Houses Across Time and Space

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The questions

Suppose population and labour productivity grow at a steady rate in an economy.

- Can we expect the price of houses to stabilise relative to incomes?
- When might the house price to income ratio be falling for long periods ..when rising?
- Can we have an ever rising house price to income ratio?
- Does that mean an ever declining owner occupation rate?

No growth in average real house prices from 1870-1945; tripling in the next 70 years – source "Global House Prices 1970-2012", Knoll, Schularick and Stiga, 2014.
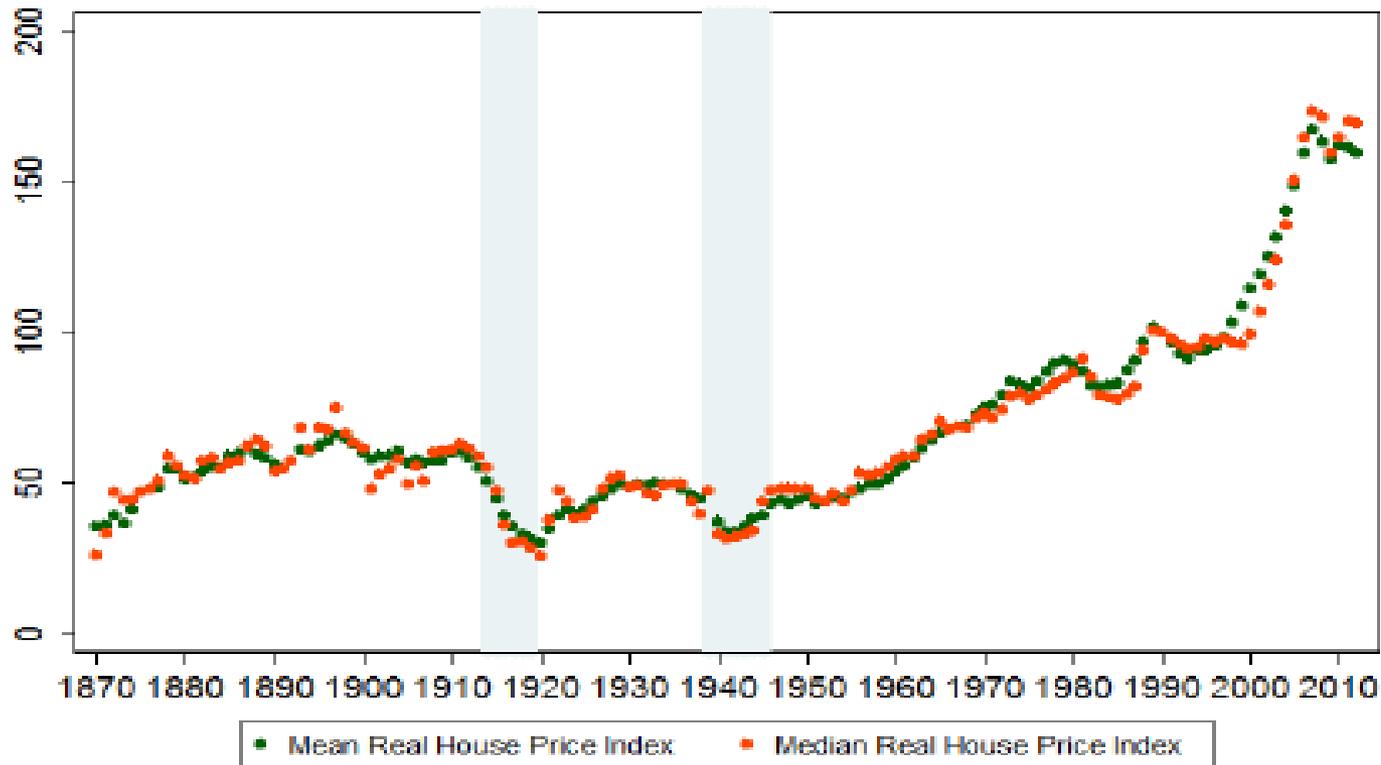
Figure 15: Mean and median real house prices, 14 countries.

We use a framework that combines features of a Ramsey two-sector growth model with a model of the geography of residential development.

The model tracks the change in location of the population over time, and the price of land to residential capital.

This has rarely been tried and never with flexible functional forms that do not impose implausible elasticites by assumtion (eg Cobb Douglas).

Background
Three literatures

- 1. Literature on urban economics and the value of land and the price and location of residential development: classics go back to Alonso (1960), Alonso (1964), Mills (1967), Mills (1972) and Muth (1969); resurgence was triggered by Krugman (1991) and Lucas (2001, 2002). See also Glaeser et al (2004, 2005).
- 2. Macro linkages between housing and wider economy - Deaton and Laroque (2001); Kiyotaki, Michaelides, and Nikolov (2011); Grossmann and Steger (2016).
- 3. Very recent empirical literature on long run patterens of land and housing costs:particularlry Knoll, Schularick, and Steger (2017), and also Jordà, Schularick, and Taylor (2015).

Background

- This paper builds up a picture of the aggregate economy from micro foundations for location choices, land values and the mix of land and capital at different locations.
  Aggregate market clearing generate wages and interest rates; local market clearing generates house and land values as well as densities at all locations.
  So it is micro to macro with a focus on how housing develops over time.

Key elements

- Four factors:
- 1. technology of producing houses – how are land and structures mixed.
- 2. preference for housing versus other goods and preferences for different mixes of land and structure in housing
- 3. the nature of bequests and how wealth is transferred from the old to middle aged and on to the relatively young.
- 4. The speed with which people can travel further distances to get to work

Housing Equilibrium

- The price of material goods (structures) is the same everywhere but land prices fall with distance from the centre
- The rate of decline in land prices depends on λ, which changes (and historically falls) over time.
- The ratio of land use to structure in creating housing varies by location - least land intensive (and most structure intensive) at the centre.
- If a country is large enough it will not use land beyond a certain distance from the centre for housing - that distance changes over time.

General Equilibrium

- Market for land clears at every location
- Market for goods clears
- Household demand for housing matches supply at every location
- Return on investment (net of depreciation) equals the real interets rate
- Agregate saving out of income (output) matches investment in buildings and in productive capital
- Housholds maximise welfare and are rational and forward looking
- The model can generate a balanced growth path under a specific condition: $\dot{\lambda} = -(g + m)/2$
- In this case the developed area in a country grows at the rate of GDP.

Numerical Simulations

Base Case Parameters

Parameter	Value	Notes
θ	0.02	
a	0.85	
b	0.78	
δ_K	0.07	
δ_B	0.02	
g	0.02	
γ	1.5	
α	0.3	
ρ	0.6, 0.9	$\rho < 1$ Ermisch, Findlay,Gibb (1996)
ε	0.5, 0.75	$\varepsilon < 1$ Muth (1971), Thorsnes (1997) and Ahlfeldt, Daniel McMillen (2014)

Table shows what the model generates for key ratios for the balanced
growth path (using US land availability) and the US averages for 1950-60.

	US ratios	Ratios on balanced growth
Real return on capital:	6.5%	6.5%
housing in total consumption :	13.8%	14.1%
Total consumption/GDP :	77%	85%
Gross profits share in GDP :	35.4%	37.8%
Net profit share in GDP	26.8%	26.2%
Value of capital stock to GDP :	180%	197%
residential buildings to GDP :	102%	96%
residential land relative to GDP :	82%	87%
Total wealth to GDP	364%	381%
Total wealth to NDP	413%	452%

Path of House Prices and Rents

- Base case parameters
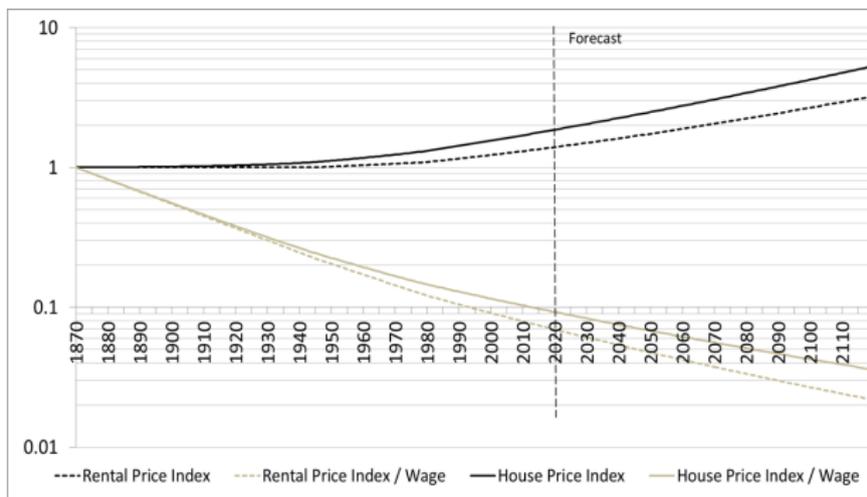- $\varepsilon = 0.5; \rho = 0.6$

Figure: Plot of house prices and rents

Crowded Old Europe

- around $1/10$ per capita land availability of US
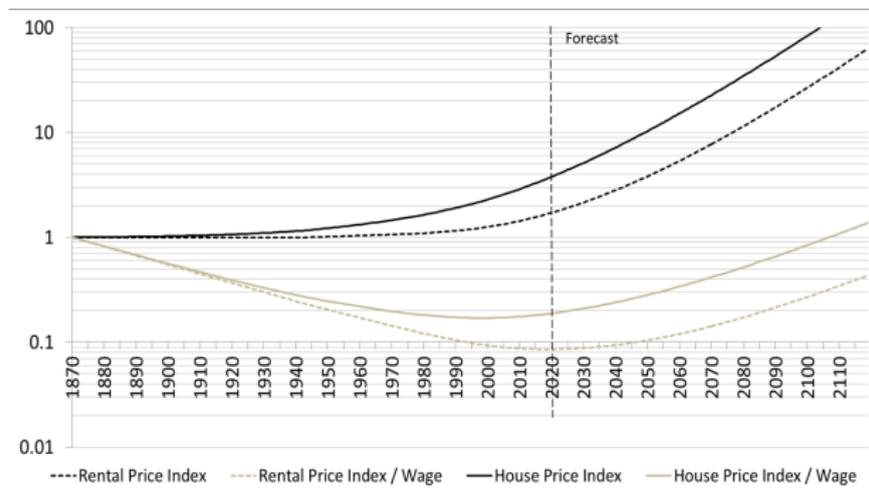- $\epsilon = 0.5; \rho = 0.6$

Figure: Plot of housing prices and rents - US simulation

More substitutability between structure and land

- Crowded old Europe
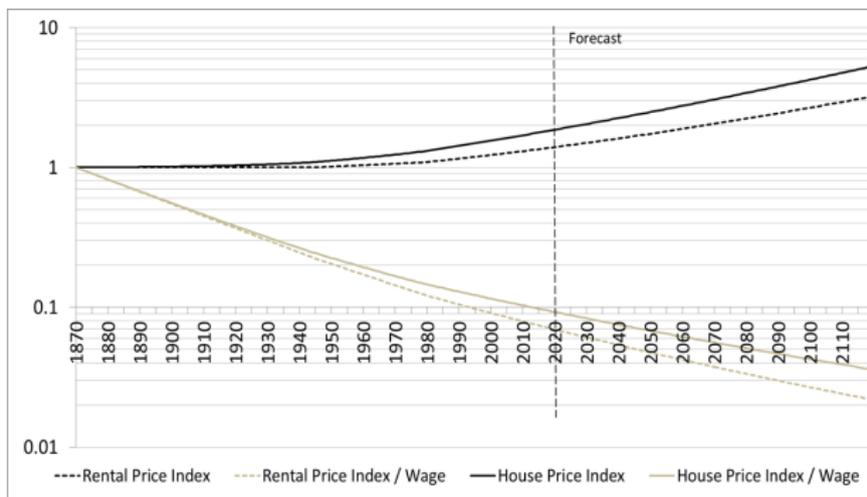- $\epsilon = 0.75; \rho = 0.6$

Figure: Plot of house prices and rents

More substitutability between consumer goods and housing

- Crowded old Europe
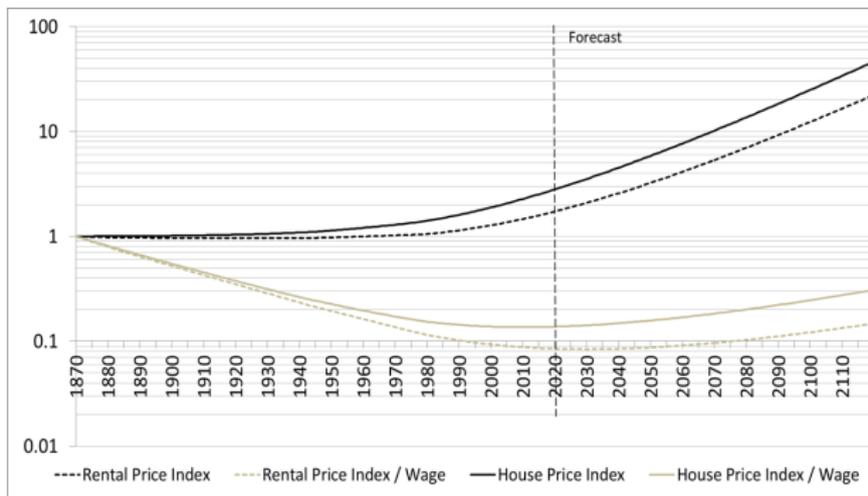- $\epsilon = 0.5; \rho = 0.9$

Figure: Plot of house prices and rents

Conclusions

- We find that plausible parameter estimates plugged into this growth model can easily generate ever rising housing costs — relative to the price of other goods and to incomes.

- That happens once transport improvements fall behind $(g+m)/2$ - something which has happened in many economies after the 1970's.

- But there is great sensitivity of that to parameters that reflect both preferences (between different characteristics of houses) and technology.

- The great sensitivity of the equilibrium (or fundamental) housing cost trajectory to small changes in two key elasticities means it is hard to know whether house prices relative to incomes rising to levels not seen before is the start of a bubble or just the natural path we should expect in a growing economy.

- Using a simple metric like the house price to income ratio relative to its history is unlikely to be a very reliable guide to whether prices are out of line with fundamentals.

Conclusions

Housing over the long term could become increasingly expensive and increasingly rented.

- That would be more likely if:
- A. population and productivity both grow steadily
- B. people are increasingly unwilling to live high in the sky or even underground – which will limit the scope to economise on land use.
- C. people do not substitute much away from spending money on houses and divert it to other consumption as house prices rise.
- D there is no improvement in travel times.
  These conditions probably all hold in the UK. But massive investment in transport infrastructure could mean future price rises can be limited. . . . . . .