Entrepreneurs, Managers and Inequality

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CEPR ESSIM

Some Facts

In the U.S., income distribution has become more concentrated post 1980s

- In 1962, top income percentile earned 8.3% of aggregate income
- In 2000, top income percentile earned 20% of aggregate income

Closely connected with changes in labor income

- Top wage income percentile earnings increased from 6.2 to 15.5%
- Wage income share of top income percentile grew from 45.6 to 61.7%

Wealth is more concentrated than income

- In 1962, top wealth percentile held 32.2% of aggregate wealth
- In 2000, top wealth percentile held 32.2% of aggregate wealth

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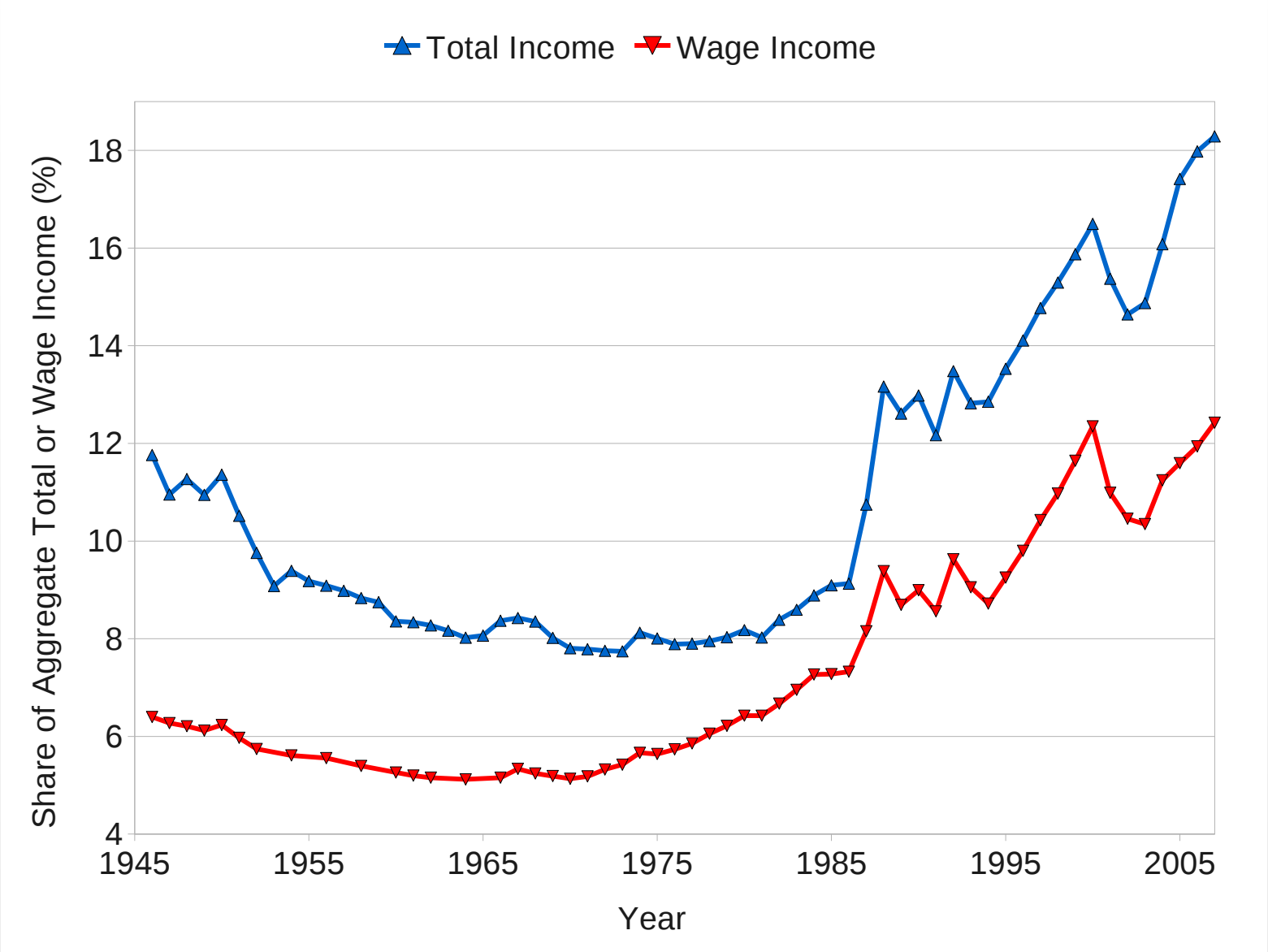
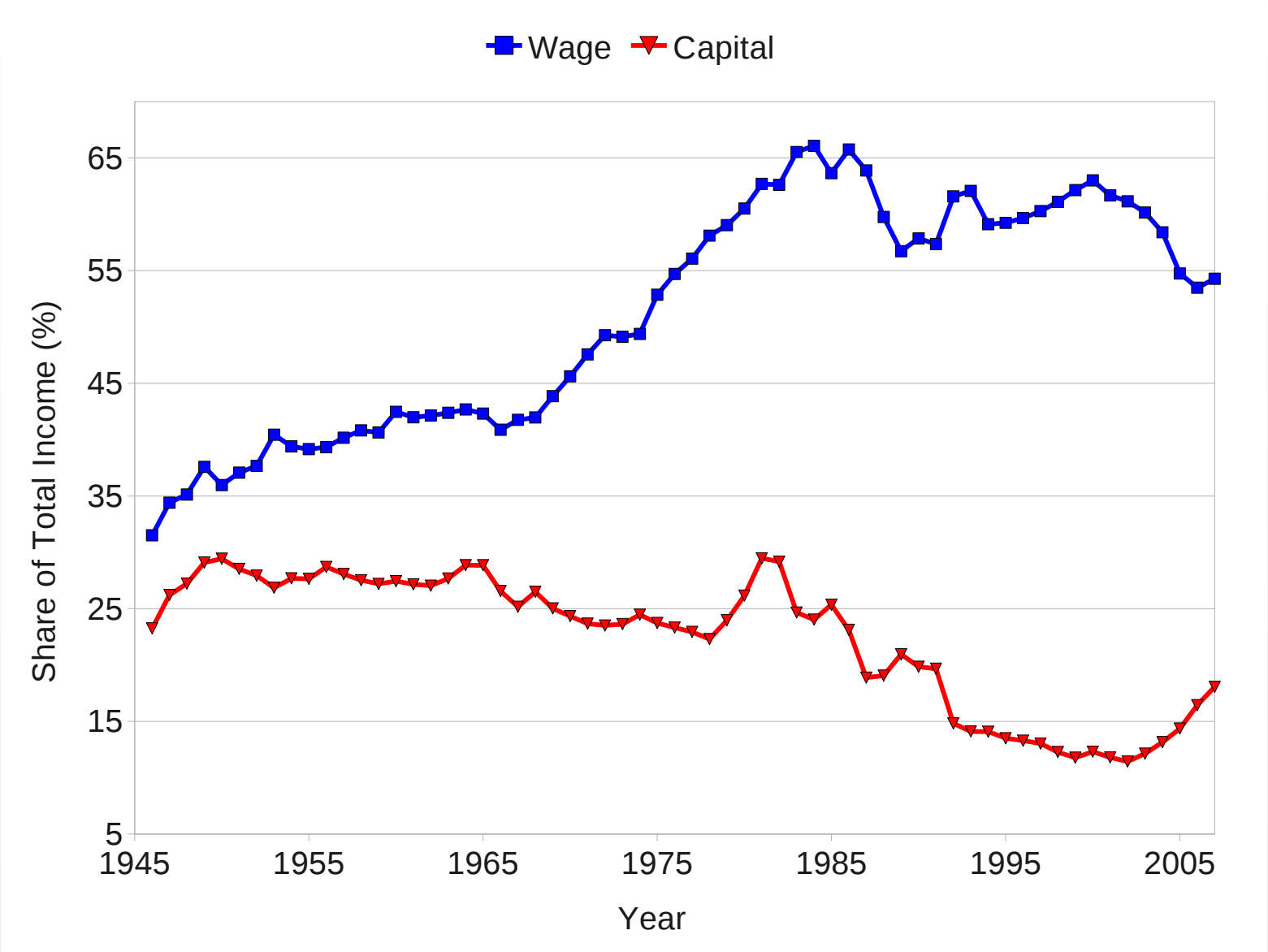
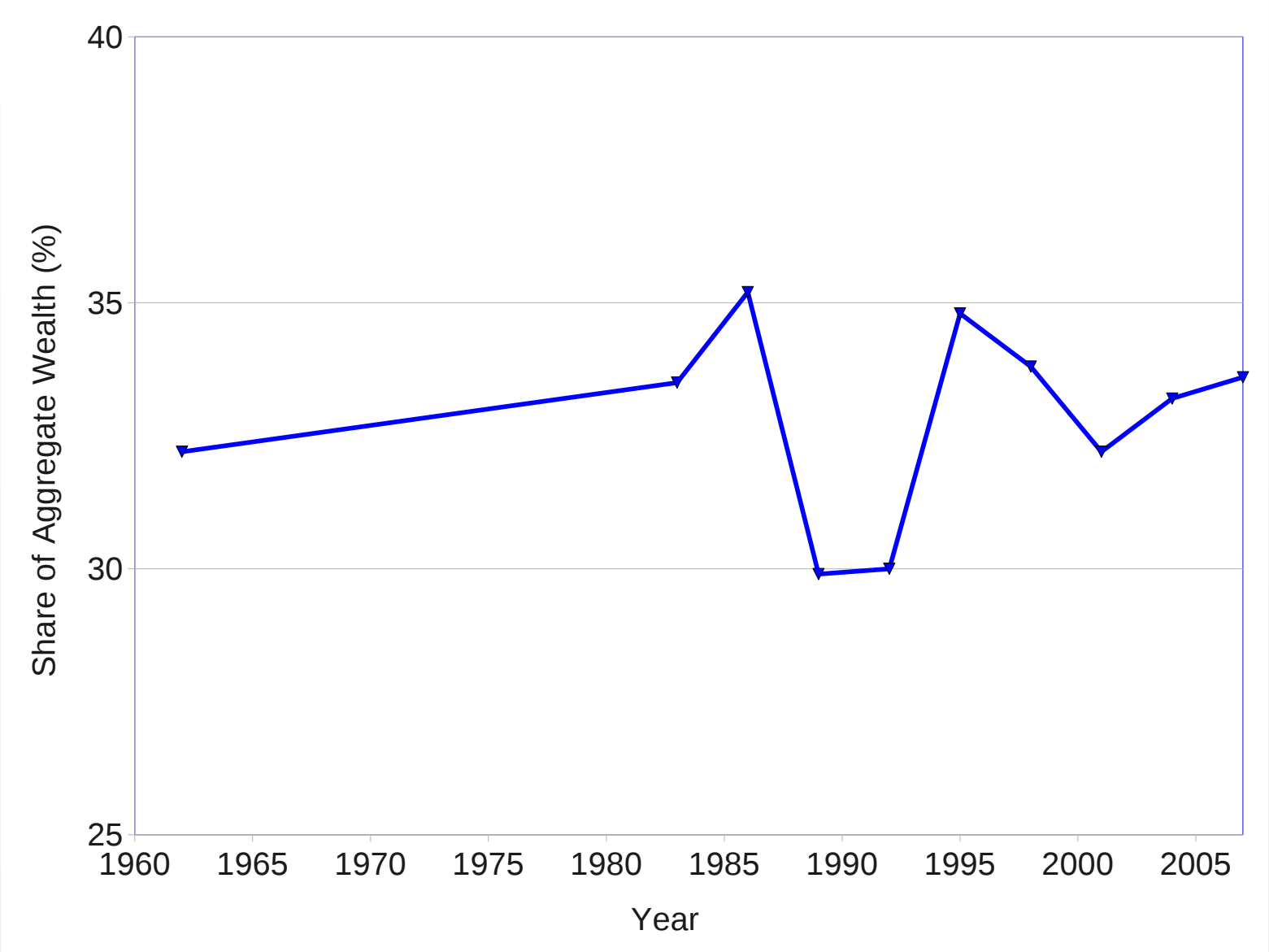


Top percentile shares of total and wage income, 1946-2007.



Wage and capital income share of top income percentile, 1946-2007.



Top percentile share of wealth, 1962-2007.

Modeling Choices

Previous models cannot explain these facts

- Do not account for sources of income separately, nor link that to wealth
- High wealth concentration creating mechanisms lead to strong correlation between income and wealth concentrations

I use occupations to differentiate sources of income

- **Entrepreneurs** vs **Managers**
- Differing sources of income, savings motive
- Individual choices determined in general equilibrium

Change in tax code $\Rightarrow$ Change in high income occupations
$\Rightarrow$ Change in distributions of income and wealth

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Related Facts

Sharp increase in executive compensation

- Associated with huge increase of corporate sector
- Executive compensation accounted for as wage income

Less progressive taxation

- But high income group share of total tax revenue has increased
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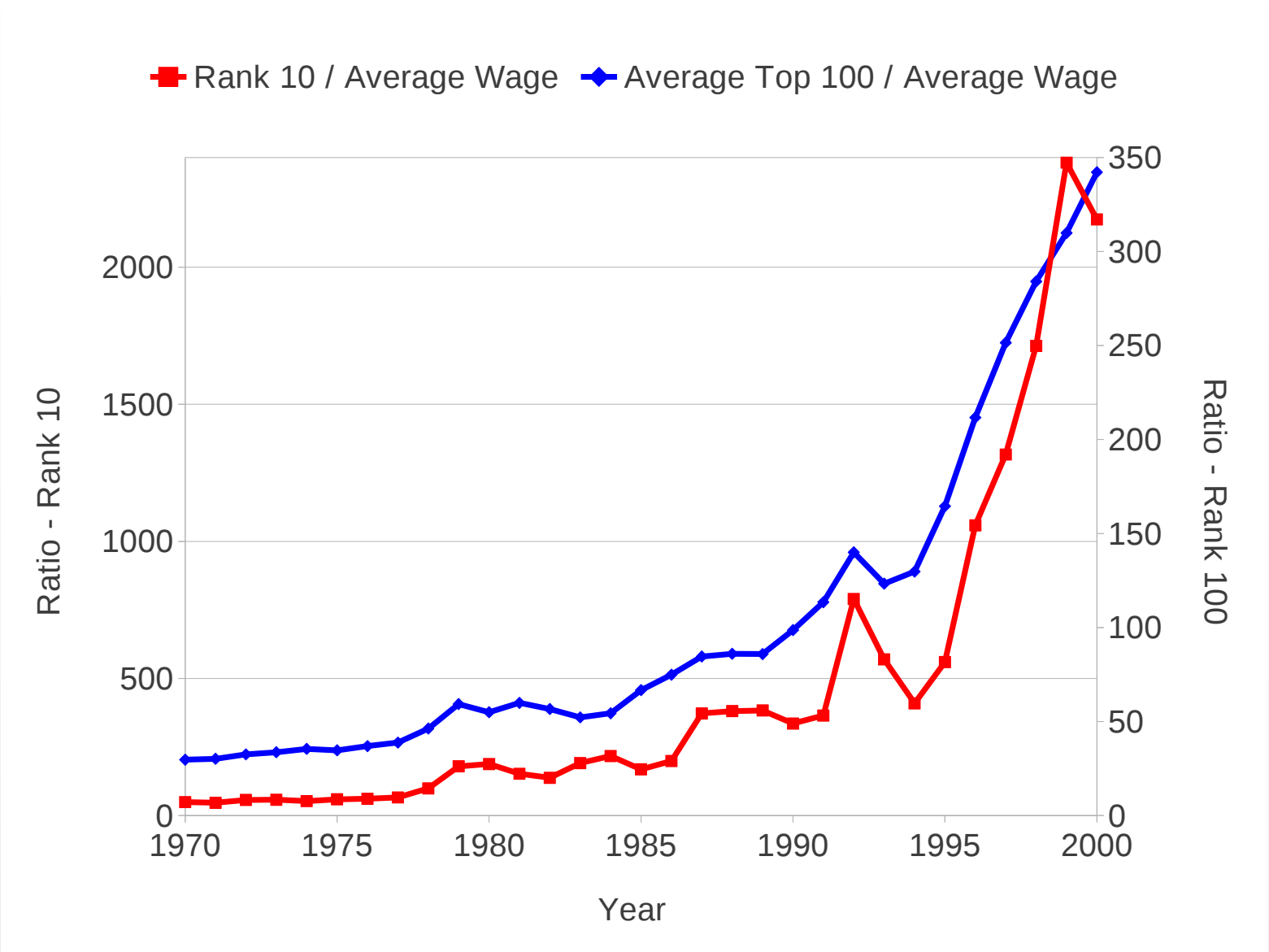
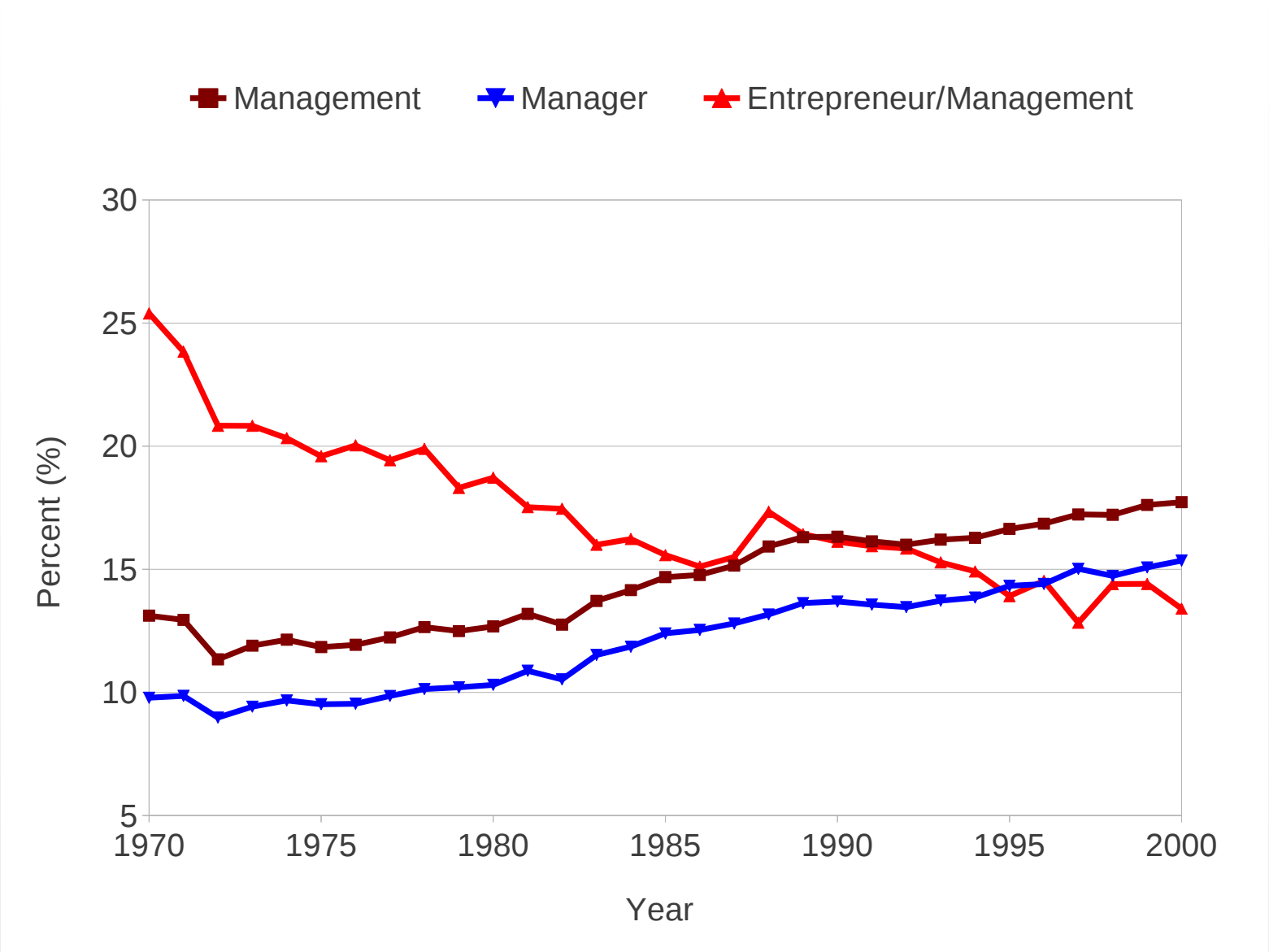
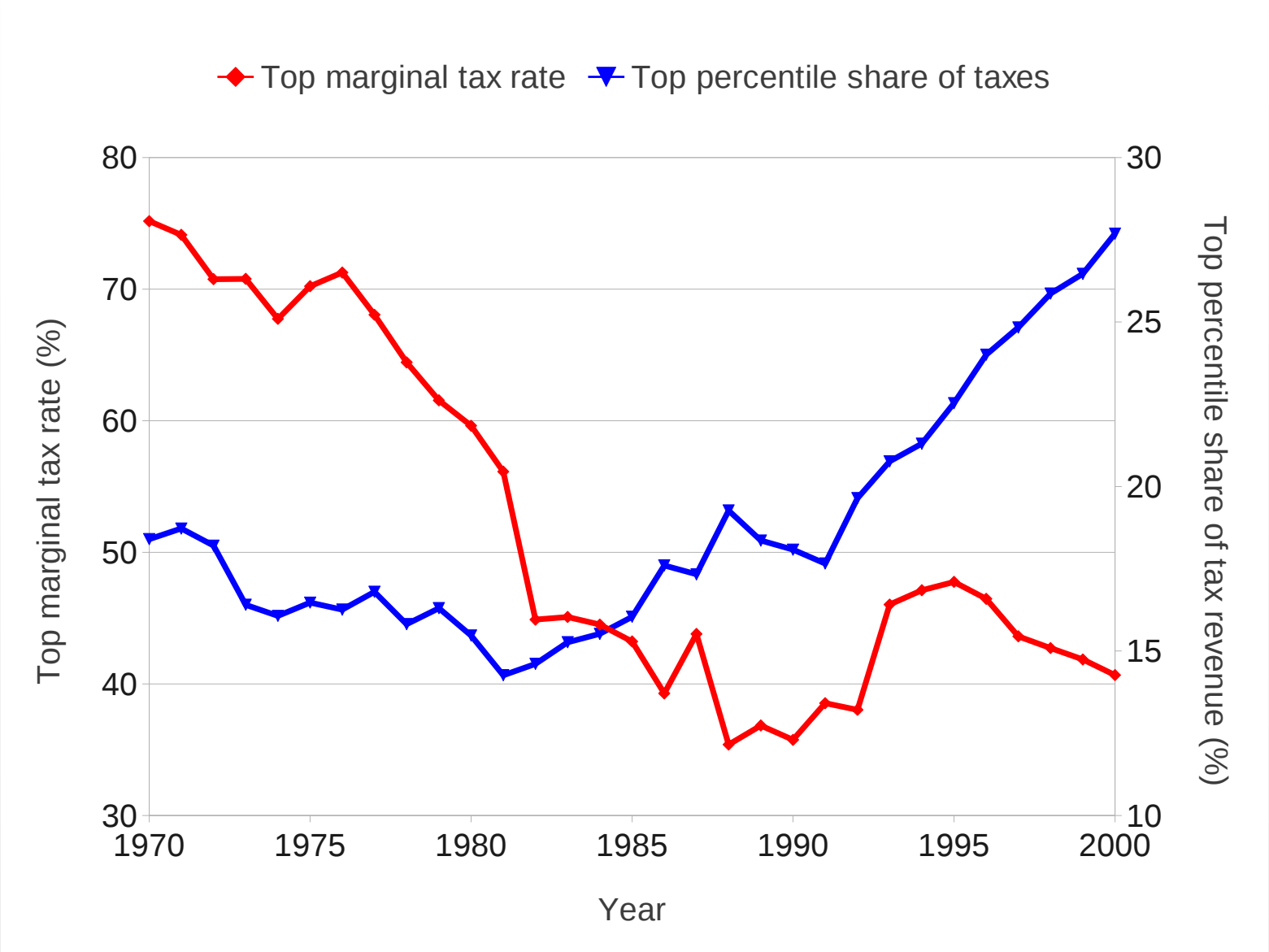


Executive compensation / average annual wage, 1970-2000.



Occupation ratios, 1970-2000.

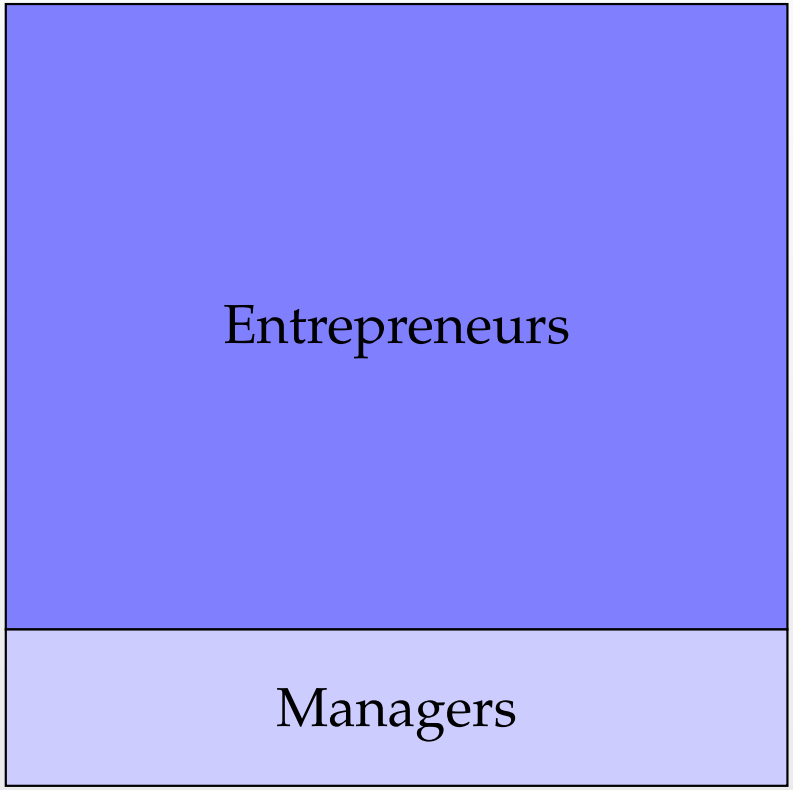


Occupation ratios, 1970-2000.

Key Findings

- Tax progressivity explains one third of increase in earnings and income concentration
- Wealth concentration is flat in progressivity
- More progressive taxation can increase welfare (1-2%)

Mechanism of the Model



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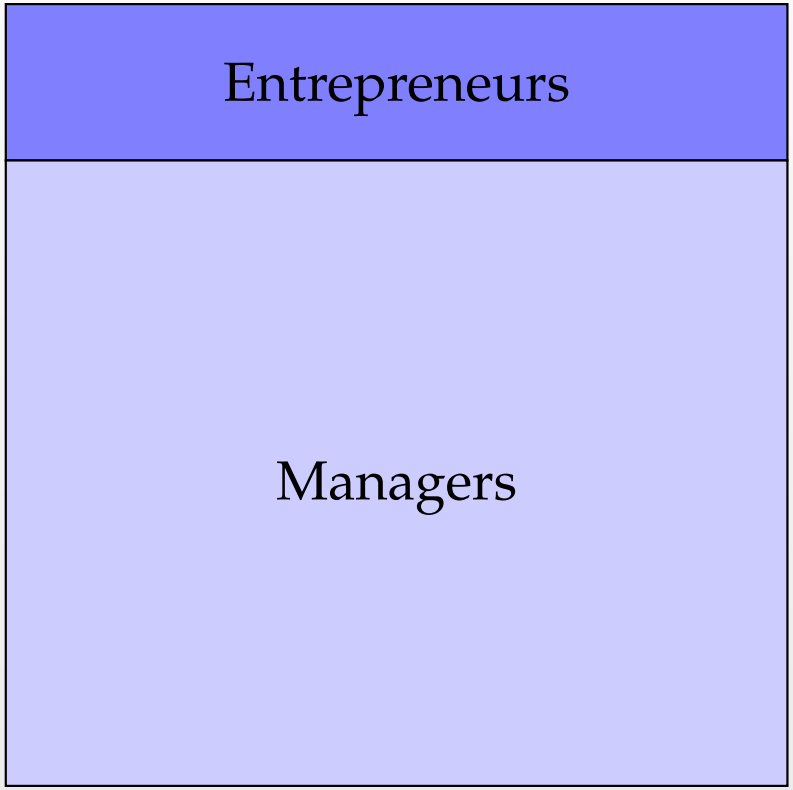

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- Less wealth concentration

- Larger income, save less

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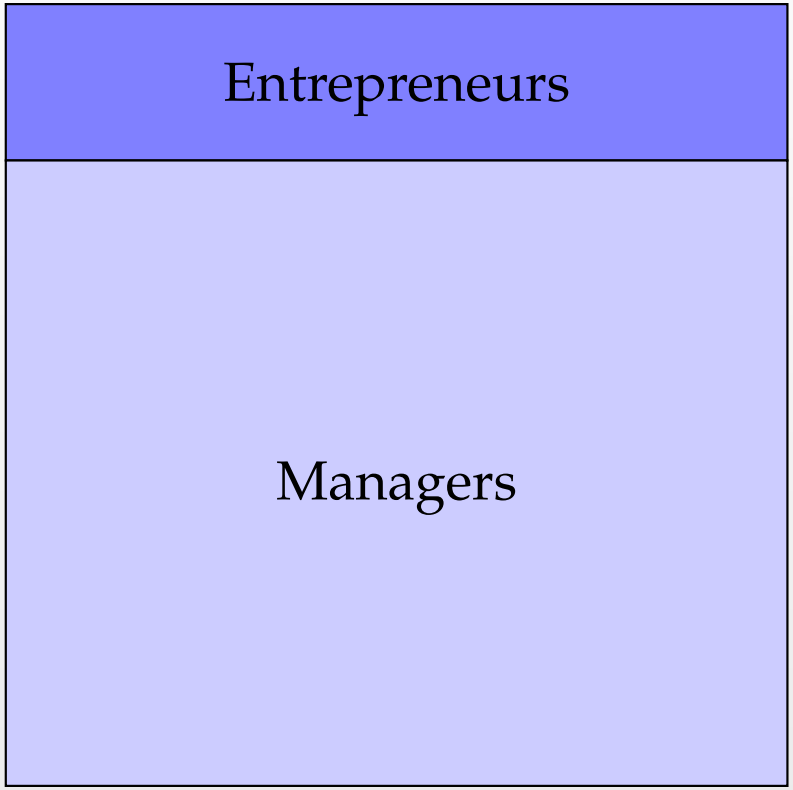

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$\Rightarrow$ **But wealth does not**

Setup (stationary model without taxes)

- Discrete time, year $t = 0, 1, \ldots$
- Infinitely lived households with standard CRRA period utility

$$u(c) = \frac{c^{1-\gamma}}{1-\gamma}$$

- Agents enter period with state variable (q, m, a)
- $q \in \{0, \underline{q}, \overline{q}\}$: Projects with Markov transition probability ω_q
- $m \sim F[0, \overline{m}]$: Managerial ability, survives with probability v_q
- a: asset holdings, earns economy-wide interest rate r

All markets are competitive, subject to 2 financial frictions

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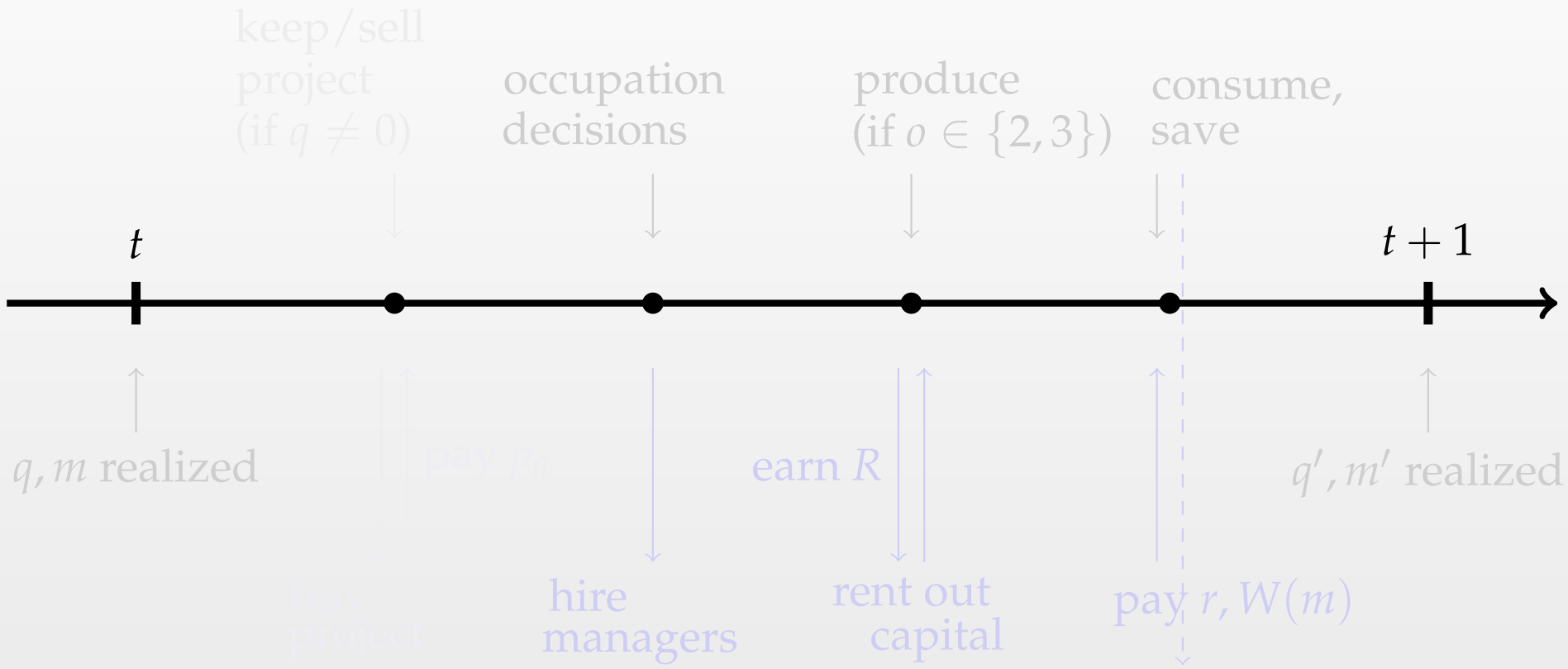

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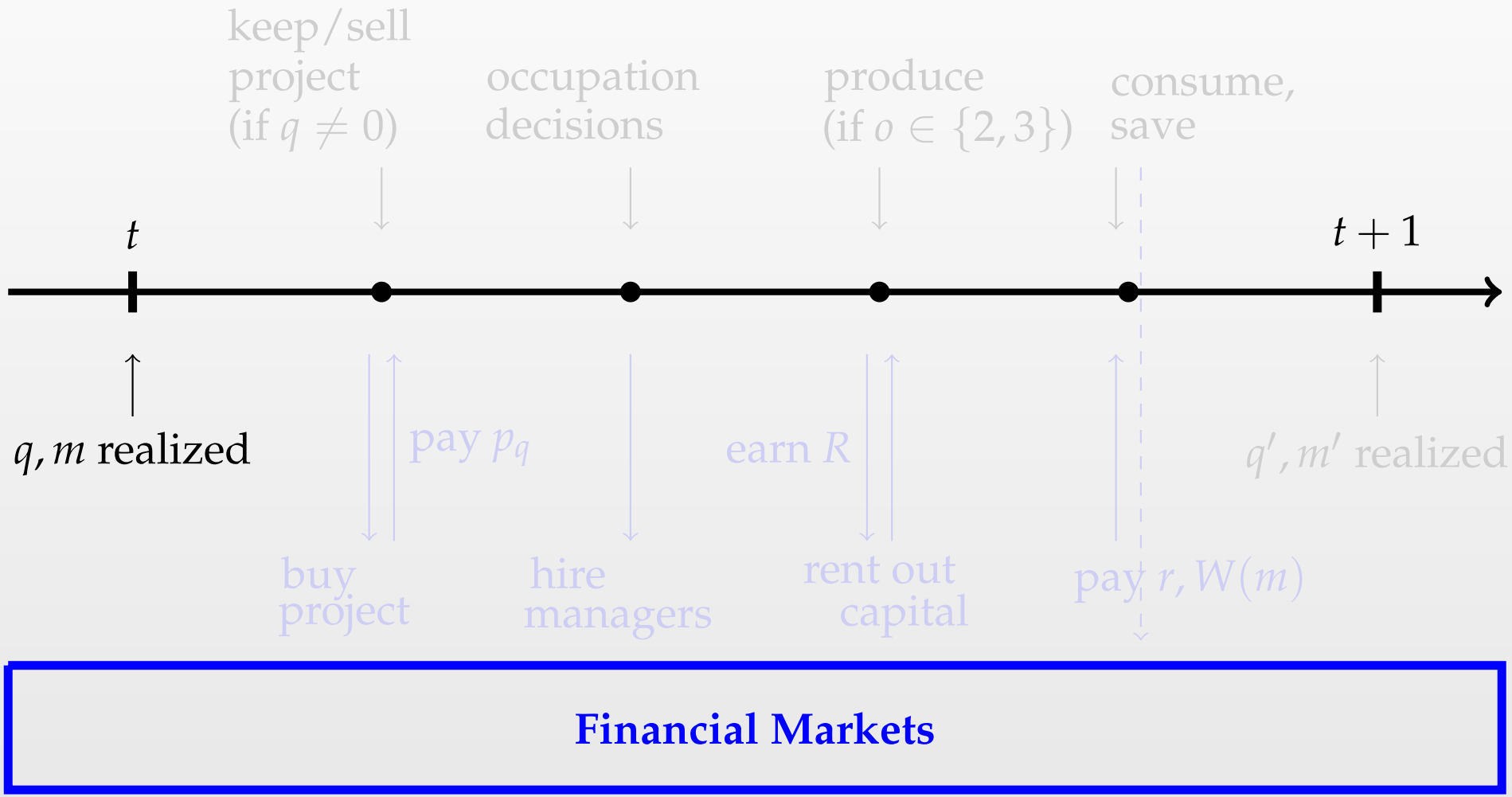
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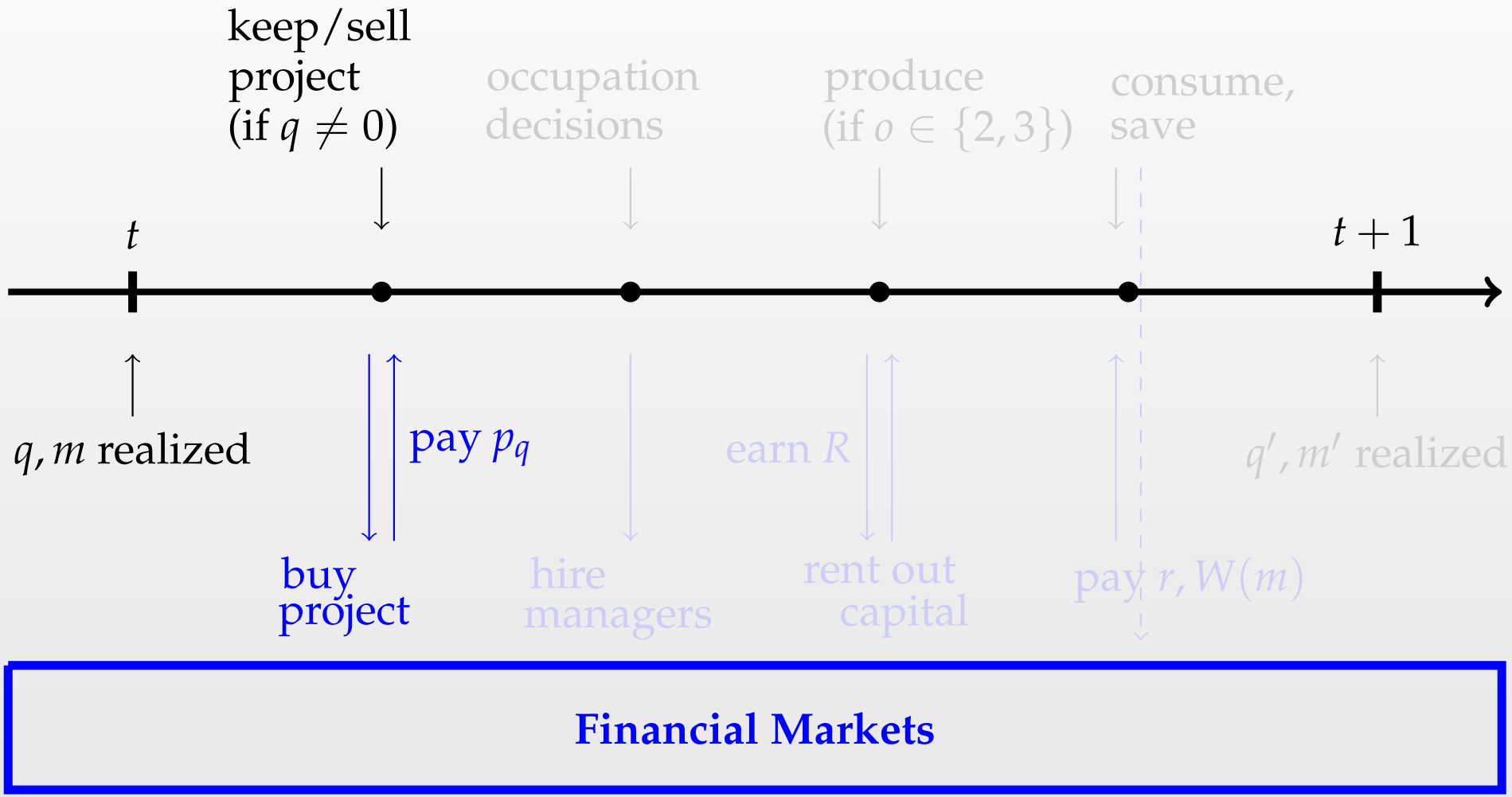
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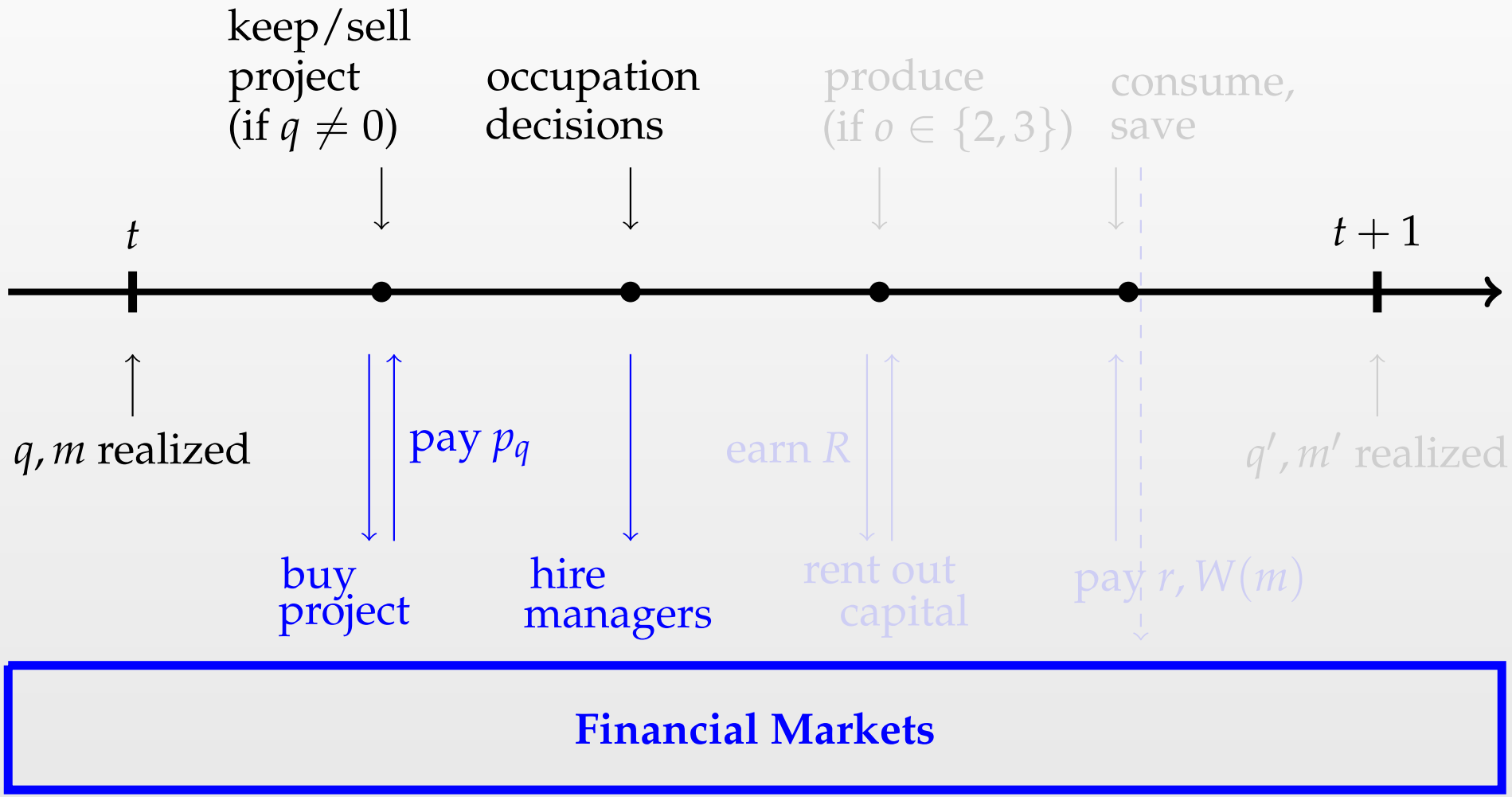
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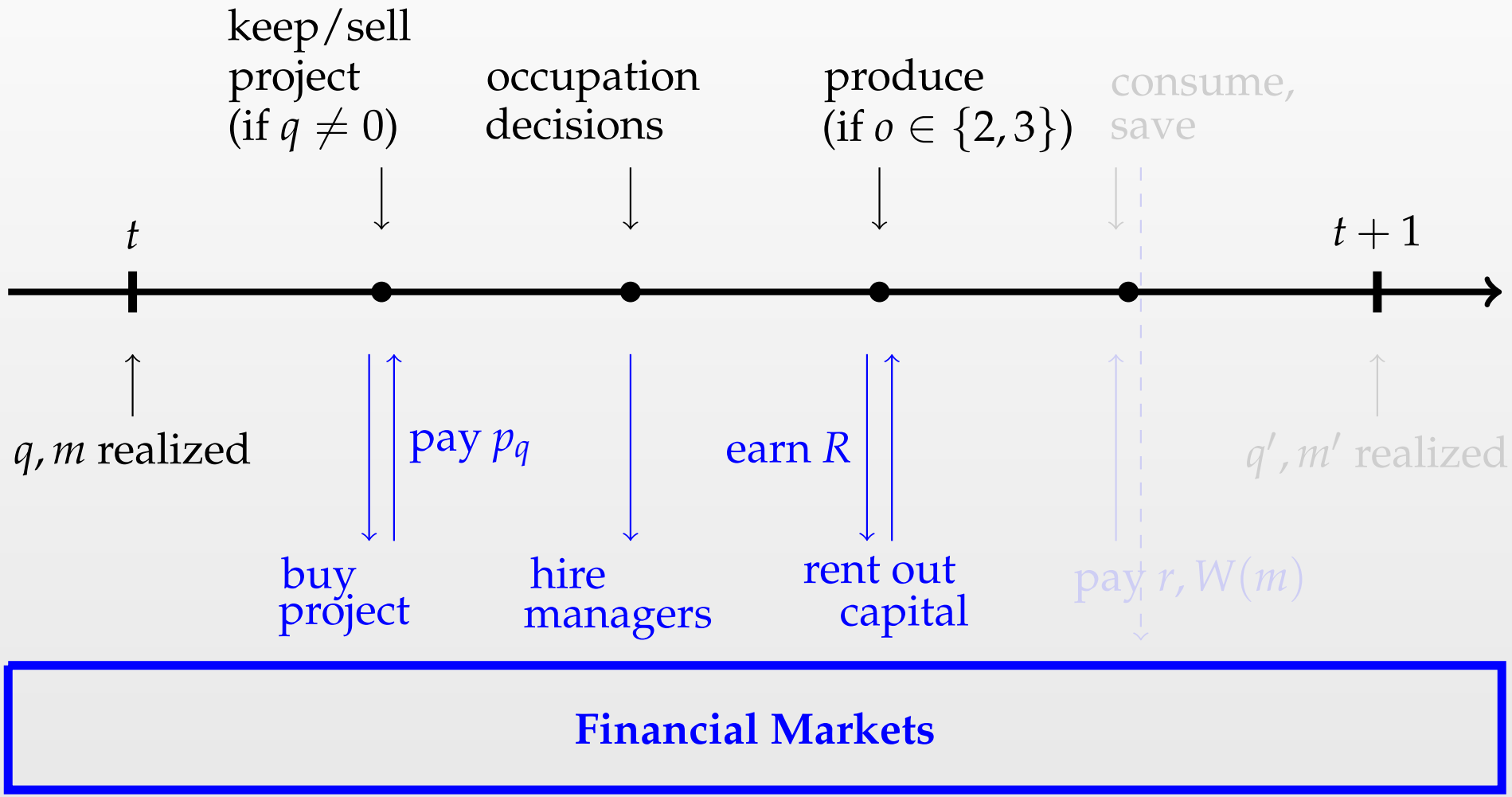
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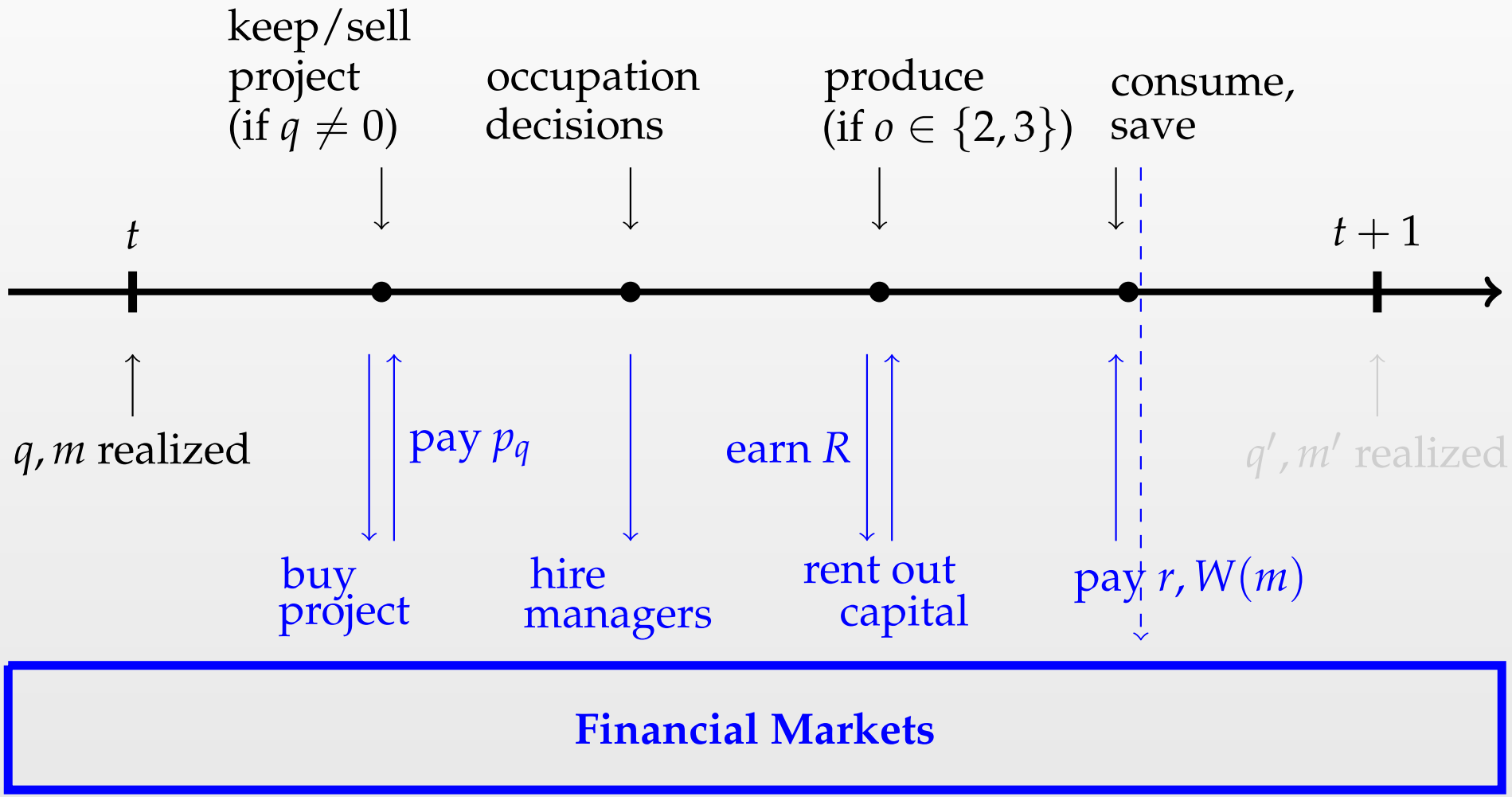
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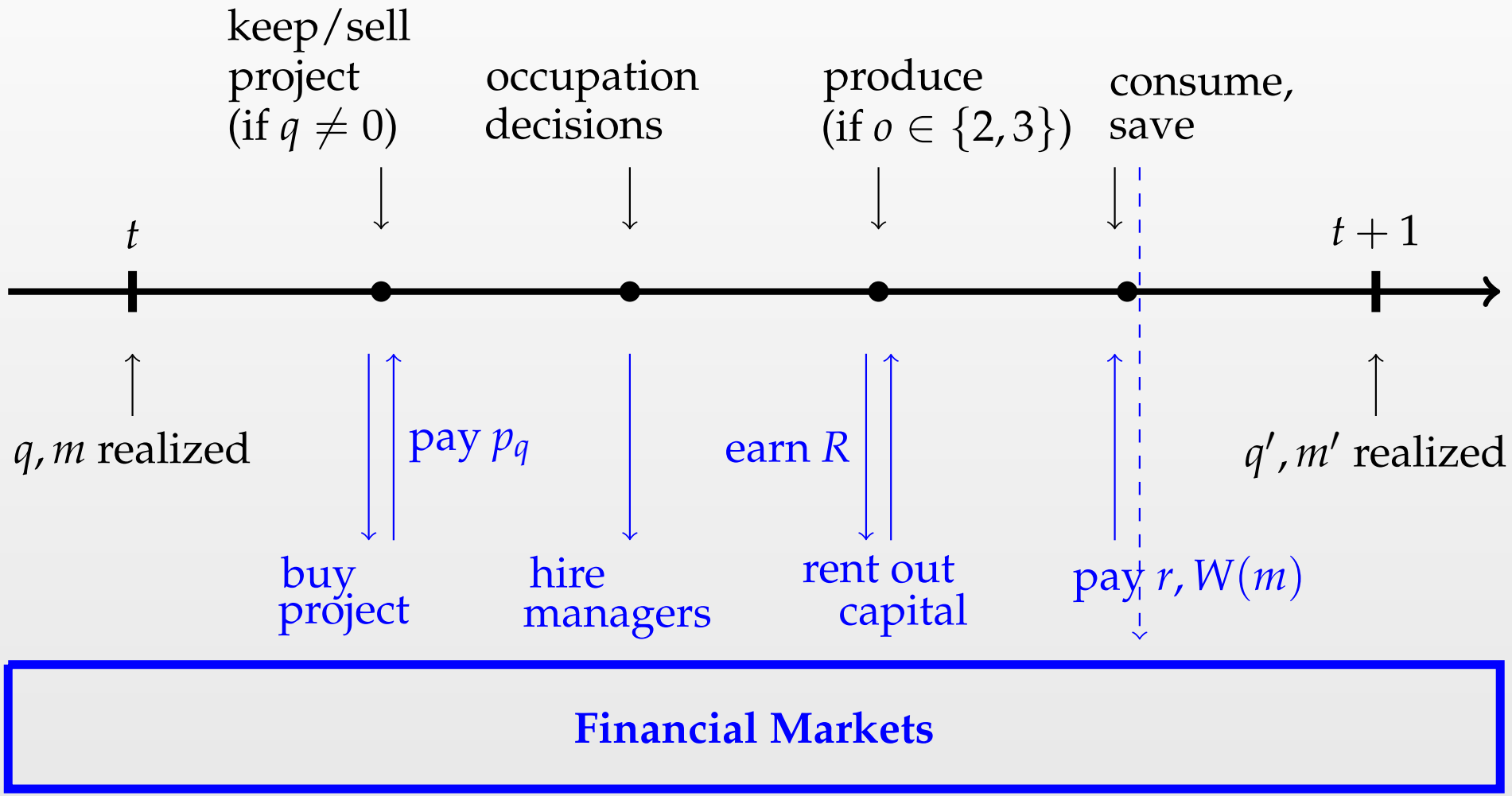
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Projects

- $q \neq 0$: access to economy-wide technology, i.e. "project":

$$f(q\tilde{m}, k, l) = (q\tilde{m})^{1-\alpha-\nu} k^{\alpha} l^{\nu}$$

- DRS ($\alpha + \nu < 1$), otherwise there's only one manager
- $\tilde{m}$: effective ability of the individual operating the project

- $[\pi^*(q\tilde{m}), k^*(q\tilde{m}), l^*(q\tilde{m})]$: unconstrained profits, factor choices

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Entrepreneurs

- If implemented - **"entrepreneur"** (self-run business owner)
- Face collateral constraint $k \leq \lambda a$
- Profits and factor choices are

$$\{\pi(qm,a), k(qm,a), l(qm,a)\} = \begin{cases} \{\pi_c, \lambda a, l_c\} & \text{if } \lambda a < k^*(qm) \\ \{\pi^*, k^*, l^*\} & \text{if } \lambda a \geq k^*(qm) \end{cases}$$

- But opportunities also sellable at price p_q

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Financial Intermediaries (FI)

- FI's take deposits from households and rent capital to firms...

  or buy projects at price p_q

- Once sold, FI's hire **managers** to run the project
- Managers are unconstrained, but assignment is subject to friction κ
- FI and manager split total return: $\pi^*((1-\kappa)qm) = d_q + W(m)$

- Zero profit condition implies

$$\frac{d_q}{p_q} = 1 + r \quad \Rightarrow \quad p_q = \frac{d_q}{1+r}$$

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Managerial Compensation

- Perfect competition in the manager market
  $\Rightarrow$ implies managers reap all additional returns to ability:

$$W(m) = w + \underline{q}(1-\kappa)\left[\pi^*(m) - \pi^*(\hat{m})\right] \qquad \text{if } m \leq \hat{\hat{m}}$$
$$W(m) = W_{\underline{q}}(\hat{\hat{m}}) + \overline{q}(1-\kappa)\left[\pi^*(m) - \pi^*(\hat{\hat{m}})\right] \qquad \text{otherwise}$$

  where $\hat{m}$: manager market clearing cutoff; $\hat{\hat{m}}$: top manager cutoff

- FI earns

$$d_{\underline{q}} = (1-\kappa)\pi^*(\hat{m}) - w$$
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Entrepreneurs vs Managers

- **Entrepreneurs:** implement their own projects
- **Managers:** implement FI's projects

- **Entrepreneurs:** subject to $k \leq \lambda a$ but retain all profits
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- **Competing mechanisms** - high savings or high earnings?

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Occupation Choices and Incomes

Results in state-dependent income:

$$\phi(q=0,m,a) = \begin{cases} w & \text{if} \quad m \leq \hat{m} \\ W(m) & \text{if} \quad m > \hat{m} \end{cases}$$

$$\phi(q \neq 0,m,a) = \begin{cases} w + p_q & \text{if} \quad m \leq \hat{m} \quad \text{and} \\ & \quad w + p_q > \pi(m,a) \\ W(m) + p_q & \text{if} \quad m > \hat{m} \quad \text{and} \\ & \quad W(m) + p_q > \pi(m,a) \\ \pi(m,a) & \text{if} \quad \pi(m,a) > \max\{w, W(m)\} + p_q \end{cases}$$

Agent's Problem

Taking price vector $P = \{r, w, p_q, W(m)\}$ as given, agent solves

$$\begin{aligned} V(q,m,a) &= \max_{c,a'} \left\{ u(c) + \beta \mathbb{E}\left[V(q',m',a') | q,m \right] \right\} \\ \text{s.t.} \quad c + a' &= \phi(q,m,a) + (1+r)a \end{aligned}$$

- (r, w): interest rate and wage
- p_q: price of projects
- $W(m)$: managerial compensation
- $\phi(q, m, a)$: income resulting from occupation choice

Stationary Equilibrium

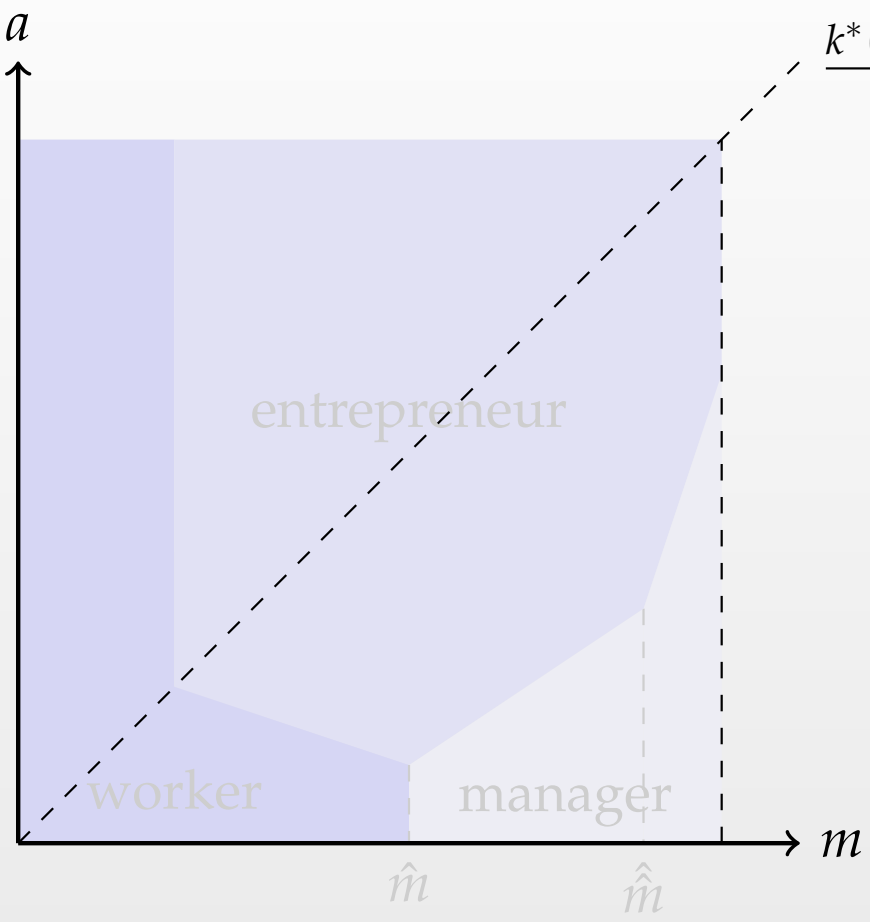
Definition

- Price vector $P = \{r, w, p_q, W(m)\}$ and cutoffs $\{\hat{m}, \hat{\hat{m}}\}$
- Policies $\{c(q,m,a), a'(q,m,a), o(q,m,a), k(m,a), l(m,a)\}$
- Distribution $\mu(q,m,a)$ and law of motion $\mathcal{H}$ such that
  1. given P, policies solve the agent's problem
  2. FI makes zero profit ($R = r + \delta$), project returns = capital returns
  3. capital, labor, manager and goods markets clear
  4. μ is a fixed point of $\mathcal{H}$:

$$\mu = \mathcal{H}(\mu)$$

where $\mathcal{H}$ is derived from the policy functions

Equilibrium



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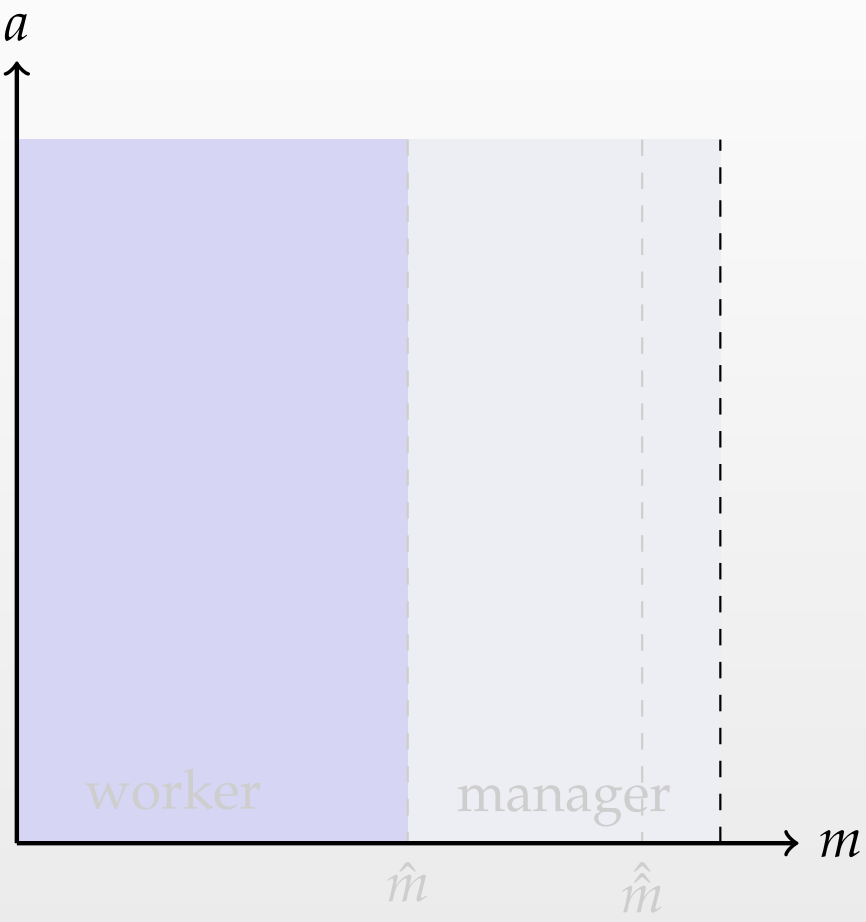

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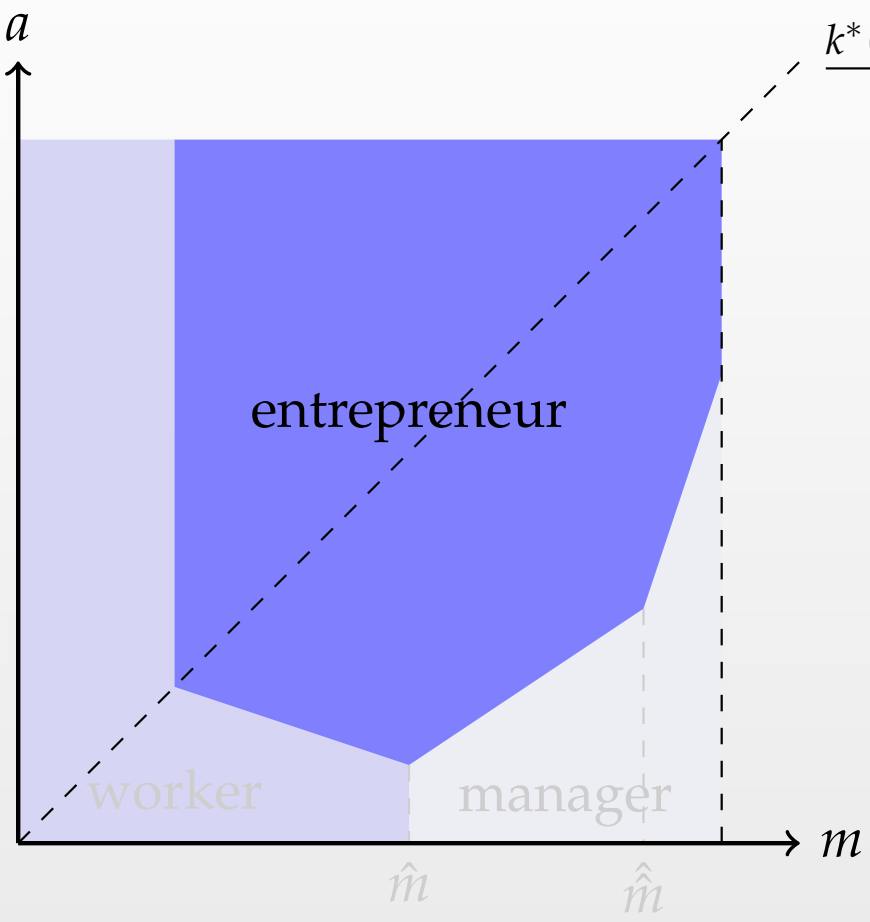

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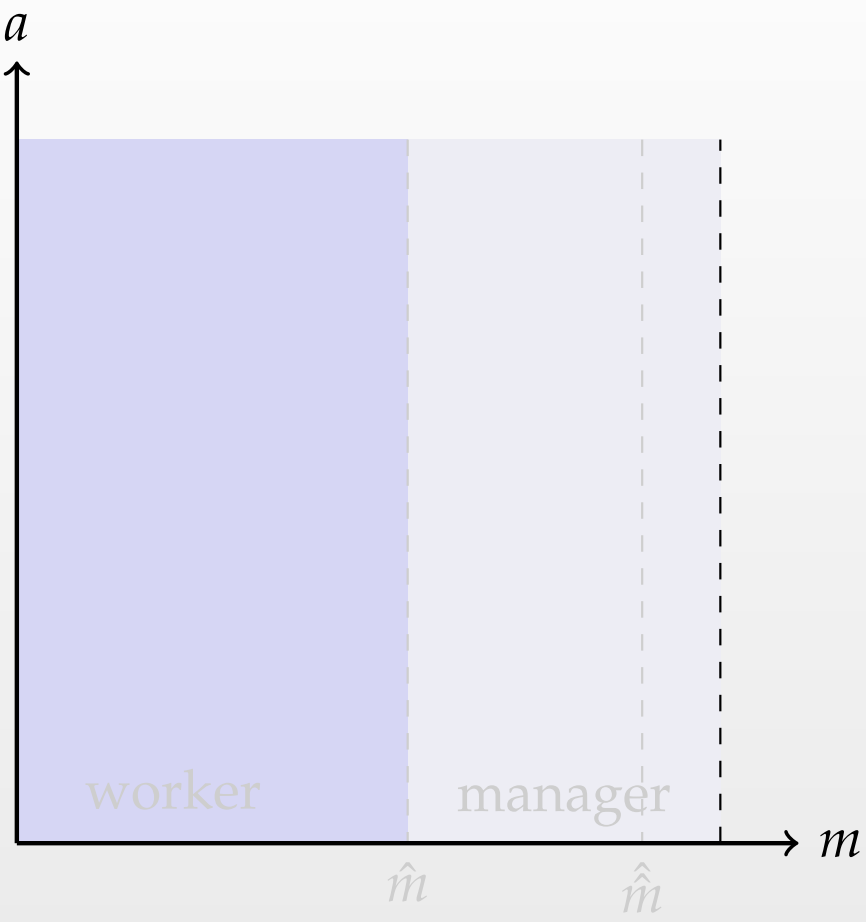

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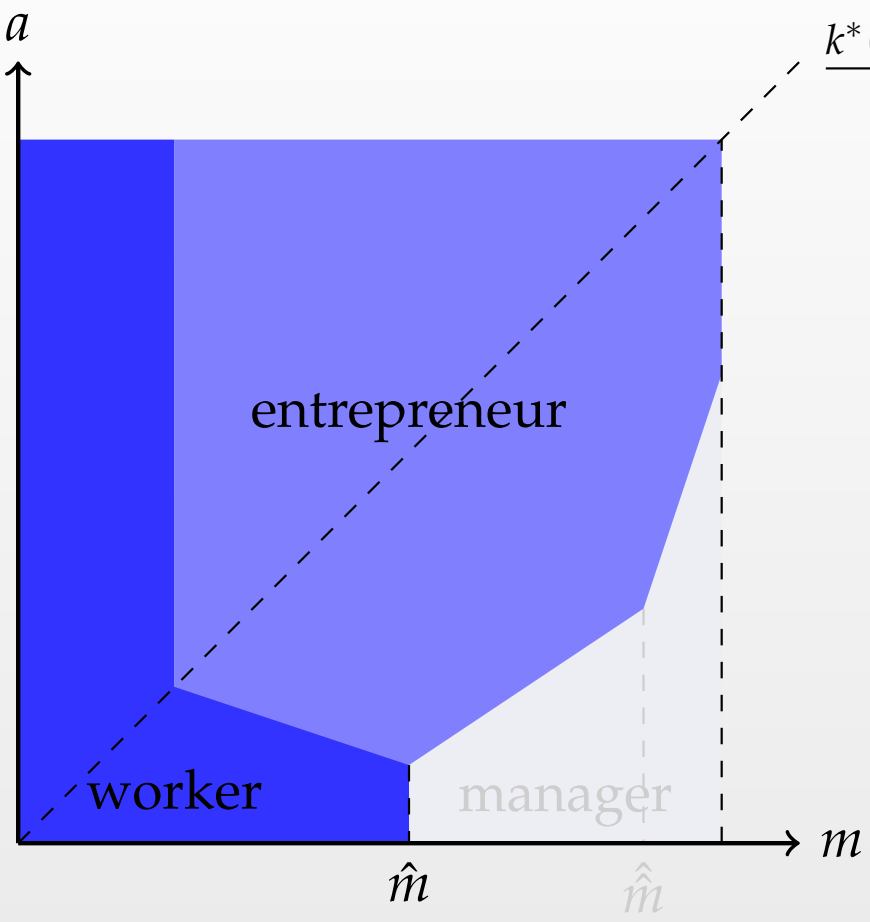

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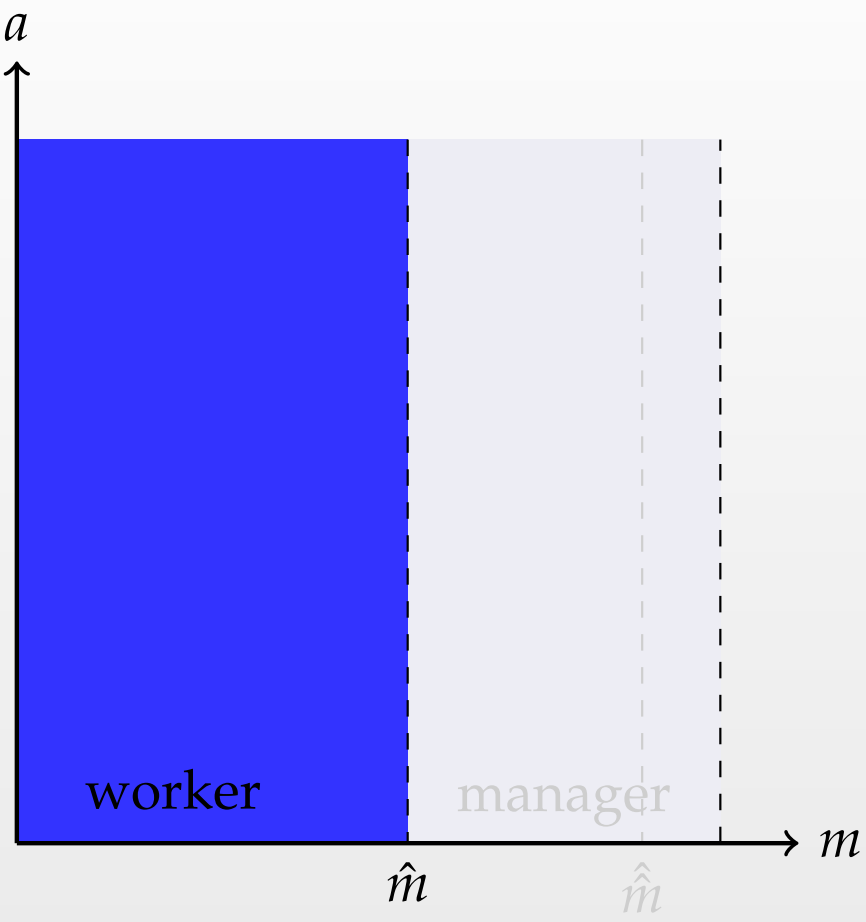

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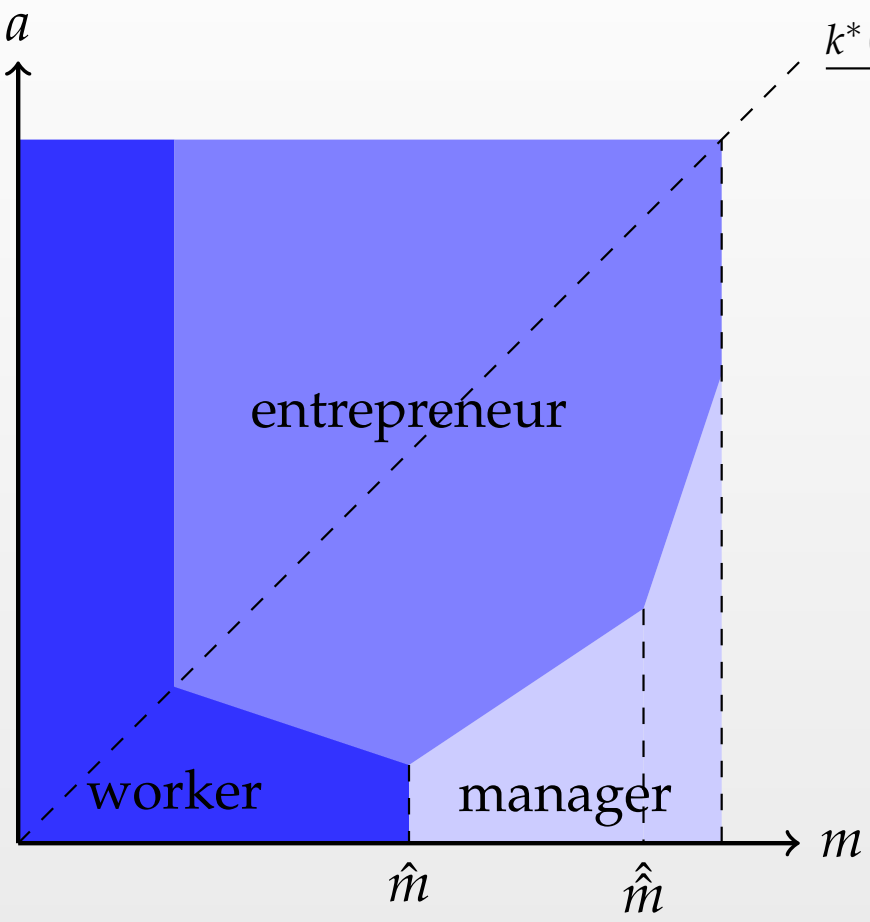

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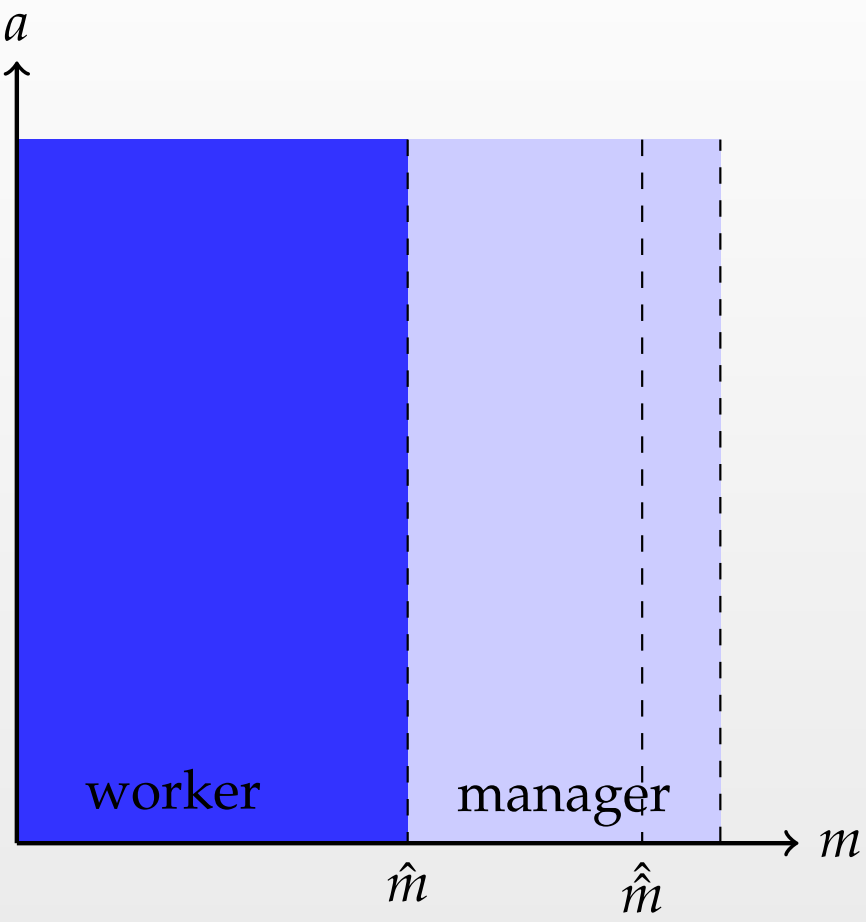

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Taxation

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- **Wage and business income**: taxed progressively according to parametrized average tax rate (ATR) function

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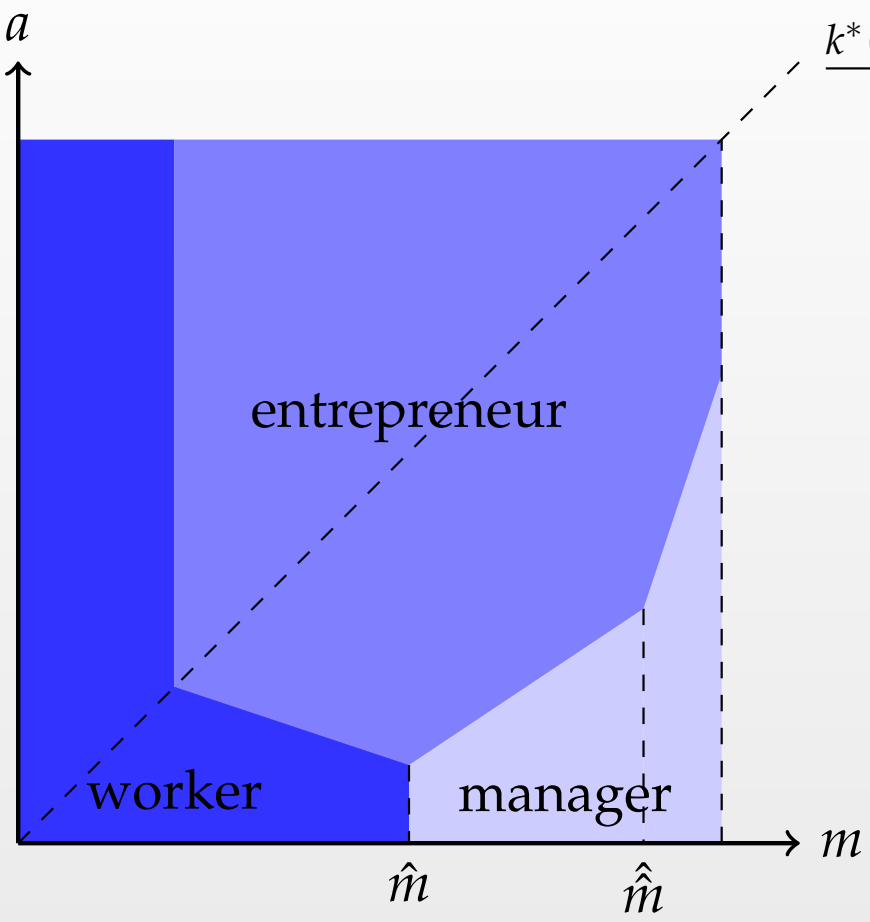
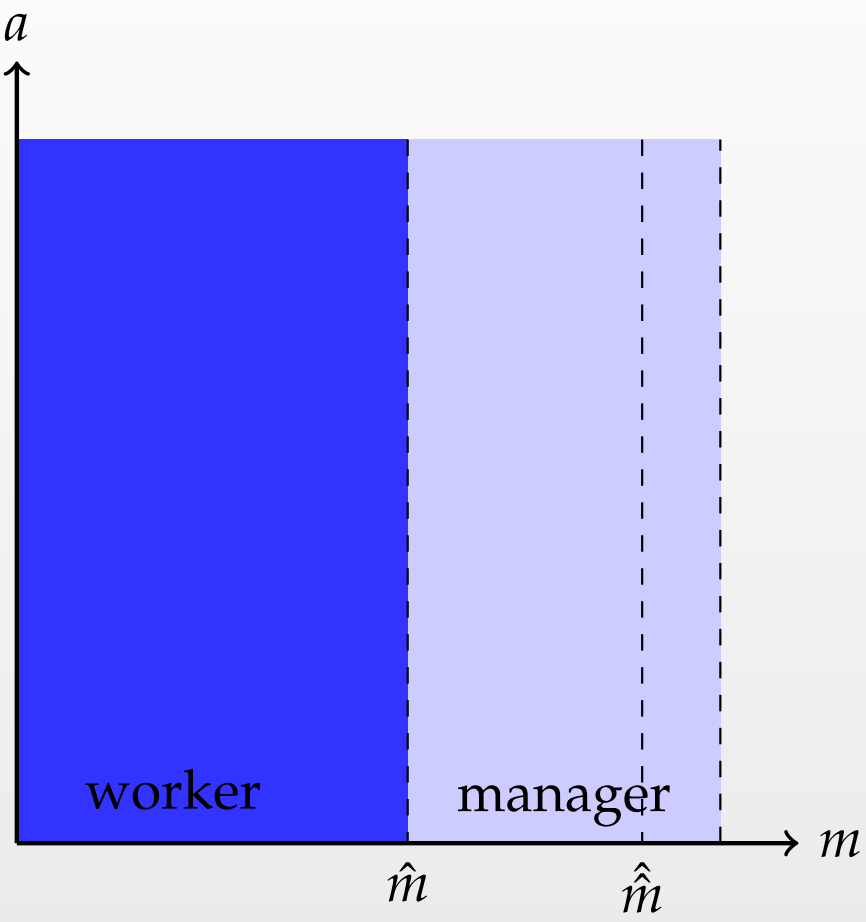
Comparative Statics



$q \neq 0$



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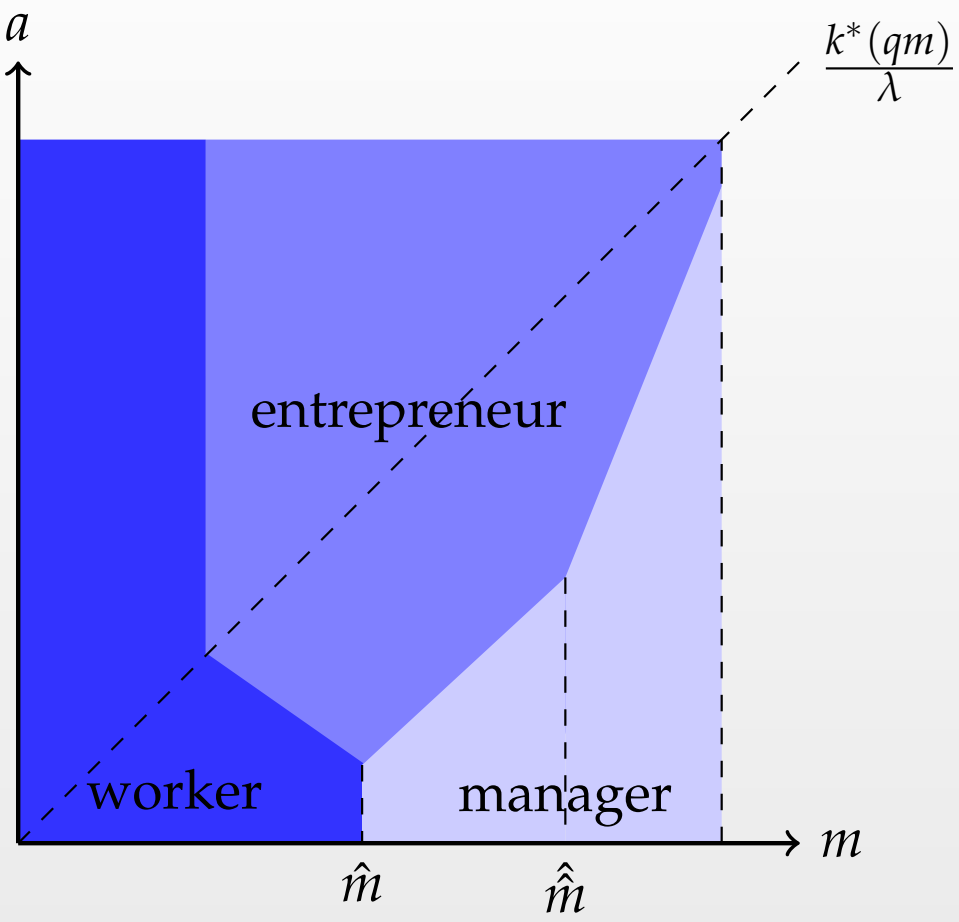

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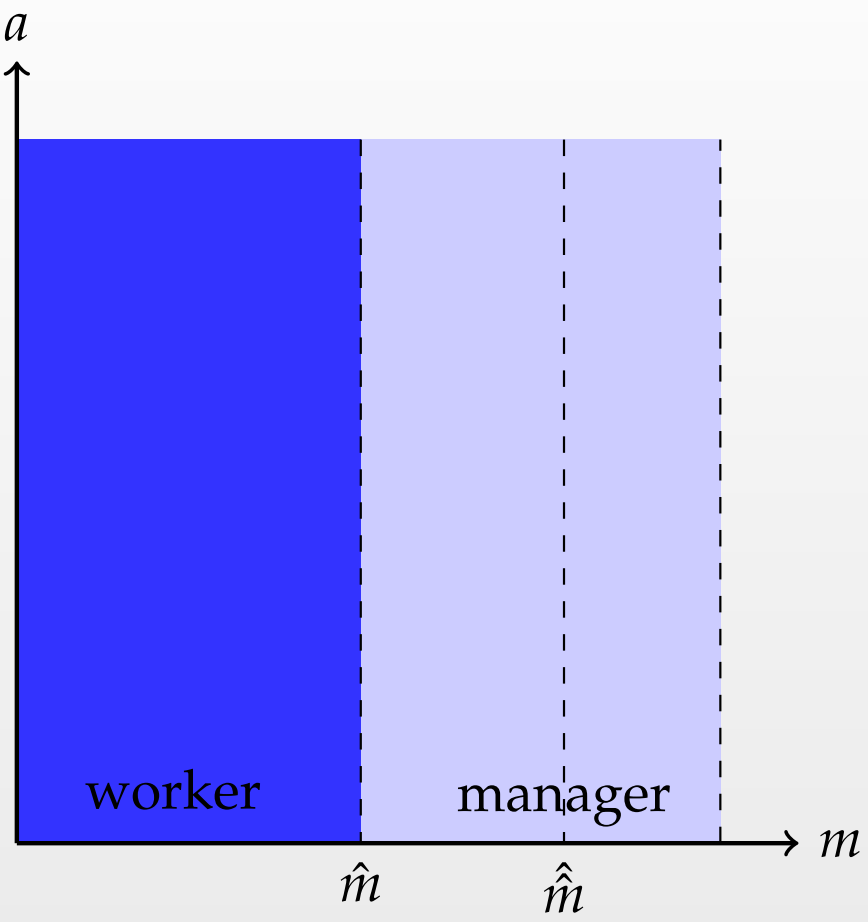

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Calibration: Exogenous Processes

- **"Shifted" Pareto distribution with shape parameter s:**

$$F(m) = \frac{1-(1+m)^{-s}}{1-(1+\overline{m})^{-s}}$$

- **Finite state Markov chain for idiosyncratic labor productivity shocks:**

$$\log \epsilon_{t+1} = (1-\rho)\mu_\epsilon + \rho \log \epsilon_t + \varepsilon_{t+1},$$

where

$$\begin{aligned} \varepsilon_{t+1} &\sim \mathbb{N}(0, \sigma_\varepsilon^2) \\ \mu_\epsilon &= -\sigma_\varepsilon^2/2(1-\rho^2) \end{aligned}$$

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Calibration: Taxation

- **Capital income tax**
  - flat rate METRs from Gravelle (2007)
  - average over 1970 to 2000: 35%

graph

- **Wage income tax**: simple polynomial function calibrated to match average tax rate / top income percentile tax share

$$ATR(y) = b_0 + b_1 y^{b_2}$$

where

$$\begin{aligned} y &: \text{ pretax wage income} \\ y_{min} &: \text{ smallest possible wage income } (w\epsilon_{min}) \\ b_0 &: \text{ lowest bracket tax rate (1970: 14\%, 2000: 15\%)} \\ b_1, b_2 &: \text{ calibrated} \end{aligned}$$

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b_1, b_2	:	calibrated

Calibrated wage income tax functions, 1970 vs 2000.

Calibration

Unfortunately, current version is $\underline{q} = \bar{q}$ Steady State Comparisons

- Calibrate model to 2000 U.S.
- Change **tax parameters only** to 1970 U.S.
- Flat wage income tax
- Welfare computations

Counterfactuals if time...

- No managers: $\kappa = 1$
- No entrepreneurs: $\lambda = 0$

Transitions running...

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Parameters and Moments

Fixed Parameters (7)

γ	δ	α	ρ	s	v	$\frac{1-\omega_0}{2-\omega_0-\omega_1}$
2	.06	.3	.95	1.00	.88	.177

Calibrated Parameters (7)

Parameter	Value	Target	Data	Model
λ	4.89	mass of entrepreneurs (%)	7.6	5.5
κ	.81	business income share of top income percentile (%)	24.7	42.1
$\overline{m}$	466.73	wage income share of top income percentile (%)	61.7	45.7
ω_1	.92	top wealth percentile share of aggregate wealth (%)	32.2	29.1
ν	.43	top earnings percentile share of aggregate earnings (%)	15.5	13.6
σ_ε	.28	Gini coefficient of wage income	.61	.52
β	.99	annual interest rate (%)	4.0	4.0

Income and Wealth Concentration

	Regime	Gini	top percentile share (%)
Wealth	Data (1970)	0.77	32.2
	Model (1970)	0.77	31.1
	Data (2000)	0.81	32.2
	Model (2000)	0.78	29.1
	Flat labor tax	0.79	29.6
	$\kappa/2$	0.65	12.2
Wage Income	Data (1970)	0.52	6.2
	Model(1970)	0.50	10.3
	Data (2000)	0.61	15.5
	Model (2000)	0.52	13.6
	Flat labor tax	0.52	13.6
	$\kappa/2$	0.54	16.1
Total Income	Data (1970)	0.58	8.3
	Model (1970)	0.57	17.7
	Data (2000)	0.63	20.0
	Model (2000)	0.57	18.3
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Composition of Income (%)

Top income percentile composition of income

Regime	Capital	Wage	Business
Data (1970)	24.4	45.6	30.0
Model (1970)	14.2	29.1	56.7
Data (2000)	13.6	61.7	24.7
Model (2000)	12.2	45.7	42.1
Flat labor tax	10.9	46.0	43.1
$\kappa/2$	7.9	85.4	6.7

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Model Mechanism

Max managerial compensation over average wage:

$W(\overline{m})/w$	Data	Model
1970	29.7	23.6
2000	342.2	44.9
Flat labor tax	-	45.1
$\kappa/2$	-	58.1

No Entrepreneurs ($\lambda = 0$)

	Regime	Gini	top percentile share (%)
Wealth	1970	0.61	7.5
	2000	0.70	16.0
Wage Income	1970	0.53	12.6
	2000	0.54	16.3
Total Income	1970	0.51	11.0
	2000	0.54	14.9

No Managers ($\kappa = 1$)

	Regime	Gini	top percentile share (%)
Wealth	1970	0.85	37.3
	2000	0.85	37.7
Wage Income	1970	0.45	4.1
	2000	0.45	4.1
Total Income	1970	0.69	35.6
	2000	0.69	35.7

Steady State Welfare Analysis

W	(consumption equivalent value)	-2.7%
AKS	(aggregate capital supply)	-7.3%
AKD	(aggregate capital demand)	-8.1%
AY	(aggregate output)	-0.2%
AC	(aggregate consumption)	-6.1%
$TX1$	(average tax rate 2000)	27.4%
$TX2$	(average tax rate 1970)	23.3%

- Decrease in equilibrium capital stock (-)
- Increased efficiency in production (+)...κ has larger effect
- Decreased variation in equilibrium consumption plan (+)

- Transitions running...but loss must be lower given that capital will be eaten along the transition path

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Conclusion

- Explained changes in wealth, total income and wage income concentration
- Differing sources of income and savings motive by occupation
- Differentiates entrepreneurs vis-à-vis managers
- Less progressive taxation causes shifts in occupations, leading to empirically observed changes
- Contrary to (some) popular beliefs, progressive taxation may not result in much welfare loss
- Can be extended to international and development context

Thank You!!

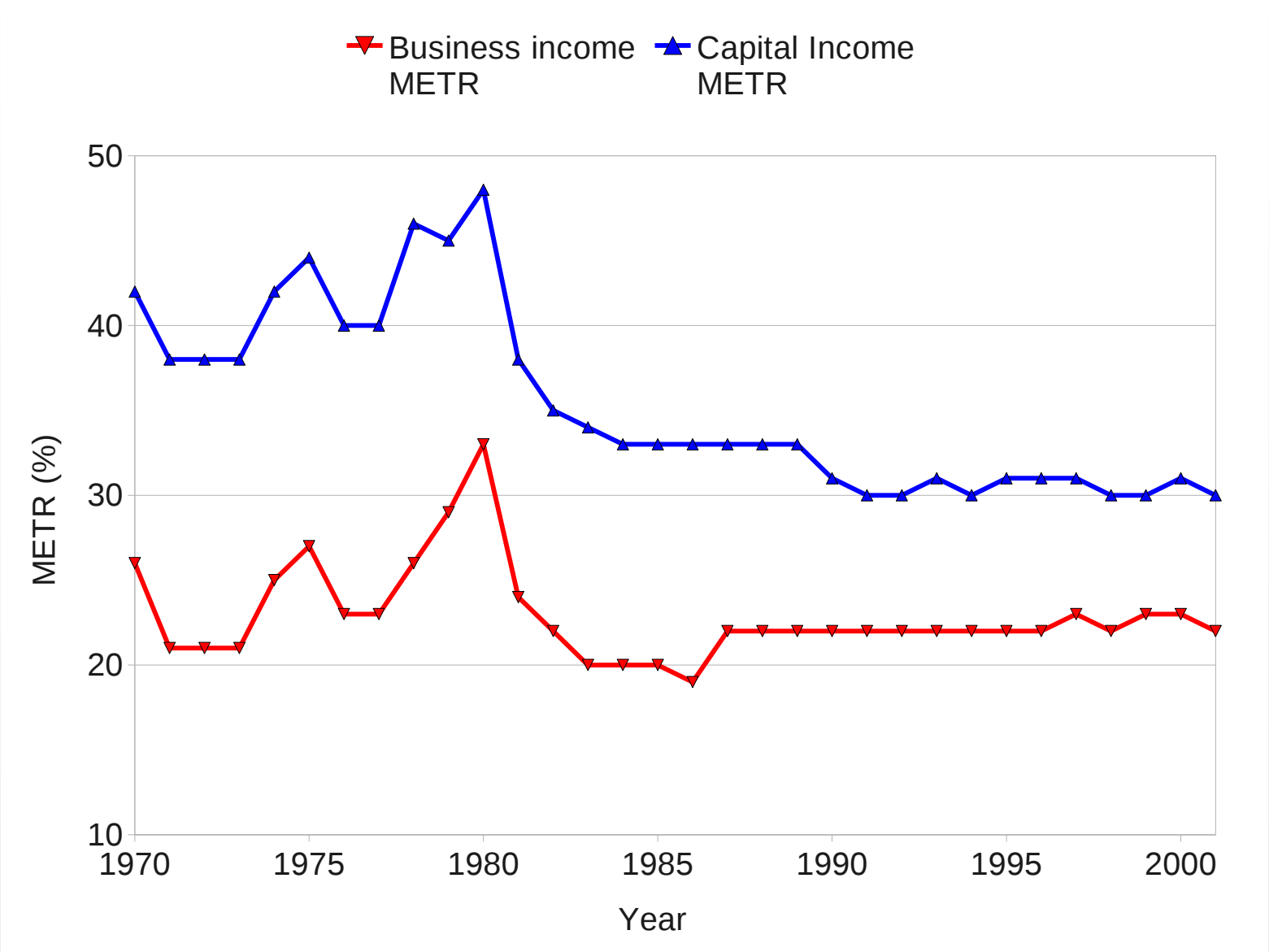
Computating the Stationary RCE

1. Discretize state space for (m, a)
2. Solve for stationary equilibrium with manager markets
   - Guess (r, w).
   - Guess $\hat{m}$, solve for policy functions, generate stationary distribution
   - Check manager market clearing
   - Check capital and labor market clearing
   - Iterate to convergence

Transition between RCEs

Extend Ríos-Rull (1997):

1. Compute the initial and terminal stationary distributions (F_0 and F_∞)
2. Pick T large, assuming that $F_T \simeq F_\infty$. Then $V_T \simeq V_\infty$.
3. Guess a path for prices $\{r, w, \hat{m}\}_{t=1}^{T}$. Solve out for $\{V_t\}_{t=1}^{T-1}$ using backward induction.
4. Starting from F_0, simulate the economy for T periods. Check market clearing for each period, and update sequence of guesses. Use bisection for each period to update the guesses.
5. Repeat from 3 until markets clear in all periods.
6. Check whether $F_T \simeq F_\infty$. If not, repeat from 2 with larger T.



Business/Capital income METRs

slides

GRAVELLE, J. G. (2007): "Historical Effective Marginal Tax Rates on Capital Income," Discussion paper, Congressional Research Service Report for Congress.

RÍOS-RULL, J.-V. (1997): "Computation of equilibria in heterogeneous agent models," Staff Report 231, Federal Reserve Bank of Minneapolis.