The 2005 Lawrence R. Klein Lecture: Emergent Class Structure

By

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The Background: Two Contrasting Views on the Employer-Worker Relation

The Left: Antagonistic:

The rich employers exploit the poor workers, who have no choice but to work.
Market creates inequality,

Emergence of a class society: *Bourgeoisie and Proletariat,*

The Solutions: Revolution (Marxists) or Redistribution (Social Democrats)

The Right: Mutual Beneficial:

The rich employers create jobs, which pulls the workers out of poverty
The market mechanism helps the rich's wealth to trickle down to the poor, leading to general prosperity

The Framework: the infinite-lived households linked through non-altruistic bequests by finite-lived agents, who differ only in inherited wealth (Galor-Zeira, Banerjee-Newman)

- Setting up a firm requires a minimum level of investment (like BN and GZ)
  Nonconvexity
- Firms hire labor (like BN, but unlike GZ)
  - Investment is more profitable when the wage rate is lower.
  - Higher investment increases the wage rate.
- Agents face the borrowing limit, when financing their investment.
  - Unlike GZ or BN, the borrowing limit increases with the profit.
  - A lower wage allows more agents to borrow.

➢ Those who inherited *relatively* large (little) wealth become employers (workers).
➢ The wage rate adjusts to equate the supply and demand for labor.

Wealth Distribution in t $\Rightarrow$ Vertical Division of Labor in t $\Rightarrow$
Wage, Profit in t $\Rightarrow$ Wealth Distribution in t+1.

What happens in steady state?

The Main Results: Characterizing steady states, depending on the parameter values,

A. **Emergent Class Structure/Rise of Class Societies**

- The equal steady state does not exist. (**Unattainability of a Classless Society**)
- All steady states are characterized by the two-point distribution of wealth (endogenous separation into the rich *bourgeoisie* and the poor *proletariat*)

  One-time Redistribution of wealth is ineffective. Reemergence of Class Structure

B. **Dissipative Class Structure or Fall of Class Societies**

- The equal steady state is the only steady state.
- Class Distinction disappears; A nation of *Petits Bourgeois*
- Anyone can become an employer, the workers are paid the "fair" value of labor

C. **Co-existence of the equal and unequal steady states**

In one of the extensions,

Self-Employment (the effects are complicated because of its dual nature).

Related Work

Household Wealth Inequality

- **Models with Exogenous Inequality**; Self-Sustainability of Inequality, Exogenous Investment Thresholds; Effective One-Shot Redistribution of Wealth
  - **Galor & Zeira (REStud 1993);** No interaction between households
  - **Banerjee & Newman (JPE 1993);** the rich may pull the poor out of poverty
- **Models with Endogenous Inequality;** Unattainability of Equality; One-Time Redistribution is Ineffective.
  - **Freeman (JPE 1996), Rosen (JLE 1997)**: Welfare Enhancing Inequality
  - **Matsuyama (RES, 2000):** Operating through Credit Market
    Rich Borrowers/Poor Lenders

Symmetry-Breaking, Self-Organized Pattern Formations, and Emergent Structure

- Aross Time; Booms-Recessions, Endogenous Cycles and Fluctuations
- Across Space; Core-Periphery Patterns; Endogenous Regional Inequality
- Across Agents; Class Structure, Discrimination, Occupational Choices, etc.

2. The Model.

Time: discrete, extends to infinity.
Good: A single numeraire good
Population: A continuum of infinitely-lived households linked by one-period agent through inheritance.

The Agents: differ only in the inherited wealth:

$G_t(w)$: the fraction of the agents inherited less than w at the beginning of period t.

- Receive w_t as the inheritance at the beginning of the period
- Occupational and investment "choices" to max the end-of-the period wealth.
- Consume and Bequest at the end of the period

Occupational and Investment Choices:

- *Workers*: Earn the wage rate, v_t, and lend w_t at the gross return r $\Rightarrow v_t + rw_t$
- *Employers*: invest F, employ n_t at v_t, $\phi(n_t)$ units of the output $\Rightarrow \pi(v_t) + r(w_t - F)$

Production Technology: $\phi(n) > 0$, $\phi'(n) > 0$, $\phi''(n)$, $\phi(\infty) = \infty$, $\phi'(\infty) = 0$.
$n(v_t)$: the equilibrium employment, defined by $\phi'(n(v_t)) \equiv v_t$
$\pi(v_t) \equiv \phi(n(v_t)) - v_t n(v_t) > 0$: the gross profit
$\pi'(v_t) = -n(v_t) < 0$, $\pi''(v_t) = -n'(v_t) > 0$, $n(0) = \pi(0) = \phi(\infty) = \infty$.

The agents want to invest, if $\pi(v_t) - v_t \geq rF$, or

Profitability Constraint: $v_t \leq V$, where $\pi(V) - V = rF$.

- $v_t < V$, every agent wants to be an employer.
- $v_t = V$, indifferent.
- $v_t > V$, every agent wants to a worker.

V: the "fair" value of labor

Credit Market Imperfections: due to the imperfect pledgeability

- The employer can pledge only up to a fraction, λ, of the gross profit, $\lambda\pi(v_t)$.
- The lender would lend only up to $\lambda\pi(v_t)/r$.

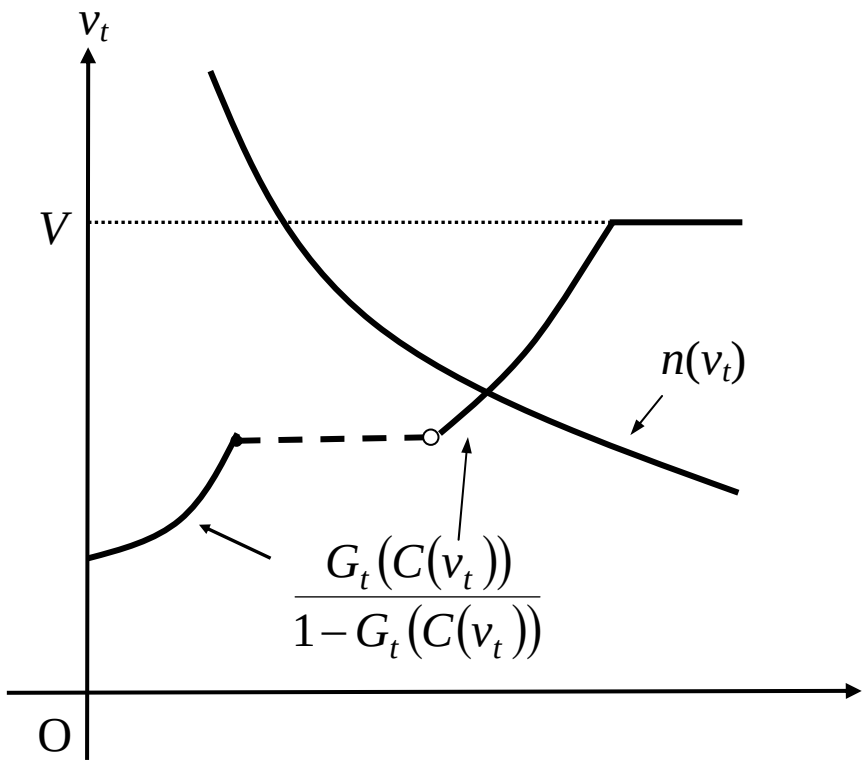
Borrowing Constraint: $w_t \geq C(v_t) \equiv \text{Max}\{0, F - \lambda\pi(v_t)/r\}$,

$C(v)$: Collateral requirement: $C'(v) > 0$ and $C''(v) < 0$, if $C(v) > 0$.
$C(v) = 0$ for a small v.

- $v_t > V$, then $v_t > \pi(v_t) - rF$:
  - nobody sets up a firm, no demand for labor.
- $v_t < V$, then $v_t < \pi(v_t) - rF$:
  - The agents with $w_t < C(v_t)$ have no choice but to become workers.
  - The agents with $w_t \geq C(v_t)$ become employers and hire $n(v_t)$ each.
- $v_t = V$, then $v_t = \pi(v_t) - rF$:
  - The agents with $w_t < C(v_t)$ have no choice but to become workers.
  - The agents with $w_t \geq C(v_t)$ are willing to be employers and hire $n(v_t)$ each.

Labor Market Equilibrium: $\dfrac{G_t(C(v_t))}{1-G_t(C(v_t))} \le n(v_t);\qquad v_t \le V,$

Figure 1



Bequest Rule:

$$u_t = (1-\beta)\log c_t + \beta \log w_{t+1} \qquad (\beta < 1/r),$$

Household Wealth Dynamics

$$w_{t+1} = \begin{cases} \beta(v_t + rw_t) & \text{if } w_t < C(v_t), \\ \beta(\pi(v_t) - rF + rw_t) & \text{if } w_t \geq C(v_t). \end{cases}$$

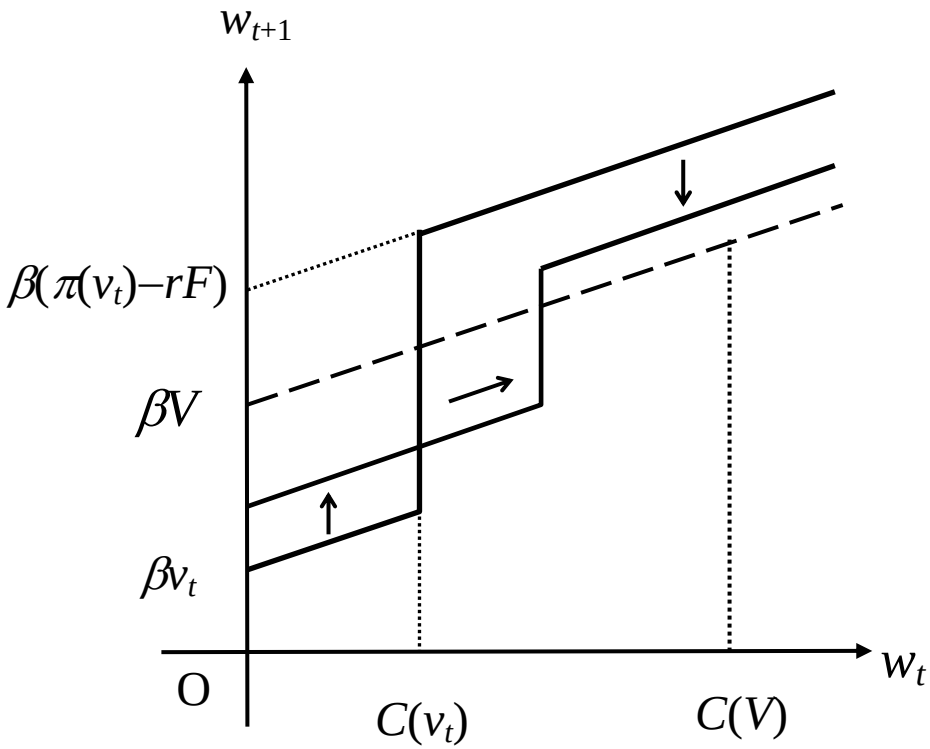


Figure 2.

3. The Steady State Analysis

The Classless Society: The Steady State with Wealth Equality $v_\infty = V$.

$w_{t+1} = \beta(V+rw_t)$ → $\mathbf{w_\infty = \beta V/(1-\beta r) \geq C(V) = Max\{0, F - \lambda\pi(V)/r\}.}$

Labor Market clears because the agents are indifferent.

The Class Society: The Steady States with Wealth Inequality $v_\infty < V$

Bourgeoisie's wealth: $w_{t+1} = \beta(\pi(v_\infty) - rF + rw_t)$

→ $w^B_\infty = B(v_\infty) \equiv \beta(\pi(v_\infty) - rF)/(1-\beta r) \geq C(v_\infty)$,

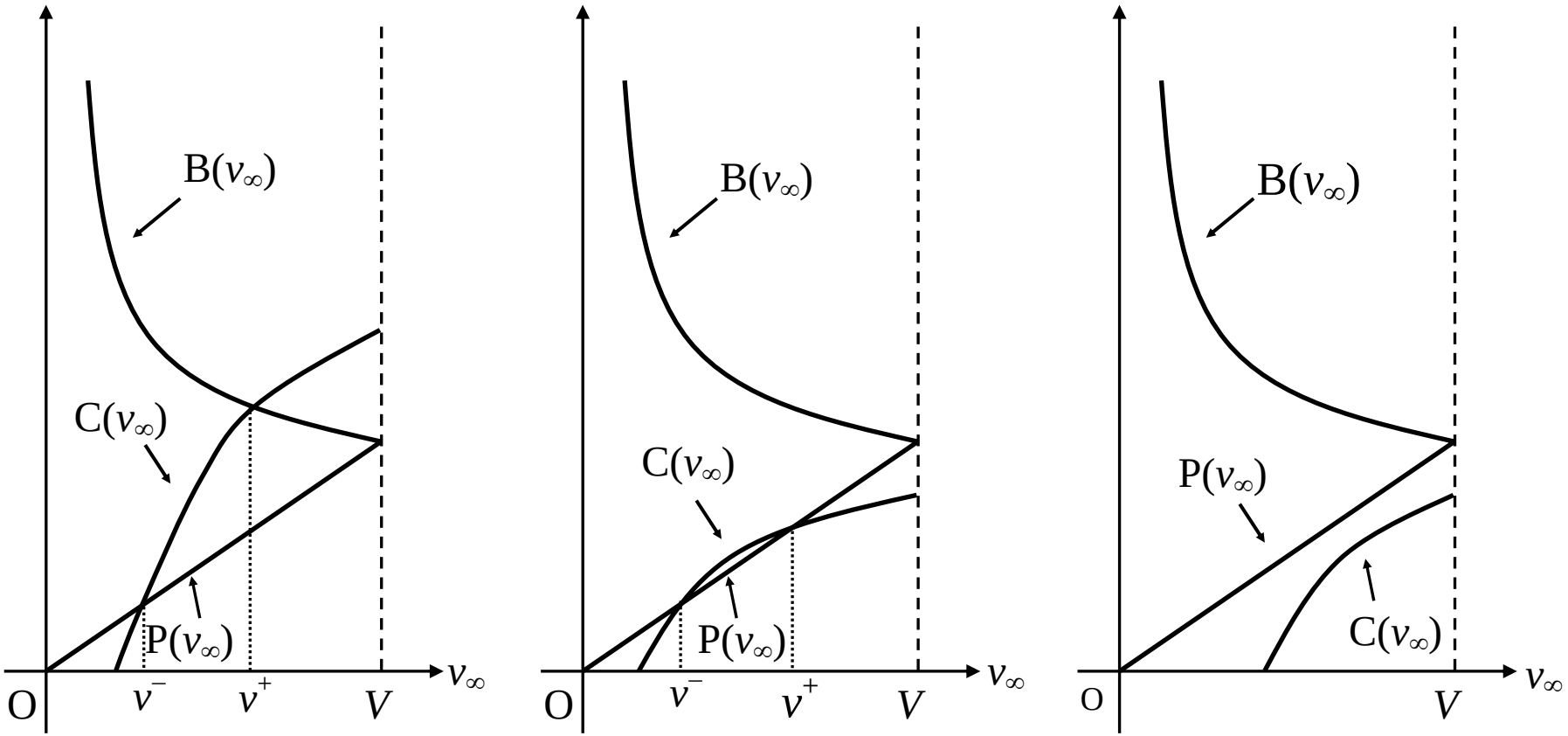
Proletariat's wealth; $w_{t+1} = \beta(v_\infty + rw_t)$

→ $w^P_\infty = P(v_\infty) \equiv \beta v_\infty/(1-\beta r) < C(v_\infty)$,

$\mathbf{P(v_\infty) \equiv \beta v_\infty/(1-\beta r) < C(v_\infty) \equiv F - \lambda\pi(v_\infty)/r \leq B(v_\infty) \equiv \beta(\pi(v_\infty) - rF)/(1-\beta r).}$

Labor Market Equilibrium; $X_\infty/(1-X_\infty) = n(v_\infty)$

Figure 3


B(v_∞)
C(v_∞)
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v^-
v^+
V
v_∞
b)
B(v_∞)
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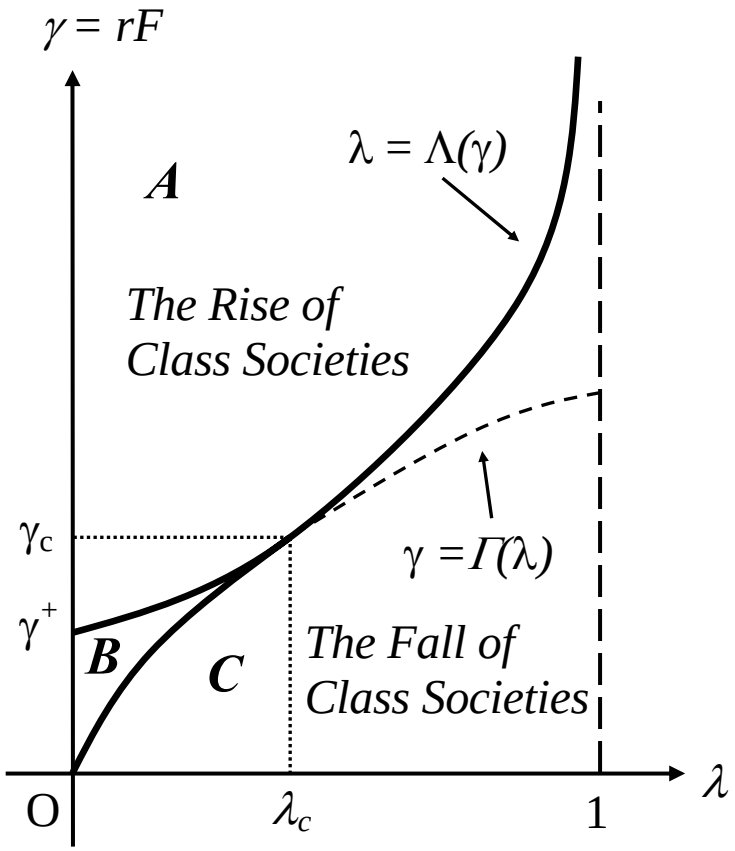
C(v_∞)
O
V
v_∞
c)

Figure 4: Parameter Configurations



4. Self-Employment

Dual Nature of Self-Employment

offers the poor an alternative to working for the rich employer

offers the rich an alternative to investing to the job-creating project

The Self-Employment Technology: Invest F^S at the beginning of the period, earn π^S at the end of the period. $\lambda^S\pi^S$ is the default cost.

Define

$V^S \equiv \pi^S - rF^S$: the net income of the self-employed

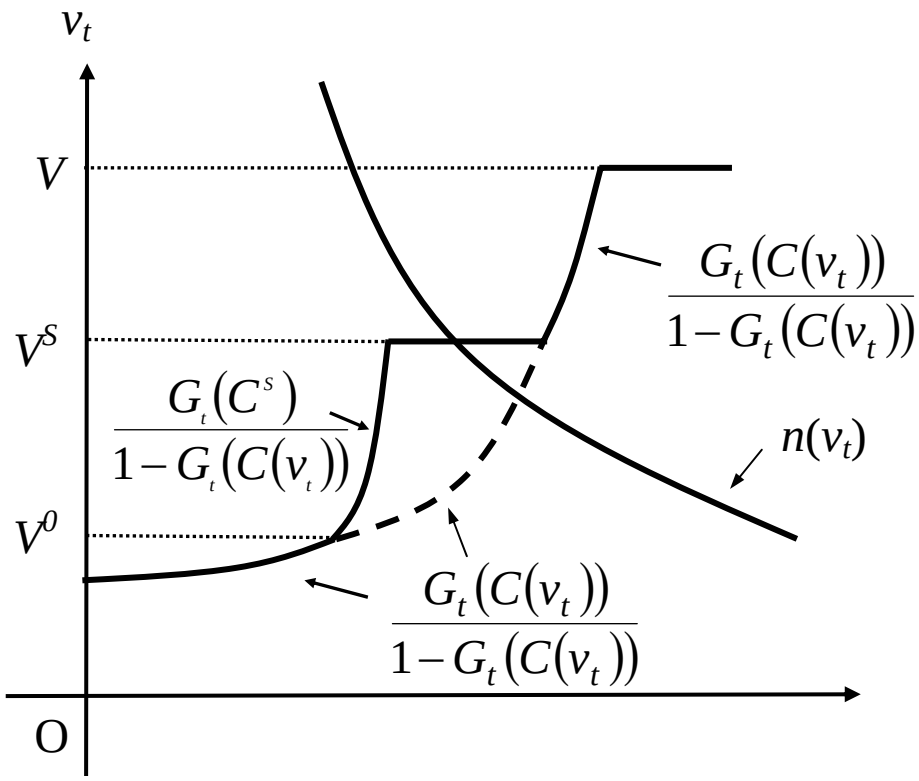
$C^S \equiv \text{Max}\{0, F^S - \lambda^S\pi^S/r\}$ is the collateral requirement to be the self-employed.

(A1) $V^S < V$; being an employer is preferable to being self-employed

(A2) $C^S < C(V^S)$; self-employment can be a viable alternative.

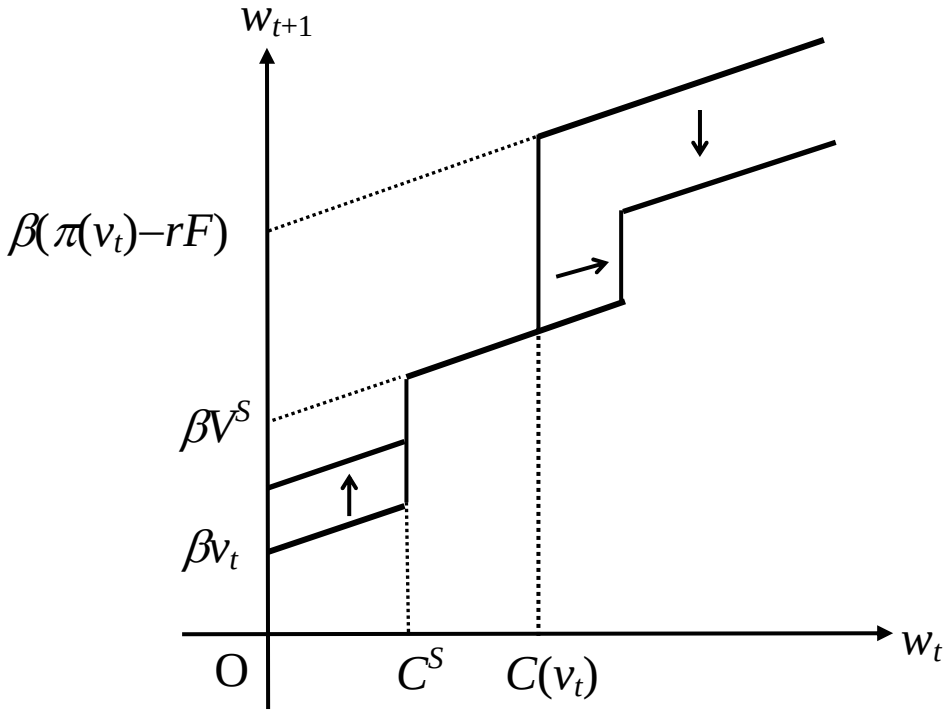
(A3) $C^S \leq P(V^S)$. sustainability of the self-employed status.

Figure 5: The Labor Market Equilibrium with Self-Employment



The Household Wealth Dynamics with Self-Employment

$$(14)\quad w_{t+1} = \begin{cases} \beta(v_t + rw_t) & \text{if } w_t < C^S \\ \beta(V^S + rw_t) & \text{if } C^S \le w_t < C(v_t) \\ \beta(\pi(v_t) - rF + rw_t) & \text{if } w_t \ge C(v_t). \end{cases}$$



The Classification of the Steady States:

1-Class Steady State without Active Self-Employment: ($v_\infty = V$).
2-Class Steady States without Active Self-Employment: ($v_\infty < V$).

1-Class Steady State with Active Self-Employment: (everyone is self-employed)
2-Class Steady States with Active Self-Employment; ($v_\infty = V^S$)
3-Class Steady States; $v_\infty \in (V^0, V^S)$, with three-point wealth distributions.

Table 1: The Steady States in the Model with Self-Employment

		No Active Self-Employment		Active Self-Employment		
		One-Class	Two-Class	One-Class	Two-Class	Three-Class
A	I	$\varnothing$	$(v^{-}, v^{+}]$	$\varnothing$	$\varnothing$	$\varnothing$
A	IIa	$\varnothing$	$[V^{S}, v^{+}]$	V^{S}	V^{S}	$\varnothing$
A	IIb	$\varnothing$	$(v^{-}, V') \cap [V^{S}, v^{+}]$	V^{S}	V^{S}	(V'', V')
A	**IIIa**	$\varnothing$	$\varnothing$	$\mathbf{V^{S}}$	$\varnothing$	$\varnothing$
A	IIIb	$\varnothing$	(v^{-}, V')	V^{S}	$\varnothing$	(V'', V')
A	IIIc	$\varnothing$	$(v^{-}, v^{+}]$	V^{S}	$\varnothing$	$(V'', v^{+}]$
B	I	V	(v^{-}, v^{+})	$\varnothing$	$\varnothing$	$\varnothing$
B	IIa	V	$[V^{S}, v^{+})$	V^{S}	V^{S}	$\varnothing$
B	IIb	V	$(v^{-}, V') \cap [V^{S}, v^{+})$	V^{S}	V^{S}	(V'', V')
B	**IIIa**	**V**	$\varnothing$	$\varnothing$	$\varnothing$	$\varnothing$
B	IIIb	V	(v^{-}, V')	$\varnothing$	$\varnothing$	$\varnothing$
B	IIIc	V	(v^{-}, v^{+})	$\varnothing$	$\varnothing$	$\varnothing$
C		V	$\varnothing$	$\varnothing$	$\varnothing$	$\varnothing$

5. Investment Without Diminishing Returns

Employers: Invest $K_t \geq F$, employ N_t at the beginning of period ; produced $\Phi(N_t, K_t)$ units of the output at the end of period. Φ is a CRS, with $\Phi(N_t, K_t) = 0$ if $K_t < F$.

Let $k_t \equiv K_t/F$, $n_t \equiv N_t/k_t$, and $\phi(n_t) \equiv \Phi(n_t, F)$.

For $k_t \geq 1$, $\text{Max}_N\{\Phi(N, K) - vN\} = \text{Max}_n\{\phi(n) - vn\}k = \{\phi(n(v)) - vn(v)\}k = \pi(v)k$, where n(v) and $\pi(v)$ are defined as before.

k: the scale of operation chosen by the employer, defined as the investment measured in multiples of F

$\pi(v)$: the equilibrium profit per unit of operation.

We allow for the employer to supply one unit of labor (to avoid IRS)

Borrowing Constraint: $w_t \geq [F - \lambda\pi(v_t)/r]k_t = C(v_t)k_t$,

Labor Market Equilibrium: $\dfrac{n(v_t)}{C(v_t)} \int_{C(v_t)}^{\infty} w dG_t(w) \geq 1$; $0 < C(v_t) \leq C(V)$,

Figure 7: Labor Market Equilibrium without Diminishing Returns

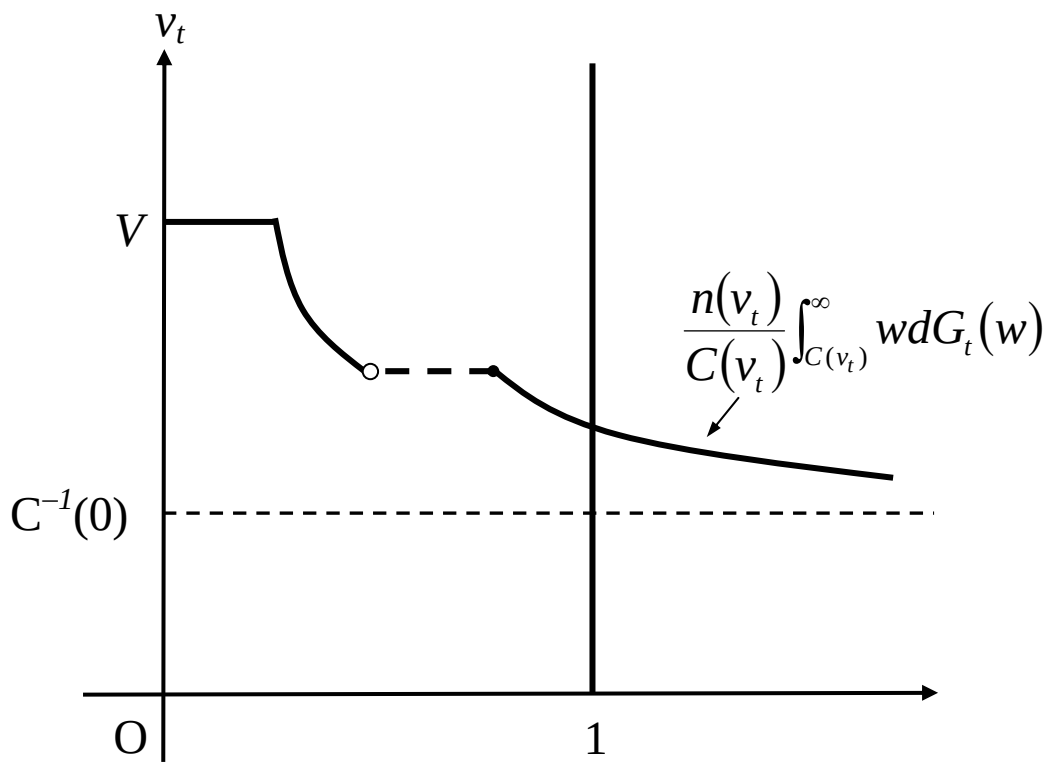


Figure 8: Household Wealth Dynamics without Diminishing Returns