Comparative Statics for Immigration (Johnson 1980)

Josh Angrist

MIT 14.661 (FALL 2017)

1 Elasticities

In the p-comp price-taking world, *market-level* supply and demand elasticities drive comparative statics.

Suppose there's there's one type of labor; demand for it is $D(w)$, with derivative $D'(w)$ and that homogeneous labor is supplied by natives according to $S_1(w)$.

- The elasticity of demand is

$$\eta = \frac{dL}{dw}\frac{w}{L} = \frac{D'(w)w}{L} < 0$$

- We similarly define the elasticity of (native) labor supply

$$\varepsilon = \frac{S_1'(L)w}{L} > 0$$

  Recall that these describe movements *along* supply and demand curves.

2 Market structure

Johnson (1980) assumes that wages and employment of low-skill natives are determined by equilibrium in a perfectly competitive factor market.

- n_1 identical (low-skilled) natives supply this much labor:

$$L_1 \equiv S_1(w) = n_1 h(w), \tag{1}$$

  where $h(w)$ is per-capita hours worked (normalized to vary from 0 to 1)

- Firms demand $D(w)$ low-skill workers

- Without immigration, equilibrium wages (w^*) and employment (L_1^*) in the low-skill labor market satisfy:

$$L_1^* = n_1 h(w^*) = D(w^*)$$

3 Shocking Immigration

Look out! 40,000 Canadian economists with H1Bs are a comin' down I-93 . . .

- These n_2 immigrant economists supply labor inelastically (just happy to be here, *mon ami*! will run regressions for food)
- New equilibrium
$$n_1 h(w^*) + n_2 = D(w^*) \tag{2}$$
  - what's the key economic assumption here (besides p-comp)?
- We now ask:
  1. What's the diff between the with-immigrants equilibrium and the no-immigrant equilibrium?
  2. What parameters does the effect of immigration on equilibrium outcomes depend on?
- *Comparative Statics* is how we find answers*:* Totally differentiate the equilibrium conditions, and solve for the change in equilibrium outcomes with respect to a change in the exogenous variable of interest. In this case, we want to know
$$\frac{dw^*}{dn_2} = ? \tag{3}$$
$$\frac{dL_1^*}{dn_2} = ? \tag{4}$$
- Write the solution as a function of things that look good in Greek

Details

Totally differentiate (2) to find

$$D'(w)dw = n_1 h'(w)dw + h(w)dn_1 + dn_2$$

Assume $dn_1 = 0$, so

$$D'(w)dw = n_1 h'(w)dw + dn_2$$

Divide by $D(w)$, multiply by $\frac{w}{w}$, $\frac{n_2}{n_2}$, as needed to get:

$$\underbrace{\left[\frac{D'(w)w}{D(w)}\right]}_{\eta}\underbrace{\left(\frac{dw}{w}\right)}_{d\ln w} = \underbrace{\left[\frac{n_1 h'(w)w}{S_1(w)}\right]}_{\varepsilon}\underbrace{\left[\frac{S_1(w)}{D(w)}\right]}_{1}\left(\frac{dw}{w}\right) + \underbrace{\left(\frac{dn_2}{n_2}\right)}_{d\ln n_2}\left(\frac{n_2}{D(w)}\right)$$

where

$$\equiv \frac{n_2}{D(w)}, \text{ the } \textit{immigrant share}$$

This produces the first comparative statics result:

$$\frac{d\ln w}{d\ln n_2} = \frac{}{\eta \quad \varepsilon(1 \qquad)} < 0 \tag{5}$$

To get the employment effect, we differentiate (1):

$$dL_1 = S_1'(w)dw$$

or, in elasticity terms

$$\frac{dL_1}{L_1} = \underbrace{\left[\frac{S_1'(w)w}{S_1(w)}\right.}_{\varepsilon} \left(\frac{dw}{w}\right)$$

Using (5), we get the second comparative statics result

$$\frac{d\ln L_1}{d\ln n_2} = \frac{\varepsilon\phi}{\eta \quad \varepsilon(1 \qquad)} < 0$$

Here, however, its useful to work in levels instead of logs:

$$\frac{dL_1}{dn_2} = \left[\frac{d\ln L_1}{d\ln n_2}\right] \underbrace{\left(\frac{L_1}{n_2}\right)}_{(1 \quad)/} = \frac{\varepsilon(1 \qquad)}{\eta \quad \varepsilon(1 \qquad)} \tag{6}$$

This bodies-to-bodies equation answers the question: *When 100 immigrants arrive, how many natives lose their jobs?*

- Jobs are lost indeed, but less than 1:1 (see Johnson 1980, Table 1)

Discussion questions

1. What do wage declines depend on?
2. What do job losses depend on?
3. When are job losses at the extremes?

4 Key Assumptions

- Immigrants and natives are perfect substitutes
- Immigrant labor supply is inelastic
- Immigrants have no capital
- Immigrants don't buy or make anything that matters for native labor demand

What can we say about a more realistic world, where immigration raises employment for some natives? DRAW THIS!

Table 1. Employment Reduction of Domestic Low-Skilled Workers Caused by Additional 100 Employed Immigrants for Selected Values of ε, η, and μ.[a]

	μ =0			μ =.5		
	ε_1 =.2	ε_1 =.5	ε_1 =1	ε_1 =.2	ε_1 =.5	ε_1=1
η_1 =.5	29	50	67	17	33	50
η_1 =1	17	33	50	9	20	33
η_1 =1.5	12	25	40	6	14	25

[a] ε = supply elasticity, η = demand elasticity, and μ = proportion of low-skilled labor force composed of immigrants.

14.661 Labor Economics I

Fall 2017