# The Labor Market Impact of Immigration: What Have We Learned?

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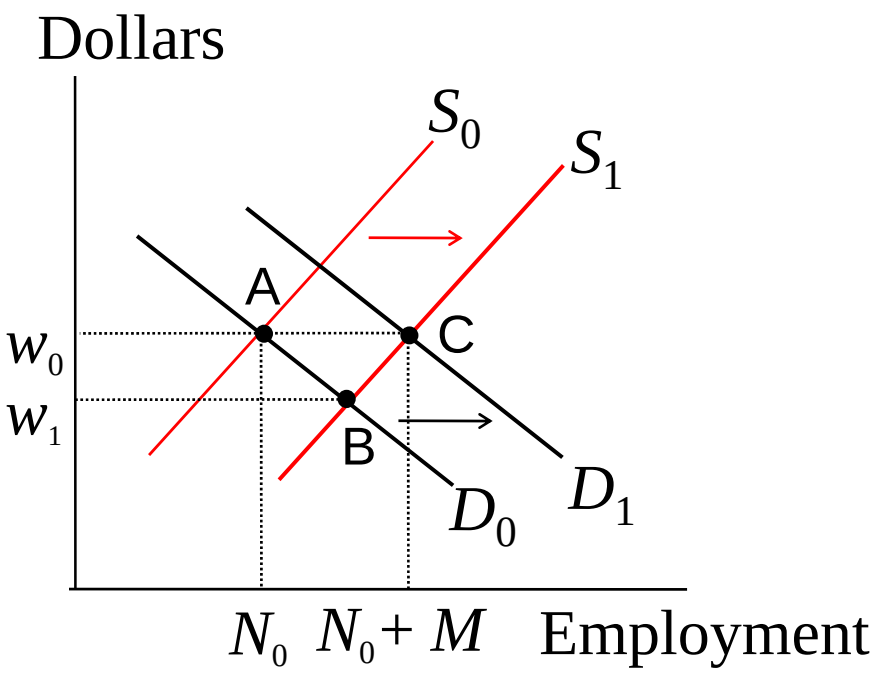
# 1. The question

- Do immigrants alter the employment opportunities of native workers?
  - “After World War I, laws were passed severely limiting immigration. Only a trickle of immigrants has been admitted since then. . .By keeping labor supply down, immigration policy tends to keep wages high. Let us underline this basic principle: Limitation of the supply of any grade of labor relative to all other productive factors can be expected to raise its wage rate; an increase in supply will, other things being equal, tend to depress wage rates”
    - Paul Samuelson, *Economics*, 1964.

# 2. Short and long run, homogeneous labor




- Pre-immigration equilibrium at A.
- **Short-run:** stock of capital fixed. Equilibrium at B. Wages and native employment fall.
- **Long-run:** returns to capital fixed. Equilibrium at C. Wages and native employment return to pre-immigration equilibrium if the aggregate production function $f(K, L)$ is linearly homogeneous.

## 3. Short and long run, heterogeneous labor

- Production function: $q = f(K, L_1, \ldots, L_n)$.
- **Short run:**
  - Wage of the "average" labor input falls.
  - There are also distributional impacts: drop in relative wage of groups with largest immigrant-induced supply shifts.
- **Long run:**
  - Wage change for "average" labor input is zero.
  - But there are distributional impacts: reduction in relative wage of groups with largest immigrant-induced supply shifts.

# 4. The empirical puzzle

- Summary of findings (*circa* 2000):
  - Friedberg and Hunt (1995, p. 42): “The effect of immigration on the labor market outcomes of natives is small.”
  - National Academy of Sciences (1997, p. 220): “The weight of the empirical evidence suggests that the impact of immigration on the wages of competing native workers is small.”
- Puzzle: The immigrant supply shock in the United States has been very large, and Hamermesh (1993) concludes that the labor demand curve is not perfectly elastic. **Why can’t we observe an impact?**

# 5. Spatial correlation approach

- Suppose there are a number of *closed* labor markets that immigrants penetrate *randomly*. We can then relate the change in the wage in a particular market to the number of immigrants in that market. The estimated correlation measures the impact of immigration.
- Immigrants cluster in a small number of geographic areas. Most studies exploit this geographic clustering to test the implications of the textbook model.
  - Grossman (1982), Borjas (1987), Altonji and Card (1991), LaLonde and Topel (1991), Schoeni (1997), Card (2001). Most influential study: Card's (1990) analysis of the Mariel flow.

# 6. Card's (1990) Mariel paper

| Unemployment rate of blacks in: | The Mariel flow (Card, 1990) | | The Mariel flow that didn't happen (Angrist & Krueger, 1999) | |
|---|---|---|---|---|
| | Before (1979) | After (1981) | Before (1993) | After (1995) |
| Miami | 8.3 | 9.6 | 10.1 | 13.7 |
| | | | | |
| Comparison cities | 10.3 | 12.6 | 11.5 | 8.8 |

The comparison cities are Atlanta, Houston, Los Angeles, and Tampa-St. Petersburg.

# 7. Problems with spatial correlations

- Immigrants may not be randomly distributed across labor markets. If immigrants cluster in cities with thriving economies, there would be a spurious positive correlation between immigration and local employment conditions (Borjas, 2001).
- Local labor markets are not closed. Natives may respond to the immigrant supply shock by moving their labor or capital to other cities, thereby re-equilibrating the national economy.
  - There is an unresolved debate over whether these equilibrating flows exist. See Borjas, Freeman, Katz (1997), Card (2001), Borjas (2006).
- Measurement error (Aydemir and Borjas, 2006)

# 8. A tangential puzzle

- Explicit contradiction between spatial correlations estimated in the minimum wage and immigration literatures.
- Card-Krueger et al estimate regressions of the form:

$$\log L = \alpha \log w + \text{other variables}$$

  - Use regions as the unit of observation.
  - Estimated coefficient $\alpha$ is often close to zero.
- Grossman, Card, et al estimate regressions of the form:

$$\log w = \beta \log L + \text{other variables}$$

  - Use regions as the unit of observation
  - Estimated coefficient $\beta$ is often close to zero.
- Both sets of results cannot be correct. Labor demand curve cannot be perfectly elastic and perfectly inelastic at the same time!
- Interesting conjecture: Neither conclusion is right.

# 9. A new type of natural experiment


- "After a wave of raids by federal immigration agents on Labor Day weekend, a local chicken-processing company called Crider Inc. lost 75% of its mostly Hispanic 900-member work force. The crackdown threatened to cripple the economic anchor of this fading rural town. But for local African-Americans, the dramatic appearance of federal agents presented an unexpected opportunity. Crider suddenly raised pay at the plant. An advertisement in the weekly Forest-Blade newspaper blared "Increased Wages" at Crider, starting at $7 to $9 an hour—more than a dollar above what the company had paid many immigrant workers." (*The Wall Street Journal*, January 17, 2007)
- Implied wage elasticity = -0.20

# 10. Factor proportions approach

- Borjas, Freeman, and Katz (1992, 1997) change the unit of analysis to the national level. If the aggregate technology is given by a linear homogeneous CES production function with two inputs (high school dropouts and everyone else), the relative wage of the two groups depends linearly on their relative quantities.

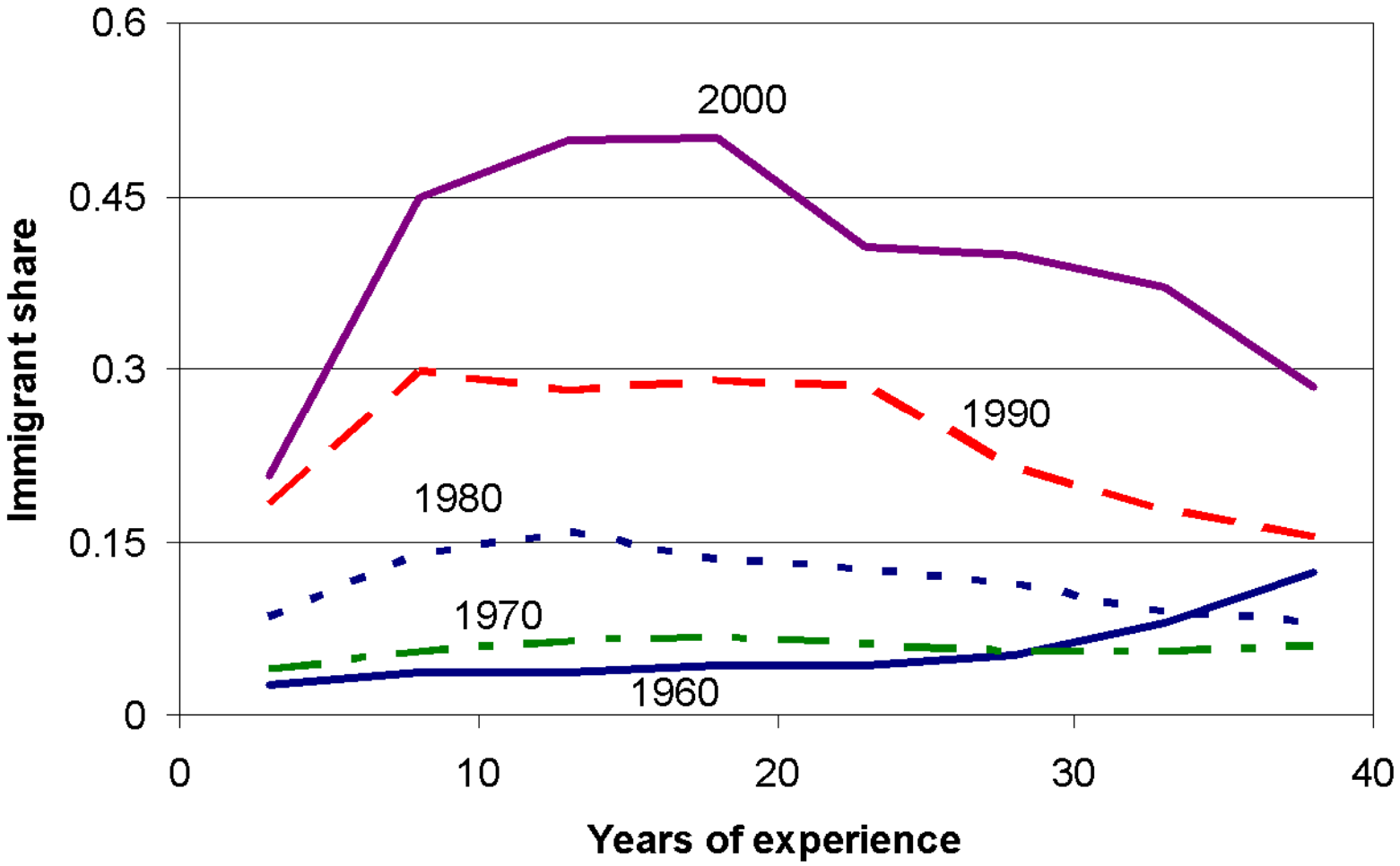
$$\log (w_1/w_2) = \text{constant} + \sigma \log(L_1/L_2)$$

- BFK use Katz-Murphy estimate of $\sigma$ to predict the value of the wage ratio between skilled and unskilled natives if immigration had not changed factor proportions. They find that 40% of the decline in the relative wage of high school dropouts is due to immigration.
- **Problem:** The factor proportions approach does not *estimate* the impact of immigration on the labor market. Instead, it *simulates* the impact.

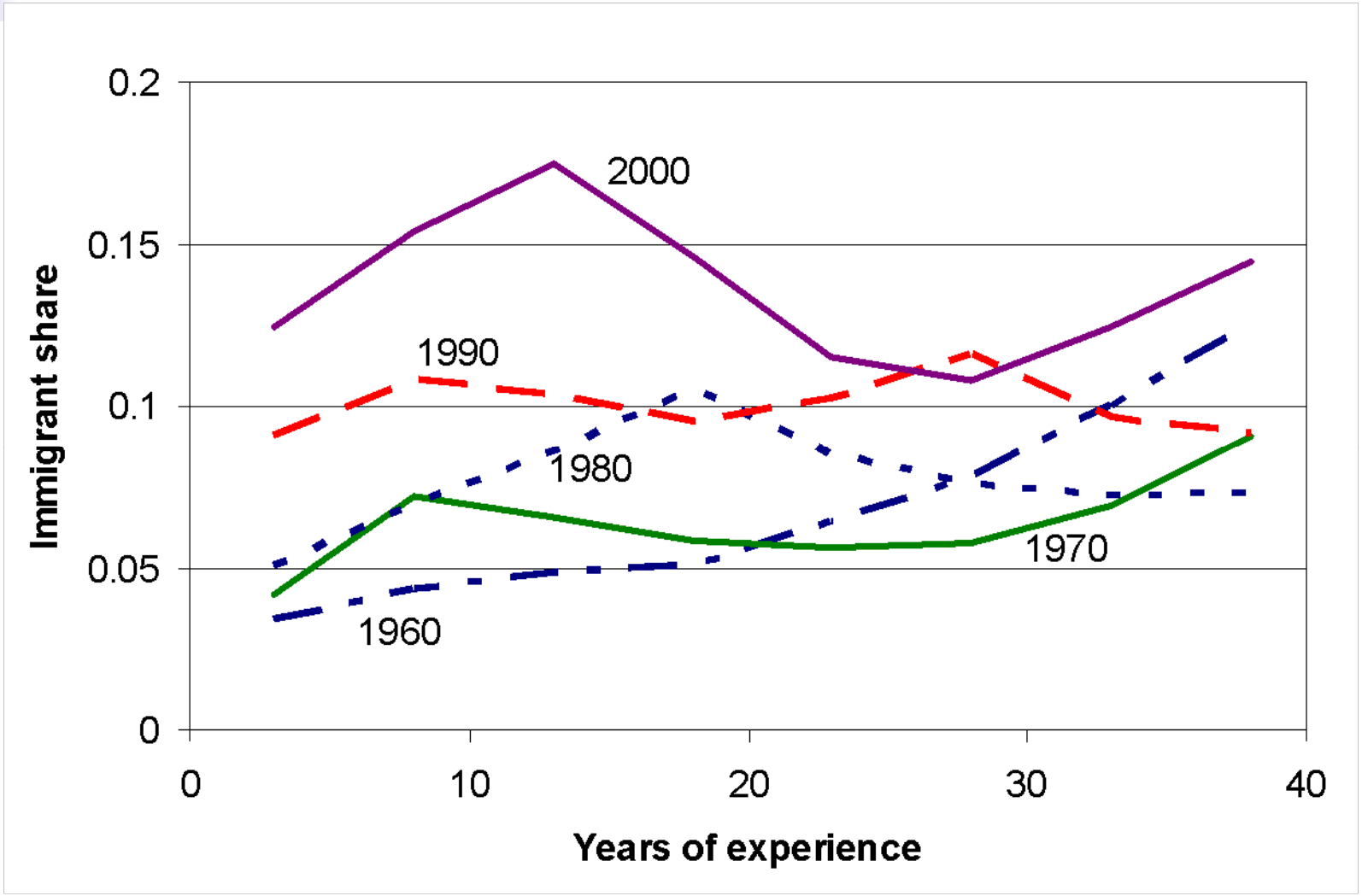
# 11. An alternative approach (Borjas, QJE, 2003)

- First, pay closer attention to the definition of a skill group. Both schooling *and* work experience determine a person's stock of acquired skills.
  - Immigration is not balanced evenly across all experience cells in a particular schooling group. The immigrant influx will tend to affect some native workers more than others. And the nature of the supply "imbalance" changes over time.
- Second, local labor market may not be the right unit of observation. So examine evolution of national wage structure (in the spirit of Murphy-Welch, 1992; Katz-Murphy, 1992, Card and Lemieux, 2001).
- This approach reconfirms that the labor demand curve is indeed downward sloping: An influx of immigrants into a particular skill group lowers the wage of that skill group.

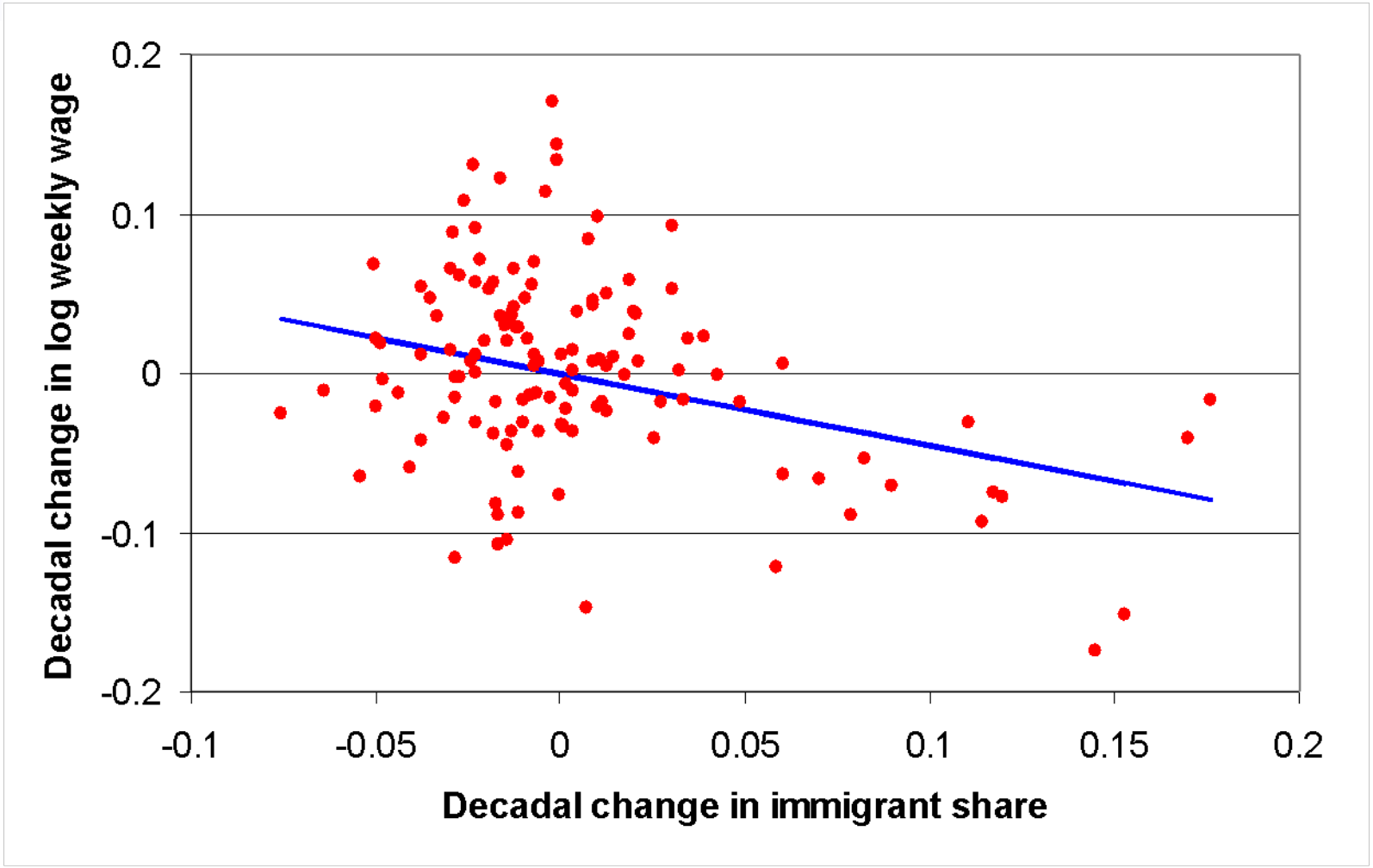
# 12. Supply shock for high school dropouts in US



# 13. Supply shock for college graduates in US



# 14. Scatter diagram relating wages and immigration (removing decade effects)



# 15. Regression model

- Let $y_{ijt}$ be the mean value of a particular labor market outcome for *native* men with education $s$, experience $x$, in year $t$. I stack the data across skill groups and estimate:

$$y_{sxt} = \theta\, p_{sxt} + S + X + T + (S \times X) + (S \times T) + (X \times T) + \varepsilon_{sxt}$$

- $S$ are fixed effects indicating educational attainment; $X$ are fixed effects indicating work experience; $T$ are fixed effects indicating calendar year; $p$ is the immigrant share in the cell.
- The interactions control for the experience profile of $y$ differing across schooling groups, and for the impact of education and experience changing over time.

# 16. Interpreting the adjustment coefficient

- The regression model is:

$$y_{sxt} = \theta\, p_{sxt} + S + X + T + (S \times X) + (S \times T) + (X \times T) + \varepsilon_{sxt}$$

- Let $m_{sxt} = M_{sxt} / N_{sxt}$; the percentage increase in the labor supply of the skill group. Define the wage elasticity as:

$$\frac{\partial \log w_{sxt}}{\partial m_{sxt}} = \theta (1 - p_{sxt})^2 .$$

- By 2000, the immigrant share in the workforce was around 0.14. The factor price elasticity—evaluated at the mean value of the immigrant share—is obtained by multiplying $\theta$ by 0.7.

# 17. Estimated adjustment coefficients

| Study | Immigration | Emigration |
|---|---|---|
| 1. United States (Aydemir and Borjas, 2007) | -0.489 | --- |
| | (0.223) | |
| 2. Canada (Aydemir and Borjas, 2007) | -0.507 | --- |
| | (0.202) | |
| 3. Mexico (Aydemir and Borjas, 2007) | --- | 0.798 |
| | | (0.443) |
| 4. Mexico (Mishra, 2006) | --- | 0.440 |
| | | (0.110) |
| 5. Great Britain (Peev, 2007) | -0.508 | --- |
| | (0.198) | |
| 6. Puerto Rico (Borjas, 2007) | -0.583 | 0.405 |
| | (0.267) | (0.184) |

# 18. Remarks

- Does approach require the existence of a “national” labor market?
- Not necessarily. Suppose that local labor markets are isolated island economies. The national level regression (which averages out the local data) should then exactly replicate the spatial correlation.
- The fact that the two approaches lead to different answers seems to contradict the assumption that local labor markets are isolated island economies.

# 19. A structural approach

- A structural approach specifies the technology of the aggregate production function.
- One can then estimate the own-effect of immigrants on the wage of competing native workers and the cross-effects on the wage of other natives.
- Suppose the aggregate production function can be represented in terms of a three-level CES technology: Similarly educated workers with different levels of work experience are aggregated to form the effective supply of an education group; and workers across education groups are then aggregated to form the national workforce.

# 20. The three-level CES technology

$$Q_t = \left[ \lambda_{Kt} K_t^{\nu} + \lambda_{Lt} L_t^{\nu} \right]^{1/\nu}, \text{with } \nu = 1 - \frac{1}{\sigma_{KL}}.$$

$$L_t = \left[ \sum_s \theta_{st} L_{st}^{\rho} \right]^{1/\rho}, \text{with } \rho = 1 - \frac{1}{\sigma_E}.$$

$$L_{st} = \left[ \sum_x \alpha_{sx} L_{sxt}^{\eta} \right]^{1/\eta}, \text{with } \eta = 1 - \frac{1}{\sigma_X}.$$

# 21. Advantages of three-level CES

- There are 33 factors of production: 32 education-experience groups plus capital.
- A more general specification (e.g., the translog) requires estimating 561 different parameters. The three-level CES reduces the parameter space to three elasticities of substitution.
- **Main disadvantage:** the CES greatly restricts the types of substitution that can exist.
  - $\sigma_X$ takes on the same value for workers in adjacent experience categories as for workers who differ greatly in their experience; $\sigma_E$ is the same for high school dropouts and high school graduates as for high school dropouts and college graduates; and $\sigma_{KL}$ is the same for all the different types of workers.
  - Results are extremely sensitive to assumption about the trend in the productivity vector $\theta$.

# 22. Measuring the wage impact of immigration

- Use estimated $\sigma$'s to calculate the wage impact of the 1980-2000 flow of international migrants.
- Theory predicts $w = w(K, L_1,\ldots,L_n)$. Suppose the capital stock is constant. Let $\varepsilon_{sx,ij}$ be the factor price elasticity (the wage impact on group $sx$ of an increase in the number of workers in group $ij$). Let $m_{ij}$ be the migrant-induced percent increase in labor supply.
- Short-run impact on the log wage of group ($s$, $x$) is:

$$\Delta \log w_{sx} = \sum_i \sum_j \varepsilon_{sx,ij}\, m_{ij}$$

# 23. Long-run impact

- Long run: suppose rental rate of capital is constant. The predicted wage impact is:

$$\Delta \log w_{sx} = \frac{s_K}{\sigma_{KL}} \tilde{K} + \sum_i \sum_j \varepsilon_{sx,ij} m_{ij}, \quad \text{where } \tilde{K} = \sum_\ell s_\ell m_\ell / s_L$$

- Short- and long-run impacts differ only by a positive constant, so full capital adjustment mutes the adverse wage impact of immigration but leaves the relative wage effects unchanged.
- Because first-level CES has constant returns, supply shocks induce a corresponding shift in the capital stock that leaves the capital/labor ratio constant and the average wage in the economy unchanged.

# 24. Predicted percent wage impacts of 1980-2000 immigrant supply shock, United States and Canada

| | High school dropouts | High school grads. | Some college | College grads. | Post-grad. degree | All workers |
|---|---|---|---|---|---|---|
| **U.S.** | | | | | | |
| Supply shock (%) | 22.8 | 8.1 | 9.2 | 12.0 | 12.8 | 11.1 |
| Short-run, $\sigma_{KL} = 1.0$ | -7.1 | -2.3 | -2.7 | -3.6 | -3.9 | -3.3 |
| Long run | -3.8 | 1.0 | 0.6 | -0.3 | -0.6 | 0.0 |
| | | | | | | |
| **Canada** | | | | | | |
| Supply shock (%) | -5.6 | 3.2 | 13.3 | 29.0 | 32.0 | 10.4 |
| Short-run, $\sigma_{KL} = 1.0$ | 2.7 | -0.9 | -4.3 | -9.7 | -11.5 | -3.3 |
| Long-Run | 6.0 | 2.4 | -1.0 | -6.4 | -8.2 | 0.0 |

# 25. Predicted percent wage impacts of 1980-2000 emigrant supply shock, Mexico

| | High school dropouts, 0-8 yrs | High school dropouts, 9-11 yrs | High school grads. | Some college | College grads. | All workers |
|---|---|---|---|---|---|---|
| Supply shock (%) | -11.6 | -11.6 | -35.6 | -29.7 | -5.8 | -14.6 |
| Short-run, $\sigma_{KL} = 1.0$ | 3.8 | 3.8 | 12.3 | 10.2 | 1.7 | 4.8 |
| Long run | -1.0 | -1.1 | 7.5 | 5.4 | -3.1 | 0.0 |

# 26. Reflections on the long run

- This type of long-run modeling cannot be correct.
- In the long run, the average wage goes back to its pre-immigration equilibrium in both receiving and sending countries.
- What about factor price equalization?
- In absence of information about extent of capital adjustment, the CES approach is perhaps best interpreted as giving the impact of immigration on **relative wages**, rather than the impact of immigration on absolute wages.
- Important caveat: CES approach imposes a lot of restrictions that may not be valid.

# 27. Imperfect substitution (Ottaviano-Peri, 2006)

- Suppose immigrants and natives within a skill group are not perfect substitutes.

$$L_{sxt} = \left[ \theta_{sxt} N_{sxt}^{\gamma} + (1 - \theta_{sxt}) M_{sxt}^{\gamma} \right]^{1/\gamma},$$

- Ottaviano-Peri claim this extension of the model leads to a new simulation result: 1990-2000 immigrant influx raises average wage of native workers by 1 to 2 percent
- **BUT:** average wage change must be zero, so average wage of immigrants must have declined substantially!
- **Another caveat:** Finding of imperfect substitution is not robust to specification of model. In US data, one cannot reject hypothesis of perfect subst. if one includes educ*time, experience*time, and educ*experience fixed effects.

# 28. Predicted long run wage impact of 1990-2004 inflow with imperfect substitution

| First 2 columns from O-P, Table 9 | Natives | Immigrants | Observed 1990-2000 change in $\Delta$ log w (M-N) |
|---|---|---|---|
| HS dropouts | -1.1% | -16.3% | +0.002 |
| College graduates | +0.7% | -24.2% | -0.005 |

- Impact of immigrants on immigrants seems implausibly high. The raw data **contradicts** implication that relative wage of immigrants dropped dramatically in the 1990s.
- Aggregated results are similar to Borjas *QJE* results. Borjas defines "natives" as the pre-existing population. So wage of pre-existing HS dropout dropped by about -5.7%.
- One interpretation: CES restrictions are straight-jacketing the data and twisting the evidence.

# 29. Conclusion

- Wage response to immigration is a crucial parameter in any assessment of the efficiency and distributional impact of international migration.
- Previous estimates—particularly those at the MSA level—may have underestimated the impact because of attenuation bias introduced by sampling error and behavioral responses.
- A number of puzzles and confusing conjectures remain:
  - Why do spatial correlations lead to contradictory conclusions in the minimum wage and immigration literatures?
  - How do “pre-existing workers” respond to immigration?
  - How does capital respond to immigration?
  - How long does it take to reach the long run?
  - Does immigration lead to factor price equalization?