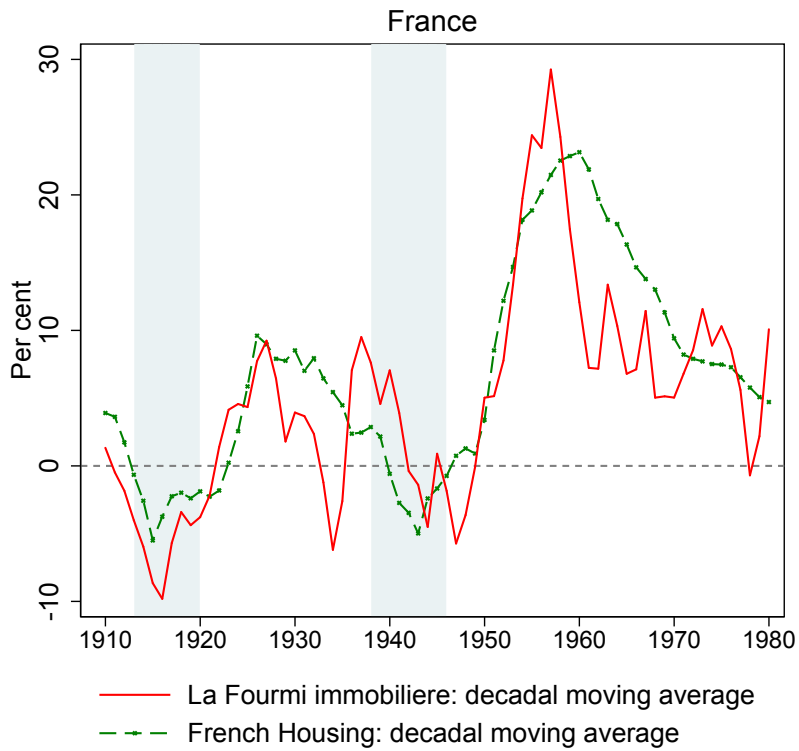
Comparing French housing return with La Fourmi

	Fourmi immobiliere	French Housing	French Equities
Mean return p.a.	16.93	15.69	8.79
Std.dev.	31.35	10.37	24.54
Observations	87	87	87

Note: Arithmetic average annual returns. Consistent sample coverage.

Housing returns compared to REITS





Comparing with Piketty/Zucman 2018

Piketty's r^{Pik} is the sum of capital gain and yield, but computed using national accounts data

- Yield component: capital income divided by total wealth:

$$\text{Yield:} \quad D_t^{Pik} = \alpha/\beta = Y_{cap,t}/W_t, \tag{1}$$

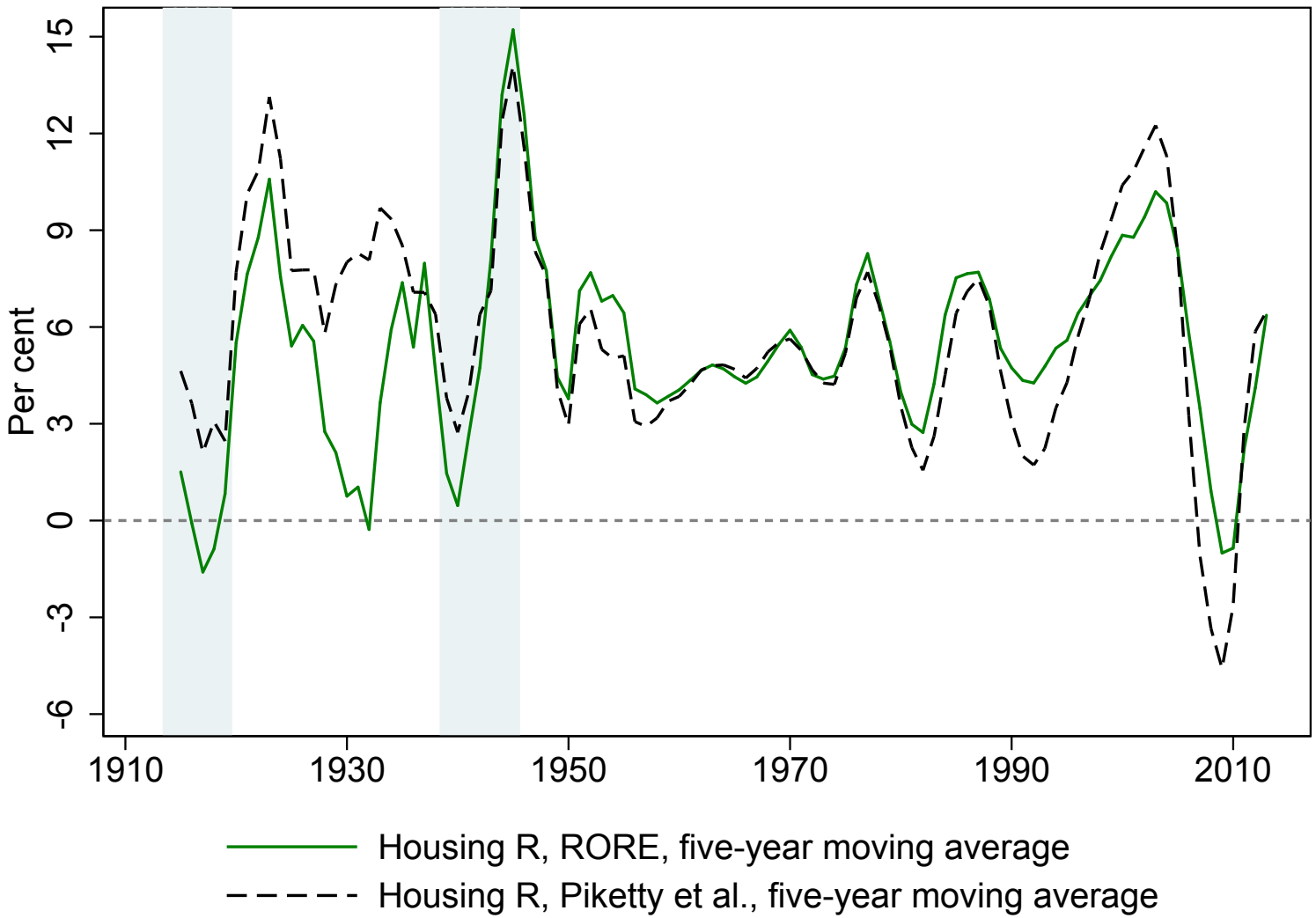
where α is the capital share in GDP, β is the wealth-to income ratio, Y_{cap} is capital income, and W is national wealth.

- Capital gain is a residual: the growth in national wealth not explained by investment.

$$\text{Capital gain:} \quad \Delta P_t^{Pik} = W_t/W_{t-1} - i_{t-1} * Y_{t-1}/W_{t-1}, \tag{2}$$

i is the investment rate.

Housing returns in the US



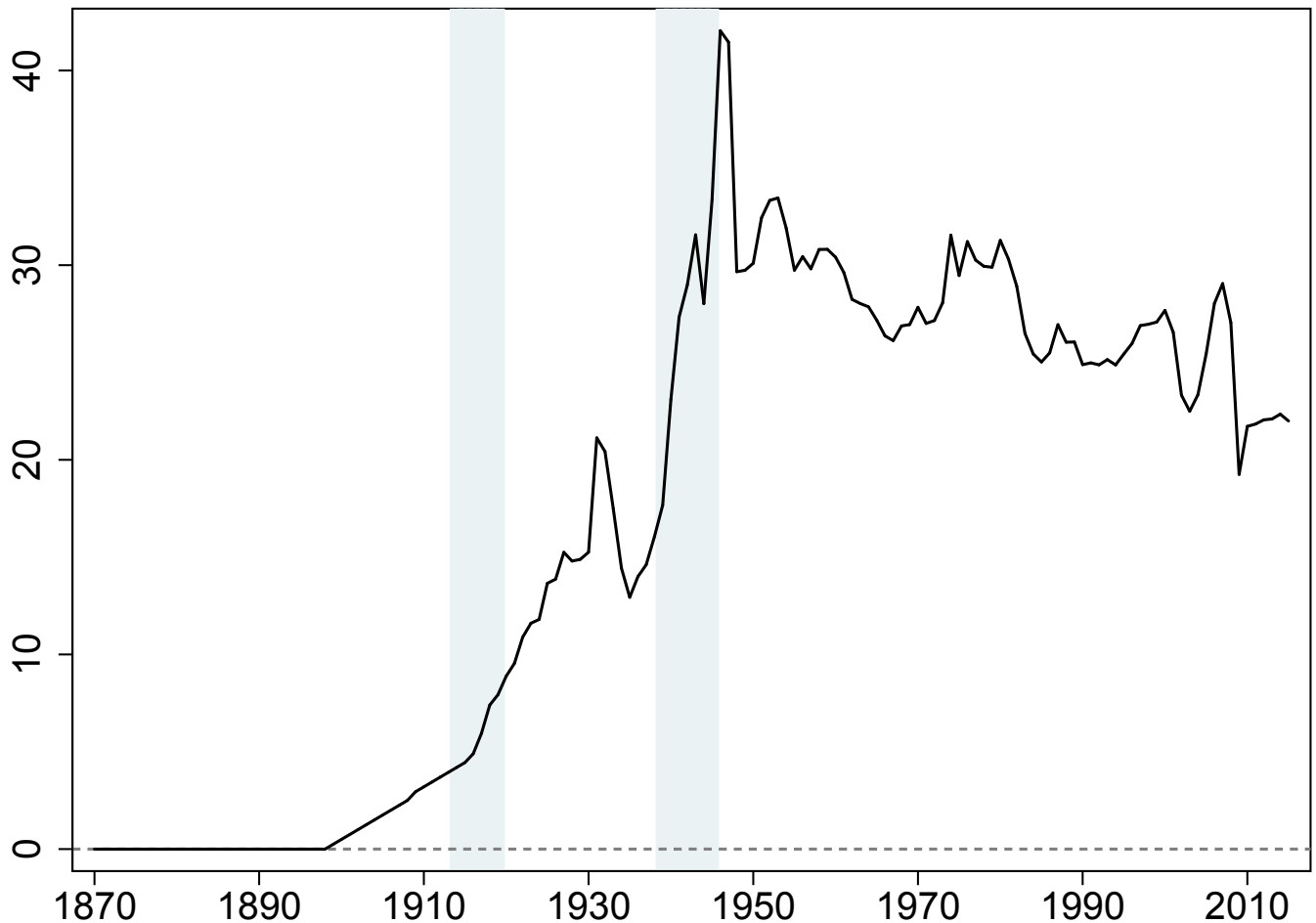
Note: Five-year moving average real total return. Piketty et al. returns are from Piketty, Saez and Zucman (2018) "Distributional National Accounts".

Taxation

- All our returns are pre-tax (too much variation in property and capital income taxation to track)
- But: corporate profits are post-tax.
- Does it make a difference?
- Clearly not for households as investors, but fundamentally.

History of corporate taxation

Figure: Effective corporate tax rate, average of 5 countries



Note: Average effective tax rate in Australia, France, Germany, Japan and US, equally weighted. Japanese tax rate interpolated between 1900 and 1930. Effective tax rate is total taxes paid / net corporate profits. Where effective data are not available, we extrapolate the series using statutory (top marginal) tax rates.

Effects of corporate taxation

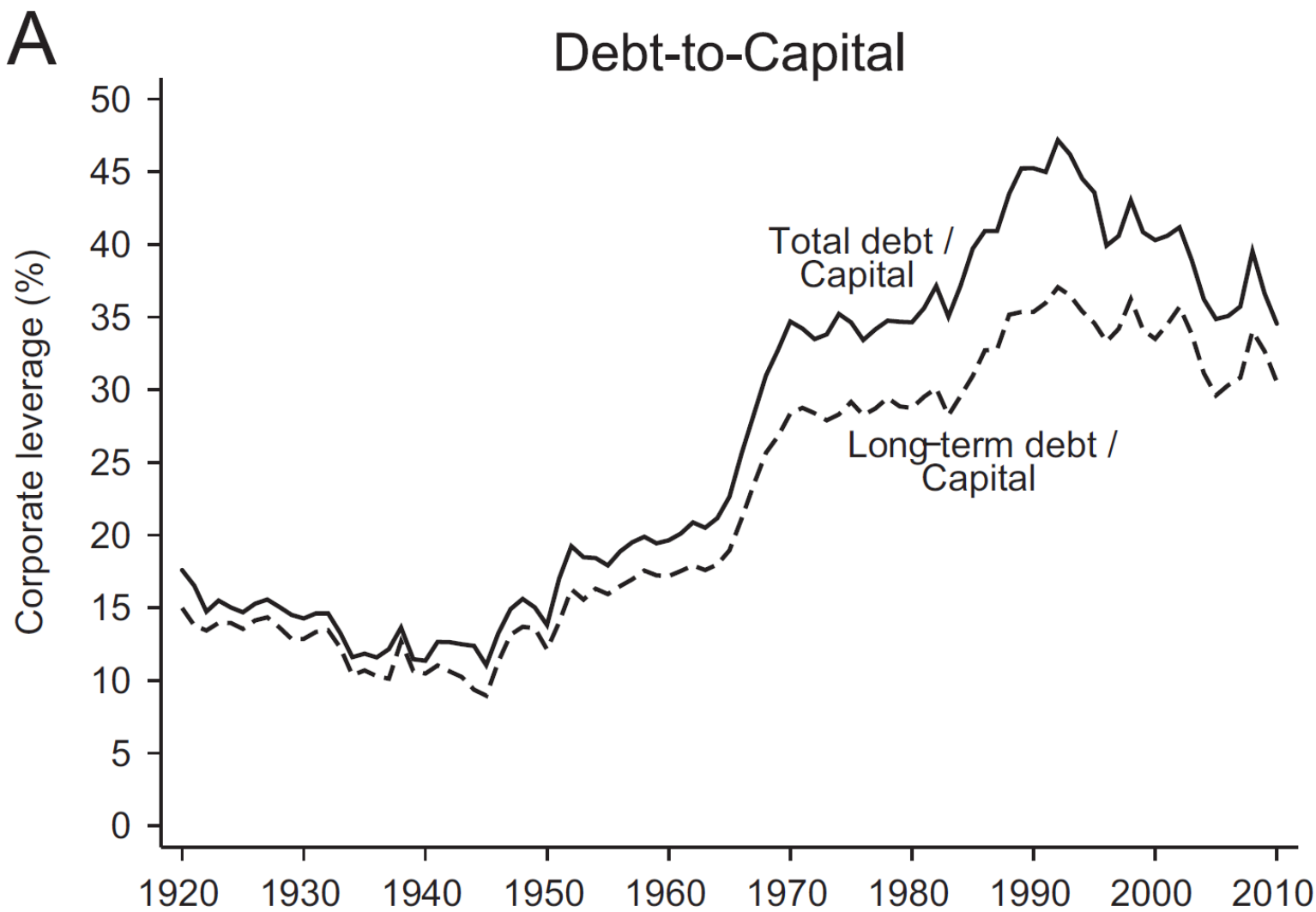
	Baseline	Adjusting dividends	Adjusting profits
Australia	7.88	8.29	9.17
France	3.97	4.19	4.44
Germany	6.85	6.98	7.03
Japan	6.09	6.57	8.45
United States	8.46	8.94	10.54

Note: Arithmetic average annual returns over the full sample. Period coverage differs across countries. Consistent coverage within countries.

Leverage

- Our housing returns are returns on asset.
- Stock returns are returns on equity.
- Solution: relever housing or deleverage equity returns.

Leverage of US corporates, 1920-today



Source: Graham/Leary/Roberts (2014)

Returns: deleveraged and tax adjusted

	Baseline	Deleveraged	Adjusting dividends	Adjusting profits
Australia	7.88	6.57	6.85	7.47
France	3.97	3.12	3.27	3.46
Germany	6.85	5.85	5.94	5.97
Japan	6.09	4.85	5.22	6.72
United States	8.46	7.11	7.47	8.70

Note: Arithmetic average of deleveraged annual equity returns. Returns are deleveraged using data on debt/capital of U.S. firms. Period coverage differs across countries. Consistent coverage within countries.

Returns across countries

And the winner is:

And the winner is: Finland

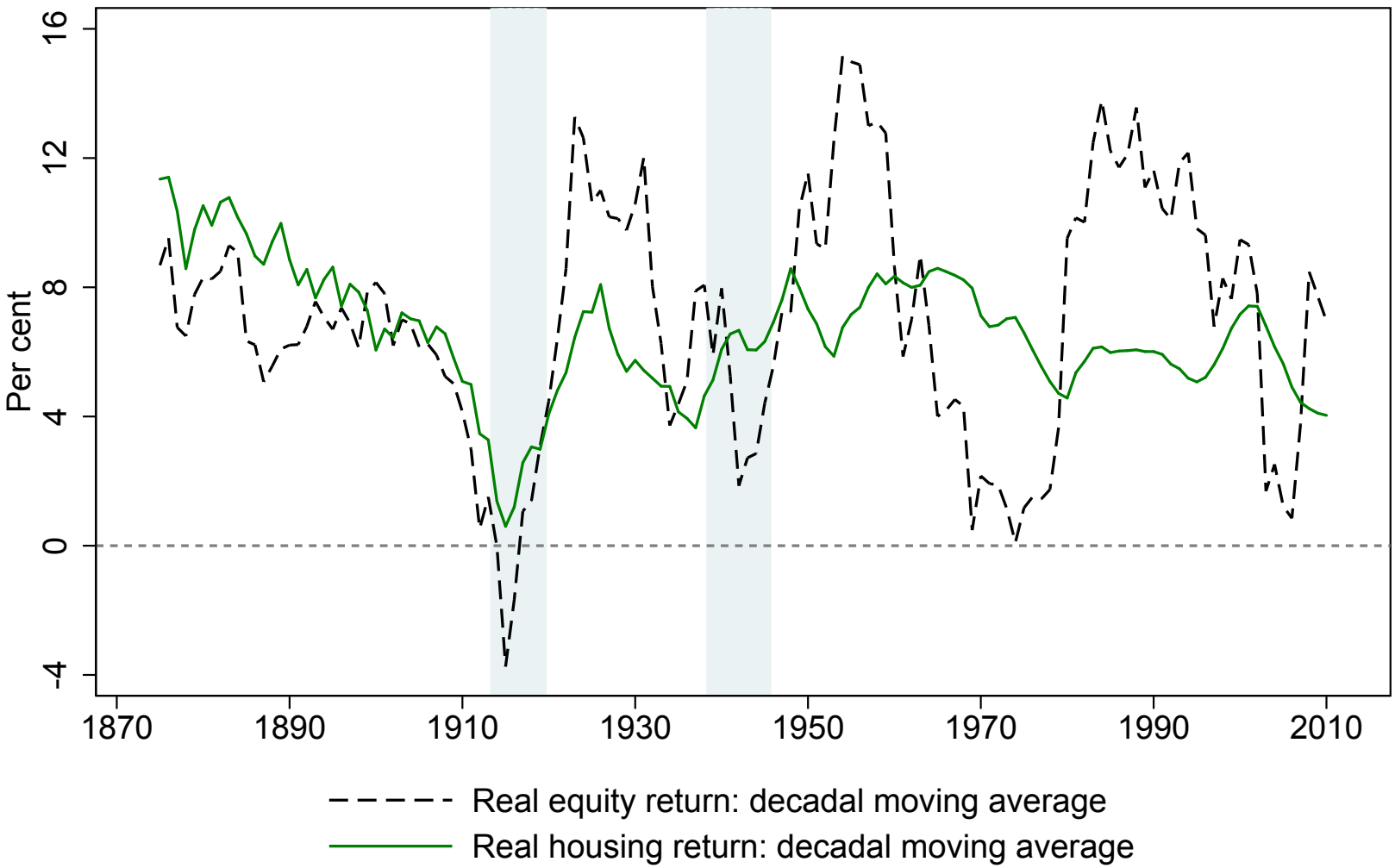
	Bills	Bonds	Equity	Housing
Australia	1.29	2.26	7.75	6.54
Belgium	0.70	2.87	6.78	8.64
Denmark	2.64	3.24	7.20	8.17
Finland	0.08	4.25	**9.98**	**9.58**
France	-0.48	1.44	4.06	7.34
Germany	2.65	4.03	6.85	7.82
Italy	1.37	3.19	7.32	4.77
Japan	0.39	2.18	6.09	6.54
Netherlands	0.78	1.85	7.09	7.28
Norway	0.90	2.29	5.95	8.03
Portugal	-0.48	1.37	4.37	6.31
Spain	-0.03	1.39	5.93	5.09
Sweden	1.56	3.14	7.98	8.30
Switzerland	0.81	2.33	6.90	5.77
UK	1.15	1.96	7.20	5.36
USA	**1.45**	**2.26**	**8.39**	**6.03**
Average, unweighted	1.15	2.62	6.65	7.32
Average, weighted	1.26	2.49	7.11	6.75

Decomposition of returns

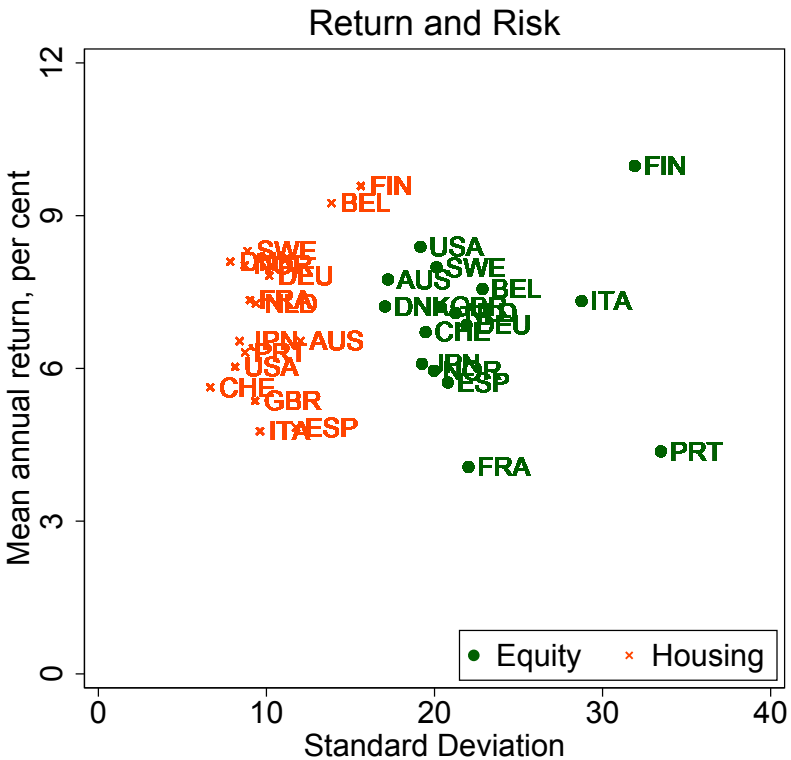
	Housing		Equity	
	All countries	U.S.	All countries	U.S.
Yield	5.5	5.3	4.2	4.4
Real capital gain	1.5	0.7	2.7	4.0
Total return	7.0	6.0	6.9	8.4

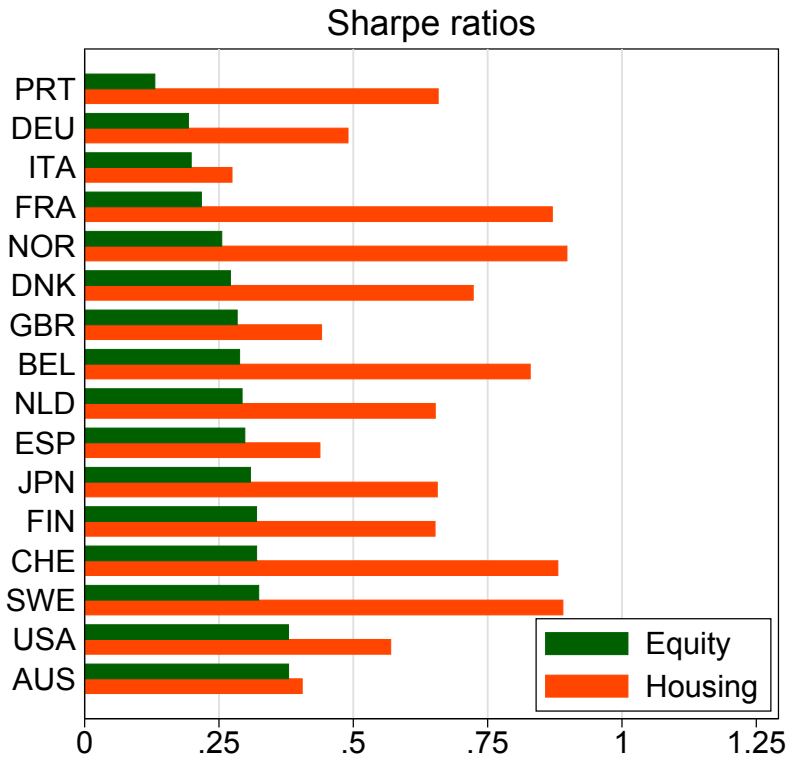
Note: annual returns, pooled over countries.

Returns on equities versus housing



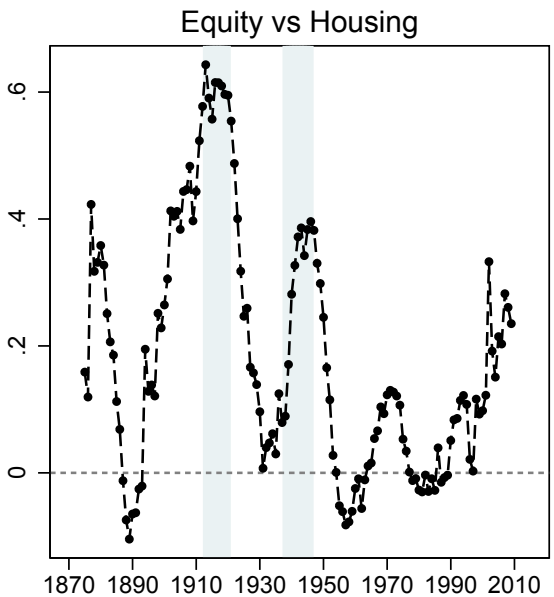
Risk and return of equities and housing

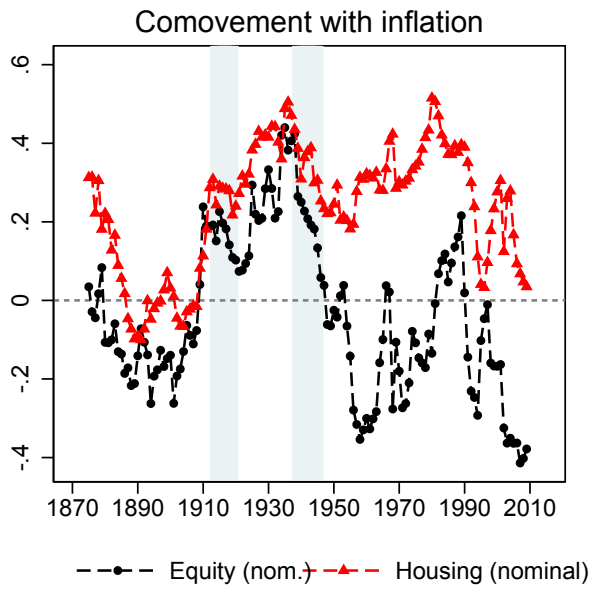


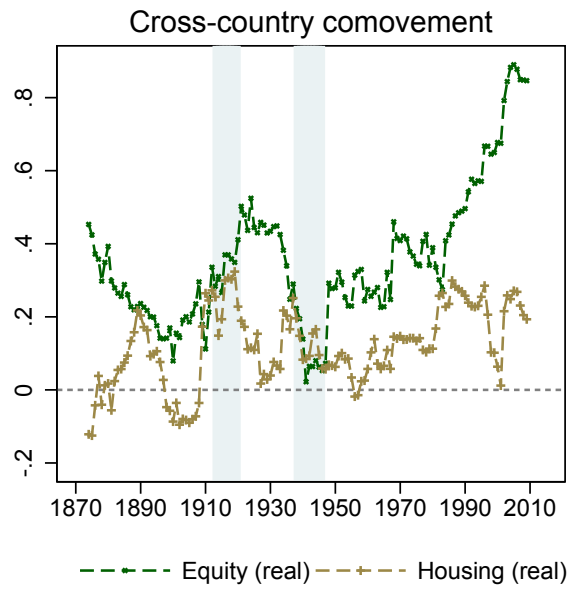


Returns on equities versus housing

Correlations







$$Corr_{i,t} = \frac{\sum_j \sum_{k \neq j} Corr(r_{i,j,t \in T}, r_{i,k,t \in T})}{\sum_j \sum_{k \neq j} 1}$$

for asset i, $T = (t-5, t+5)$; j and k denote the country pairs

Takeaways

- Returns from just equities (Mehra-Prescott, 1985; Campbell, 2003) to **all risky assets**
- Housing & equity returns $\rightarrow$ avg. 7% real p.a.
- Housing rtns $\approx$ equity rtns, yet less volatile $\rightarrow$ **puzzle**? Diversification harder, local/national vol. in house prices?
- **Low covariance** of equity and housing returns $\rightarrow$ diversification gains
- **International diversification** $\rightarrow$ equity returns increasingly cross-correlated, not housing
- **Capital gain:** housing $\approx 50 - 55\%$; equities $\approx 65 - 70\%$

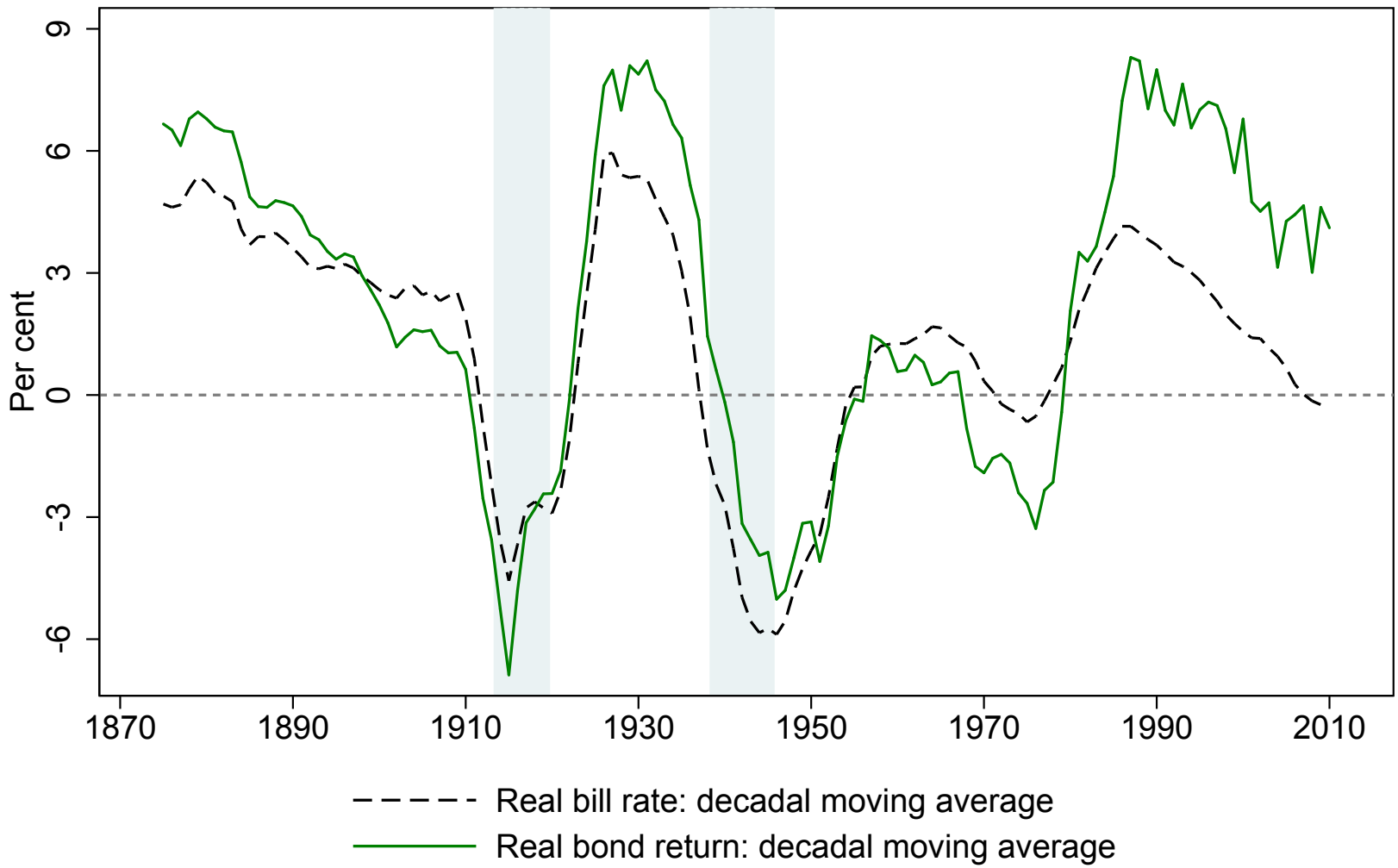
Before this paper, we couldn't quantify these features

Safe rates of return

Safe assets

- **More data:** from about 30 to 145 years
- **Larger swings** in safe returns than risky returns
- **Bigger term premium** since the 1980s
- World wars *very* low safe returns ($\ll 0$), also 1970s inflation/growth crises
- Drop since 1980s $\approx$ decline from 1870 to WW1: why safe return so high in mid-1980s?

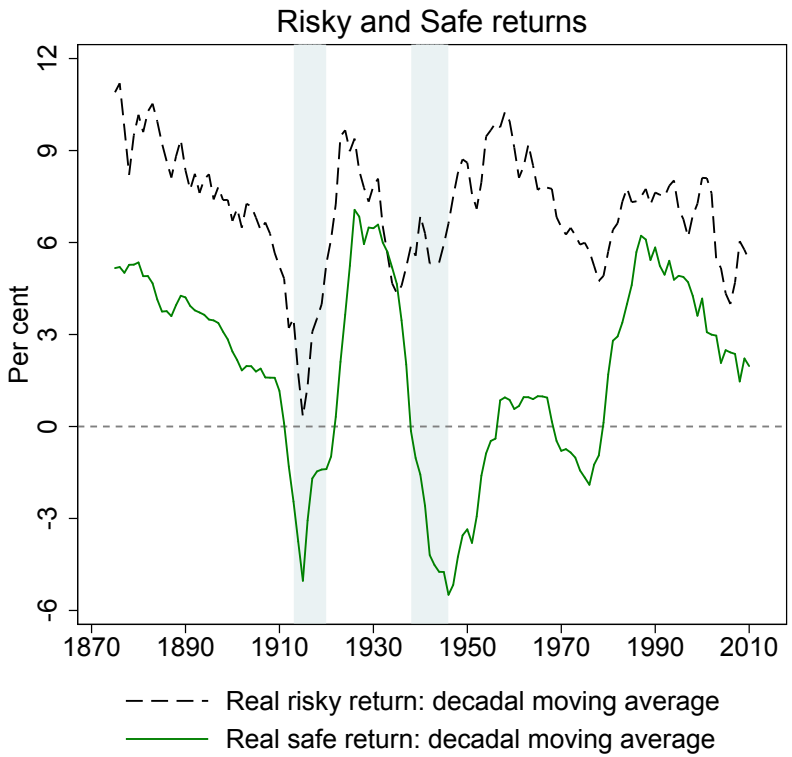
Returns on bills versus bonds

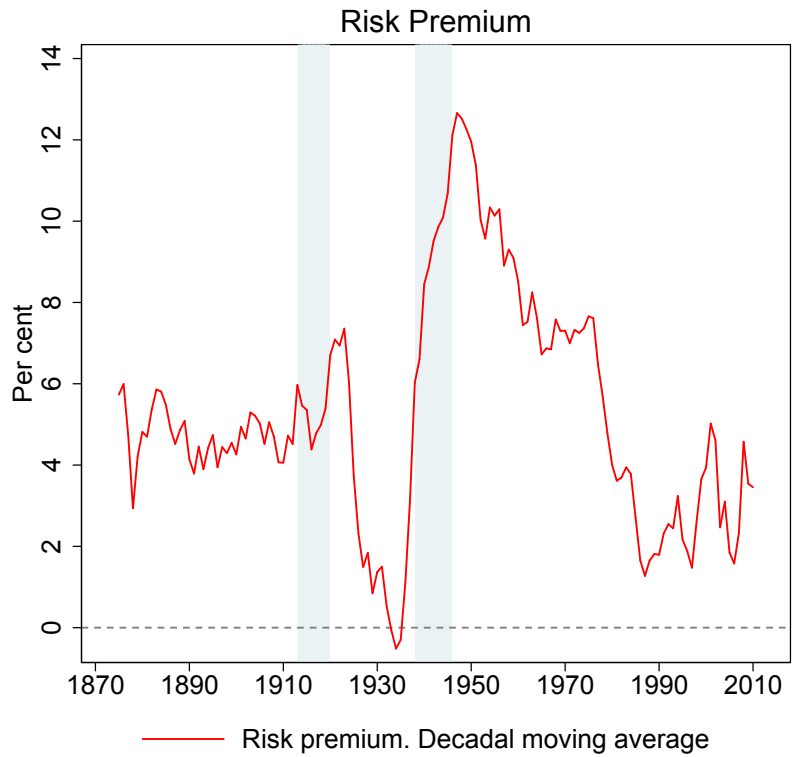


Risk premium

The risk premium, $r_{risky} - r_{safe}$

Cross-country means

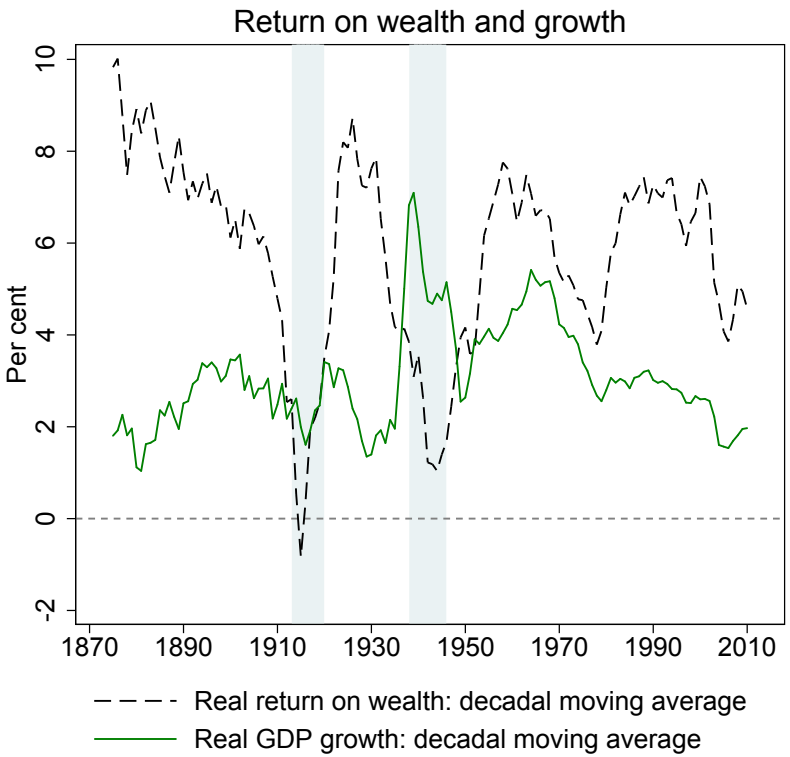


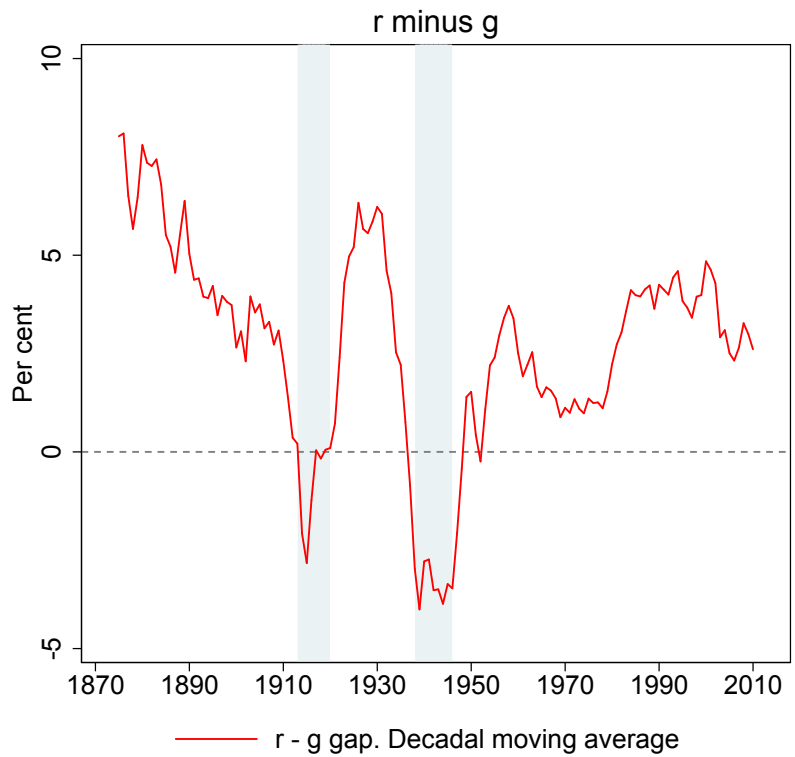


$r > g$

Returns on total wealth and growth

r > *g*





Returns on wealth and growth

Country	Full Sample		Post 1950		Post 1980	
	Return on wealth	GDP growth	Return on wealth	GDP growth	Return on wealth	GDP growth
Australia	5.91	3.58	7.40	3.85	7.55	3.41
Belgium	6.37	2.31	7.27	2.65	6.87	2.12
Denmark	7.50	2.78	7.24	2.59	6.68	1.76
Finland	9.70	3.58	11.84	3.29	11.66	2.40
France	5.01	2.61	8.24	3.37	6.96	2.07
Germany	6.95	2.84	5.25	2.86	4.70	2.49
Italy	5.05	3.81	5.04	3.29	4.95	1.35
Japan	5.58	4.15	6.33	4.17	4.21	2.04
Netherlands	5.27	3.16	6.68	3.20	6.73	2.28
Norway	6.91	3.06	7.62	3.45	9.25	2.79
Portugal	5.76	3.39	5.53	3.48	6.77	2.12
Spain	4.50	3.21	5.37	4.03	5.18	2.55
Sweden	7.40	2.88	8.66	2.86	9.82	2.35
Switzerland	5.67	2.33	6.06	2.68	7.20	1.94
UK	4.70	2.04	5.92	2.50	7.29	2.45
USA	5.91	3.38	5.77	3.32	6.37	2.80
Average, unweighted	**6.28**	**2.87**	6.89	3.25	6.97	2.30
Average, weighted	**5.89**	**3.05**	6.01	3.33	5.98	2.48

Main takeways

1. Housing returns similar to equity returns
2. Safe returns more variable than risky returns
3. Risk premium shows large swings
4. $r \gg g$ across time and countries
5. Cross-country equity returns increasingly correlated, but not housing