Course Material – Section 4. Labor Demand

Heterogeneous demand for labor, skill biased technological change (SBTC), globalization, and institutions


Stylized view: The increase in earnings inequality in the UK/US and the rise in unemployment rates in continental Europe during the 80s and 90s reflect an increase in the relative demand for more highly skilled labor since the relative supply of more highly skilled labor has increased at the same time.

Framework mostly used to study these developments: Supply, demand, and institutions $SDI$

Two skill groups: $S$ skilled $U$ unskilled

$N_S, N_U$ employment

$w_S, w_U$ wages

For empirical trends see Figures 1–3 in Acemoglu (2002)
Change from period 0 to period 1:

- Inelastic relative supply increases from $N_0$ to $N_1$
- Labor demand increases from $D_0$ to $D_1$

We observe

- higher skill differential in wages $w_1$ in period 1 compared to $w_0$ in period 0 and
- higher relative employment of skilled workers $N_1$ in period 1 relative to $N_0$ in period 0
The increase in demand at a given wage ratio was larger than the increase in supply

⇒ Search for reasons why relative demand has changed: SBTC, change in product demand across industries with different skill intensities e.g. through increasing international trade

Institutional effects:
Intersection of supply and demand curves describes competitive equilibrium
⇒ Rents for groups of workers can change over time
⇒ Minimum wages (e.g. through unions) can prevent wage adjustment in equilibrium: If wage remains at old level $w_0$, the relative demand $\frac{N_S}{N_U}$ exceeds the relative supply resulting in unemployment of the unskilled workers

• DiNardo, Lemieux, Fortin (1997, Econometrica) show that decline of unions can statistically explain trends in wage ratios and employment ratios

Tasked–based approach (Routinization hypothesis):

• Autor, Levy, Murnane (2003, QJE) and Spitz–Oener (2006, JOLE) argue that upskilling of employment is the result of the shift away from routine tasks towards non–routine tasks; computers/machine substitute routine tasks
Formalization based on a CES-Produktion Function
Output: Constant returns to scale

\[ Q_t = \left[ \alpha_t (a_t N_{st})^\rho + (1 - \alpha_t)(b_t N_{ut})^\rho \right]^{\frac{1}{\rho}} \]

\( N_{st}, N_{ut} \): skilled/unskilled employment in period \( t \)
\( \sigma = \frac{1}{1 - \rho} \): elasticity of substitution and \( \rho \leq 1 \Leftrightarrow \sigma > 0 \)
\( \alpha_t \): share of activity assigned to skilled employment
\( a_t, b_t \): skilled/unskilled labor augmenting technical progress

Skill biased technical change (SBTC)
Increases in \( \frac{a_t}{b_t} \) or \( \alpha_t \)
\( \frac{a_t}{b_t} \uparrow \) intensive SBTC: skilled workers become relatively better at existing jobs
\( \alpha_t \uparrow \) extensive SBTC: "upskilling" of work tasks
If both input factors are paid by their marginal products

\[
\frac{w_{st}}{w_{ut}} = \frac{\alpha_t}{1 - \alpha_t} \cdot \left(\frac{a_t}{b_t}\right)^\rho \cdot \frac{1}{\frac{N_{st}}{N_{ut}}}^{\frac{1}{\sigma}}
\]

In logarithms:

\[
\ln \left(\frac{w_{st}}{w_{ut}}\right) = \ln \left(\frac{\alpha_t}{1 - \alpha_t}\right) + \rho \ln \left(\frac{a_t}{b_t}\right) - \frac{1}{\sigma} \ln \left(\frac{N_{st}}{N_{ut}}\right)
\]

This equation explains the skill differential in wages as the result of relative factor supplies (× inverse of elasticity of substitution) and technical progress shifting relative labor demand. Only for \(\rho > 0\) (i.e. \(\sigma > 1\)) does a skill bias in extensive technical progress \(\left(\frac{a_t}{b_t} \uparrow\right)\) yield a higher skill differential in wages.

Elasticity of substitution

\[
\sigma = \frac{1}{1 - \rho}
\]


\[
\hat{\sigma} = 1.4 > 1 \quad \text{Cobb–Douglas case}
\]
**Alternative hypothesis:** Between industry shifts in employment shares where industries differ by skill intensity

- Industries with a high share of skilled employment have grown relative to other industries with a low share of skilled employment

→ Demand for skill intensive products has grown in comparison

→ Industrialized countries export skill intensive products and import low skill intensive products on average. Increase in international trade (globalization, outsourcing) might have shifted relative demand in favor of skilled labor.
Empirical Implications:

- Differential between- and within-industry-shifts in skill intensity
  - Between industries shifts increase overall skill intensity of employment
  - Since relative wages of skilled workers increase, relative employment of unskilled workers should increase within industries (*substitution effects*).

- Effect of international trade: Competition with countries which are abundant in low skilled labor
  - Exports skill intensive/Imports intensive in lowskilled labor
  - Stolper-Samuelson-Effects:
    Increase in skill differential of wages should be associated with an increase in the relative price of skill intensive products

- This implication of standard trade theory is not robust against outsourcing activities (*Feenstra/Hansen*)