Lecture 2: Structural Transformation

Eugenio Proto

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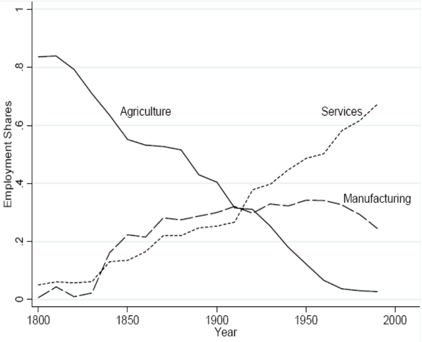


FIGURE 20.1. The share of US employment in agriculture, manufacturing and services, 1800-2000.

- Development always implies a shift of labour force from Agrarian to Manufacturing: *the Kuznets facts*.
- This pattern is common to UK and all industrialized countries
- Consumption of agrarian and manufacturing goods follow the same pattern

Agrarian Productivity and Industrialization (Crafts and Harley 2002)

- Between 1500 and 1800, the French agricultural population fell from 73 to 59 per cent of the total, while agricultural labour productivity was unchanged;
- in England it fell from 74 to 35 per cent of the total while agricultural labour productivity rose by 43 per cent (Allen 2000).
- The 1840 English share of agricultural employment was not reached in France and Germany until the 1950s.

Agrarian Productivity and Industrialization (Matsuyama 1992)

- Households preferences

$$\int_0^\infty (c^A(t) - \gamma^A)^\eta c^M(t)^{1-\eta} dt$$

  - γ^A is the minimum (subsistence) food requirement: Engel's Law.
  - c^A, c^M : consumptions in the Agrarian and manufacturing

- Production

$$Y^M(t) = X(t)F(L^M(t)) \text{ and } Y^A(t) = BG(L^A(t))$$

  - $X(t) = \kappa Y^M(t)$ learning by doing externalities,
  - Decreasing Return to labor: $F'' < 0$, $G'' < 0$

- Households Budget constraint

$$c^A(t) + p(t)c^M(t) \leq \pi(t) + w(t)$$

- Assume $BG(1) > \gamma^M > 0$: Nobody starves

Agrarian Productivity and Industrialization (cont'd)

Analysis

- Equilibrium wages:
  - $\omega(t) = BG'(L^A(t))$,
  - $\omega(t) = p(t)X(t)F'(L^M(t))$,
  - No unemployment in equilibrium $L^M(t) = n(t)$, $L^A(t) = 1 - n(t)$.
- General Equilibrium:

$$BG'(1 - n(t)^*) = p(t)^* X(t) F'(n^*(t)) \tag{1}$$

- Optimal Consumption (using 1)

$$c^A(t)^* = \gamma^A + \eta p(t) c^M(t)^* / (1 - \eta) \tag{2}$$

- Equilibrium in the good markets

$$\begin{aligned} X(t)F(n^*(t)) &= c^M(t)^* \\ BG(1 - n^*(t)) &= c^A(t)^* \end{aligned} \tag{3}$$

Agrarian Productivity and Industrialization (cont'd)

Main result

- Considering expressions (2), (2) and (1), the equilibrium labor allocation is

$$\phi(n(t)^*) = \frac{\gamma^A}{B}$$

  - with $\phi' < 0$.

- n increasing in B (agrarian productivity)
- **Proposition**: *In the above-described model, the combination of learning-by-doing and Engel's Law generates a unique equilibrium in which the share of employment of manufacturing is constant at* $n \equiv \phi^{-1}(\frac{\gamma^A}{B})$, *and manufacturing output and consumption grow at the rate* $\kappa F(n)$, *which is increasing in agricultural productivity* B.

Agrarian Productivity and Industrialization (cont'd)

- The link of growth to agrarian productivity can provide an explanation for the industrial revolution
- Can explain the difference in productivity across countries
- Proto (2006) provides a different Mechanism based on Contracts in the Agrarian sector as a source of capital accumulation

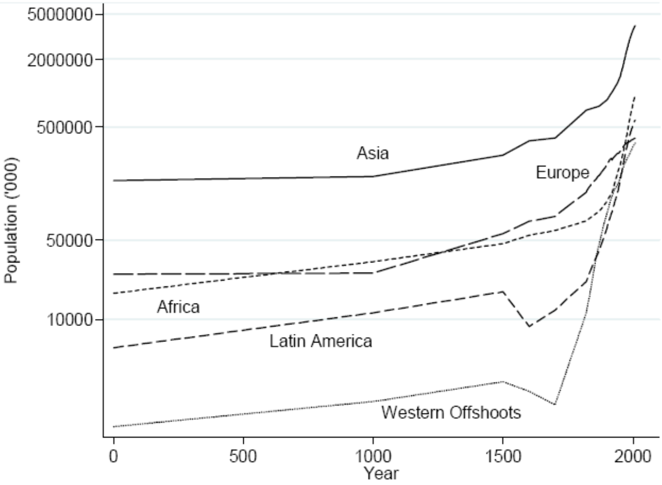
Other non Balanced Growth model

- Kongsamut, Rebelo and Xie (2001) reconcile Kuznet Facts with the Kaldor fact that the ration labour capital is always constant.
  - KRX assume

$$
\begin{aligned}
Y^A(t) &= B^A F(K^A(t), X(t)L^A(t)) \\
Y^M(t) &= B^M F(K^M(t), X(t)L^M(t)) \\
Y^S(t) &= B^S F(K^S(t), X(t)L^S(t))
\end{aligned}
$$

- Baumol's (1967) and Acemoglu and Guerrieri (2008) introduce different production functions

Demographic transition



Demographic transition

- Malthusian Regime: The relationship between income per capita and population growth is positive, no substantial improvement in the living standards
- Modem Growth Regime: Negative relationship between economic and demographic growth, increases in the living standards
- Transition regime: Positive relationship between income and population, but income grows

- Individuals' Utility

$$c^{\alpha}(t)(n(t+1)y(t+1) - \frac{1}{2}\eta n(t+1)^2)$$

  - $y(t+1)$ children' income, $n(t+1)$: number of children
  - η cost to educate each child

- Production

$$Y(t) = ZL(t)^{1-\alpha}$$

- Demographic expansion

$$L(t+1) = n(t+1)L(t)$$

Theory: Malthusian Growth (cont'd)

Analysis

- Wages

$$w(t+1) = (1-\alpha)L(t+1)^{-\alpha} = y(t+1)$$

- Optimizing

$$n(t+1) = (1-\alpha)\eta_0^{-1}L(t+1)^{-\alpha}$$

rearranging

$$L(t+1) = (1-\alpha)^{\frac{1}{1+\alpha}}\eta_0^{-\frac{1}{1+\alpha}}L(t)^{\frac{1}{1+\alpha}}$$

Theory: Malthusian Growth (cont'd)

Equilibria

$$
\begin{aligned}
L^* &= (1-\alpha)^{1/\alpha}\eta^{-1/\alpha} \\
c^* &= w^* = (1-\alpha)(L^*)^{-\alpha}
\end{aligned}
$$

- Individuals' utility

$$c^{\alpha}(t)(n(t+1)y(t+1) - \frac{1}{2}(\eta_0(1-e(t)) + \eta_1 X(t+1)e(t))n(t+1)^2)$$

- η_1 : education costs for skilled children
- Production

$$Y(t) = ZU(t)^{1-\alpha}; Y^M(t) = X(t)S(t)$$

  - $U(t)$: unskilled workers, $S(t)$: skilled workers
  - Endogenous growth

$$X(t+1) = \kappa S(t)$$

Theory: Transition (cont'd)

- Demographic expansion

$$n(t+1) = \begin{array}{cc} w^U(t+1)\eta_0^{-1} & e(t)=0 \\ \eta_1^{-1} & e(t)=1 \end{array}$$

  - $\eta_1^{-1} < w^U(t+1)\eta_0^{-1}$:more children in the Malthusian regime if skills are very expensive $(\eta_1 >> \eta_0)$

- Wages:

$$\begin{aligned} w^U(t) &= (1-\alpha)U(t)^{-\alpha} \\ w^S(t) &= X(t) \end{aligned}$$

Theory: Transition (cont'd)

- Compare individuals' utilities:

$$V^U(t) \geq V^S(t)$$

  - Malthusian regime if

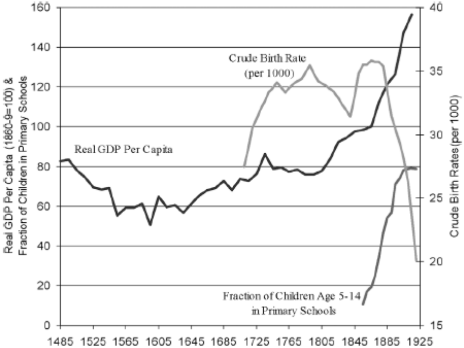
$$X(0)\eta_1^{-\alpha} < (1-\alpha)(L^*)^{-2\alpha}\eta_0^{-1}.$$

  - Transition if

$$(1-\alpha)(L(1))^{-2\alpha}\eta_0^{-1} > X(0)\eta_1^{-\alpha} > (1-\alpha)(L^*)^{-2\alpha}\eta_0^{-1}$$

  - low future wages for children may induce parents to invest in skills

Trade-off Quantity-Quality



igure 41. The sharp rise in the growth rate of real GDP per capita and its association with investment in ducation and fertility decline: England 1485–1920. Sources: Clark (2001), Feinstein (1972), Flora, Kraus and Pfenning (1983), Wrigley and Schofield (1981).

- Black, Devereux and Salvanes (2005), Angrist, Lavy and Schlosser (2006) and Qian (2007), looks at evidence from Norway, Israel and China, but does not find strong support for the quality-quantity

Other explanation for DT

- Social norms
- The large declines in mortality starting in the 19th century,
- Reduced need for child labor.