Land is back…and it must be taxed

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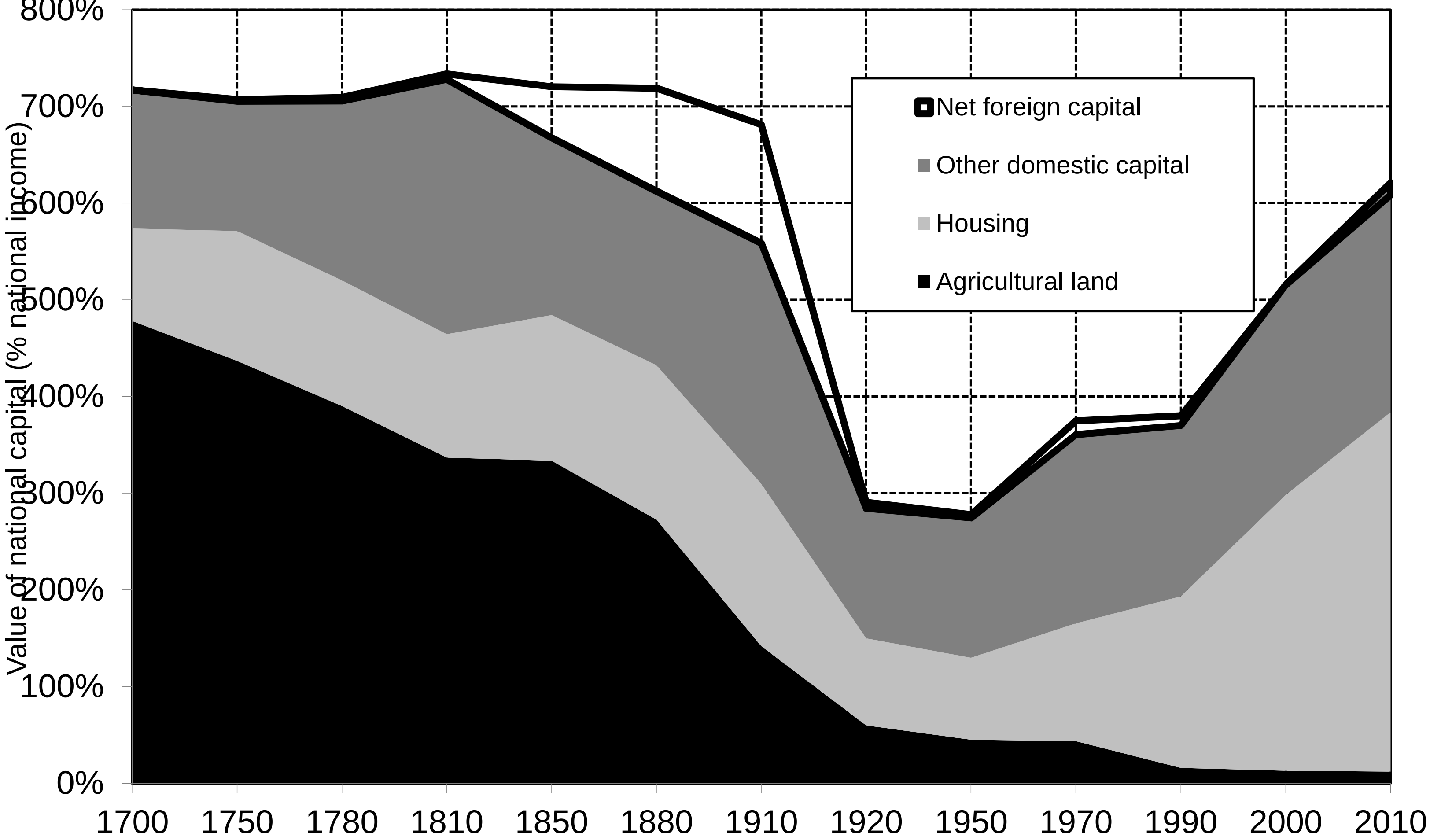
Motivation

- The impetus: "*Capital in the twenty-First Century*"

- Piketty did three things:
  1. From an empirical view point: series about K/Y
  2. From a theoretical view point: exploding accumulation of capital and linkage with growing inequality
  3. From a policy view point: a world tax on capital

Farming Land is over…

Figure 3.2. Capital in France, 1700-2010



National capital is worth almost 7 years of national income in France in 1910 (including 1 invested abroad). Sources and series: see piketty.pse.ens.fr/capital21c.

The importance of land in housing valuation

- House is a bundle combining
  - a reproducible tangible structure
  - a non-reproducible plot of land

- Label “land” : anything that makes a house more valuable than the replacement cost, adjusted for depreciation, of the physical structure.
  - All amenities associated with home’s location

- Building a land price index using *Davis and Heathcote (2007) JME*

The land price index

$$p_t^l l_t = p_t^h h_t - p_t^s s_t.$$

Perpetual inventory method

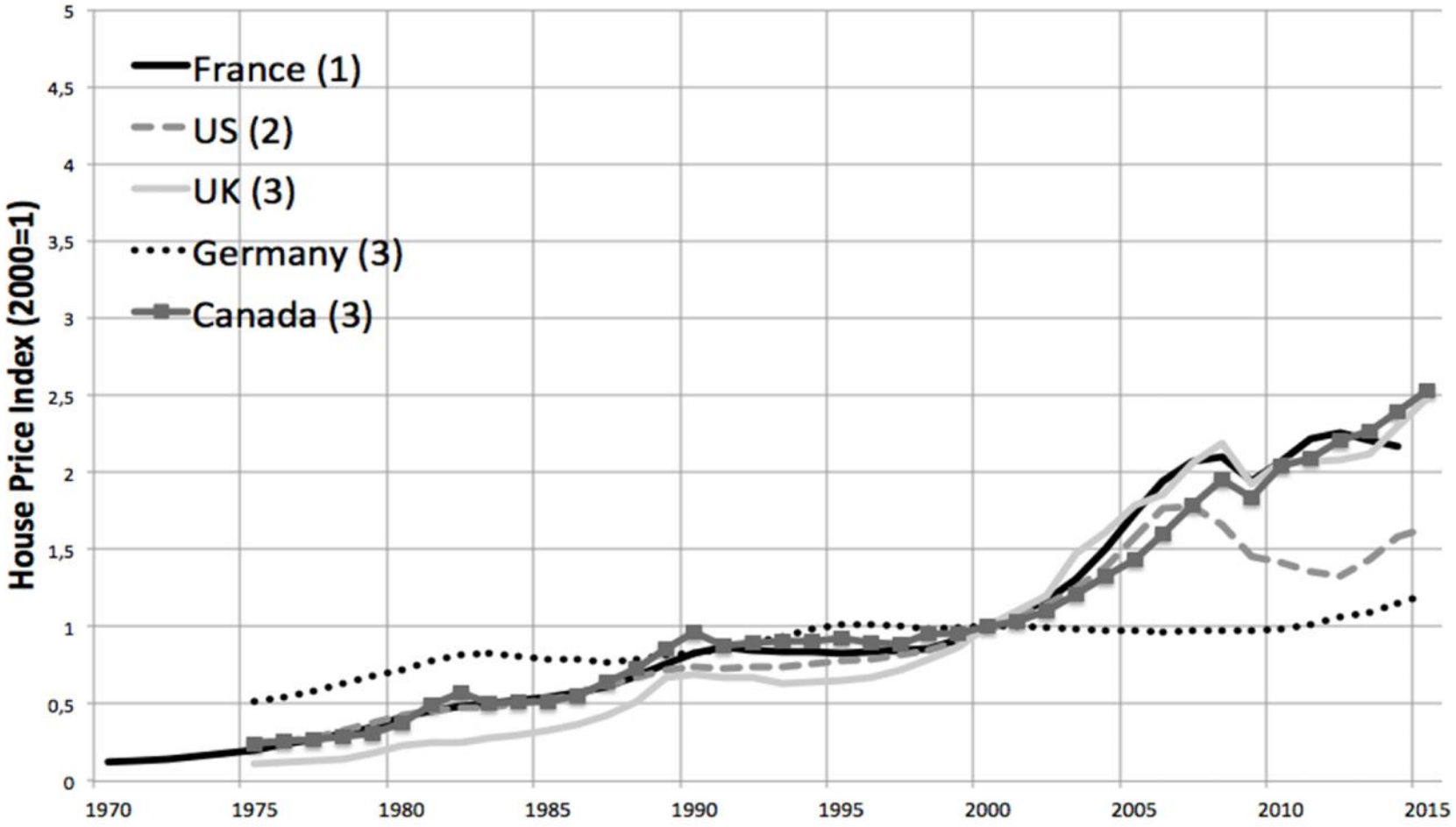
Unknown

$$w_t^l = \frac{p_t^l l_t}{p_t^h h_t} = 1 - \frac{p_t^s s_t}{p_t^h h_t}.$$

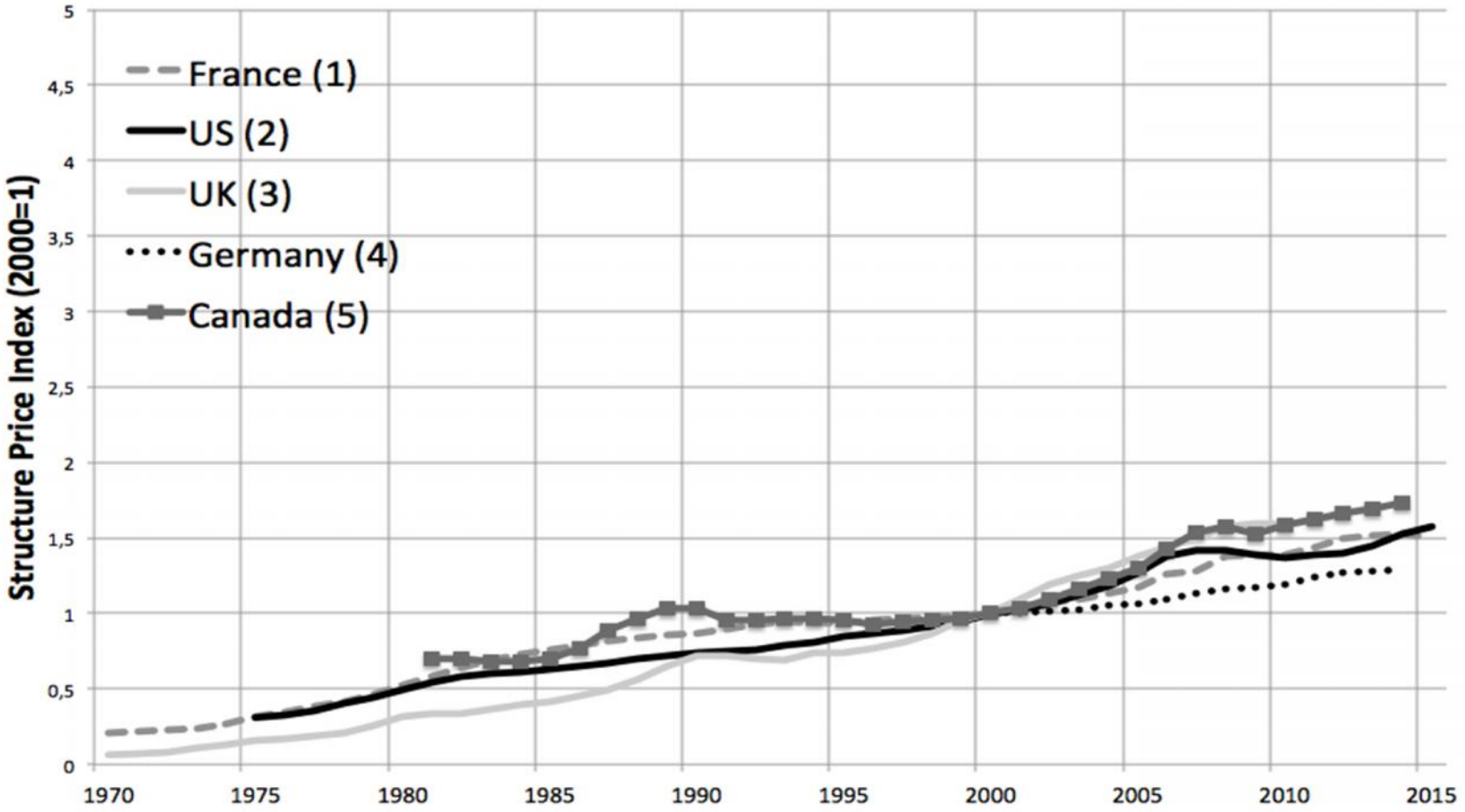
the growth rate of the price of land is

$$\frac{p_{t+1}^l}{p_t^l} = \frac{1}{w_t^l}\left[\frac{p_{t+1}^h}{p_t^h} - (1 - w_t^l)\frac{p_{t+1}^s}{p_t^s}\right].$$

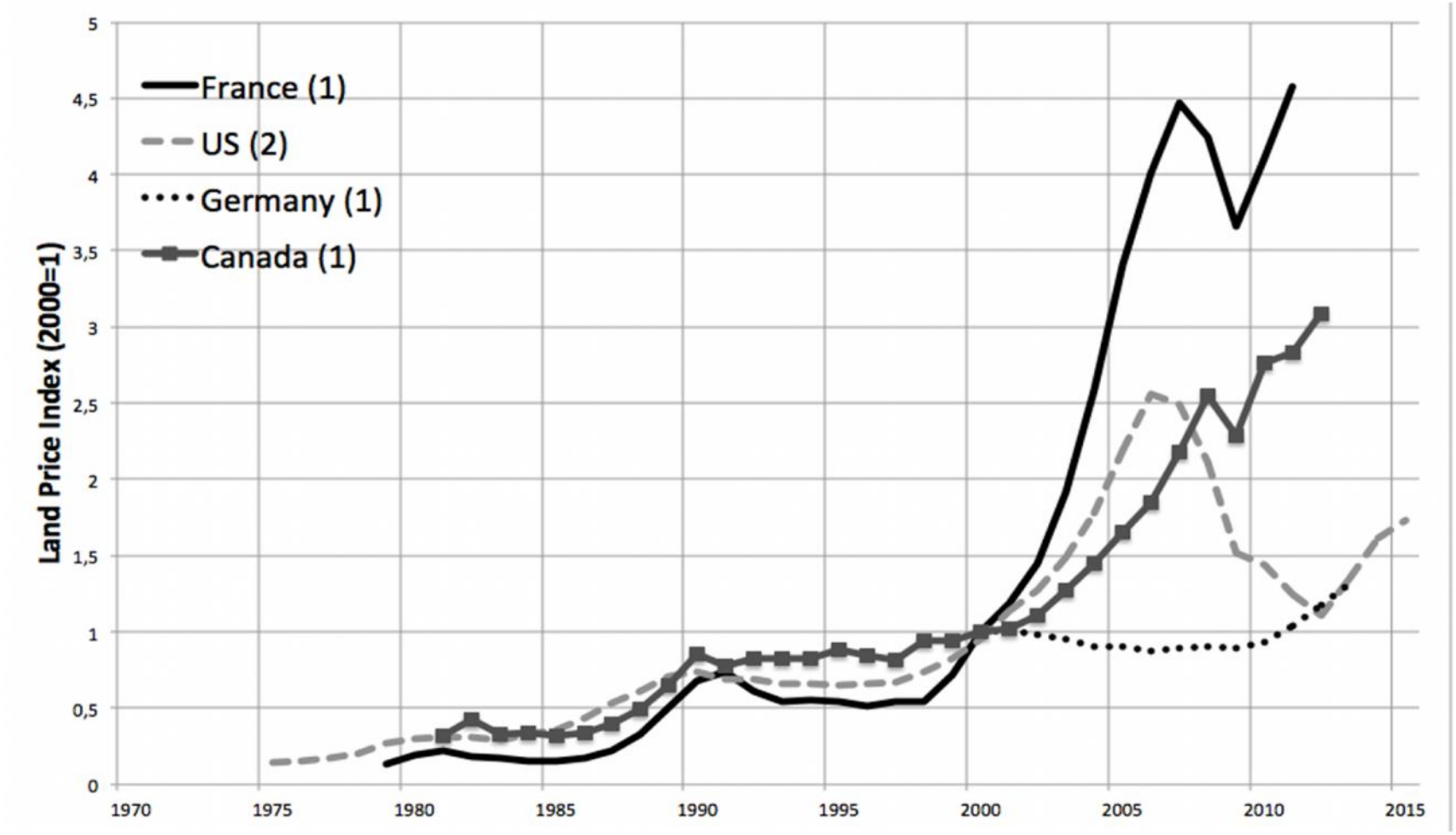
Housing price indices



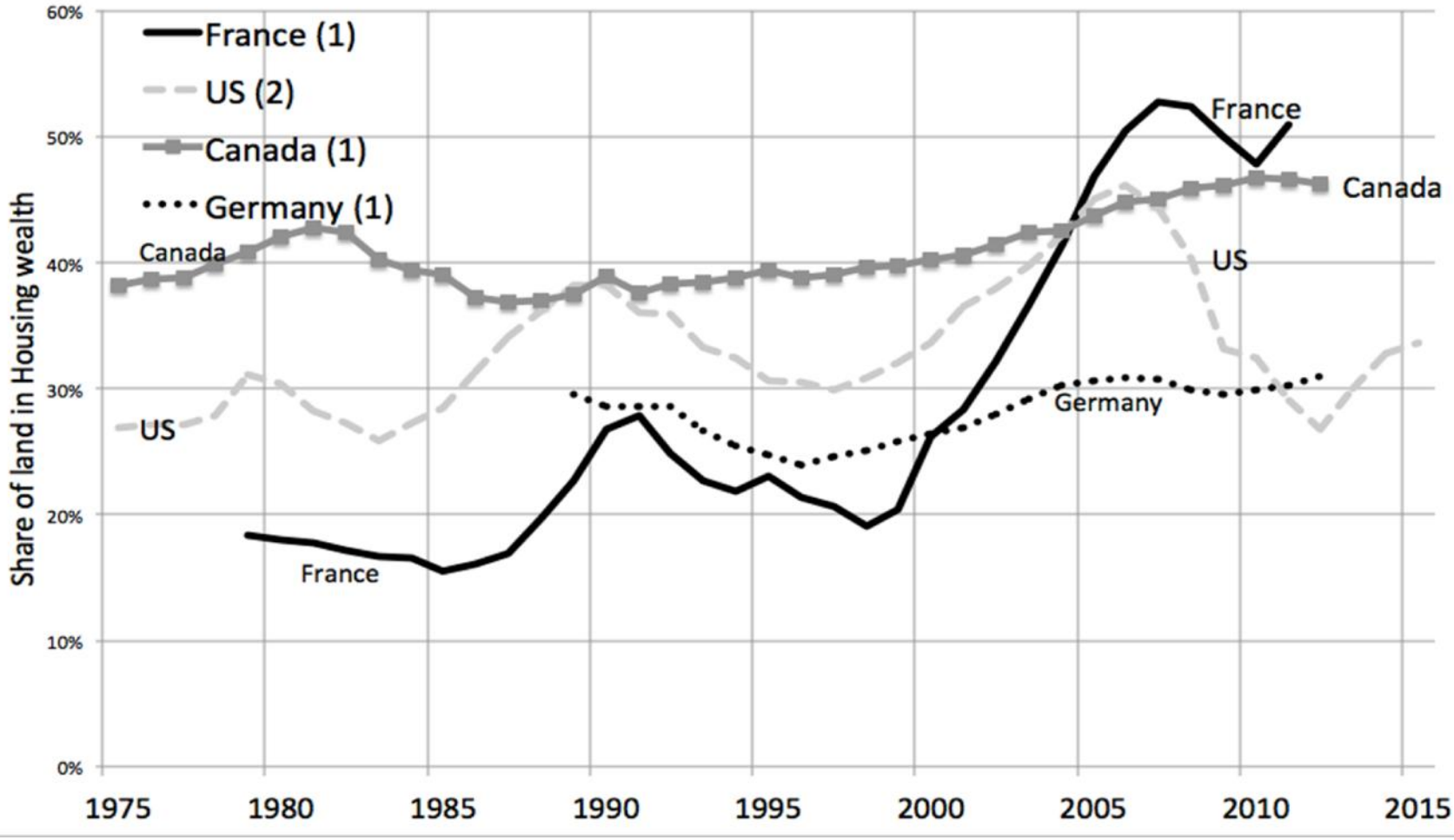
Residential-structure price indices



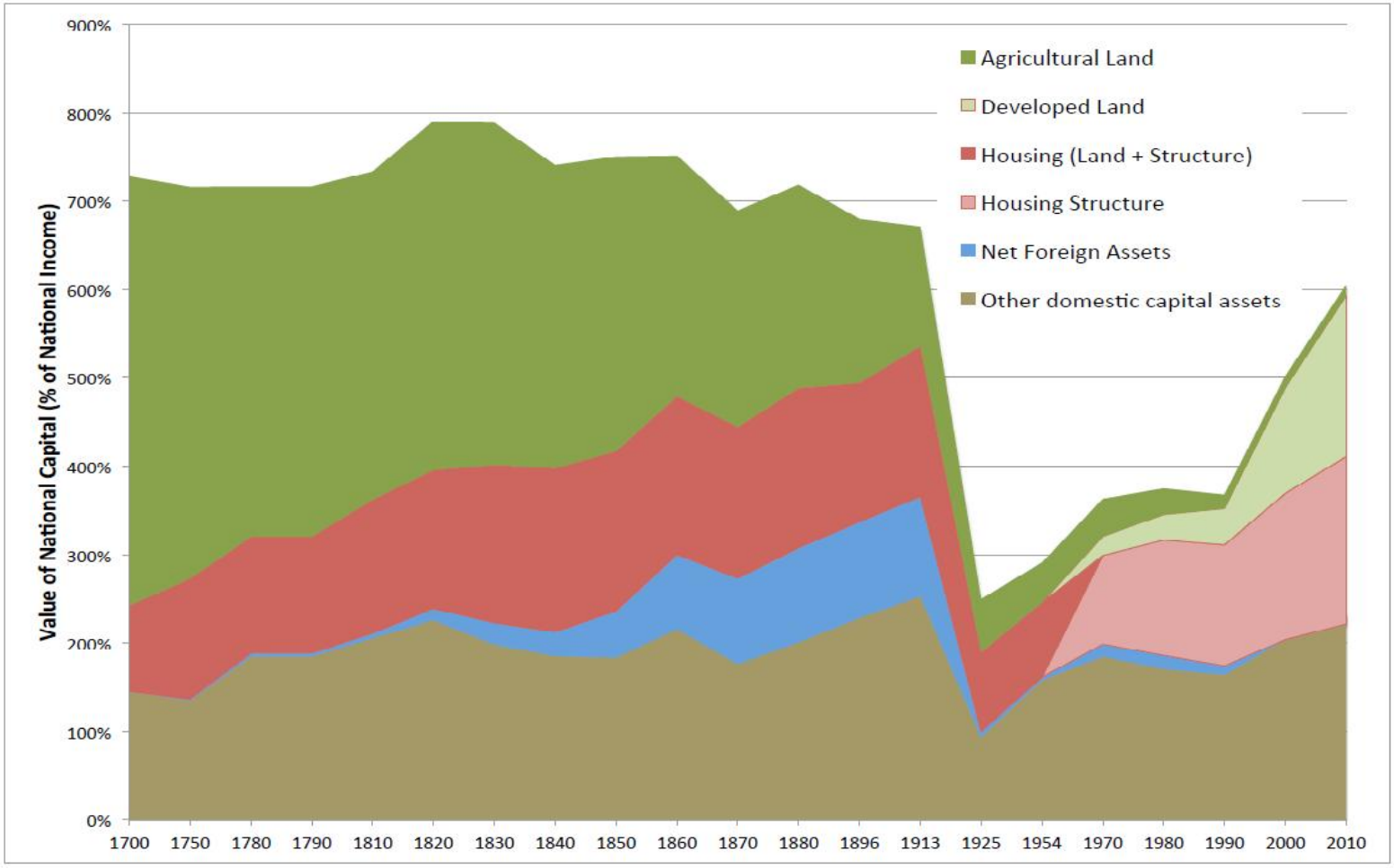
Housing Land prices indices



Share of land in housing capital



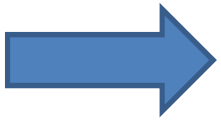
Housing land: main source of divergence of K/Y (France)



Our reading of Piketty

Empirical side

1. The evolution of K/Y is mainly governed by housing
2. The evolution of the market value of housing is mainly driven by land price

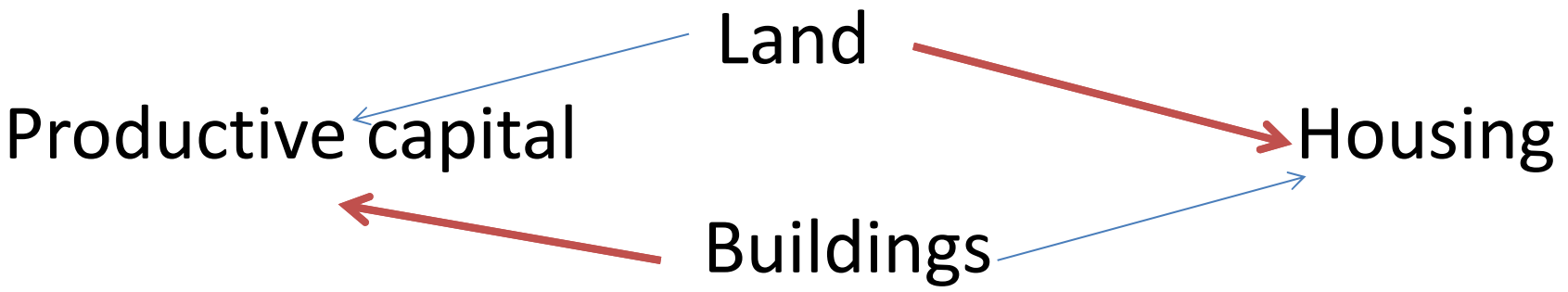


Suppose that we can tax housing land separately from structures.

Taxing housing land as productive capital ?

How to cope with capital heterogeneity in optimal taxation ?

- Structure (buildings) and land are combined both for productive capital and for residential housing



Taxation results

- We extend Judd (1985) to include housing land
- First and second best results
- No reason to tax housing land and capital at the same rate

Literature review

- Urban literature
  - The Henry George Theorem: Arnott & Stiglitz (1979)
  - Macroeconomic extension: Mattauch et al. (2013)

- Public economics
  - Housing tax to alleviate incentive constraint on labor income tax: Cremer and Gahvari (1998)

- OLG: clearly an alternative to Ramsey: the optimal capital income tax is non-zero (Conesa, Kitao and Krueger (2009-AER) (36% US))
  - Nakajima (2010): If owner-occupiers are exempted, the optimal capital income tax is almost zero

- Life-cycle savers and capitalist world (Stiglitz 2015): Land but not housing

Literature review (cont'd)

- The closest model is *Eerola and Maattanen (EM) (2013)* JPET

- EM extends *Chamley (1986)* with residential construct
- Representative agent: no redistribution concern
- Labor supply
- Gvt can issue bonds
- Taxes finance public expenditure

Results obtained by Eerola & Maattanen

- First best setting
  - Tax consumption and housing services at constant rate over time
  - A way to confiscate initial housing and productive capital
- Second best setting
  - Optimal tax treatment depends on the elasticities of substitution between non-housing consumption, housing and leisure
  - Housing taxation used to alleviate distorting effect of taxing labor. (reminiscence of Cremer and Gahvari (1998) in a dynamic setting)

Outline

- Optimal taxation of capital and land: Judd extended

  - Why Judd
  - First best
  - Second best

Why Judd (1985) ?

- Interesting because it borrows from the two Cambridge
- From Cambridge Mass, neoclassical tools
- From Cambridge UK, A 2 social-class model à la Kaldor
  - the capitalists, who own and don't work
  - the workers who work and don't own

Judd's model

- Follow the presentation of *Straub & Werning (2015)*
- Two types of agents, one type of capital, one aggregate consumption good
  - Capitalists optimally choose capital and intertemporally allocate consumption C_t, and capital investment I_t
  - Workers consume their wages $c_t = w_t$
- Capital taxation is not first best, and not even second best.
- Judd = Negative Ramsey result. Still some mathematical pbs

Extension to land use and property

- Two classes: capitalists and landlords vs workers and tenants.
- Benchmark: Housing = Land housing.
- The capitalists own all land $\bar{H}$
- For their housing use, H_t, and they rent the remaining to workers h_t
- Purely redistributive aim of taxation to redistribute welfare from capitalists to workers. (No public expenditure)

Only Colonial South America?

- Housing ownership is widespread in advanced countries
- Let us take France's example
  - 58% of owners, 42% of tenants (20% social housing)
  - One in two deceased person do not leave bequests
- If we discard age, there are almost one in two person who do not have capital

In the model, capitalists and workers are of mass 1

Main features missing: the life-cycle savers and the capitalists of 21st century work!

Model (I)

Capital investment equation:

$$K_{t+1} = K_t(1-\delta) + I_t$$

Utility of capitalists-landowners:

$$\sum_{t=0}^{\infty} \beta^t U(C_t, H_t)$$

Utility of workers-tenants:

$$\sum_{t=0}^{\infty} \beta^t u(c_t, h_t)$$

Model (2)

Ressource constraint of the economy:

$$c_t + C_t + K_{t+1} \leq f(K_t) + (1-\delta)K_t$$

Factor's returns:

$$w_t = f(K_t) - f'(K_t)K_t$$

$$R_t^{K_{gross}} = f'(K_t) + 1 - \delta$$

Tax on capital: $\tau_{Capital,t}$

Net return on capital : $R_t^{Knet} = (1 - \tau_{capital,t})R_t^{K_{gross}}$

Tax rate of the rent: $\tau_{Rent,t}$

Capitalists/landlords program

Maximisation program:

$$\underset{C_t,H_t,K_{t+1}}{\text{Max}} \sum_{t=0}^{\infty} \beta^t U(C_t, H_t)$$

$$s.t. \quad C_t + K_{t+1} = R_t^{K_{gross}}\left(1 - \tau_{Capital,t}\right)K_t + R_t^{H_{gross}}(1 - \tau_{Rent,t})(\bar{H} - H_t)$$

Euler equation:

$$U'_C(C_t, H_t) = \beta R_{t+1}^{K_{gross}}\left(1 - \tau_{Capital,t}\right)U'_C(C_t, H_t)$$

Intra-period allocation:

$$U'_H(C_t, H_t) = R_t^{H_{gross}}\left(1 - \tau_{Rent,t}\right)U'_C(C_t, H_t)$$

Transversality condition: $\beta^t U'_C(C_t, H_t) \to 0$

Workers/tenants program

Worker does not save. Live in h units of rented housing and consume from their wage and of a government transfer T

Maximization program:

$$\underset{c_t,h_t}{\text{Max}} \sum_{t=0}^{\infty} \beta^t u(c_t, h_t)$$

$$s.t. \quad c_t + h_t R_t^{Hgross} = w_t + T_t$$

FOC:

$$u'_h(c_t, h_t) = R_t^{Hgross} u'_c(c_t, h_t)$$

First best setting

- The Gvt is able to commit to future tax policies
- In a model without land, we already know that the first best can be implemented through
  - Constant tax on consumption for all periods (*Coleman (2000) JpubE*) or
  - Tax on capital with tax credit = tax rate (*Abel (2007 JPubE*))
  - Way to tax initial capital
- No restrictions on instruments
  - Tax on land
  - Tax on rents including imputed rents

Program of the social planner

$$\underset{c_t, C_t, H_t, K_{t+1}}{\text{Max}} \sum_{t=0}^{\infty} \beta^t [u(c_t, \bar{H} - H_t) + \gamma U(C_t, H_t)]$$

$$s.t. \qquad c_t + C_t + K_{t+1} = f(K_t) + (1-\delta)K_t$$

$$\gamma U'_C(C_t, H_t) = u'_c(c_t, \bar{H} - H_t) = \lambda_t$$

$$\gamma U'_H(C_t, H_t) = u'_h(c_t, \bar{H} - H_t)$$

$$\lambda_t / \lambda_{t+1} = \beta(f'(K_{t+1}) + 1 - \delta))$$

At the steady state: $R^{Kgross} = \frac{1}{\beta}$

Results

- A tax on land or a tax on rents including imputed rents decentralizes the first best

- Taxation of capital or rents are not first-best optimal

Extensions

- Residential structure without housing land
  - Not optimal to tax residential structure investment or rents.

- "Tied taxation" housing: Land + residential structure taxed at the same rate.
  - No more optimal to tax bundling housing

- Productive land
  - Should be taxed at the same rate as residential land

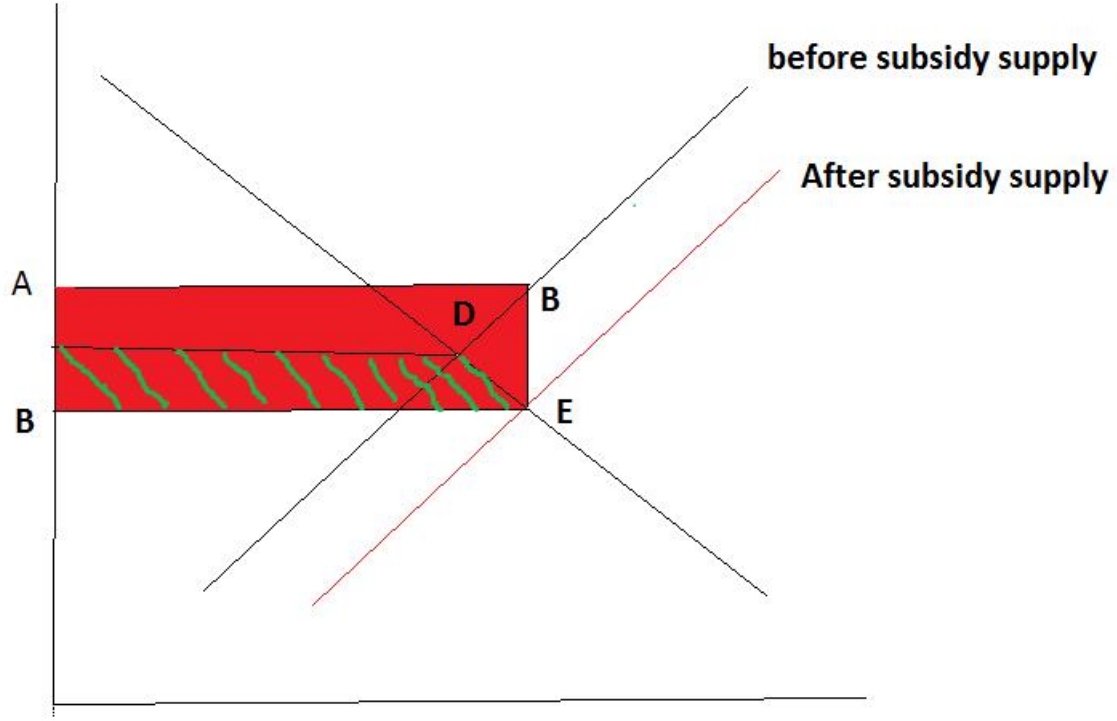
Second best setting

- The set of available distortionary tax instruments is given and the optimal tax system within this set is explored
- Not possible to confiscate initial capital
- Three constraints on land tax instruments
  - No land register
    - Only 50 countries have one (over 200) (*Van der Molen et Al 2014*)
  - The most hated tax: in the US (Cabral-Hoxby (2012)), among the Swedes (Hammar and al.(2008))
    - Cap on the property tax as in California proposition 13 (June 6, 1978).
  - Not possible any more to tax imputed rent
    - Likely because ownership becomes widespread (up to 1963 in France)

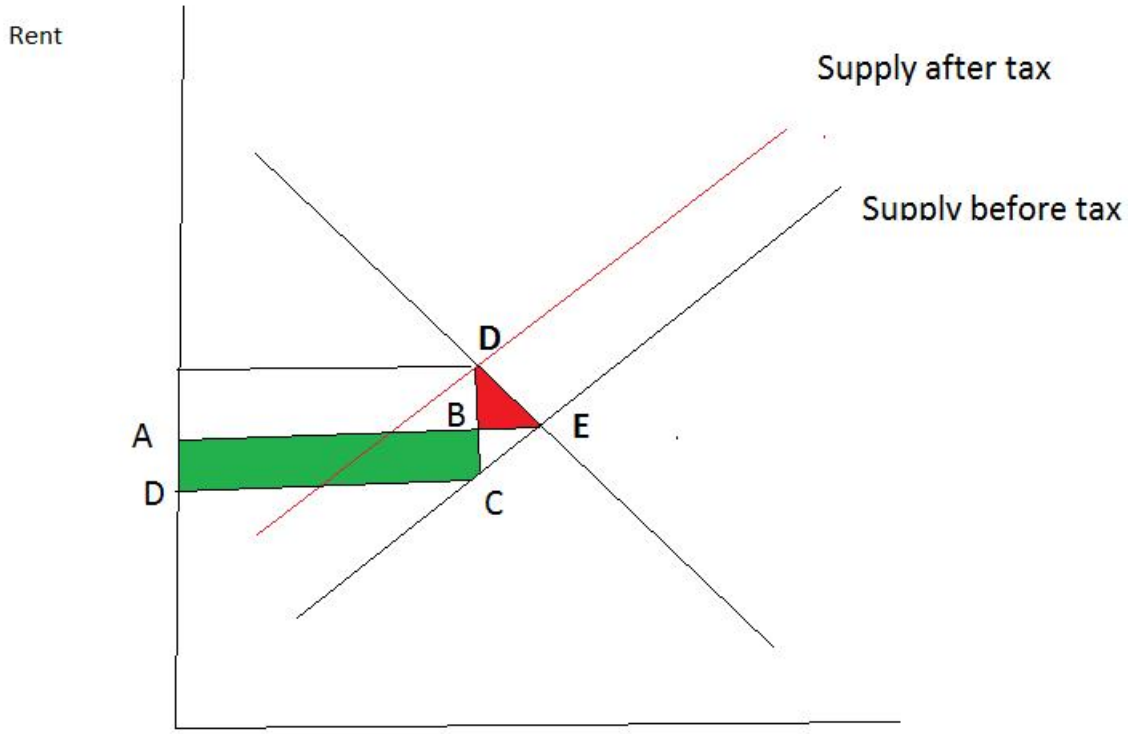
Ramsey problem

- Tax on "new" capital vs tax on housing rents
  - Gvt finances redistribution by a flat tax either on rents or capital
- Maximize social welfare under constraints
- Resource constraint of the economy for each period
- FOC of the capitalist (Euler, intraperiod allocation between consumption and housing, transversality)
- FOC of the worker

Housing Subsidy financed by a lump sum tax tenants not in the interest of the tenant



But a lump sum benefit financed by a rent tax may be in the interest of the tenant



Without Housing: Planner Program

$$\underset{c_t, C_t, K_{t+1}}{\text{Max}} \sum_{t=0}^{\infty} \beta^t [u(c_t) + \gamma U(C_t)]$$

$$c_t + C_t + K_{t+1} = f(K_t) + (1-\delta)K_t \quad \text{Multiplier } \lambda$$

$$\beta U'(C_t)(C_t + K_{t+1}) - U'(C_{t-1})K_t \quad \text{Multiplier } \mu$$

$$\beta^t U'(C_t)K_{t+1} \to 0$$

Statement of Judd's result

- (Version of Straub & Werning (2015))

Theorem:

Suppose quantities and multipliers converge to an interior steady state, i-e, c_t, C_t, K_t converge to positive values and μ_t converges. Then the tax on capital is zero in the limit.

Completing Judd's statement

We define

$$\frac{\gamma U'(C)}{u'(c)} = \alpha$$

Deviation from the first best

$$U(C) = \frac{C^{1-\sigma}}{1-\sigma}$$

Proposition:

Suppose quantities converge to an interior steady state. Then, the mutiplier μ_t converge iff $(1-\alpha)(1-\sigma) > 0$. More specifically, if $\alpha < 1$ then the convergence of multipliers occurs iff $\sigma < 1$.

With Housing : the case of separable preferences

$$u(c_t, \bar{H} - H_t) = u_1(c_t) + u_2(h_t)$$

$$U(C_t, H_t) = U_1(C_t) + U_2(H_t)$$

$$u_1(\cdot) = U_1(\cdot) = \frac{x^{1-\sigma}}{1-\sigma}$$

$u_2(\cdot)$ and $U_2(\cdot)$ unspecified

Local result

Proposition

Consider the steady state of the second best optimum when $\alpha < 1$ and $\sigma < 1$ and the tax on capital is zero in the limit. If we consider a small pertubation around the steady state with a small rent tax financing a lump sum benefit to the worker, then social welfare is improving at the margin.

However, we do not know whether a zero tax on capital is still optimal in the limit in the economy with a rent tax as an additional instrument.

The optimization pb with housing

$$\underset{c_t, C_t, H_t, K_{t+1}, \tau_{Rent,t}}{\text{Max}} \sum_{t=0}^{\infty} \beta^t (u(c_t, \bar{H} - H_t) + \gamma U(C_t, H_t))$$

C1 $c_t + C_t + K_{t+1} = f(K_t) + 1 - \delta$ multiplier λ

C2 $\beta U_1'(C_t)\left(C_t + K_{t+1} - R_t^{H_{gross}}(\bar{H} - H_t)\right) - U_1'(C_{t-1})K_t = 0$ multiplier μ

C3 $R_t^{H_{gross}} u_1'(c_t) - u_2'(\bar{H} - H_t) = 0$ multiplier η_1

C4 $R_t^{H_{gross}}(1 - \tau_{Rent,t})U_1'(C_t) - U_2'(H_t) = 0$ multiplier η_2

C5 $\tau_{Rent,t} \cdot \phi = 0$ multiplier $\phi \geq 0$

C5 $\beta^t U_1'(C_t) K_{t+1} \to 0$

Two parameters

$$\alpha = \frac{\gamma U_1'(C_t)}{u_1'(c_t)}$$

$$\alpha_h = \frac{\gamma U_2'(H_t)}{u_2'(h_t)}$$

Deviation from the first best

Main result

Proposition 3 *Assume that the following instruments are available to the decision maker, tax on capital, lump sum benefit to workers, tax on rents. Consider an economy where the preferences of both the capitalist and workers are separable, with a CCRA subadditive utility of consumption. Suppose that quantities converges to an interior steady state and that* $\sigma < 1$; $\alpha < 1$ *and* $\alpha_h < 1$, *then the optimal tax on capital is 0 and the optimal tax on rents is positive in the limit . Consequently the stock of capital in the second best remains equal to the stock of capital in the first best.*

The second best optimal housing rent tax

Proposition: *The optimal rent tax is given by*

$$\frac{\tau*}{1-\tau*} = \frac{1-\alpha}{\epsilon_S}$$

where ϵ_S the supply elasticity of rental housing land wrt to net rent

With CRRA sub-utility of housing $\epsilon_S = 1/\sigma_H$

$$\frac{\tau*}{1-\tau*} = \sigma_H(1-\alpha)$$

Interpretation of the result

- In a static setting, Diamond Mirrlees (1971) shows that it is better not to tax production. Depending on the context, it may be second best optimal to tax consumption.

- In a dynamic setting, not optimal to tax capital because it is productive.

- Housing is a consumption good and under some conditions it can be optimal to tax it.

Extensions

- Simulations

- Two limitations of the results
  - Only at the stationary state
  - When Judd's result is valid

- Extensions of the second best
  - Residential structure,
  - Bundling taxation of land and structure,
  - Productive land

Enlarging the setting

- Two issues not addressed
- No land market
  - The issue of whether to tax market value or return value
- When young, you rent. When old, you own
  - OLG dimension
- + the issue of implementation of a tax on residential land separately from structure