Wage Traps as Causes of Income Stagnation in Poor Countries

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Research on wage traps

Definition

We speak of a wage trap when the labor market features multiple equilibria, one of which generates labor incomes that fall short of subsistence needs.

Pertinent research in labor economics

Outward sloping labor supply; "S-shaped", "inverted S"; "Z-shaped".

e.g. Krueger (1962); Barzel and McDonald (1973); Dessing (2002)

Pertinent research in development economics

In context of child labor; emphasis on remedies

e.g. Basu and Van (1998); Basu (1999); Basu (2000); Dessing (2002)
The general (Z-shaped) labor supply curve

- Three distinct segments
  - backward-bending (negatively sloped at high wage rates)
  - normal (positively sloped at medium wage rates)
  - outward-sloping (negatively sloped) at subsistence-level labor income
The case of one subsistence-level equilibrium

- Labor demand curve
- Subsistence level labor supply curve
- Orthodox labor supply curve

![Diagram showing the relationship between real wage and employment with subsistence and orthodox labor supply curves meeting at point A.]
The case of multiple near-subsistence equilibria

Diagram showing the interaction between labor demand and supply curves at various real wages ($w_{HI}$, $w_T$, $w_{LO}$) and employment levels ($\bar{L}_{all}$). Points A, B, and C illustrate different equilibria.
Household utility function (I)

\[ U = U(C, L - L) \times S \]

\[ C = w \cdot L \quad U(\cdot) > 0 \]

\[ S = \begin{cases} 
1 & \text{if } wL \geq \text{MIN} \\
0 & \text{if } wL < \text{MIN} 
\end{cases} \]

Problem:
Households are indifferent between all points below subsistence threshold MIN

\[ C \] consumption
\[ L \] employment
\[ S \] survival
\[ w \] (real) wage rate
\[ \text{MIN} \] subsistence level
Household utility function (II)

\[ U = U(C, \bar{L} - L) \times S + u(wL - \text{MIN}) \times (1 - S) \]

\[ C = w \cdot L \quad U(\cdot) > 0 \quad u(0) = 0 \quad w' > 0 \]

\[ S = \begin{cases} 
1 & \text{if } wL \geq \text{MIN} \\
0 & \text{if } wL < \text{MIN} 
\end{cases} \]

- \( C \): consumption
- \( L \): employment
- \( S \): survival
- \( w \): (real) wage rate
- \( \text{MIN} \): subsistence level
Household utility function (III)

\[ U = \int_{t=0}^{\infty} e^{-\delta t} U(C, \bar{L} - L) \, dt \]

\[ U(\cdot) > 0 \]

\[ C = w \cdot L \]

\[ \delta = f (\text{MIN} - wL) \quad f' > 0 \]

- **C**: consumption
- **L**: employment
- **\( \delta \)**: rate of time preference
- **w**: (real) wage rate
- **MIN**: subsistence level
When do wage traps occur?

\[ L_S(w^*) = L_D(w^*) \]

\[ L'_D(w^*) > L'_S(w^*) \]

\[ \varepsilon_S(w) = \frac{L'_S(w) \cdot w}{L_S(w)} \]

\[ \varepsilon_D(w) = \frac{L'_D(w) \cdot w}{L_D(w)} \]

\[ \varepsilon_D(w^*) > \varepsilon_S(w^*) \]

\[ L_S(w) = \text{MIN}/w \]

\[ \varepsilon_S = -1 \]

\[ \varepsilon_D(w^*) > -1 \]

supply = demand

instability in equilibrium (1)

wage elasticity of labor supply

wage elasticity of labor demand

instability in equilibrium (2)

subsistence-level labor supply

wage elasticity of labor supply when subsistence level is parametric

existence condition for wage trap when subsistence level is parametric
Specific functional forms: Cobb-Douglas

Cobb-Douglas production function

\[ Y = F(L) = AL^\beta \ (A > 0, \ 0 < \beta < 1) \]

Wage-elasticity of labor demand when production is Cobb-Douglas

\[ \varepsilon_D = -(1 - \beta)^{-1} < -1 \]
When is a subsistence-level equilibrium unstable?

Formally:

wage-elasticity of labor supply > wage-elasticity of labor demand

Intuitively:

a subsistence-level equilibrium is unstable if labor income falls as we move down the labor demand curve. So either

- Output must fall as we move down the labor demand curve or
- the share of labor income must fall as we move down labor demand.

Does not hold when production function is Cobb-Douglas

see graphical thought experiment
Parameter constellations exist that generate wage traps when the production function is CES.

**Example:**

![Diagram showing labor supply and demand curves](image-url)
Modifications to Cobb-Douglas scenario that make wage traps more likely

- Modifications to labor supply

\[
\text{MIN}(L) = \lambda \cdot L^\lambda \ (\lambda, \gamma, L > 0)
\]

\[
\varepsilon_S^{-1} = -1 + \gamma > -1
\]

Wage trap occurs whenever \( \gamma > \beta \)
Modifications to Cobb-Douglas scenario that make wage traps more likely

- Modifications to demand side

\[ F(L) = A(E \times L)^\beta \quad \text{Cobb-Douglas with labor efficiency} \]
\[ E = w^\alpha \quad \text{Labor efficiency depends on wage rate} \]
\[ L = (\beta A w^{\alpha \beta - 1})^{\frac{1}{1-\beta}} \quad \text{Labor demand} \]
\[ \varepsilon_D = -\frac{1 - \alpha \beta}{1 - \beta} \quad \text{Wage elasticity of labor demand} \]

- \( \alpha = 0 \) standard case; no wage trap
- \( \alpha > 1 \) wage trap possible
- \( \alpha = 1/\beta \) wage trap disappears; efficiency wage scenario kicks in
Modifications to Cobb-Douglas scenario that make wage traps more likely

- Modifications to demand side

\[ F(L) = A(E \times L)^\beta \]

\[ E = \frac{w^\alpha}{L^\delta} \]

- Cobb-Douglas with labor efficiency
  - Labor efficiency depends on wage rate
  - Labor demand

\[ \epsilon_D = -\frac{1 - \alpha\beta}{1 - (1 - \delta)\beta} \]

- Wage elasticity of labor demand

\[ 1 - \delta < \alpha < 1/\beta \]

- Wage trap possible
Efficiency wages and wage traps

- Cobb-Douglas threshold: $\alpha = 0$
- Lower threshold: $\alpha = 1$
- Upper threshold: $\alpha = 1/\beta$
- Efficiency-wage case: $\alpha > 1/\beta$

Demand curves in shaded area generate wage traps:
- Lower wage makes firms’ profits rise
- Higher wage makes firms’ profits rise

$1 < \alpha < 1/\beta$
$\alpha > 1/\beta$
Policy implications

- **Foreign aid**
  
  Needs to be substantial (big push); takes long time for effects to materialize

- **Banning child labor**

  Effective! Family income rises immediately. Schooling improves human capital. BUT family income remains trapped below subsistence!

- **Minimum wage laws**

  Highly effective. Rises family incomes and improves schooling. May generate escape from wage trap. Effect on child labor may be less direct.

- **Labor unions**

  May prevent labor market from falling into wage trap. Removes incentives for child labor. BUT may generate involuntary unemployment.

- **Fair trade agreements**

  May spur or facility above measures, with similar effects.
A ban on child labor or a minimum wage
From labor market to Solow model

Bad equilibrium
with low income and human capital, and child labour

Good equilibrium
with high income and human capital, and no child labour

Subsistence threshold
Labor market dynamics

- Labor demand curves at different human capital levels
- Kinked Labor supply curve
- Good equilibrium with high income and human capital, and no child labor
- Subsistence level MIN = wL
- $L^*_A$, $L^*_B$, and $L^*_C$ for Labor L

Dennis Gärtner and Manfred Gärtner
Two identical countries with different histories

May international capital flows help?

One country in good equilibrium

One country stuck in wage trap
Main results

Outward-sloping labor supply curves near subsistence levels do not necessarily generate multiple equilibria and wage traps.

Wage traps cannot occur in scenarios with parametric subsistence levels and conventional Cobb-Douglas production.

Wage traps may occur under three stylized scenarios:

A. When labor income falls as we move down the labor demand curve.
   A1. This may happen when income increases while the share of labor income falls.
   A2. It may also happen at constant labor income shares, as in Cobb-Douglas, when labor efficiency falls when the wage rate falls.

B. When subsistence needs are not parametric, but rise with employment.

In the presence of wage traps, labor market features such as minimum wages or monopolistic trade unions may appear in a new light.

Wage traps may translate into poverty traps in neoclassical growth models and affect growth paths in models of endogenous growth.