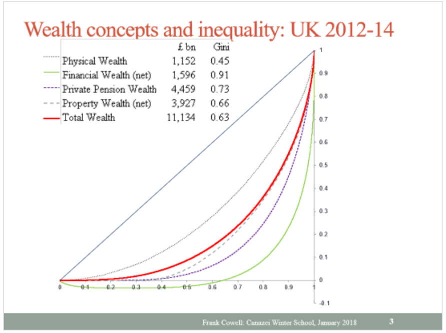
Wealth Inequality and The Taxation of Wealth Transfers

Winter School, Canazei

Frank Cowell, LSE. January 2018

Overview


Wealth concepts and inequality: UK 2012-14
£ bn Gini
Physical Wealth 1,152 0.45
Financial Wealth (net) 1,596 0.91
Private Pension Wealth 4,459 0.73
Property Wealth (net) 3,927 0.66
Total Wealth 11,134 0.63
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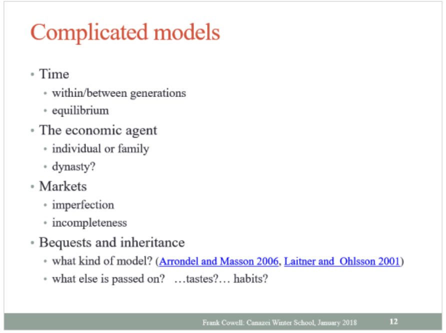
Complicated models
Time
within/between generations
equilibrium
The economic agent
individual or family
dynasty?
Markets
imperfection
incompleteness
Bequests and inheritance
what kind of model? (Arrondel and Masson 2006, Laitner and Ohlsson 2001)
what else is passed on? …tastes?… habits?
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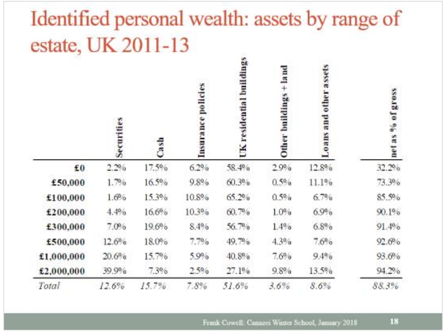
Identified personal wealth: assets by range of estate, UK 2011-13
Securities Cash Insurance policies UK residential buildings Other buildings + land Loans and other assets net as % of gross
£0 2.2% 17.5% 6.2% 58.4% 2.9% 12.8% 32.2%
£50,000 1.7% 16.5% 9.8% 60.3% 0.5% 11.1% 73.3%
£100,000 1.6% 15.3% 10.8% 65.2% 0.5% 6.7% 85.5%
£200,000 4.4% 16.6% 10.3% 60.7% 1.0% 6.9% 90.1%
£300,000 7.0% 19.6% 8.4% 56.7% 1.4% 6.8% 91.4%
£500,000 12.6% 18.0% 7.7% 49.7% 4.3% 7.6% 92.6%
£1,000,000 20.6% 15.7% 5.9% 40.8% 7.6% 9.4% 93.6%
£2,000,000 39.9% 7.3% 2.5% 27.1% 9.8% 13.5% 94.2%
Total 12.6% 15.7% 7.8% 51.6% 3.6% 8.6% 88.3%
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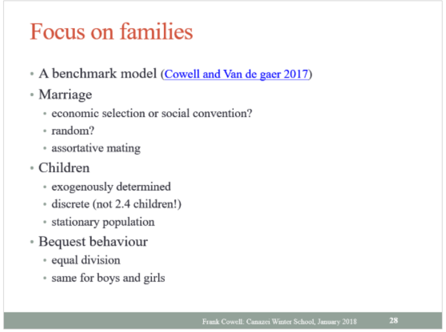
Focus on families
A benchmark model (Cowell and Van de gaer 2017)
Marriage
economic selection or social convention?
random?
assortative mating
Children
exogenously determined
discrete (not 2.4 children!)
stationary population
Bequest behaviour
equal division
same for boys and girls
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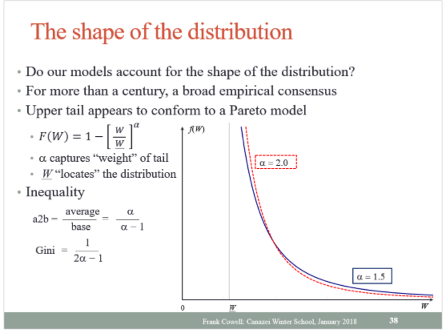
The shape of the distribution
Do our models account for the shape of the distribution?
For more than a century, a broad empirical consensus
Upper tail appears to conform to a Pareto model
F(W) = 1 − [W/W]^α
α captures "weight" of tail
W "locates" the distribution
Inequality
a2b = average/base = α/(α − 1)
Gini = 1/(2α − 1)
α = 2.0
α = 1.5
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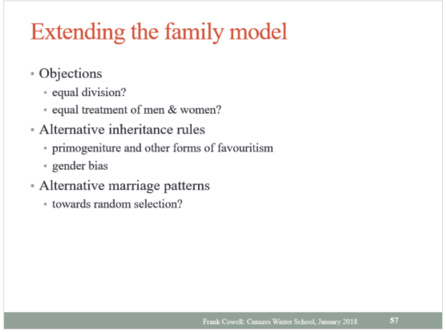
Extending the family model
Objections
equal division?
equal treatment of men & women?
Alternative inheritance rules
primogeniture and other forms of favouritism
gender bias
Alternative marriage patterns
towards random selection?
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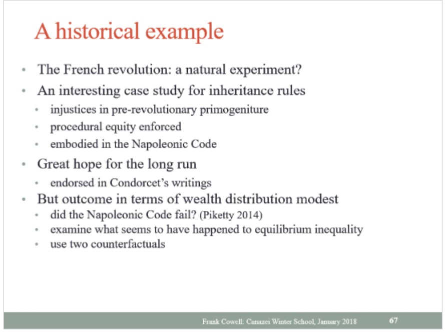
A historical example
The French revolution: a natural experiment?
An interesting case study for inheritance rules
injustices in pre-revolutionary primogeniture
procedural equity enforced
embodied in the Napoleonic Code
Great hope for the long run
endorsed in Condorcet's writings
But outcome in terms of wealth distribution modest
did the Napoleonic Code fail? (Piketty 2014)
examine what seems to have happened to equilibrium inequality
use two counterfactuals
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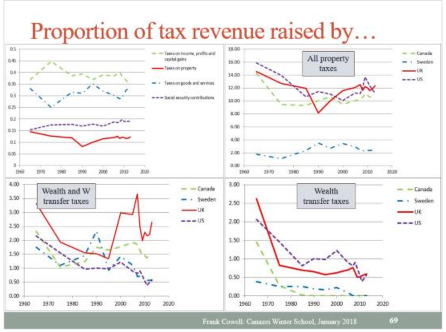
Proportion of tax revenue raised by…
All property taxes
Wealth and W transfer taxes
Wealth transfer taxes
Canada
Sweden
UK
US
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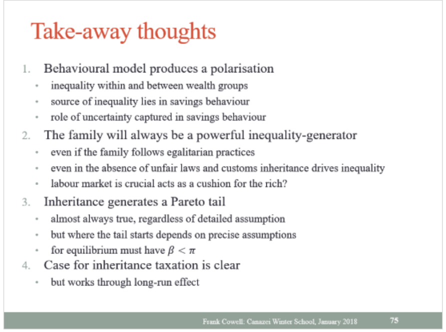
Take-away thoughts
1. Behavioural model produces a polarisation
inequality within and between wealth groups
source of inequality lies in savings behaviour
role of uncertainty captured in savings behaviour
2. The family will always be a powerful inequality-generator
even if the family follows egalitarian practices
even in the absence of unfair laws and customs inheritance drives inequality
labour market is crucial acts as a cushion for the rich?
3. Inheritance generates a Pareto tail
almost always true, regardless of detailed assumptions
but where the tail starts depends on precise assumptions
for equilibrium must have β < π
4. Case for inheritance taxation is clear
but works through long-run effect
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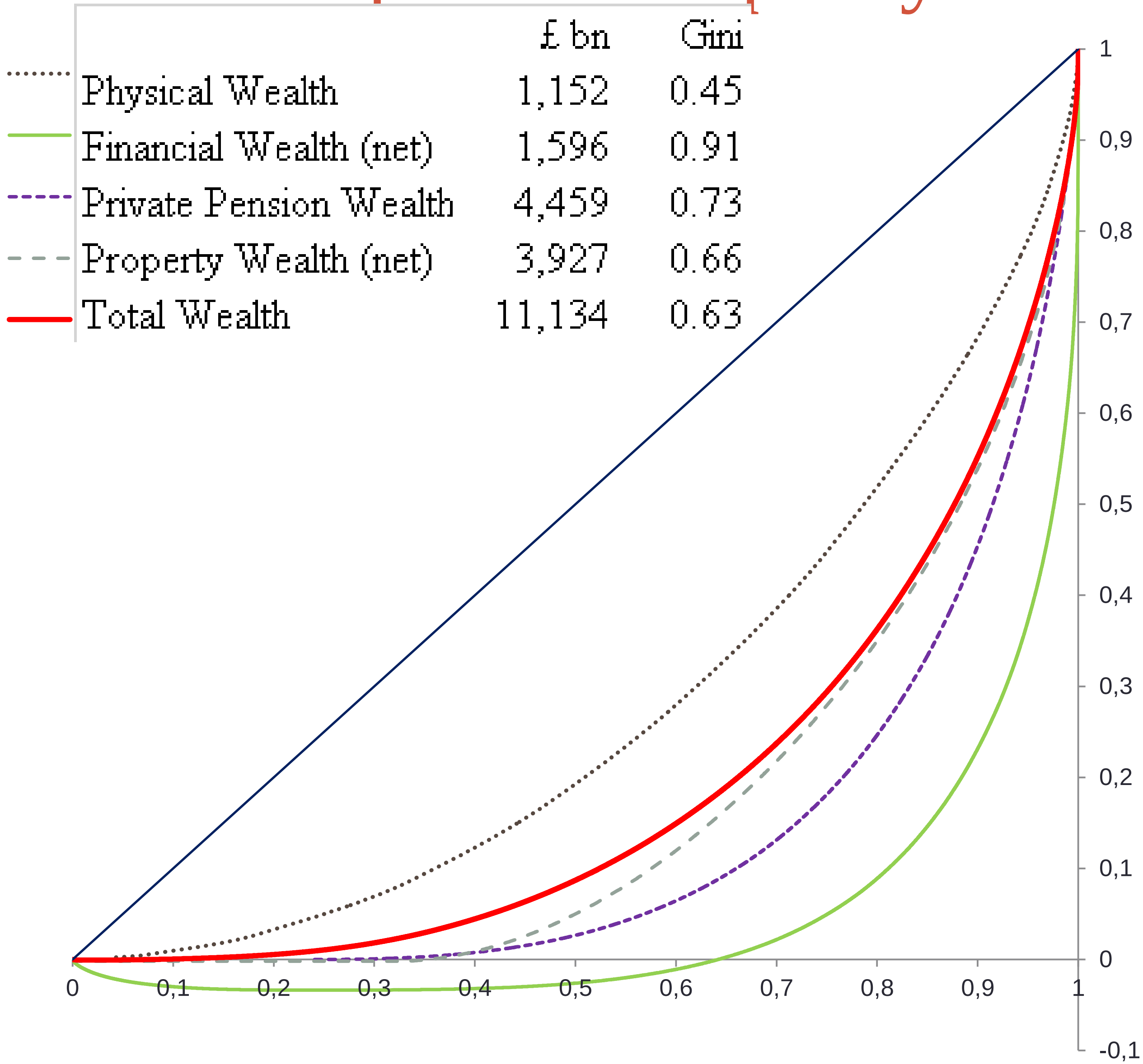
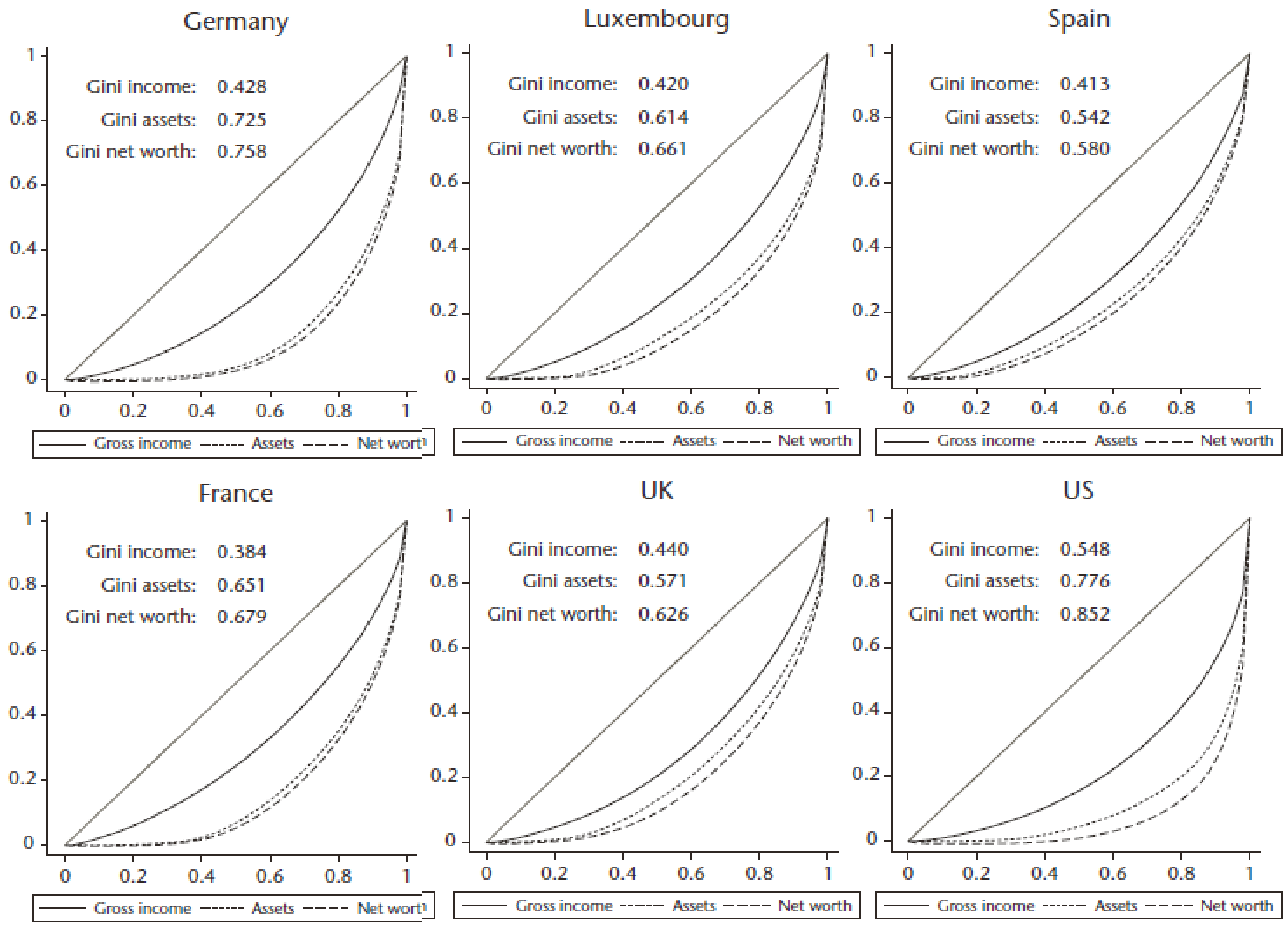
Wealth concepts and inequality: UK 2012-14

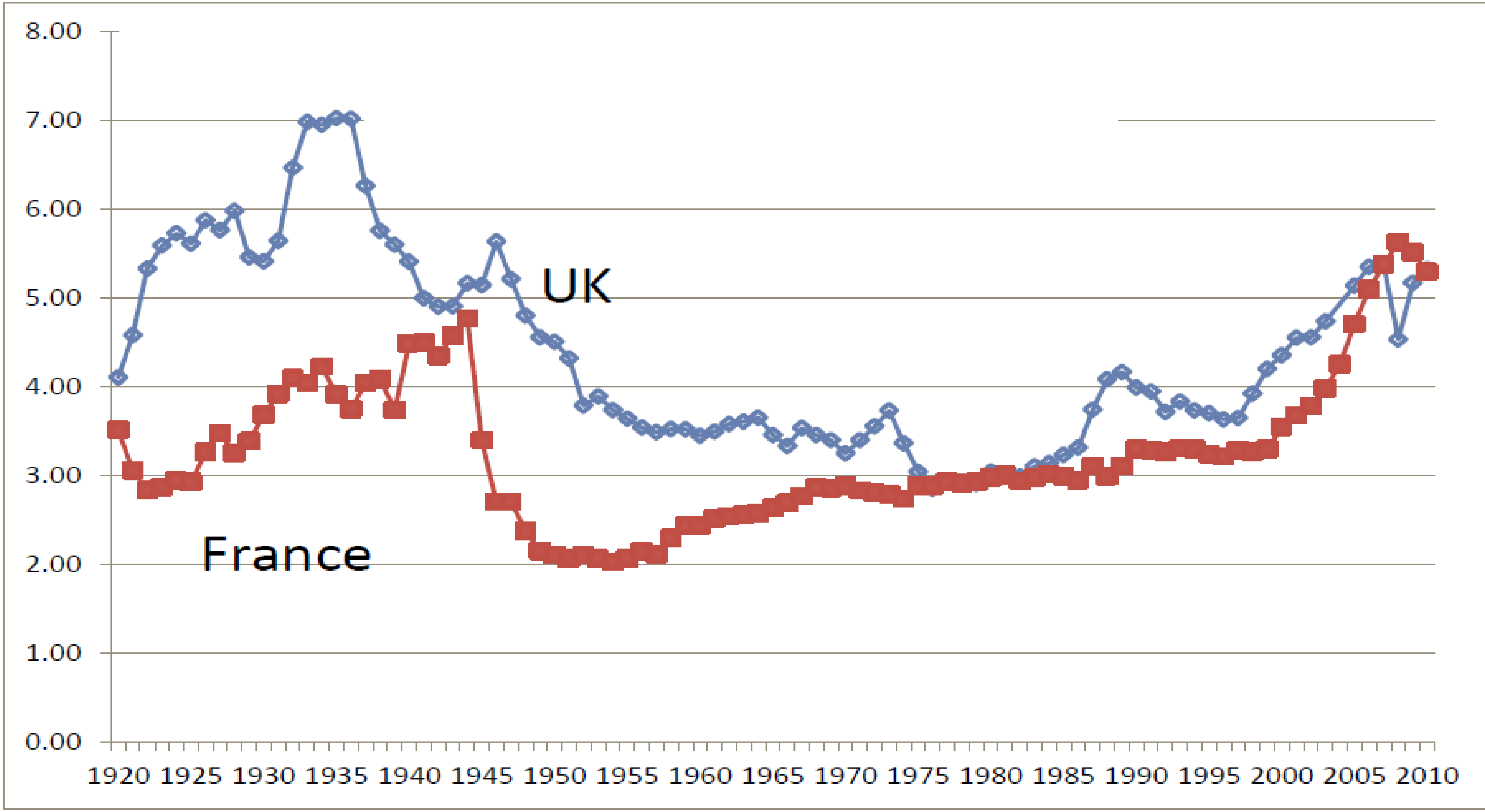


Wealth, Income and inequality



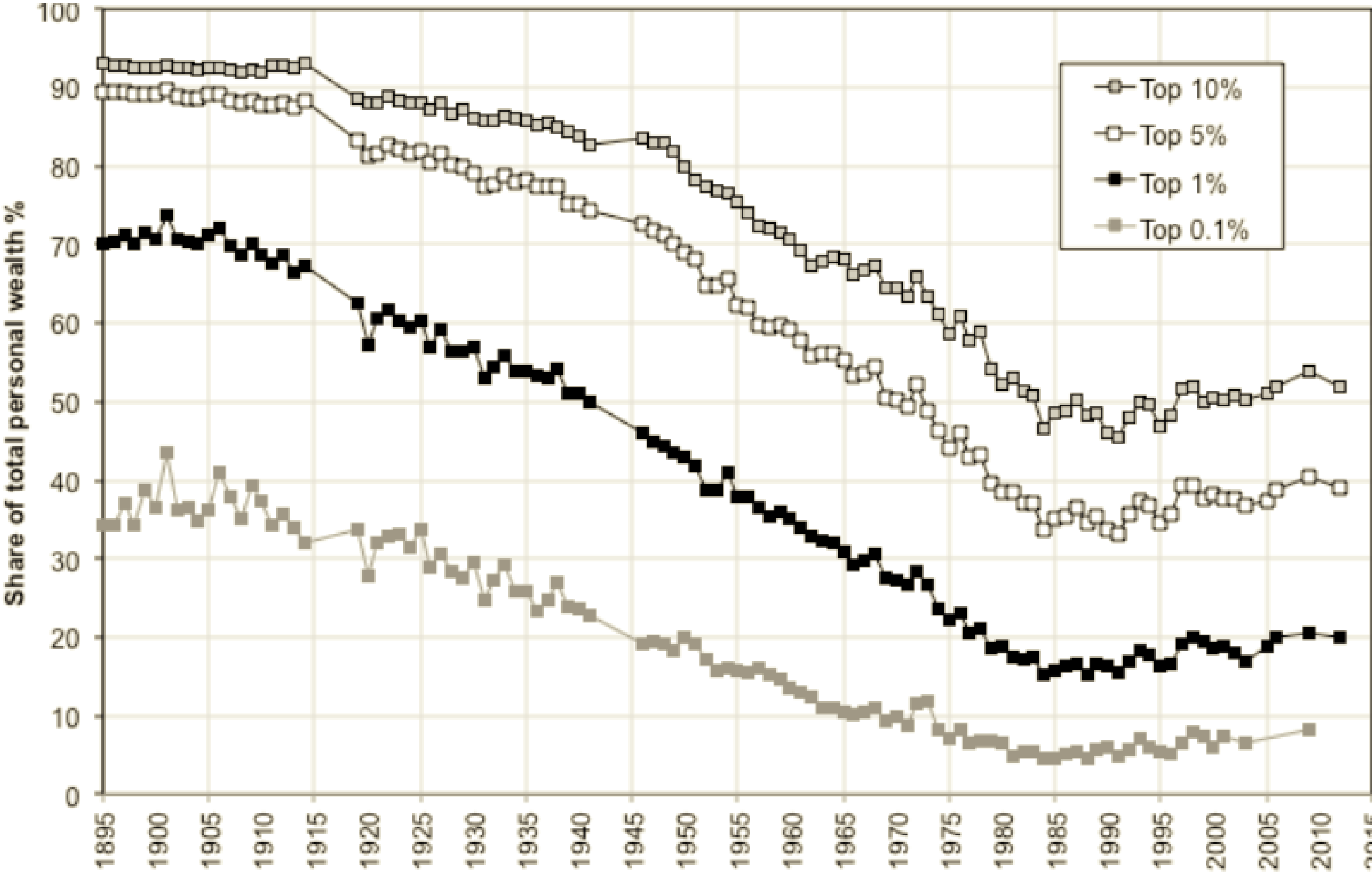
Source: [Cowell et al (2017)]

Ratio of personal wealth to national income France and the UK



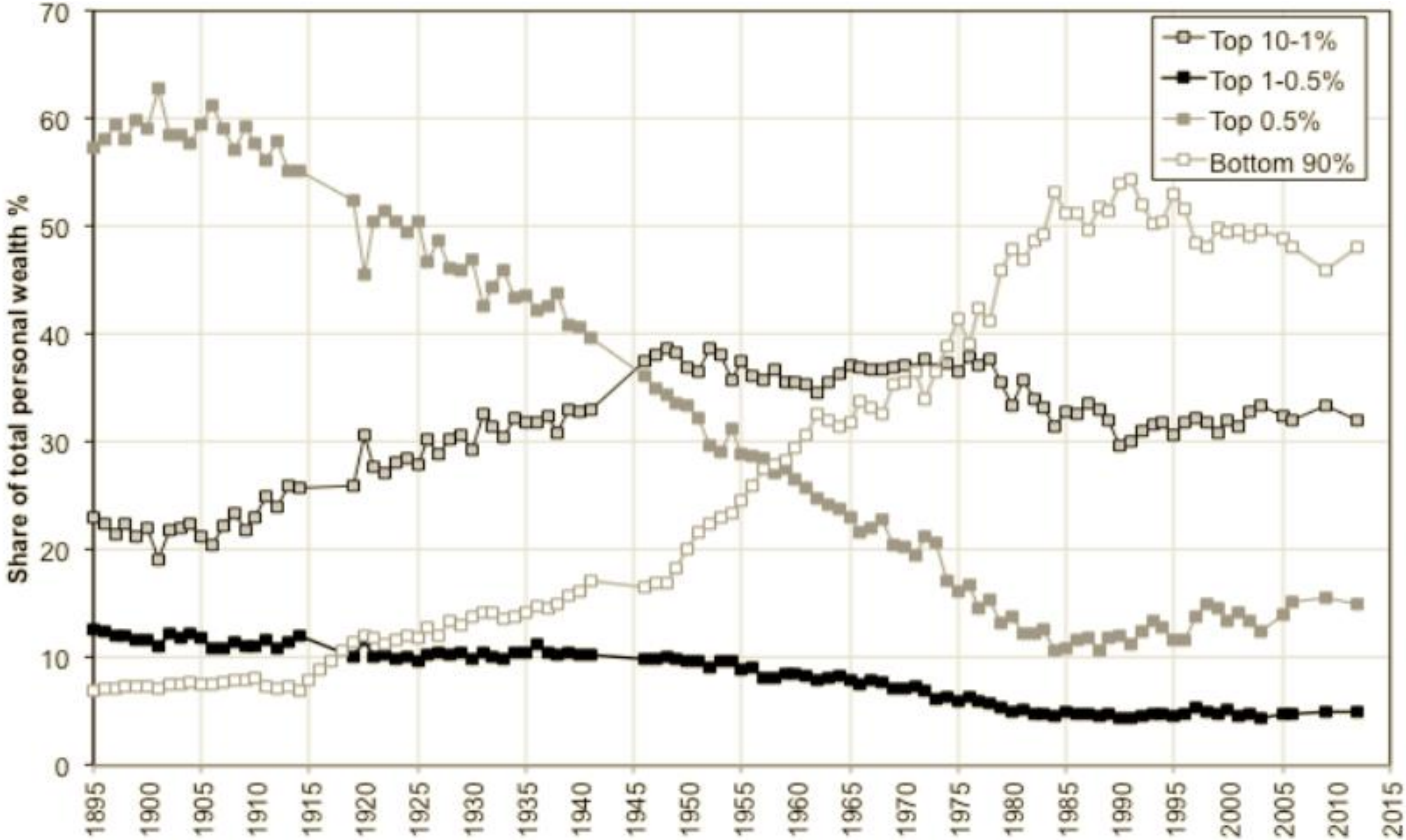
Source: [Atkinson (2018)]

Top wealth shares. UK 1895-2013



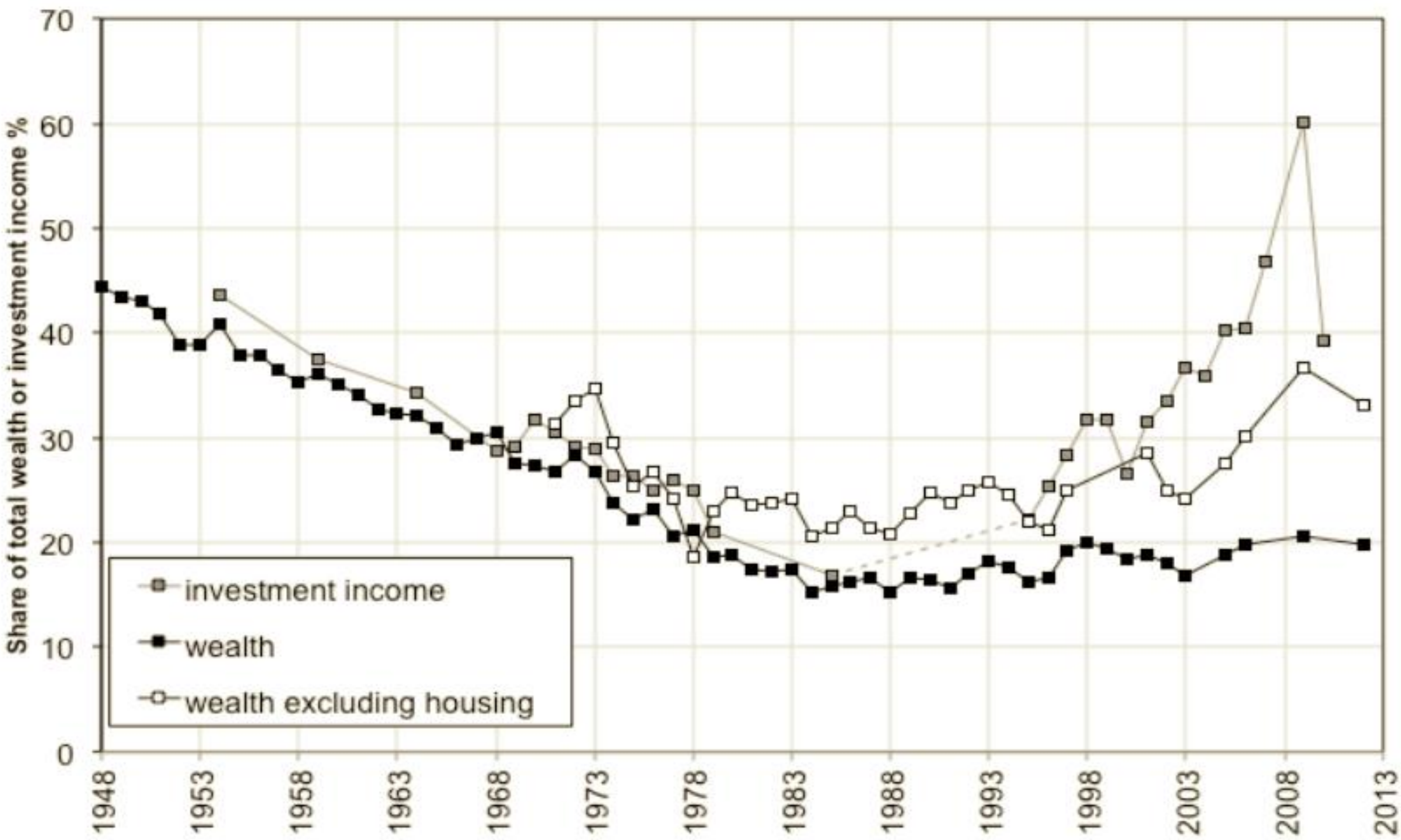
Source: [Alvaredo et al. (2016)]

Top wealth shares. UK 1895-2013



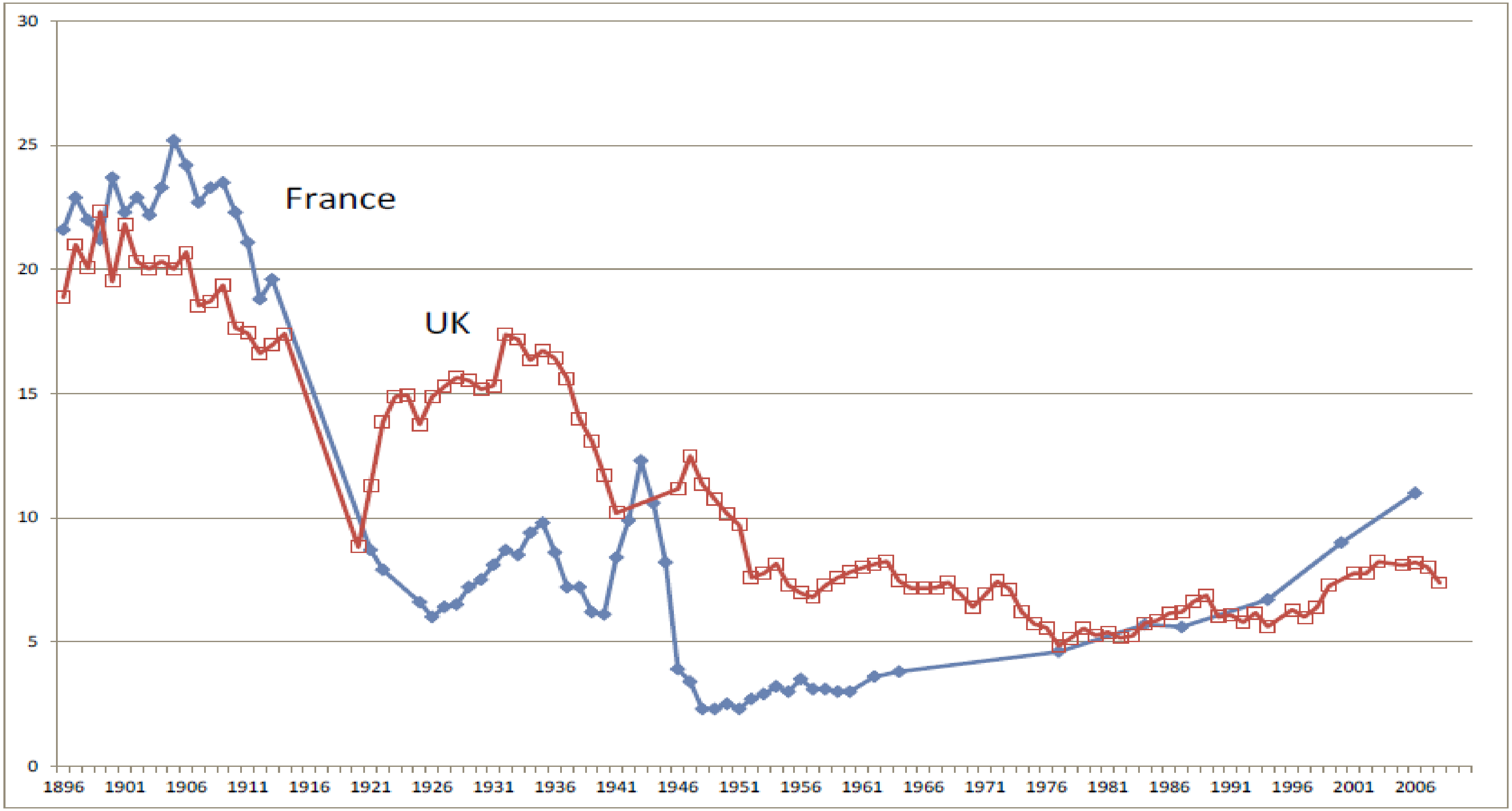
Source: [Alvaredo et al. (2016)]

Share of the top 1%



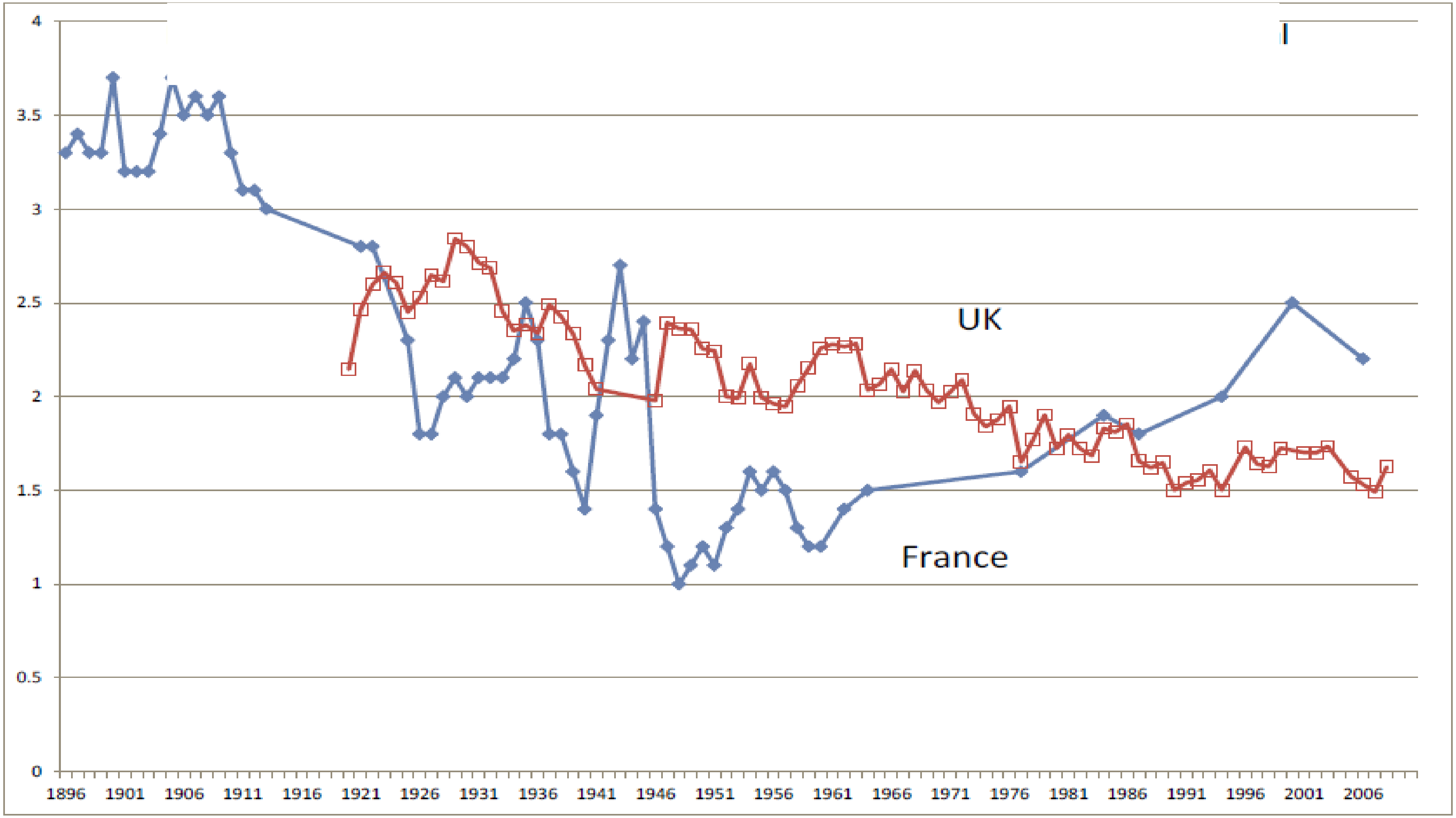
Source: [Alvaredo,et al (2016)]

France and UK: Transmitted wealth as % national income



Source: [Atkinson (2018)]

UK and France Transmitted wealth as % personal wealth



Source: [Atkinson (2018)]

Wealth inequality: issues

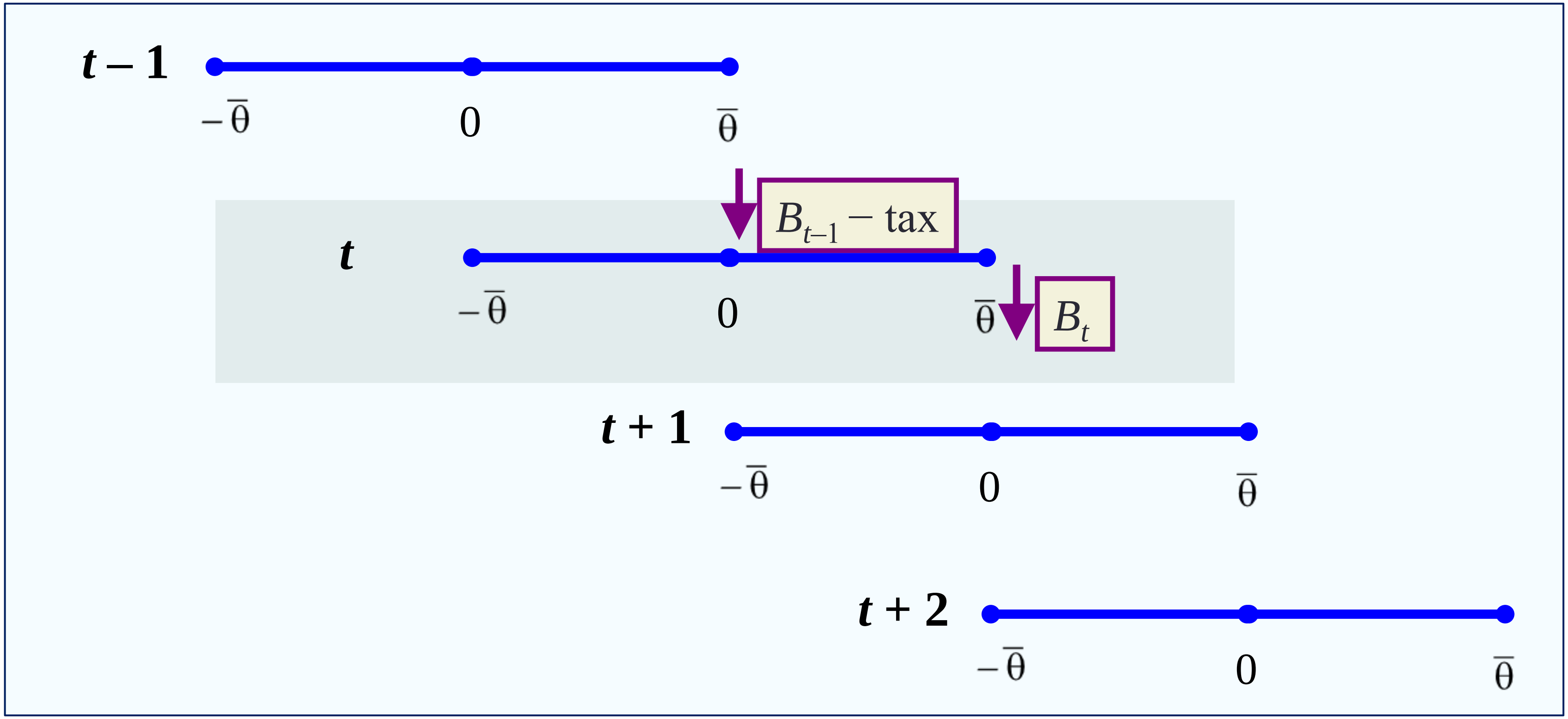
- Measurement
  - ambiguity of wealth variable
  - tech difficulties with the variable (negative values, sensitivity to mean)
  - time dimension
  - overview of issues: Cowell and Van Kerm (2015), Davies et al. (2017)
- What kind of model?
  - full GE (De Nardi 2015)
  - piecemeal focus
- Story of long-run wealth distribution (Piketty and Zucman 2015):
  - specify financial constraints
  - model preferences / tastes / habits
  - model exogenous resource flow
  - specify family formation mechanism

Complicated models

- Time
  - within/between generations
  - equilibrium
- The economic agent
  - individual or family
  - dynasty?
- Markets
  - imperfection
  - incompleteness
- Bequests and inheritance
  - what kind of model? (Arrondel and Masson 2006, Laitner and Ohlsson 2001)
  - what else is passed on?   …tastes?… habits?

Time: two aspects

- Intragenerational:
  - age runs from $-\bar{\theta}$ to $\bar{\theta}$
  - inheritance at $\theta = 0$
- Intergenerational
  - generations $\ldots, t-1,\ t,\ t+1,\ t+2, \ldots$



Equilibrium

- Distribution
  - work with distribution functions
  - $F_t(W)$: proportion with wealth $\leq W$ in generation t
- Processes
  - a variety of intra- and inter-generational forces
  - summarise as a process P from $t-1$ to t
- Equilibrium conditional on P
  - the intergenerational process: $F_{t-1} \xrightarrow{P} F_t$
  - is there an F_* such that $F_* \xrightarrow{P} F_*$?
  - if so, then $F_*(\cdot)$ is an *equilibrium distribution* for P
  - (Cowell 2014)

Standard model: outline

- Over the lifecycle
  - accumulation: $\frac{dw(\theta)}{d\theta} = y(\theta) - c(\theta)$, $w(0) = I$
  - income is given by $y(\theta) = e(\theta) + rw(\theta)$
- Wealth of any one generation:
  - consists of lifetime earnings plus inheritance $W = E + I$
  - budget constraint for bequests, consumption: $C + \frac{B}{1+g} \leq W$, $g := e^{r\bar{\theta}} - 1$
- Utility (B and C version)
  - depends on children's welfare, own consumption: $\gamma \log(B) + [1 - \gamma]\log(C)$
  - children's welfare proxied by bequest
- Implies proportionate consumption (savings)

$$C = [1 - \gamma]W; \; c(\theta) \propto W$$

Limitations of the BC model

- Ambiguity: decision maker
  - individual
  - family
  - dynasty
- Ambiguity: preferences
  - immutable?
  - purely selfish?
  - inherited?
- Omissions: market
  - labour: endogenous earnings
  - risk: short run constraints
- Omissions: non-market
  - family formation
  - bequest division

Two developments

1. Behavioural approach
   - inherited consumption levels
   - rule-of thumb within-lifetime behaviour
2. Families
   - extend to include earnings
   - concern for others
   - social norms

Identified personal wealth: assets by range of estate, UK 2011-13

	Securities	Cash	Insurance policies	UK residential buildings	Other buildings + land	Loans and other assets	net as % of gross
£0	2.2%	17.5%	6.2%	58.4%	2.9%	12.8%	32.2%
£50,000	1.7%	16.5%	9.8%	60.3%	0.5%	11.1%	73.3%
£100,000	1.6%	15.3%	10.8%	65.2%	0.5%	6.7%	85.5%
£200,000	4.4%	16.6%	10.3%	60.7%	1.0%	6.9%	90.1%
£300,000	7.0%	19.6%	8.4%	56.7%	1.4%	6.8%	91.4%
£500,000	12.6%	18.0%	7.7%	49.7%	4.3%	7.6%	92.6%
£1,000,000	20.6%	15.7%	5.9%	40.8%	7.6%	9.4%	93.6%
£2,000,000	39.9%	7.3%	2.5%	27.1%	9.8%	13.5%	94.2%
Total	*12.6%*	*15.7%*	*7.8%*	*51.6%*	*3.6%*	*8.6%*	*88.3%*

Proportion of households with inheritance or substantial gift

	All population	Bottom 20% of wealth	Middle 20-90% of wealth	Between top 90% and top 95% of wealth	Top 5% of wealth
Germany	0.27	0.07	0.30	0.47	0.51
Luxembourg	0.27	0.07	0.30	0.56	0.45
Spain	0.24	0.10	0.24	0.44	0.59
France	0.40	0.15	0.42	0.69	0.74
United Kingdom	0.13	0.08	0.13	0.18	0.19
United States	0.20	0.07	0.21	0.43	0.45

Source: Cowell et al (2017)

Average value of inheritance or gift

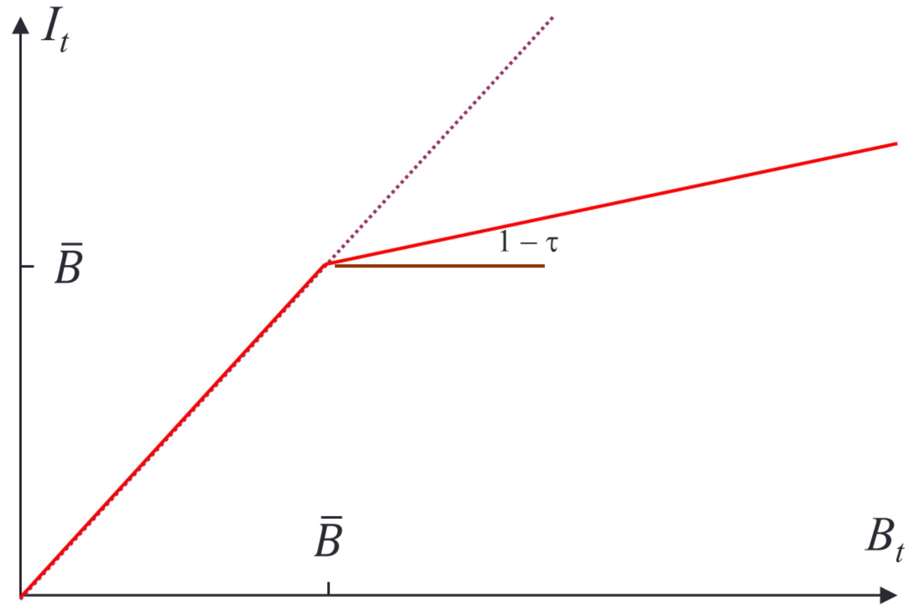
	All population	Bottom 20% of wealth	Middle 20-90% of wealth	Between top 90% and top 95% of wealth	Top 5% of wealth
Germany	0.7	0.0	0.4	2.2	5.9
Luxembourg	0.6	0.0	0.5	2.5	2.5
Spain	0.6	0.0	0.4	1.8	4.6
France	0.9	0.1	0.7	2.6	6.1
United Kingdom	0.1	0.0	0.1	0.2	0.4
United States	0.5	0.0	0.3	1.4	4.3

Source: Cowell et al (2017)

"Behavioural" savings model

- Focus on the role of consumption (Cowell 2012)
  - consumption aims at a target level: $c(\theta) = \min\{\bar{c}, y(\theta)\}$
  - consumption behaviour passed on to next generation
- Resources and taxation
  - earnings are fixed: $e(\theta) = \bar{e} < \bar{c}$
  - simple piecewise linear tax on bequests
- Wealth $w(\theta)$ over the lifetime:
  - given initial wealth w(0) and defining $\tilde{B} \coloneqq \frac{\bar{c}-\bar{e}}{r}$
  - over $[0, \bar{\theta}]$ we have: $w(\theta) = \max\{w(0) + [w(0) - \tilde{B}][e^{r\theta} - 1], 0\}$
  - rising/falling wealth as $w(0) \gtrless \tilde{B}$
  - each person leaves all his terminal wealth to one descendant

Inter-generational



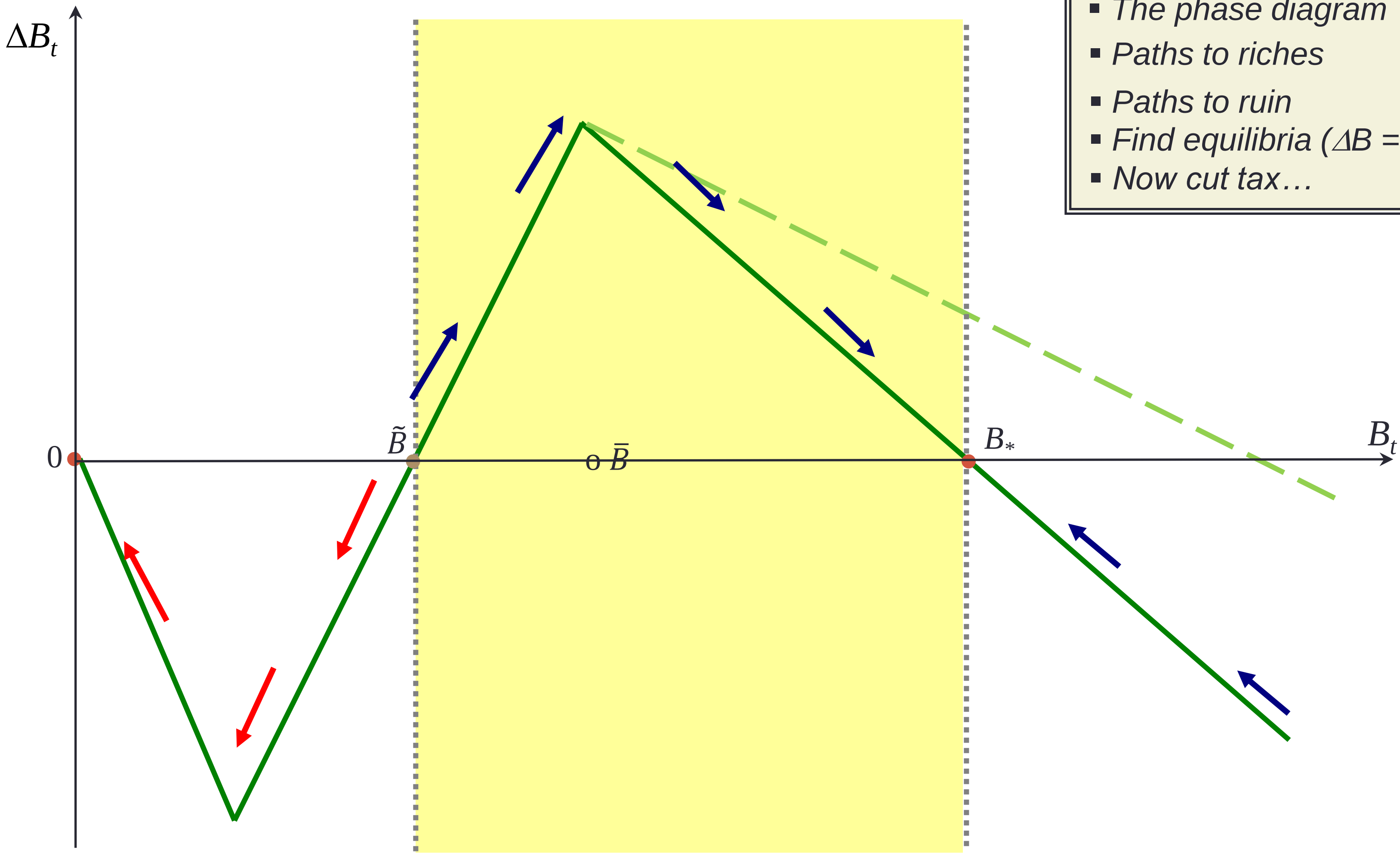
- Role of taxation is crucial:
  - bequest tax: $\max\{\tau[B-\bar{B}],0\}$
- Bequest determined by intragenerational component
  - terminal wealth: $B_t = w(\bar{\theta})$
  - tax determines next generation's inheritance:
  - $I_{t+1} = w(0) = \min\{B_t, [1-\tau]B_t + \tau\bar{B}\}$
- Get a model of bequest dynamics:
  - connect t and t +1 using:
  - the difference operator: $\Delta B_t := B_{t+1} - B_t$

Bequest Dynamics

- For low bequests (below $\bar{B}$)
  - dynamics: $\Delta B_t = g[B_t - \tilde{B}]$, if $B_t > 0$, = 0 otherwise
  - equilibrium 1: $B_t = 0$
  - equilibrium 2: $B_t = \tilde{B}$

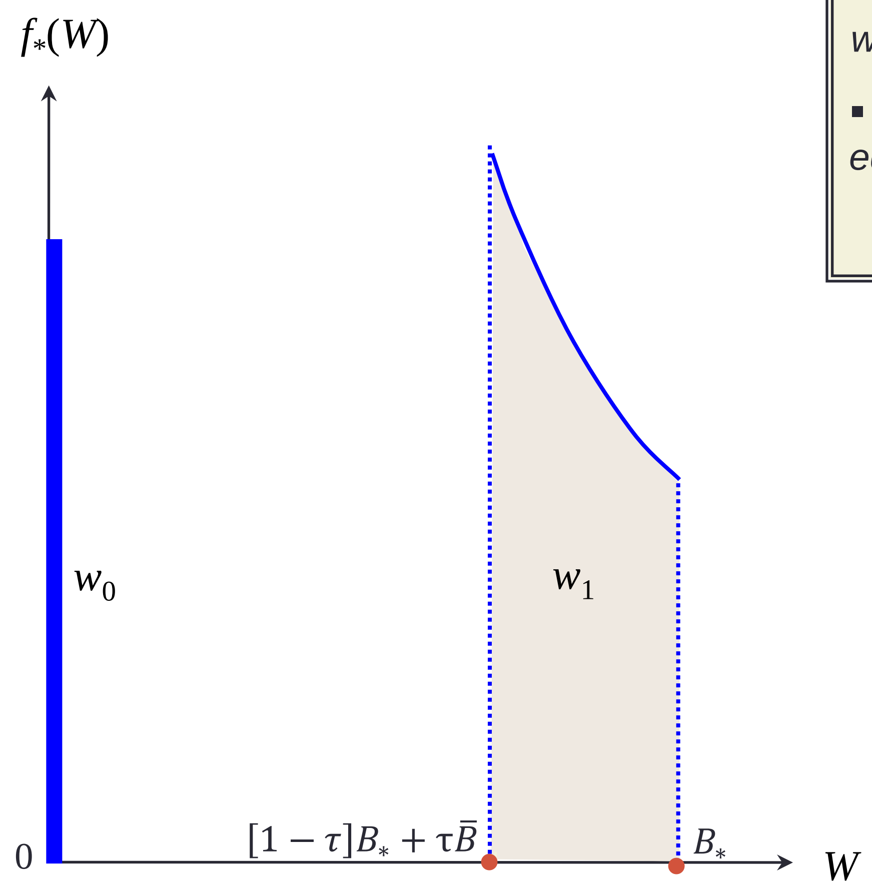
- For high bequests (above $\bar{B}$)
  - dynamics: $\Delta B_t = [g[1-\tau] - \tau][B_t - B_*]$
  - equilibrium 3: $B_* = \frac{g\tilde{B} - \tau[1+g]\bar{B}}{g - \tau[1+g]}$
- Change the tax rate: $\frac{\partial B_*}{\partial \tau} = \frac{g[1+g][\tilde{B} - \bar{B}]}{[g - \tau[1+g]]^2} < 0$

Bequest Dynamics: naïve consumption



- *The phase diagram*
- *Paths to riches*
- *Paths to ruin*
- *Find equilibria (ΔB = 0)*
- *Now cut tax…*

Equilibrium wealth distribution: snapshot

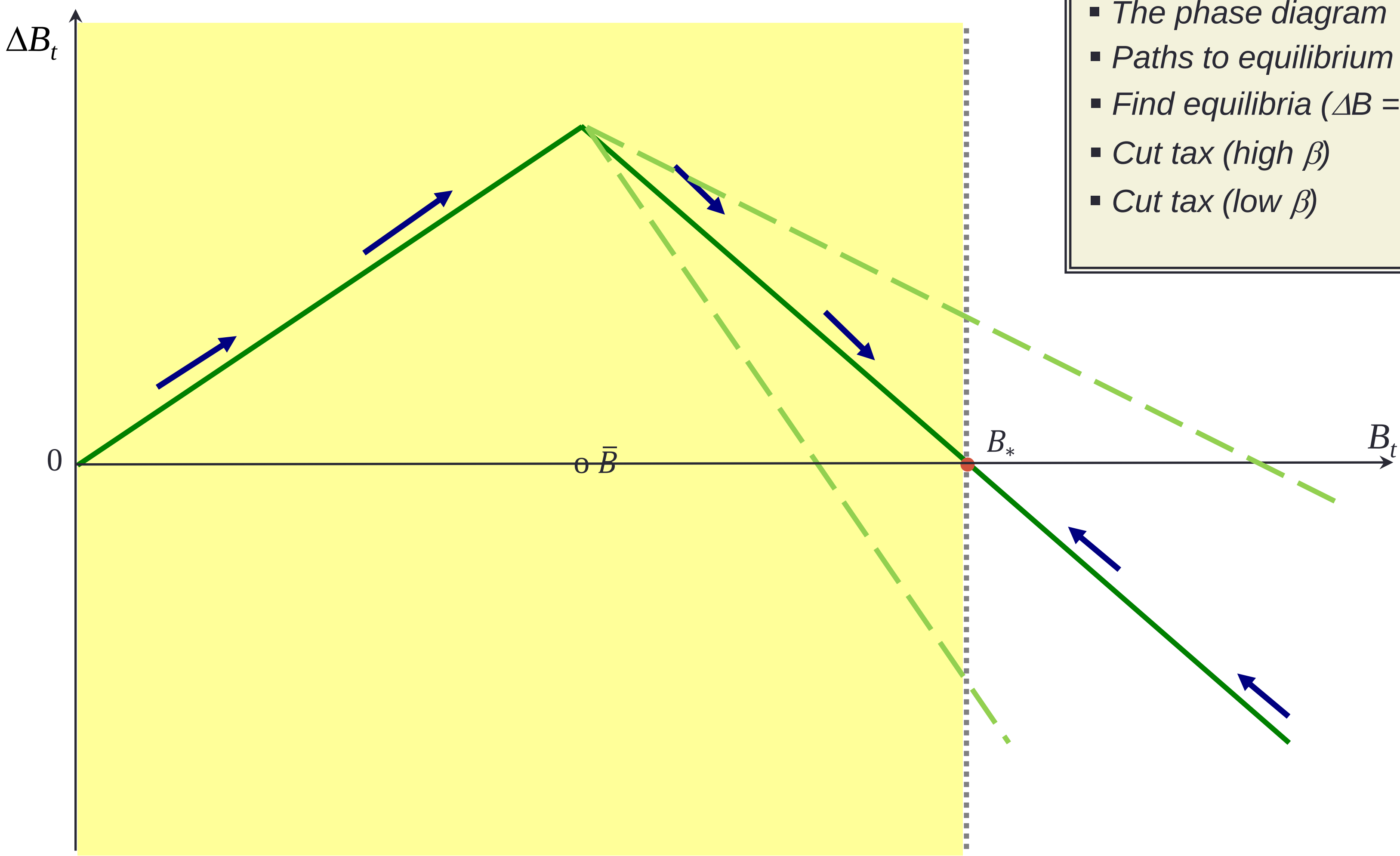


- *Distribution of W amongst wealthy*
- *Take into account lower equilibrium*

Contrast with standard (BC) model

- Consumption a proportion γ of lifetime resources
  - lifetime earnings: $E = \bar{e}\frac{g}{r}$
  - revised bequest equation: $B_t = w(\bar{\theta}) = \beta[I_t + E]$, where $\beta = s[1 + g]$
- For low bequests (below $\bar{B}$):
  - dynamics: $\Delta B_t = B_t[\beta - 1] + \beta E$
- For high bequests (above $\bar{B}$)
  - dynamics: $\Delta B_t = B_t\big[[1 - \tau]\beta - 1\big] + \beta[E + \tau\bar{B}]$
  - equilibrium: $B_* = \frac{\beta}{1-[1-\tau]\beta}[E + \tau\bar{B}]$
- Change the tax rate: $\frac{\partial B_*}{\partial \tau} = \frac{\bar{B}-\beta[\bar{B}+E]}{[1-[1-\tau]\beta]^2}$
  - positive (negative) for low (high) β

Bequest Dynamics: alternative consumption



- *The phase diagram*
- *Paths to equilibrium*
- *Find equilibria ($\Delta B = 0$)*
- *Cut tax (high β)*
- *Cut tax (low β)*

Focus on families

- A benchmark model (Cowell and Van de gaer 2017)
- Marriage
  - economic selection or social convention?
  - random?
  - assortative mating
- Children
  - exogenously determined
  - discrete (not 2.4 children!)
  - stationary population
- Bequest behaviour
  - equal division
  - same for boys and girls

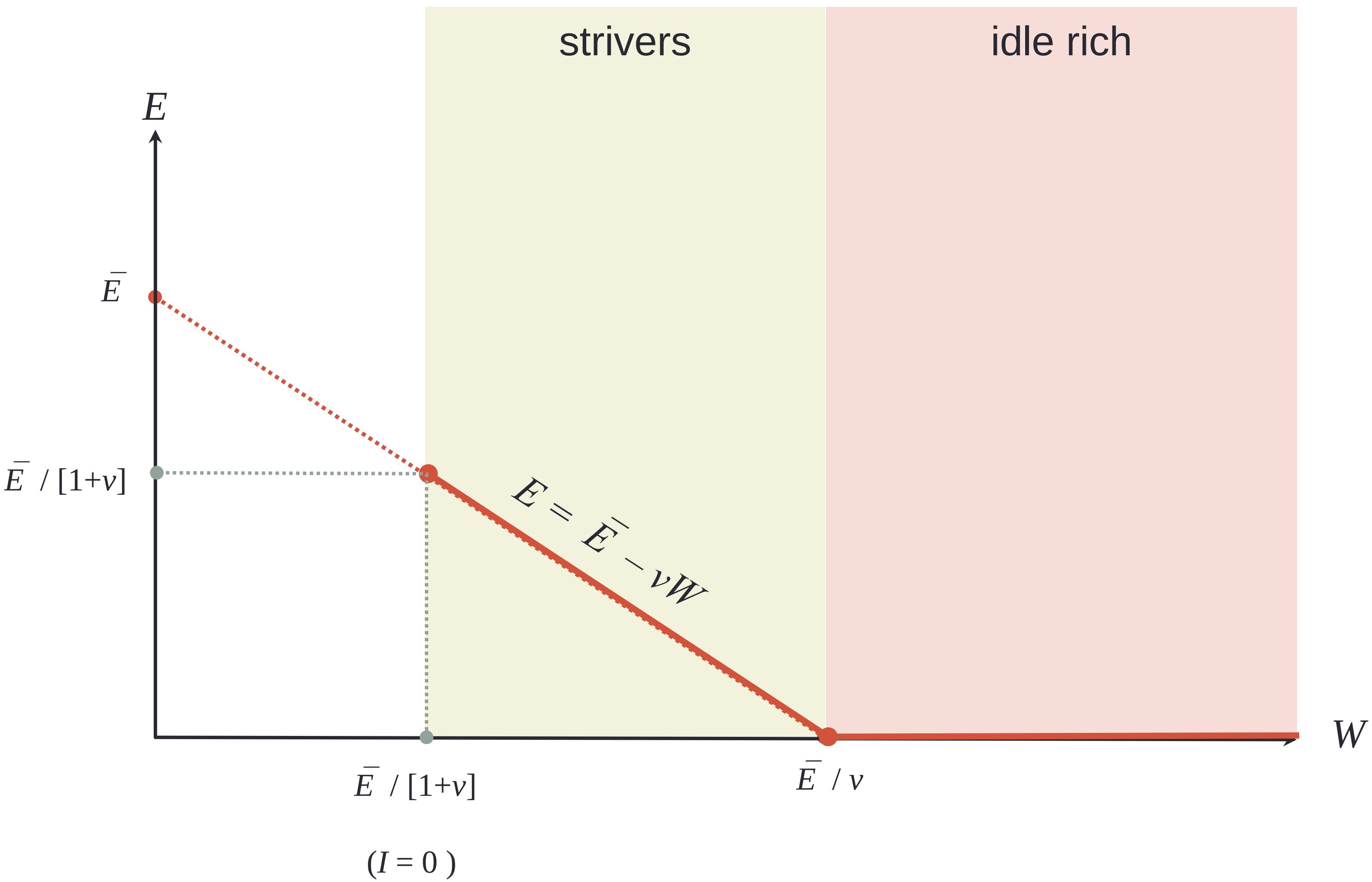
Standard model with endogenous earnings

- Utility function (BCE)
  - utility depends on children's welfare, own consumption, leisure
  - $\gamma\log(B) + [1-\gamma]\log(C) + \nu\log\left(1-\frac{E}{\bar{E}}\right)$
  - leisure is proportion of life not earning, $1-\frac{E}{\bar{E}}$, $E \geq 0,\ E \leq \bar{E}$
- Implies proportionate consumption as before
- Implies a two-regime solution for earnings: $E = \max\left\{0, \frac{\bar{E}-\nu I}{1+\nu}\right\}$
  - a linear relation between E and I in the positive-earnings regime
- Further implies linear relation between E and W

$$E = \max\{0, \bar{E} - \nu W\}$$

  - the higher the taste for leisure, the more rapidly earnings fall with wealth

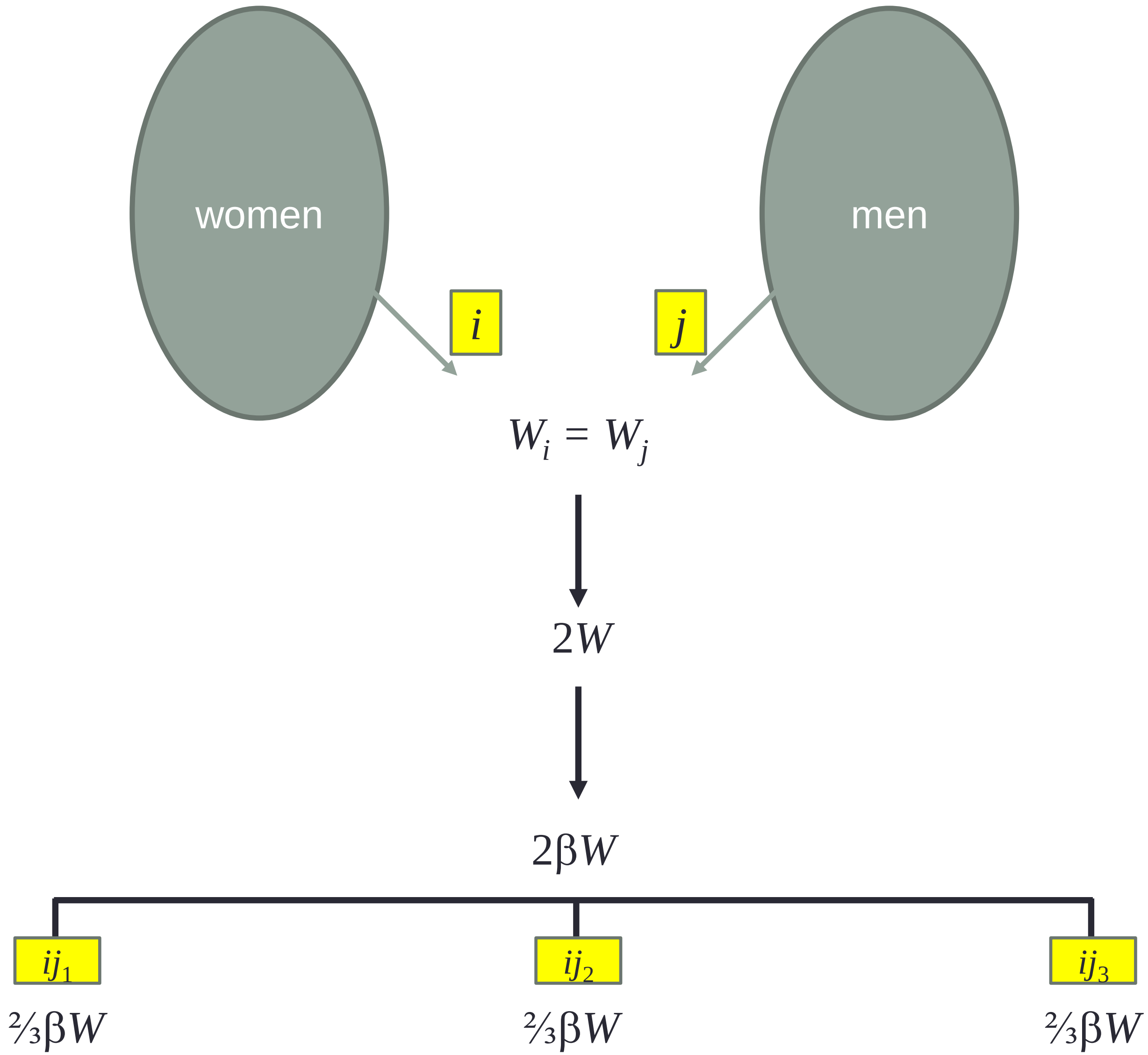
Earnings and wealth



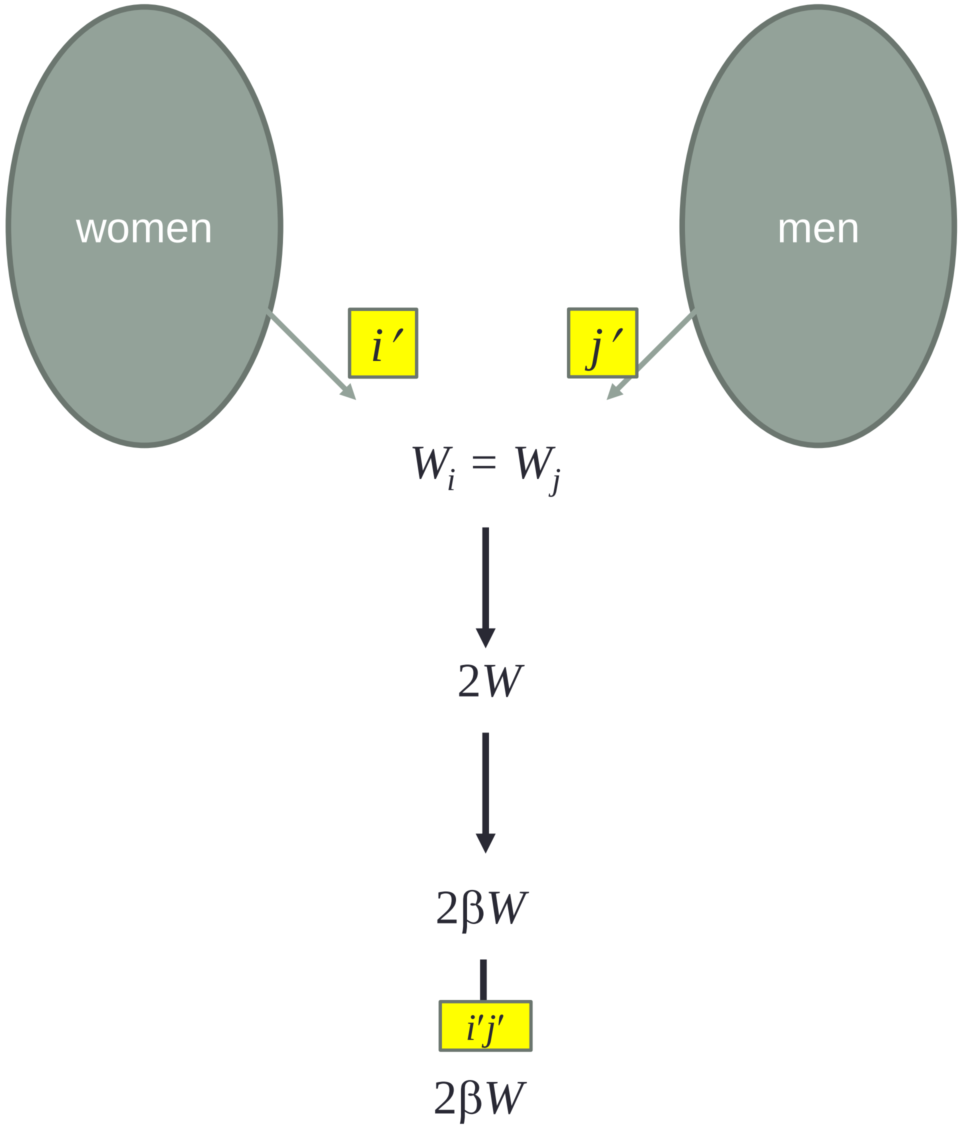
Family model: elements

- BCE behaviour
  - consumption per adult: $C = [1 - \gamma]W$
  - bequests per adult: $B = [1 + g][W - C] = \beta W$
  - growth factor: β: $[1 + g]\gamma$
- Perfect assortative mating
  - wealth of woman = wealth of man
- Equal division of bequests
  - custom? law? convenience?
  - $I_t = \frac{2}{k} B_{t-1}$
- Given stationary size distribution of families, independent of W:
  - $\left[p_1, \dots, p_K \mid p_k \geq 0,\ \sum_{k=1}^{K} p_k = 1\right]$
  - $\sum_{k=1}^{K} \frac{1}{2} k p_k = 1$

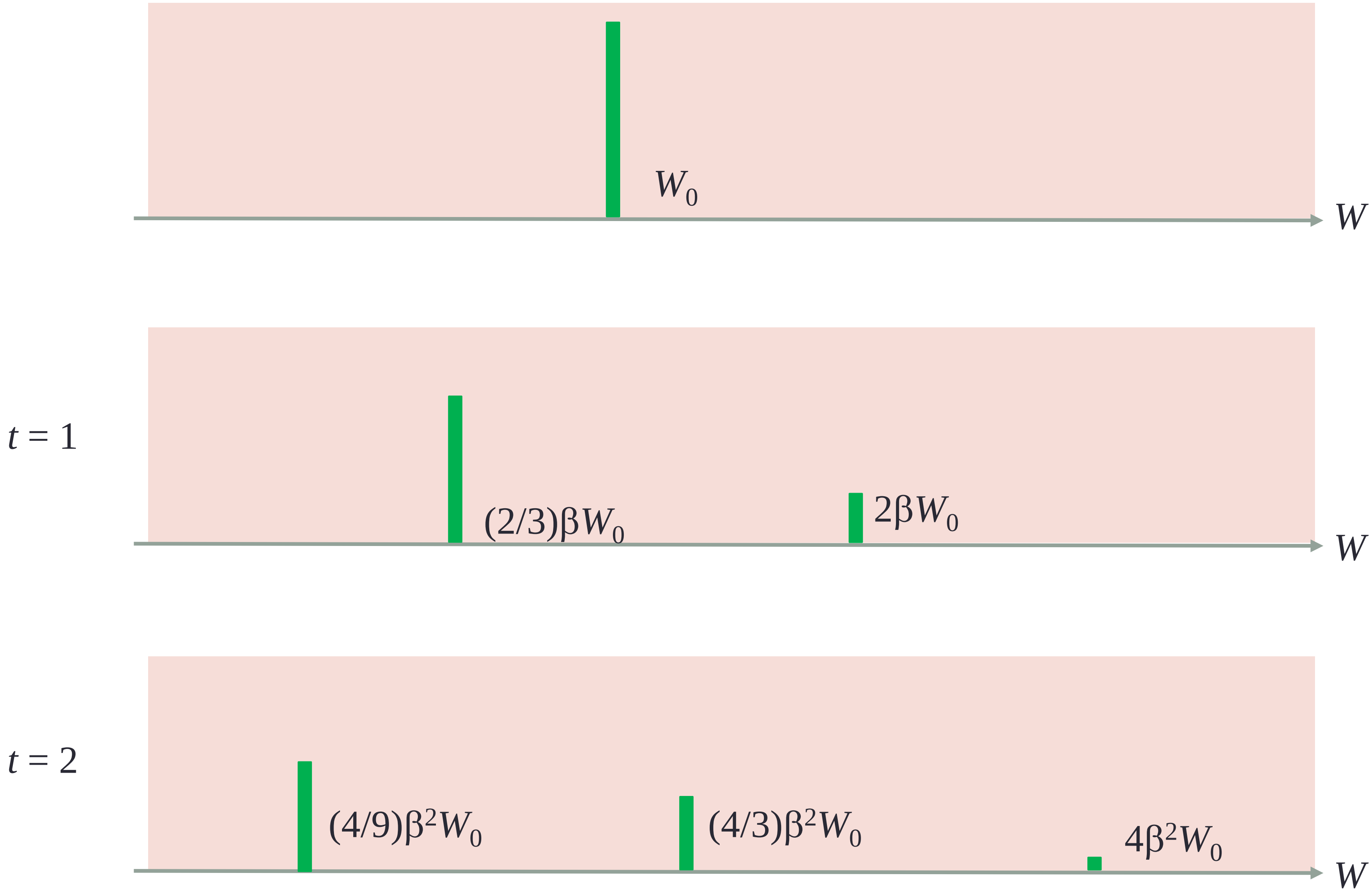
Family model "i&j + 3"



Family model: “little emperor”



An inequality generator



Family model: idle rich

- Look more closely at how this works
- Focus first on the idle rich
  - actually a subset of them
  - those whose children will also choose to be idle
- Suppose you have wealth *W* and are from a *k*-family
  - you are one of *k* children
  - your parents had equal wealth
  - given growth factor *β*, they must each have had $\frac{kW}{2\beta}$
- The mechanics of distributional change:

$$F_t(W) = \sum_{k=1}^{K} \tfrac{1}{2} k p_k \, F_{t-1}\left(\frac{kW}{2\beta}\right)$$

Family model: strivers

- Now focus on the strivers, where $E > 0$
  - again it is a subset
  - $E = \bar{E} - vW$
- Suppose you have wealth W and are from a k-family
  - you are one of k children
  - your parents had equal wealth
  - given growth factor β, they must each have had $k\frac{W-E}{2\beta}$
- The mechanics of distributional change:

$$F_t(W) = \sum_{k=1}^{K} \tfrac{1}{2}kp_k\, F_{t-1}\left(k\frac{W-E}{2\beta}\right)$$

Family model: changing distribution

- Mechanics of distributional change (general):

$$F_t(W) = \sum_{k=1}^{K} \tfrac{1}{2} k p_k \, F_{t-1}\left(k \frac{W - E}{2\beta}\right)$$

  - strivers: $E > 0$
  - idle rich: $E = 0$
- Distribution at t is an "average" of bits of distribution at $t - 1$

$$F_t(W) = \sum_{k=1}^{K} a_k \, F_{t-1}(b_k[W - c])$$

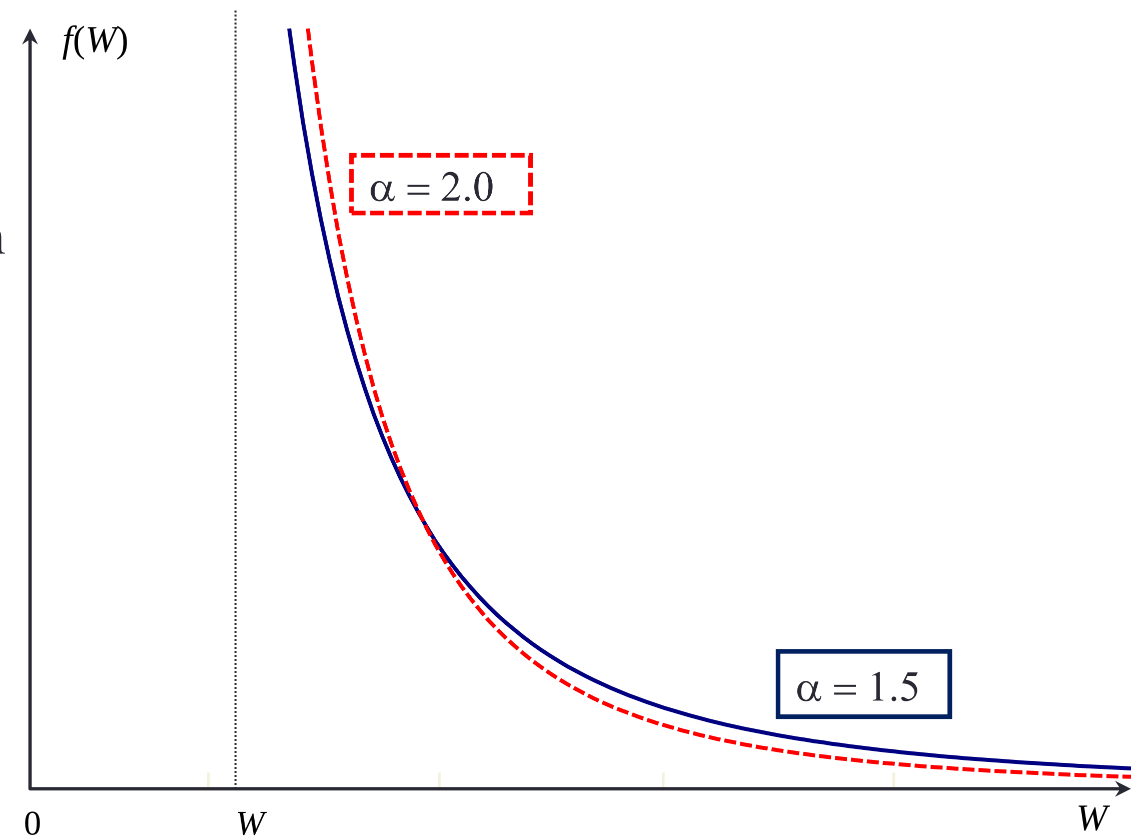
  - where $a_k := \tfrac{1}{2} k p_k$
  - for strivers: $b_k := \frac{k[1+\nu]}{2\beta}, c = \bar{E}$
  - for idle rich: $b_k := \frac{k}{2\beta}, c = 0$

The shape of the distribution

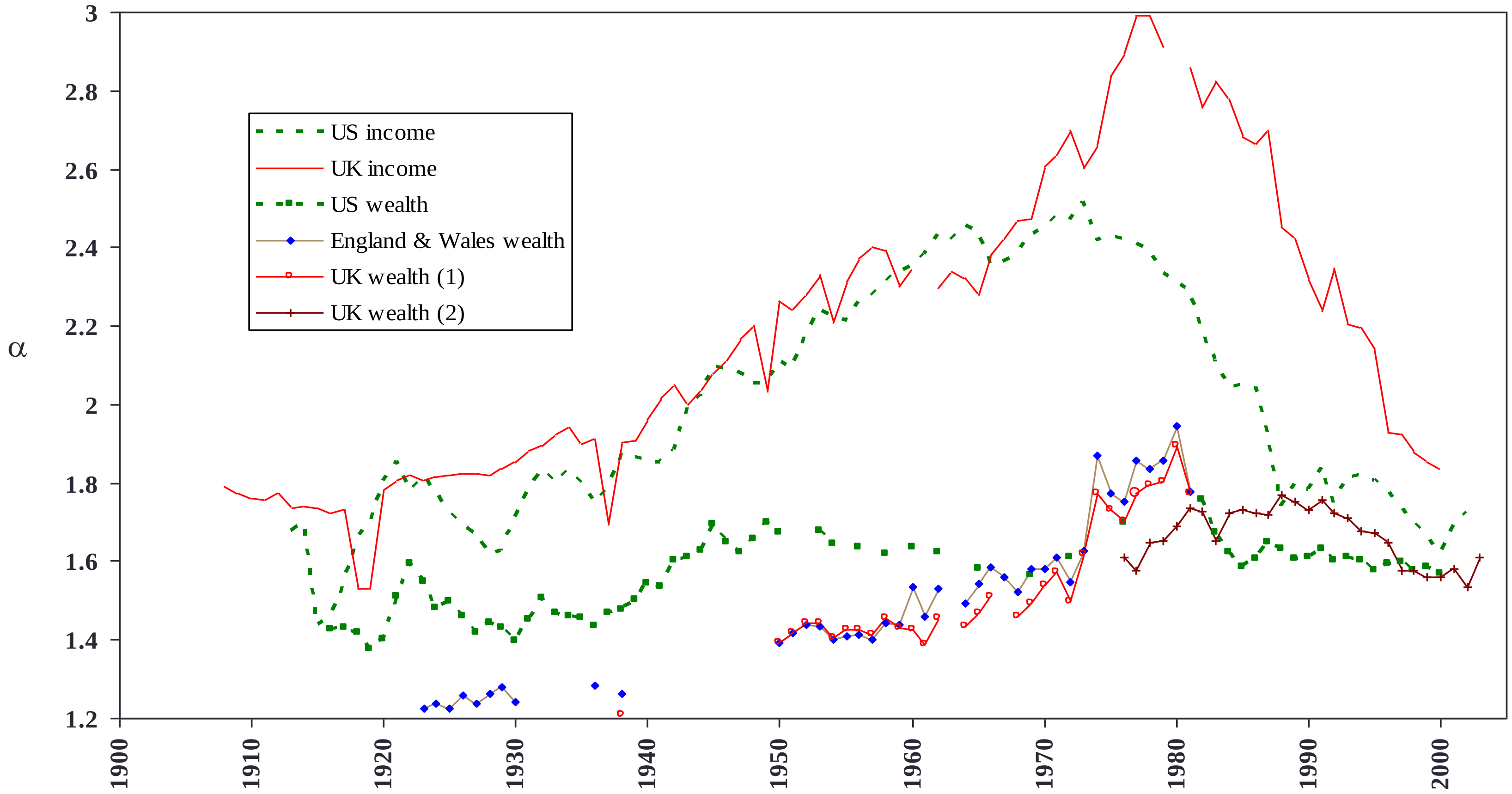
- Do our models account for the shape of the distribution?
- For more than a century, a broad empirical consensus
- Upper tail appears to conform to a Pareto model
  - $F(W) = 1 - \left[\frac{W}{\underline{W}}\right]^{\alpha}$
  - α captures "weight" of tail
  - $\underline{W}$ "locates" the distribution
- Inequality

$$\text{a2b} = \frac{\text{average}}{\text{base}} = \frac{\alpha}{\alpha - 1}$$

$$\text{Gini} = \frac{1}{2\alpha - 1}$$

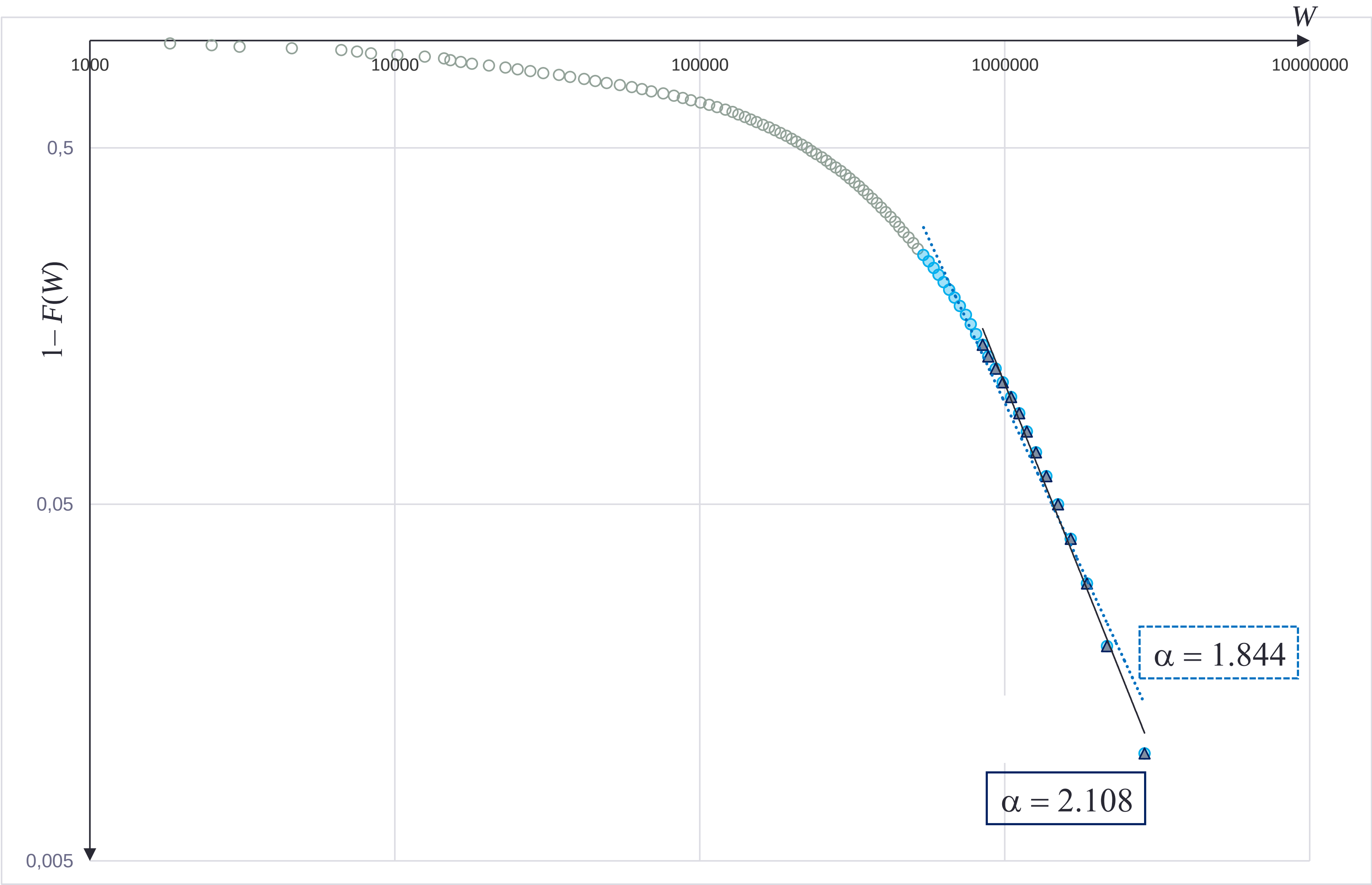


Pareto's α: USA and UK



- Sources: see [Cowell (2011)]() Chapter 4

Pareto diagram: UK wealth 2012-14



Family model: finding equilibrium (1)

- Basic description of changing distribution

$$F_t(W) = \sum_{k=1}^{K} a_k F_{t-1}(b_k[W - c])$$

- We have equilibrium if, for all *W*, $F_t(W) = F_{t-1}(W)$
- So, fundamental equation of the equilibrium distribution:

$$F_*(W) = \sum_{k=1}^{K} a_k F_*(b_k[W - c])$$

- For given constants $\{a_k, b_k, c\}$ this must hold for arbitrary *W*
- A *functional equation* in F_*
  - solve for unknown function from the weighted-average equation
  - with *W* over appropriate domain

Family model: finding equilibrium (2)

- Strivers only:
  - Equilibrium distribution found from:

$$F_*(W) = \sum_{k=1}^{K} a_k \, F_*(b_k[W - c]), c > 0$$

  - Solution potentially complicated, found by simulation
- Idle rich only:
  - Equilibrium distribution found from:

$$F_*(W) = \sum_{k=1}^{K} a_k \, F_*(b_k W)$$

  - Solution simple: follows from results on functional equations
  - Has to be of the form: $F_*(W) = A + BW^C$

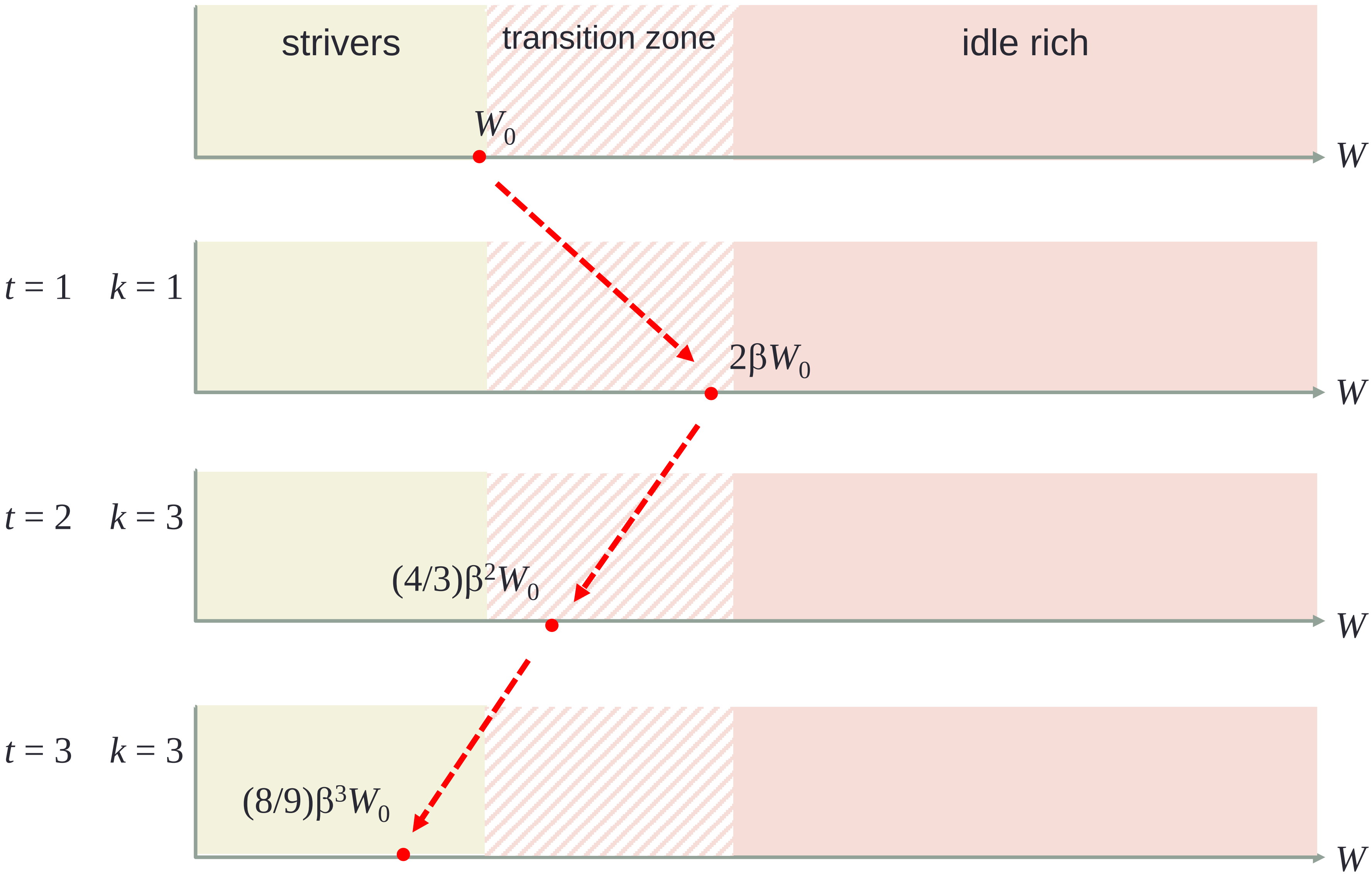
Family model: nature of equilibrium

- Define
  - $\overline{W} := \overline{E}/\nu$: if W is above $\overline{W}$, you don't work
  - $\overline{\overline{W}} := \max\left\{\frac{K}{2\beta}\overline{W}, 2\beta\overline{W}\right\}$: if W is above $\overline{\overline{W}}$, then *also* (a) your kids don't work and (b) your parents didn't work
- Three regimes of interest:

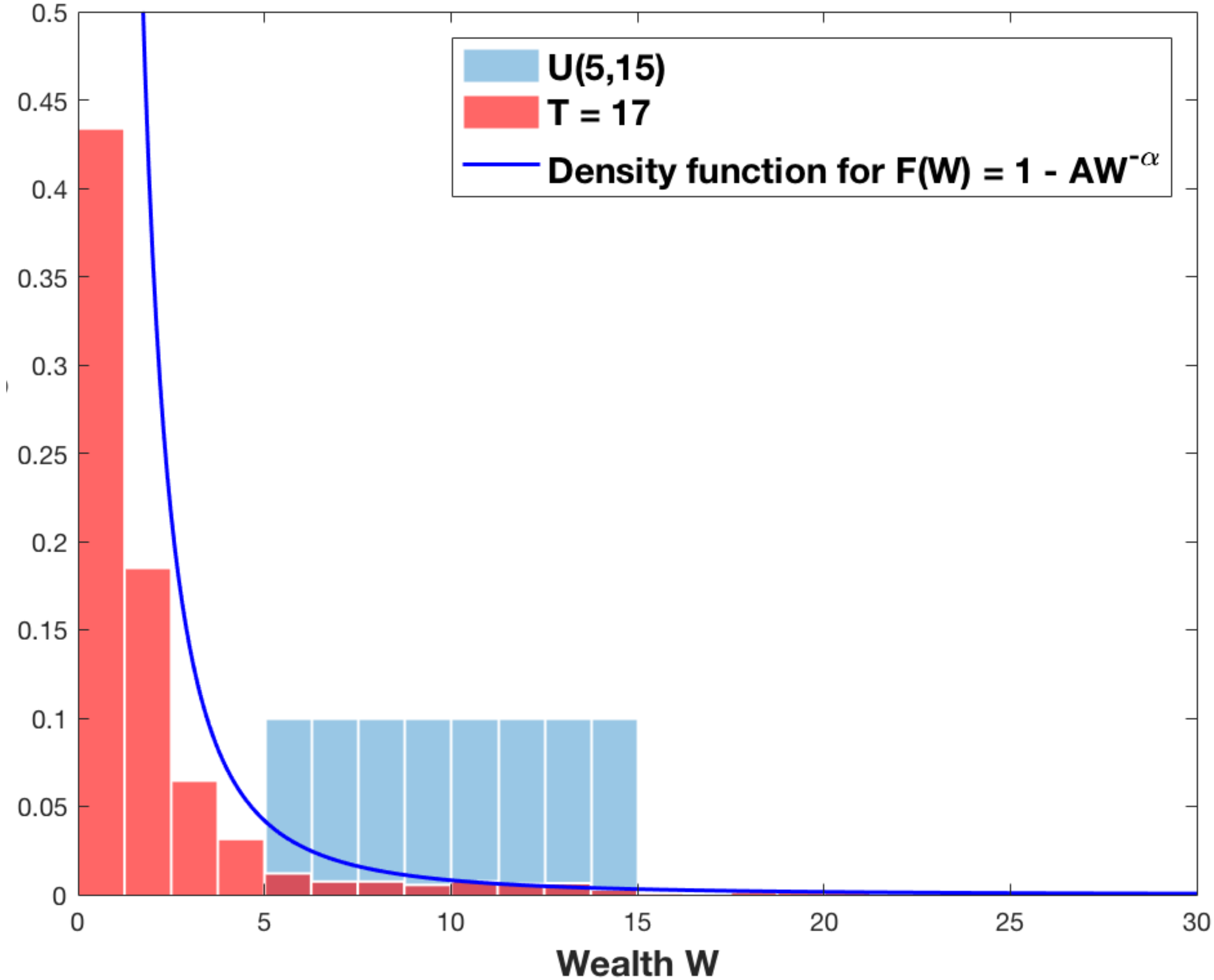
1. For $W < \overline{W}$ you are a striver: striver rules apply
2. For $\overline{W} \leq W < \overline{\overline{W}}$ you are in a transition zone, part of the idle rich: this part of the equilibrium to be simulated
3. For all $W \geq \overline{\overline{W}}$ we can compute equilibrium easily

- In the equilibrium, there is mobility
  - over the generation members of a dynasty move up / down
  - move between regimes

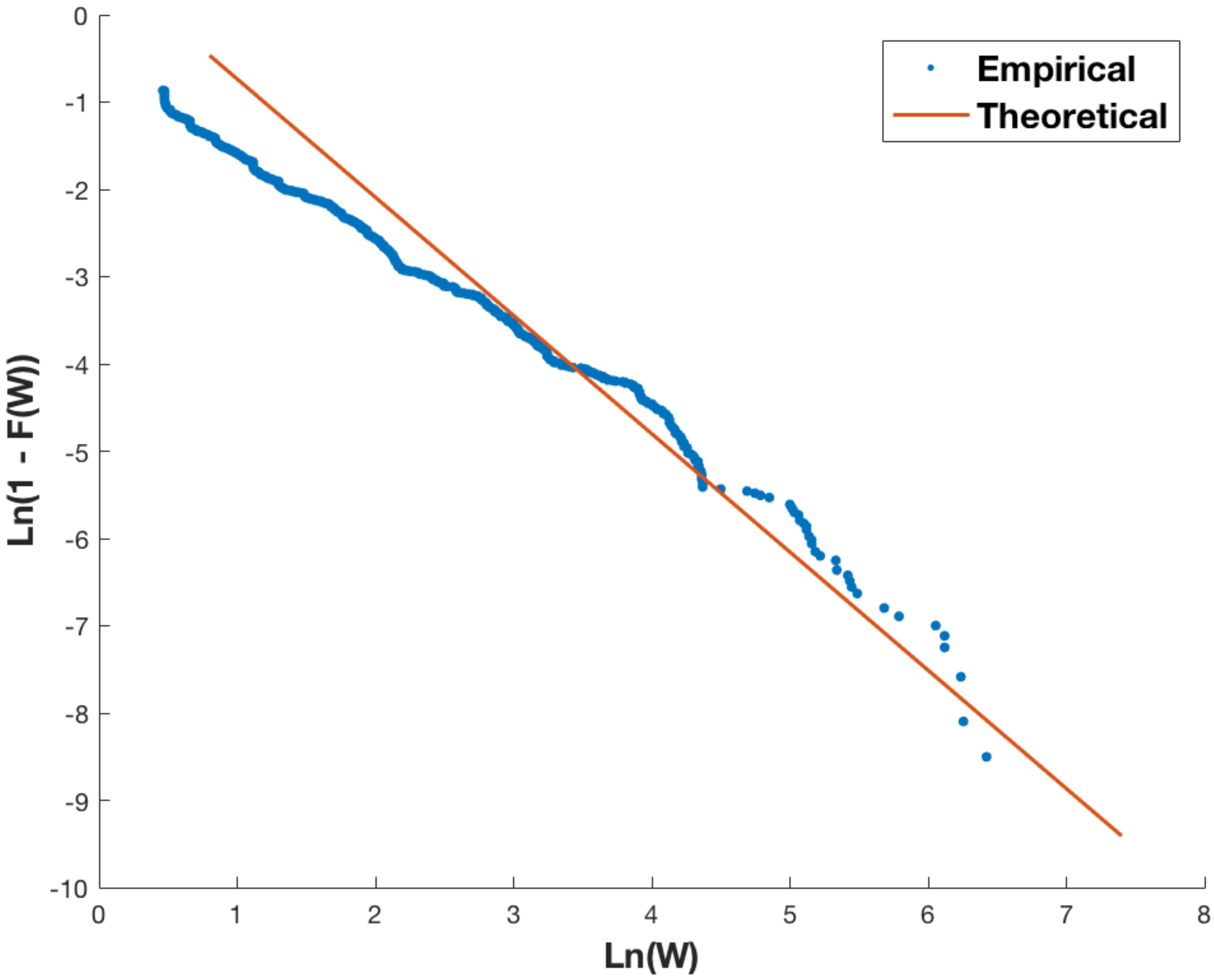
Wealth mobility ($\beta = 0.95$)



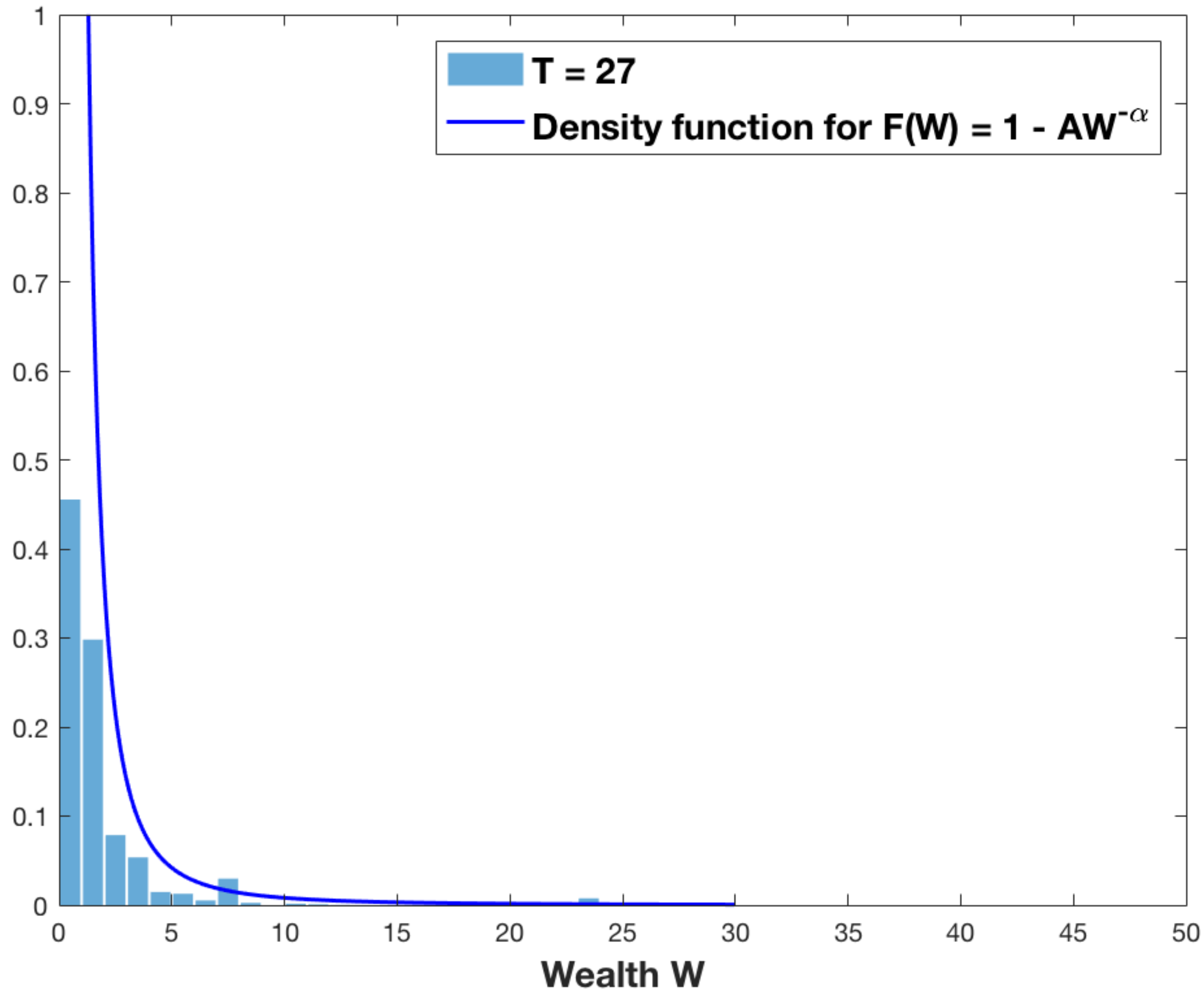
Start from a uniform distribution



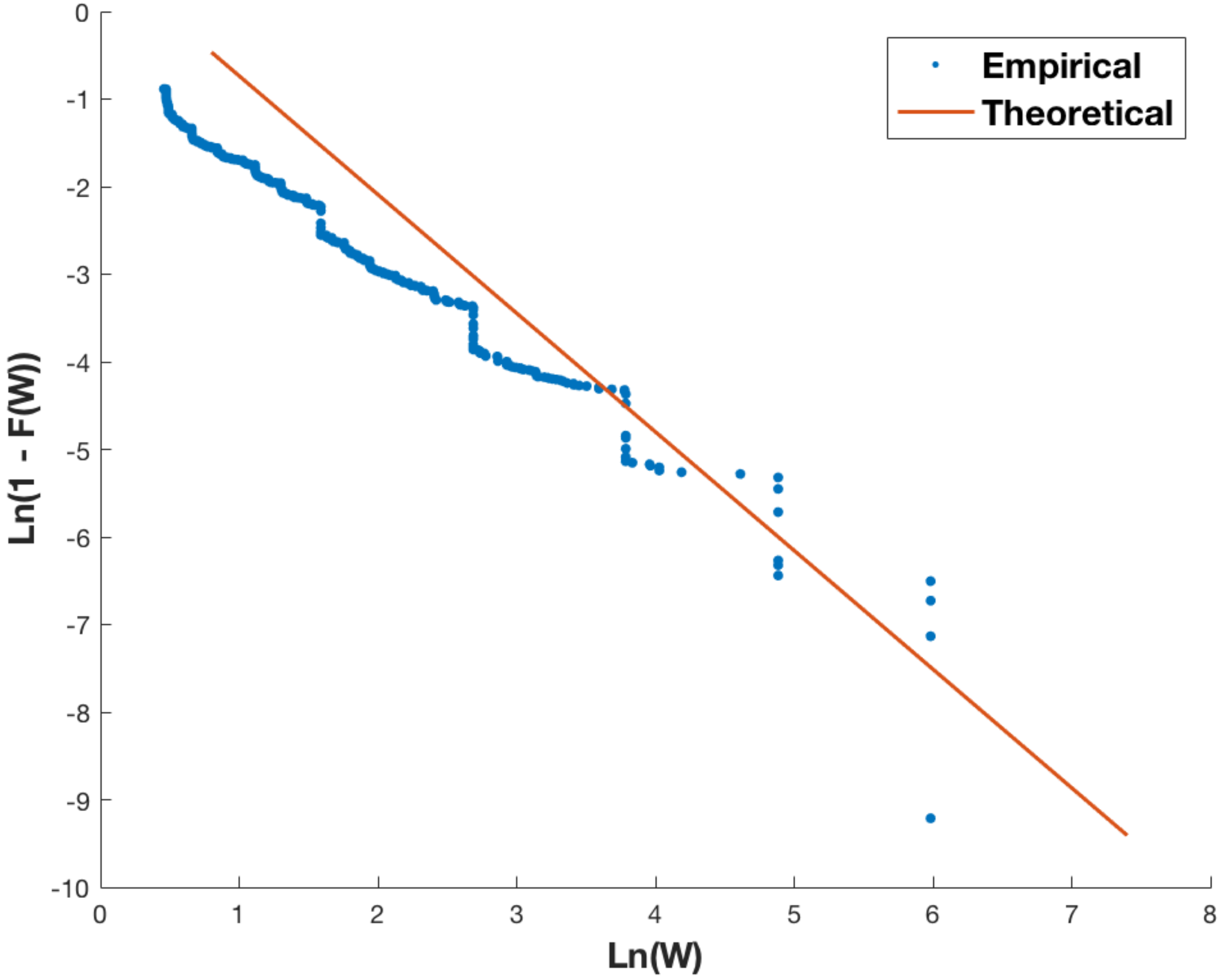
Wealth Distribution in Equilibrium



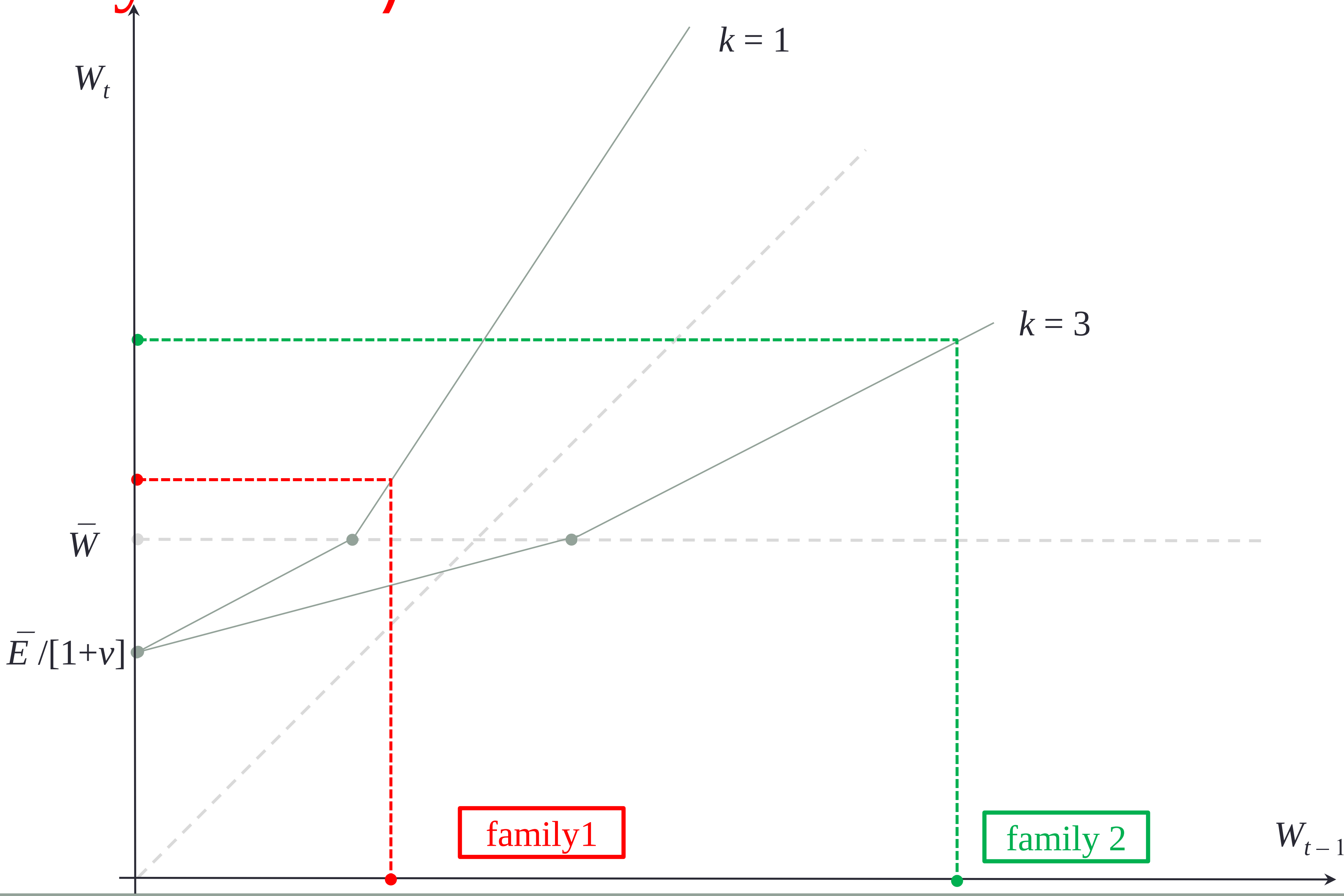
Start from perfect equality



Wealth Distribution in Equilibrium



Dynamics $\beta = 0.75$



Idle rich: equilibrium?

- Clearly there may be no equilibrium
- If β is too high:
  - rapid per-generation net growth of wealth
  - distribution keeps moving to the right
- For equilibrium given a stationary population
  - $\sum_{k=1}^{K} \frac{1}{2} k p_k = 1$
  - must have $\beta < 1$
- Generalisation to a growing population
  - write population growth factor as π
  - $\sum_{k=1}^{K} \frac{1}{2} k p_k = \pi$
  - must have $\beta < \pi$

Idle rich: equilibrium!

- For stationary population we need the F_* that solves:

$$F_*(W) = \sum_{k=1}^{K} \tfrac{1}{2}k p_k \, F_*\left(\frac{kW}{2\beta}\right)$$

- This is of the form: $F_*(W) = A + BW^C$
    - a Pareto distribution!
    - parameter α is $-C$, to be found using the original equation

$$A + BW^{-\alpha} = \sum_{k=1}^{K} \tfrac{1}{2}k p_k \left[A + B\left[\frac{kW}{2\beta}\right]^{-\alpha}\right]$$

    - So α is found from β as a root of the equation

$$\beta^{-\alpha} = \sum_{k=1}^{K} p_k [½k]^{1-\alpha}$$

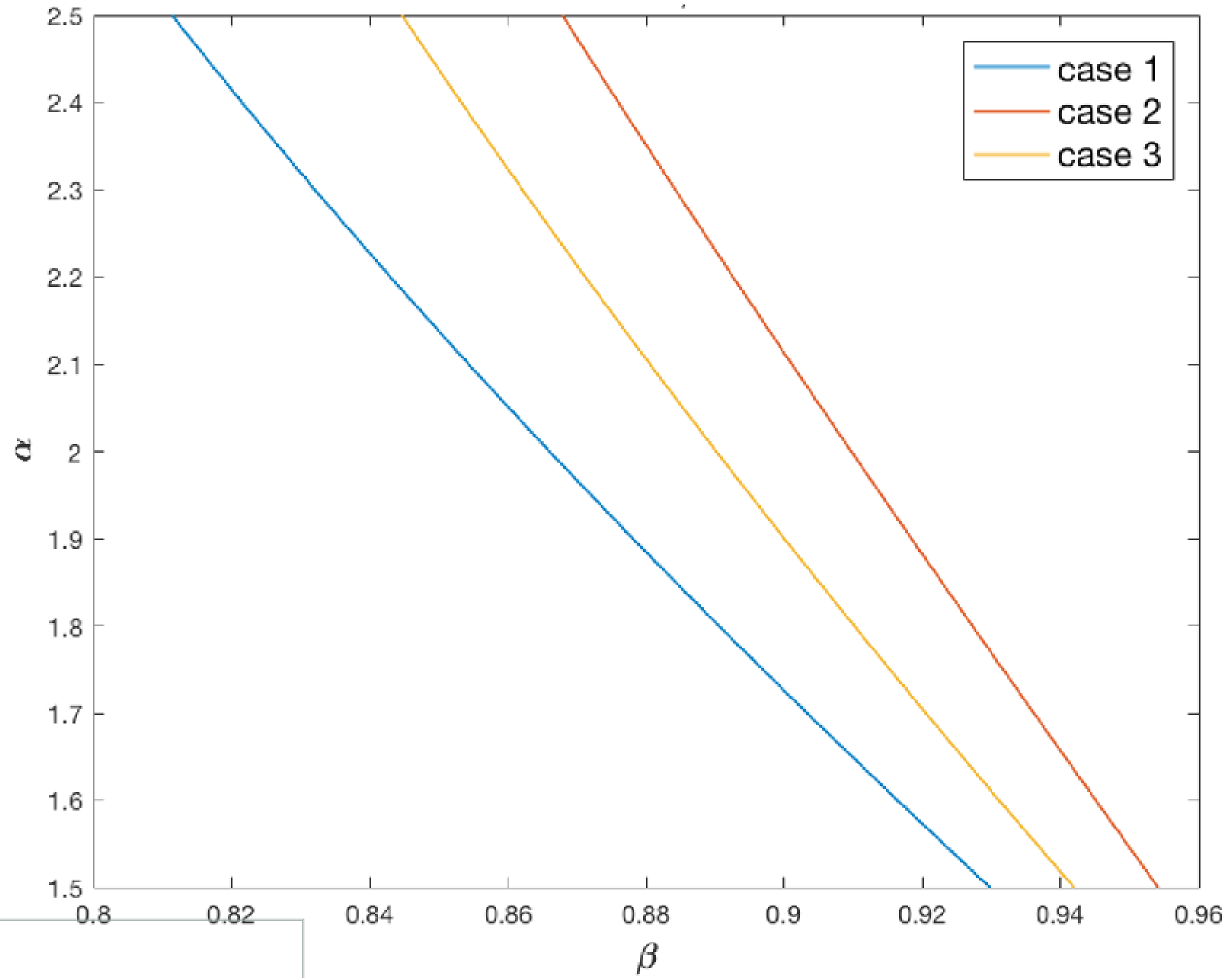
Idle rich: implications

- Equilibrium inequality determined by α
  - Gini for a Pareto distribution is $\frac{1}{2\alpha-1}$
- In turn α is determined by β
  - the savings rate multiplied by…
  - … (1 + the underlying growth rate)
- This relation depends on size distribution of families
- The β-to-α question: given the savings (growth) rate what is equilibrium inequality?
- The α-to-β question: given a target level of inequality, what savings rate will permit it?

Family size and inequality (1)

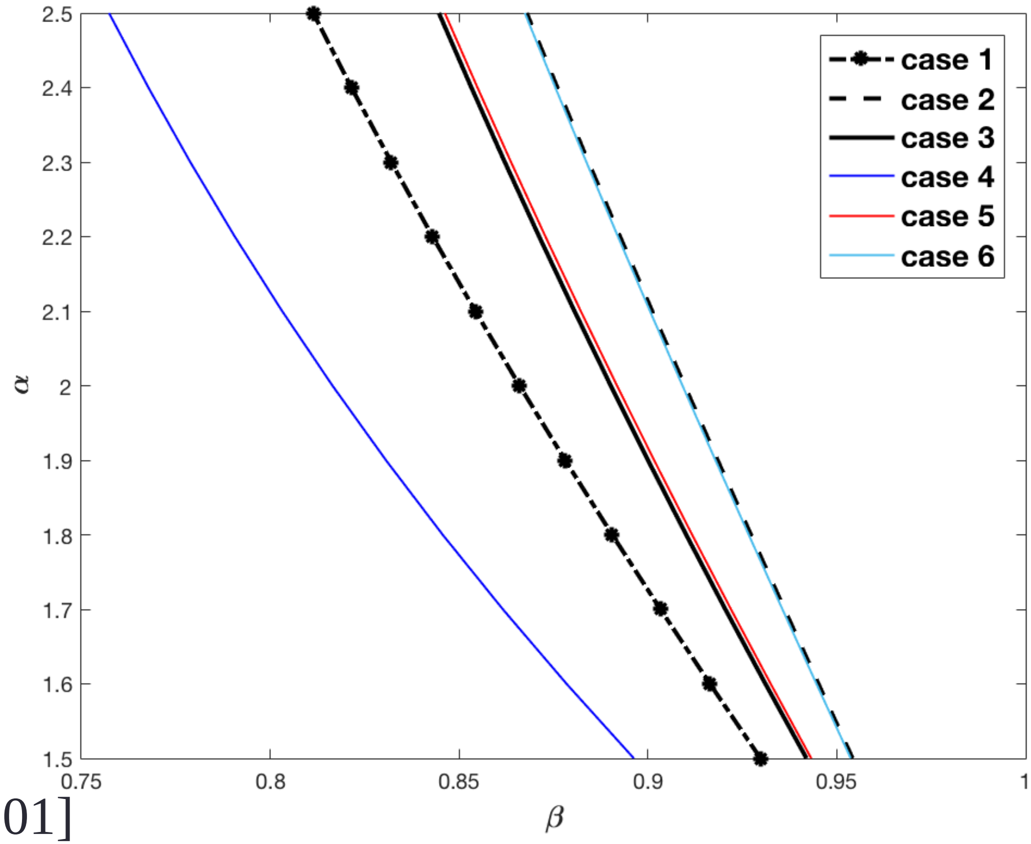
- How does family size interact with wealth distribution?
- Take three family-size distributions:
  - case 1: **p** = [0.5 0 0.5]
  - case 2: **p** = [0.3 0.45 0.2 0.05]
  - case 3: **p** = [0.35 0.45 0.1 0.06 0.03 0.01]
- We could look at the rank-ordering of the **p** distributions
  - case 3 found by mean-preserving spread of case 2
- Is it this dominance relation that drives wealth inequality?
  - answer this question by plotting the (α,β) relation for each case
  - for a given β read off the corresponding α for each case
  - higher α means lower inequality

Family size and inequality (2)



- case 1: **p** = [0.5 0 0.5]
- case 2: **p** = [0.3 0.45 0.2 0.05]
- case 3: **p** = [0.35 0.45 0.1 0.06 0.03 0.01]

Family size and inequality (3)



- 1: $\mathbf{p}$ = [0.5 0 0.5]
- 2: $\mathbf{p}$ = [0.3 0.45 0.2 0.05 0 0]
- 3: $\mathbf{p}$ = [0.35 0.45 0.1 0.06 0.03 0.01]
- 4: $\mathbf{p}$ = [2/3 0 0 1/3]
- 5: $\mathbf{p}$ = [0.35 0.43 0.12 0.08 0.01 0.01]
- 6: $\mathbf{p}$ = [0.3 0.45 0.22 0.015 0.01 0.005]

Family model: lessons

- Convergence to equilibrium
  - depends on β
  - also on the existence of the striver zone
  - mobility in equilibrium
- Nature of equilibrium
  - Pareto distribution for the idle rich
  - get a relation between α and β
- Role of family
  - distribution of families by size affects equilibrium W-distribution
  - little emperors rule!

Extending the family model

- Objections
  - equal division?
  - equal treatment of men & women?
- Alternative inheritance rules
  - primogeniture and other forms of favouritism
  - gender bias
- Alternative marriage patterns
  - towards random selection?

Unconventional inheritance

- Ancient Egypt
- Israel in biblical times

- Special treatment of the eldest son
  - “right of first-born”
  - (Esau sold his to Jacob)
- An “old colonial” rule!
  - Mass, Conn, NH, Pa, Del
  - early 18th century
- Eldest son gets double share
- Practice inherited from England

Modifying the model

- Generalise the share-out rule
  - unequal division within one sex
  - differential treatment of men & women
- Reconsider the mixture distribution
  - a general extension is straightforward in principle
  - let ω_k^j be the share going to child *j* in a family with *k* children
  - (in the original family model $\omega_k^j = \frac{1}{k}$)
- "Favouritism" – a convenient simplification
  - one child gets an allocation of $1 + \xi$; every other gets an allocation of 1
  - so $\omega_k^j = \frac{1+\xi}{k+\xi}$ for the favourite and $\omega_k^j = \frac{1}{k+\xi}$ for all the other kids
  - for "no favouritism": $\xi = 0$
  - for the "old Testament / old Colonial": $\xi = 1$

Idle rich again

- Mechanics of distributional change:

$$F_t(W) = \sum_{k=1}^{K} \tfrac{1}{2}kp_k \sum_{j=1}^{k} F_{t-1}\left(\frac{W}{2\beta\omega_k^j}\right)$$

- Now we need the F_* that solves:

$$F_*(W) = \sum_{k=1}^{K} \tfrac{1}{2}kp_k \sum_{j=1}^{k} F_*\left(\frac{W}{2\beta\omega_k^j}\right)$$

- Again this will be a Pareto distribution
  - Now α is found from β as a root of the equation

$$\beta^{-\alpha} = 2^{\alpha-1} \sum_{k=1}^{K} p_k \sum_{j=1}^{k} [\omega_k^j]^\alpha$$

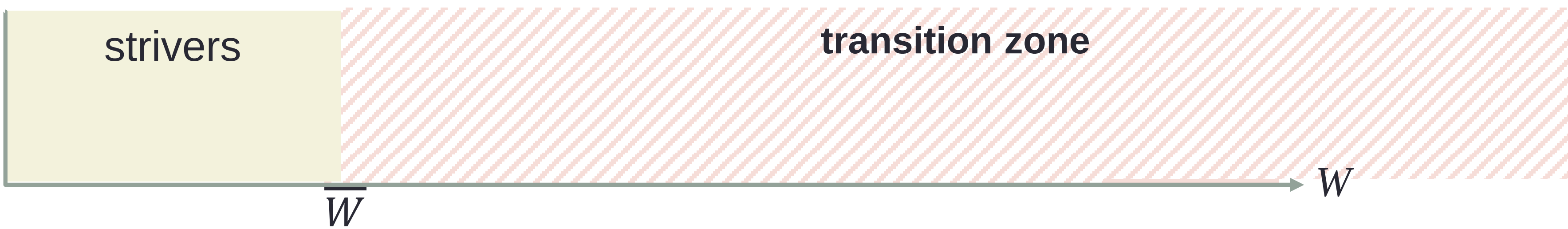
- But the general result with ω_k^j not transparent

Favouritism

- Take special case where just one child gets a premium ξ
- The dynamic equation becomes:

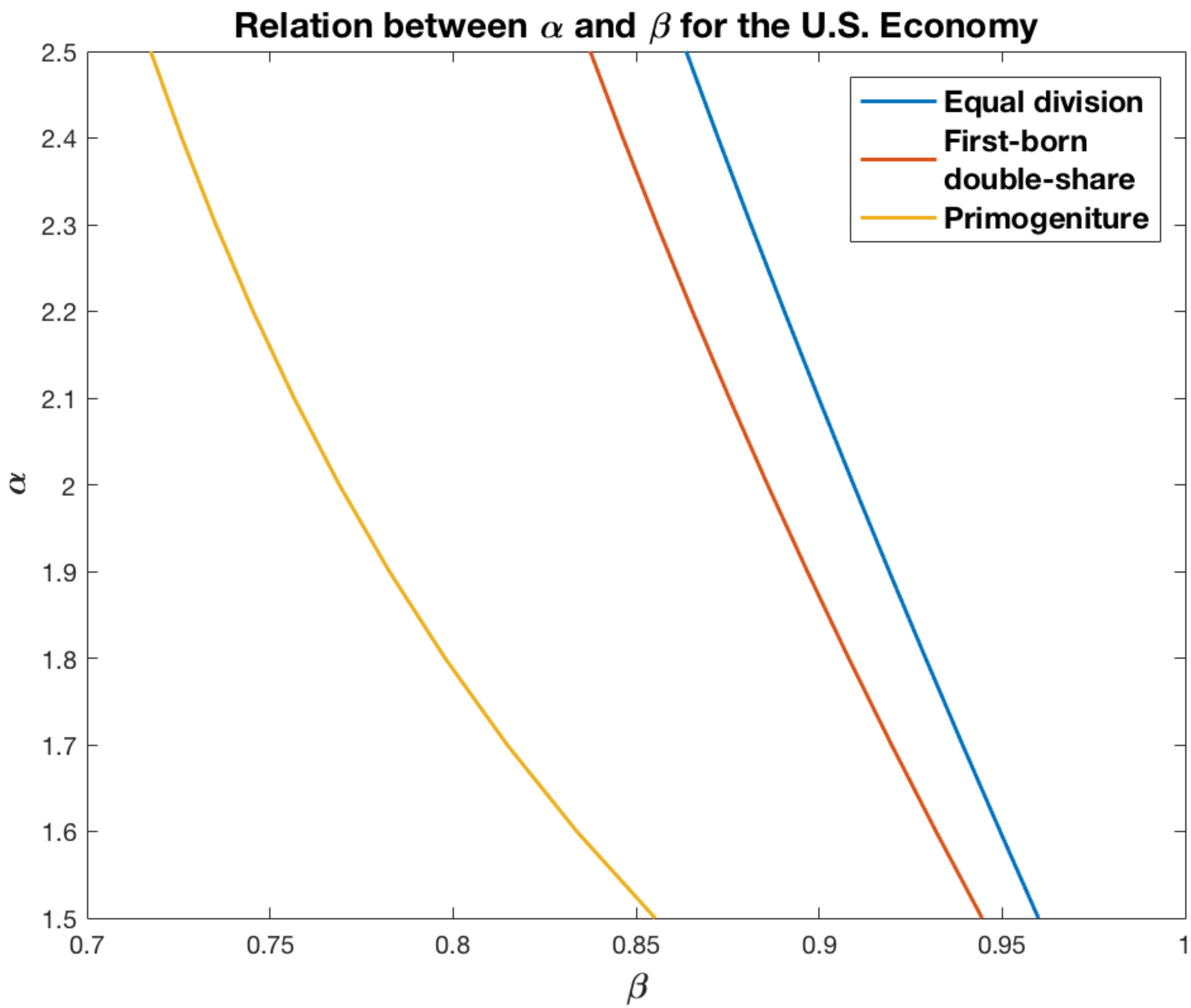
$$F_t(W) = \sum_{k=1}^{K} {}^1\!/2 p_k \left[F_{t-1}\left(\frac{W[k+\xi]}{2\beta[1+\xi]} \right) + [k-1] F_{t-1}\left(\frac{W[k+\xi]}{2\beta} \right) \right]$$

  - over the "idle rich" region $\mathbb{W} = \left[\frac{K+\xi}{2\beta}\overline{W}, \infty \right)$
- What happens if the premium ξ increases?



  - as ξ increases, transition zone increases, "idle rich" region shrinks
  - Pareto tail starts "further up" the distribution
  - as $\xi \to \infty$ the transition zone tends to $[\overline{W}, \infty)$
  - Pareto tail vanishes for pure primogeniture

Favouritism in the US



Gender Bias

- Should be very familiar
  - but perhaps under-researched
  - extend the family model
- Build on the idea of favouritism
  - introduce the “boy premium” ζ
  - assume equal division among the boys, among the girls
  - each boy gets $1 + \zeta$ times what a girl would get
- Get a “two population” solution
  - separate equations for males and females
  - for the males:

$$F_t^{\mathrm{m}}(W) = \sum_{k=1}^{K}\sum_{b=1}^{k} {}^1\!/\!{}_2 p_{kb} b F_{t-1}^{\mathrm{m}}\left(\frac{W\,[k+b\zeta]}{\beta\,[2+\zeta]}\right)$$

Gender Bias (2)

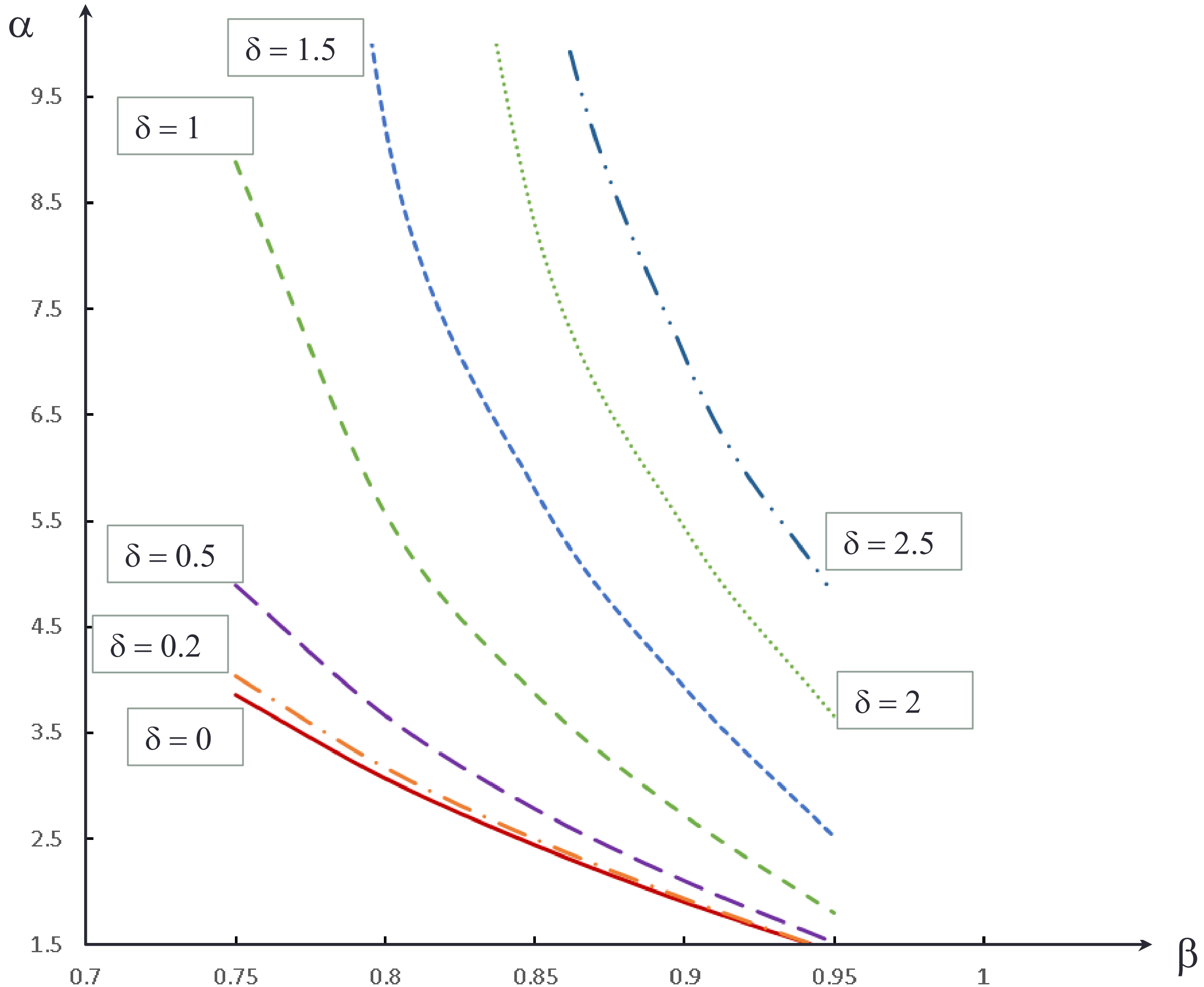
- Can have *both* forms of favouritism in the same model
  - boy-premium
  - first-born premium
- The two forms work in different ways
  - easiest to see in extreme forms
  - let the relevant premium become infinite
- Extreme boy premium:
  - as $\zeta \to \infty$ becomes like the family model
  - but boys only
- Extreme first-born premium:
  - as $\xi \to \infty$ the Pareto tail disappears
  - irrespective of gender bias

Marriage

- We have assumed strict assortative mating
  - empirically reasonable?
  - but maybe need a more general approach
  - full analysis can be quite complex
- Prince and Shepherdess
  - a model with "class-disloyalty" δ
  - handle simple upward- and downward matches
  - everyone marries someone with $1+\delta$ or $\frac{1}{1+\delta}$ times their own wealth
- Again you get a Pareto tail
  - modified condition for α
  - collapses back to standard case if $\delta = 0$

$$\sum_{k=1}^{K} p_k k^{1-\alpha} = \frac{1+[1+\delta]^\alpha}{\beta^\alpha [2+\delta]^\alpha}$$

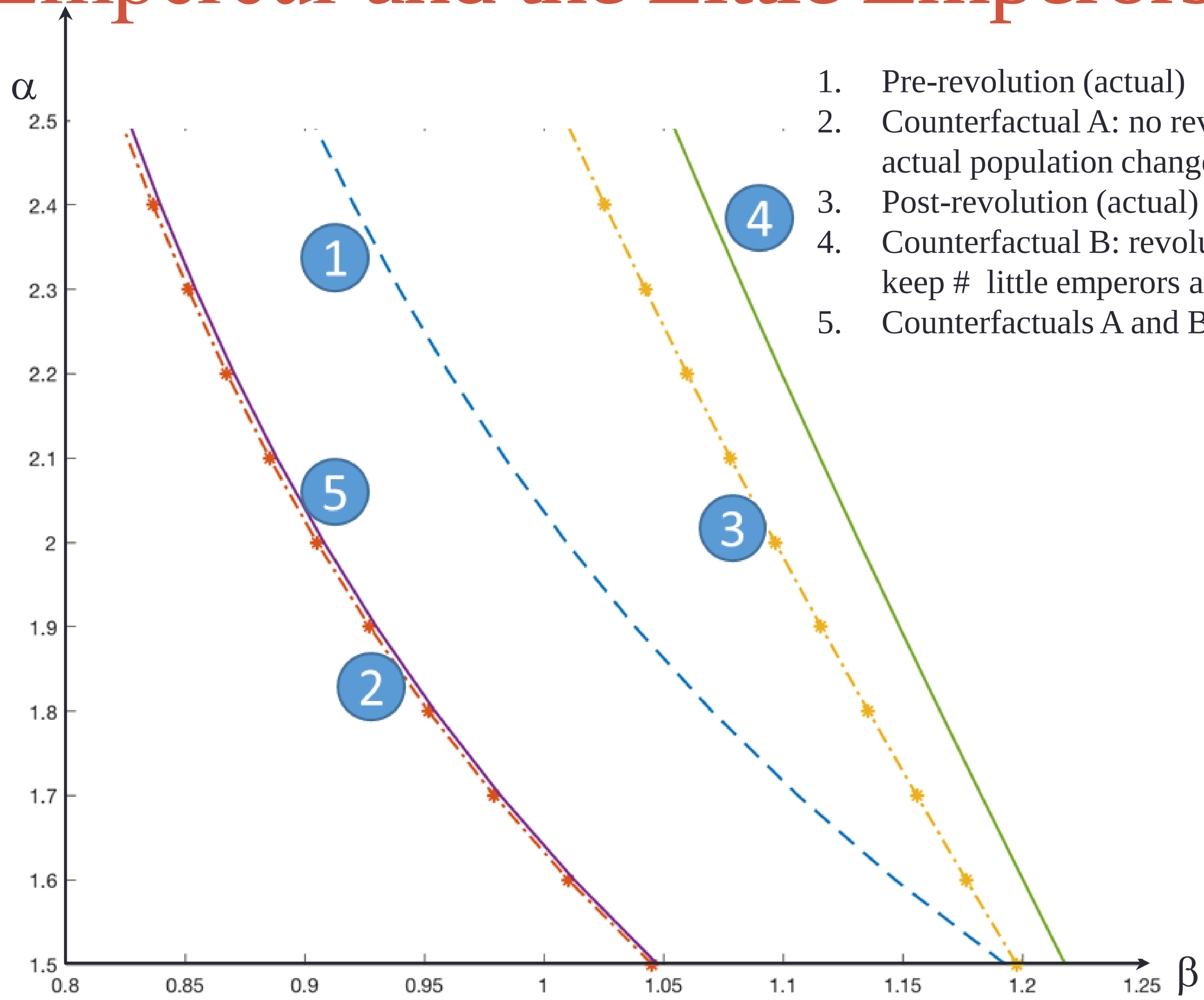
The (α,β)-relationship and marriage



A historical example

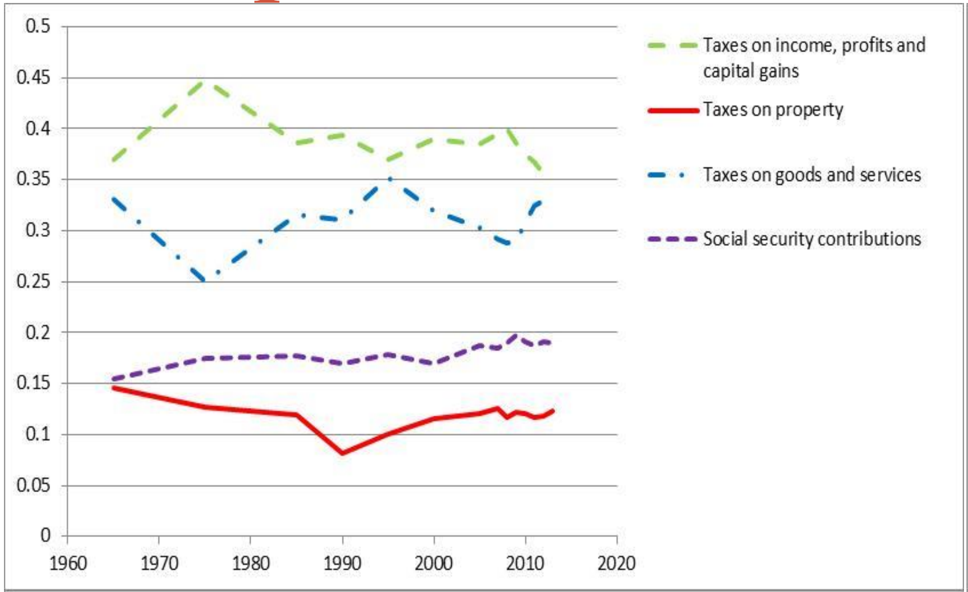
- The French revolution: a natural experiment?
- An interesting case study for inheritance rules
  - injustices in pre-revolutionary primogeniture
  - procedural equity enforced
  - embodied in the Napoleonic Code
- Great hope for the long run
  - endorsed in Condorcet's writings
- But outcome in terms of wealth distribution modest
  - did the Napoleonic Code fail? (Piketty 2014)
  - examine what seems to have happened to equilibrium inequality
  - use two counterfactuals

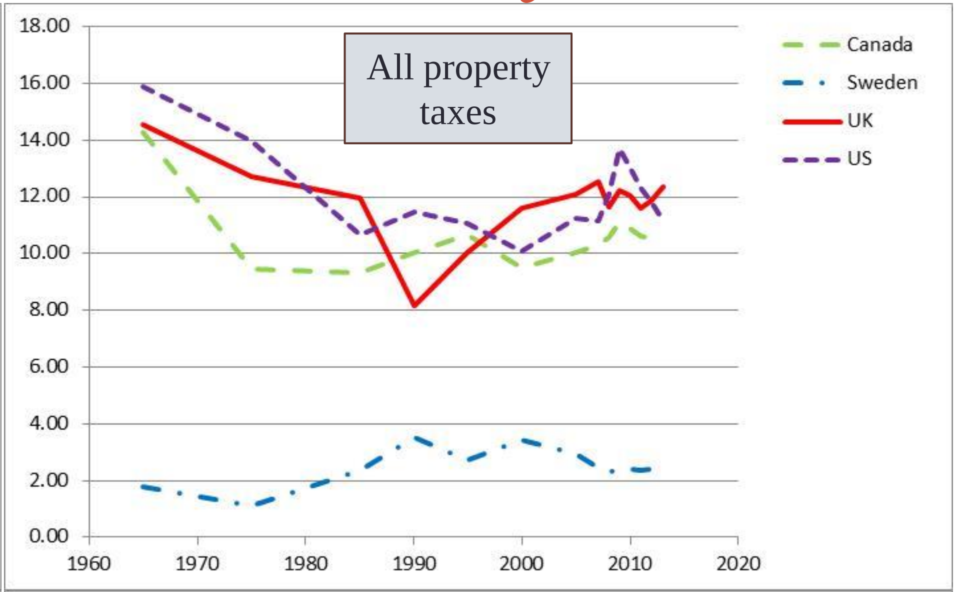
L’Empereur and the Little Emperors

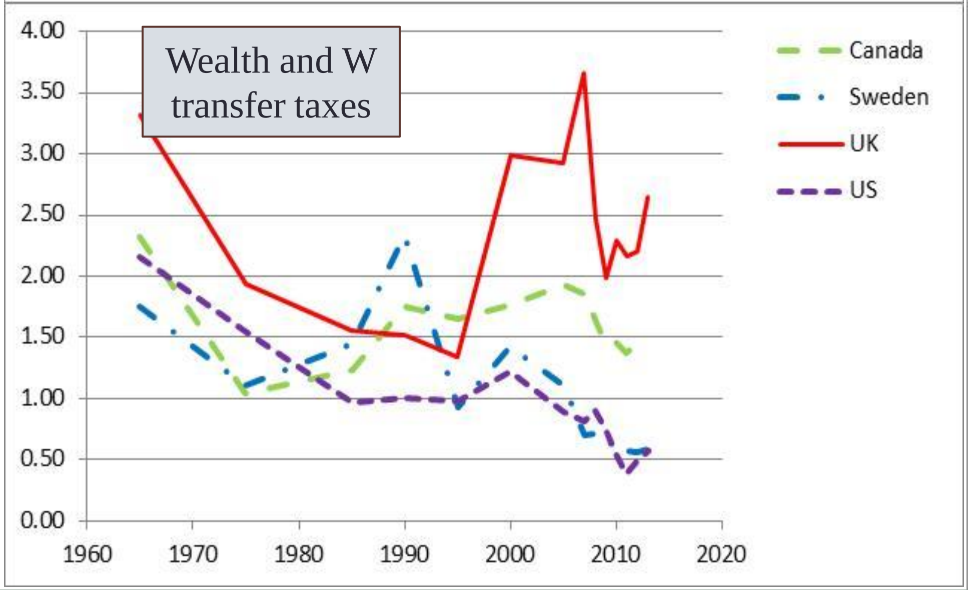


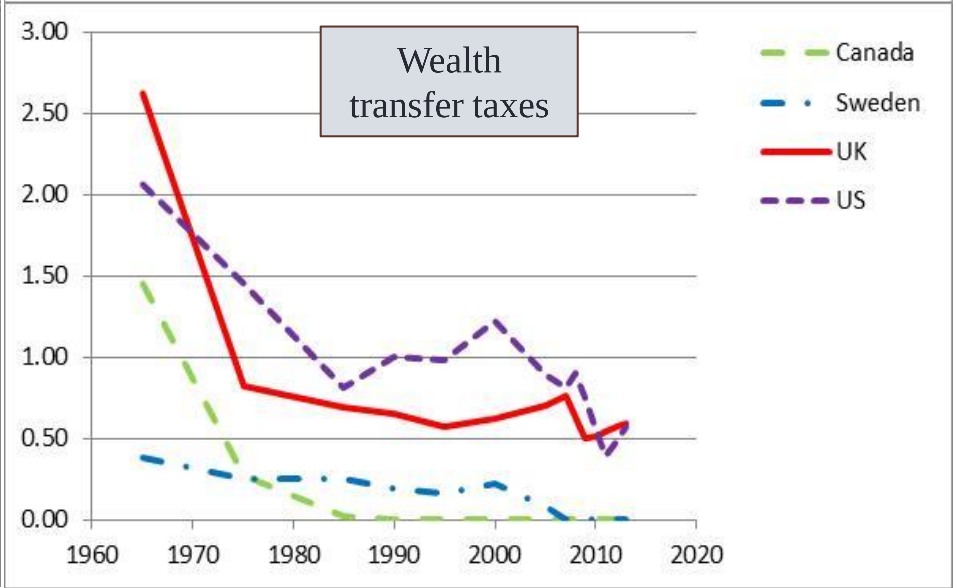
1. Pre-revolution (actual)
2. Counterfactual A: no revolution, just the actual population change
3. Post-revolution (actual)
4. Counterfactual B: revolution + adjustment to keep # little emperors at pre-revolution level
5. Counterfactuals A and B combined

Proportion of tax revenue raised by…









Forms of taxation

- Annual wealth tax:
  - tax on a measure of *stock* of assets
  - comprehensive forms of tax are fairly rare
  - important examples of specific wealth taxes (property taxes)
- Inheritance / estate tax: (Pestieau 2003)
  - taxes on *transfer* of wealth at death
  - inheritance tax (IHT): on the beneficiaries of the estate
  - estate tax: on personal representatives of the deceased
  - other taxes on transfer of wealth not necessarily at death
- On other side of balance sheet?
  - "asset-based egalitarianism"
  - start-of-life grants ("demogrant")
  - state pension provision

  - Kopczuk (2013)

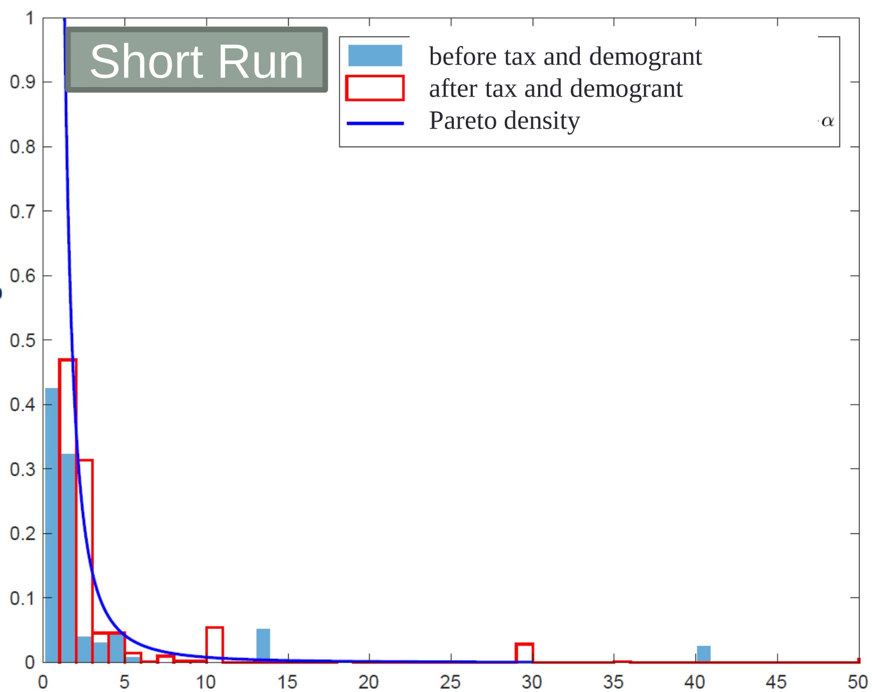
IHT as a policy tool?

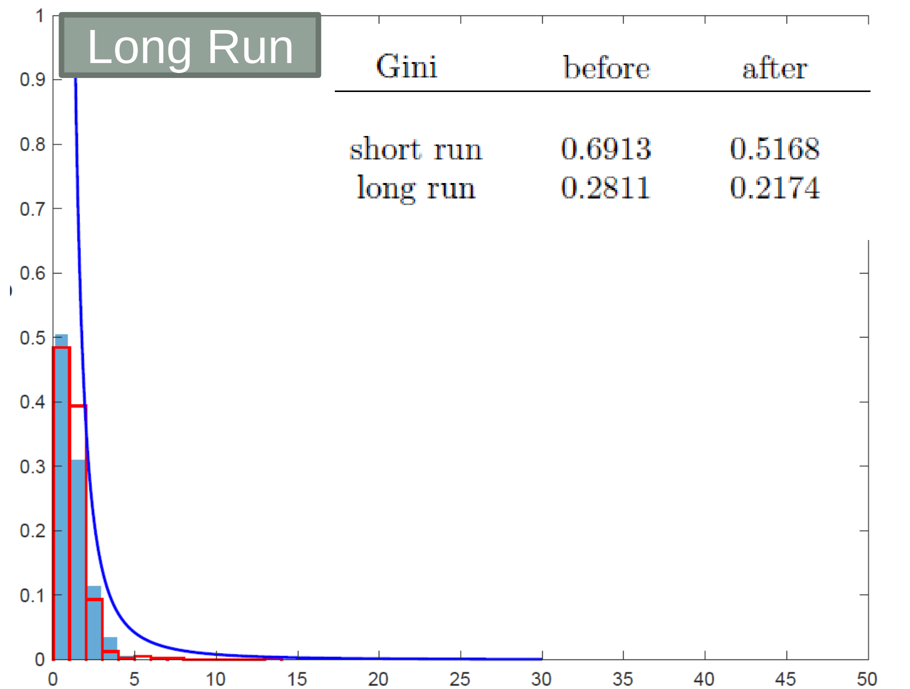
- Revenue raising is unlikely to be major role
  - revenue raised less than 1% of tax receipts? (OECD Revenue Statistics)
  - (however it is remarkably unpopular – Gross et al. 2017)
- Efficiency case for or against wealth taxation is unclear
  - (Cremer and Pestieau 2006)
- Equity case for wealth taxation is more promising
  - direct impact of inheritance taxation on redistribution must be small
  - in long run taxes may influence savings and bequest behaviour
  - these influence wealth accumulation and inequality
  - small taxes can have big effect on the equilibrium (Kaplow 2000)

- Distinguish between: (Cowell, Van de gaer and He 2017)
  - **redistribution**: apparent instantaneous impact
  - **predistribution**: effect on equilibrium wealth distribution

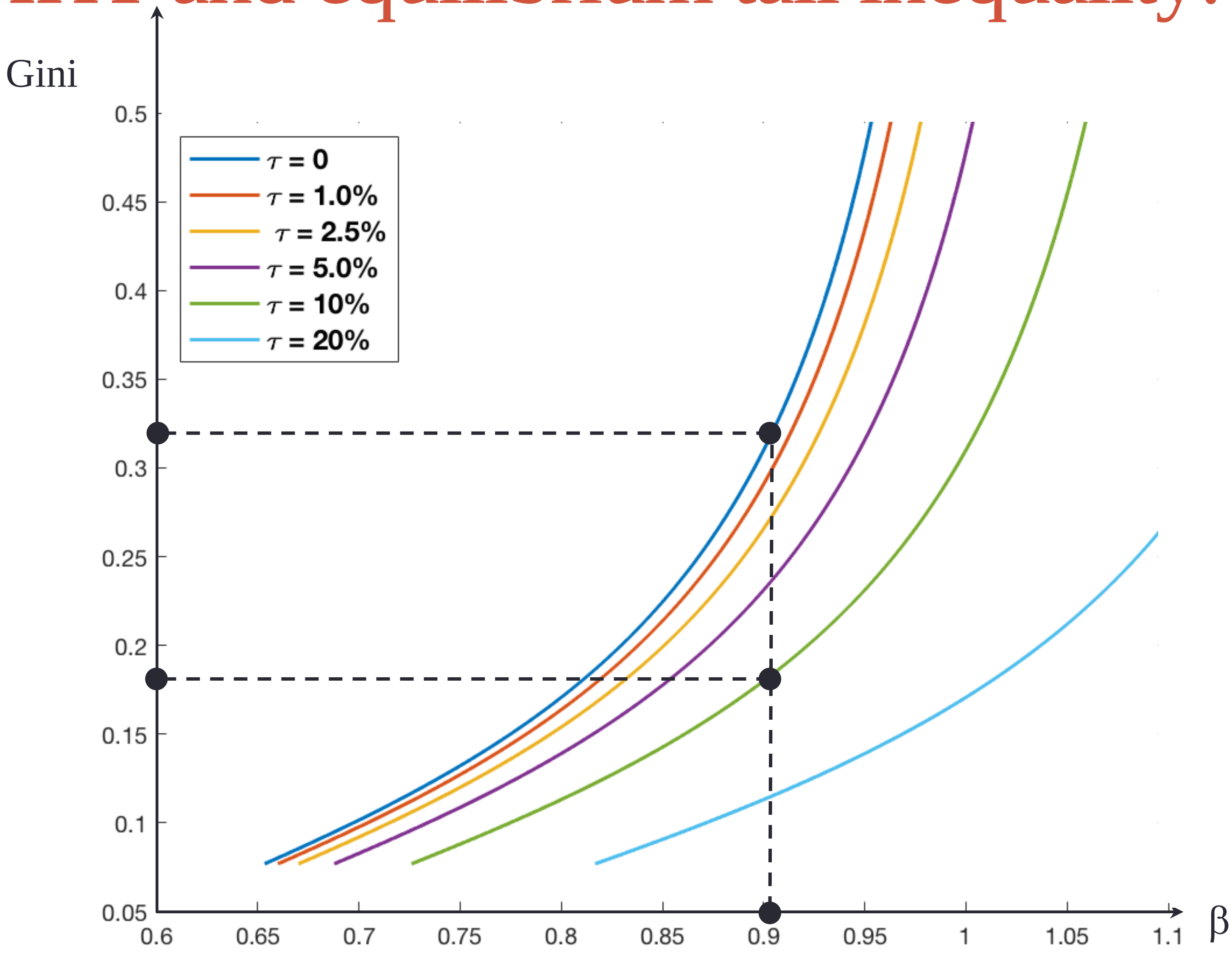
IHT: re- and pre-distribution

- Find before-tax equilibrium distribution
  - case 1 population structure
- Introduce 30% inheritance tax and balance-budget uniform demogrant
- Compute short-run equilibrium
  - single period only earnings adjustment
- Compute long-run equilibrium distribution

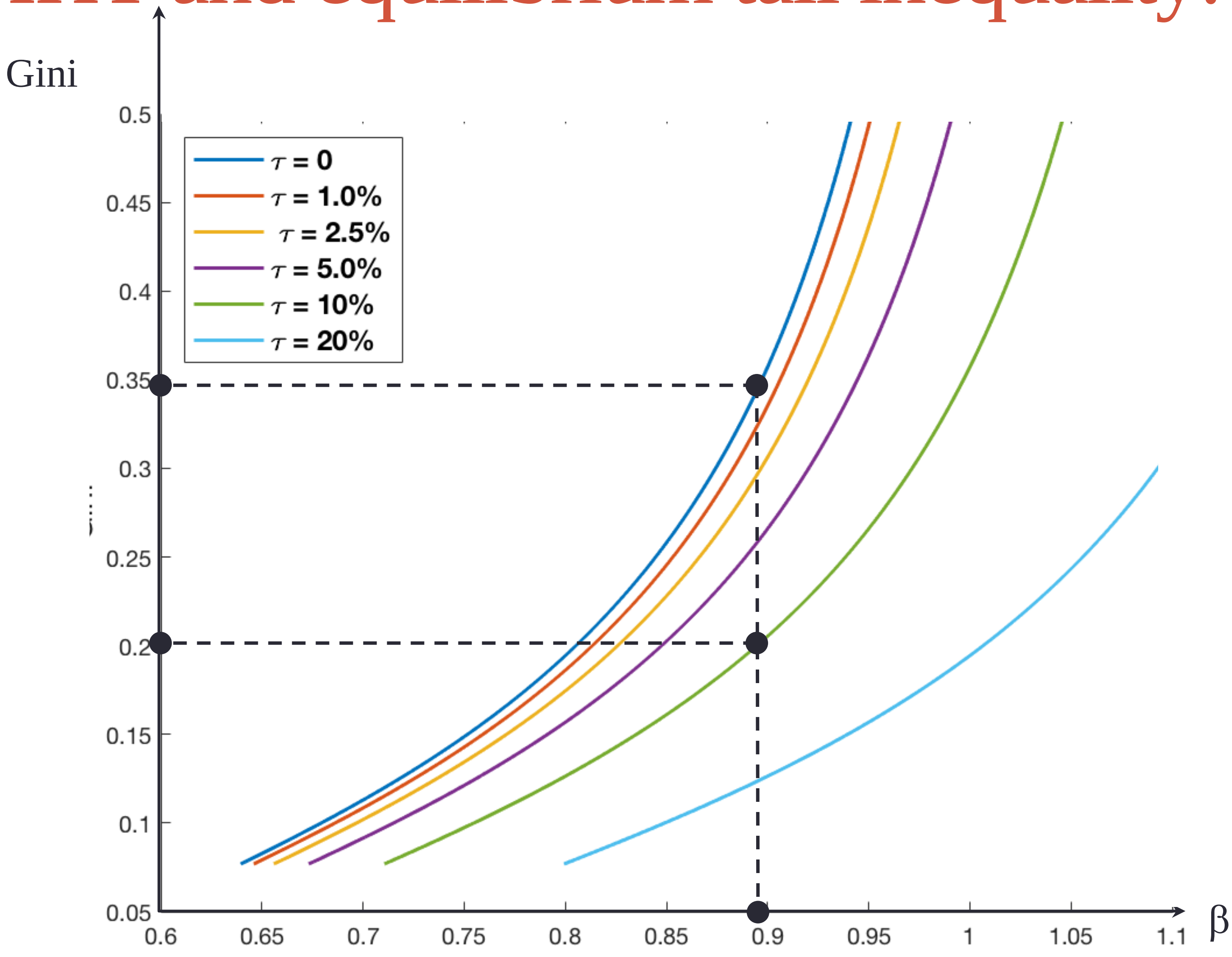




IHT and equilibrium tail inequality: Case 2



IHT and equilibrium tail inequality: Case 3



Take-away thoughts

1. Behavioural model produces a polarisation
   - inequality within and between wealth groups
   - source of inequality lies in savings behaviour
   - role of uncertainty captured in savings behaviour
2. The family will always be a powerful inequality-generator
   - even if the family follows egalitarian practices
   - even in the absence of unfair laws and customs inheritance drives inequality
   - labour market is crucial acts as a cushion for the rich?
3. Inheritance generates a Pareto tail
   - almost always true, regardless of detailed assumption
   - but where the tail starts depends on precise assumptions
   - for equilibrium must have $\beta < \pi$
4. Case for inheritance taxation is clear
   - but works through long-run effect

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