The Labor Market Effects of Educational Expansion in an Extended Harris-Todaro Model

Gary S. Fields
Cornell University, IZA, and WIDER

June, 2018

I. Introduction to the Issues

My motivation: Assessing the economy-wide effects of educational expansion (and not just the effect of education on the persons who receive it). This is essential input into a social cost-benefit assessment of educational investment.

Market-level effects of educ expansion (1) - Gary Becker's *Human Capital* **(1964):**
 "A student generally needs only determine the effect of a college education on his earnings, but society needs to determine its effect on national income."

Market-level effects of educ expansion (2) - James Heckman's Nobel Speech (2001):

"Accounting for general equilibrium effects is both substantively and theoretically important. The challenge in this literature is to develop empirically credible structural relationships based on micro data that can be linked to macro aggregates."

Strength of Heckman's work: heterogeneous returns for workers of different ability.

But if he's tackled the macro aggregates question, I haven't seen it.

Question addressed in this paper: Extending the Harris-Todaro labor market model to allow for educational differences among workers, what are the market-level effects of (an uneven) educational expansion?

Effects examined in this paper:
1)   Employment and unemployment
2)   Average wages by educational attainment and the educational wage premium
3)   Economy-wide output
4)   Unemployability

Answers (one-liner): Four model variants; one to be presented today. Effects vary a) within a model across zones, and b) across models. Non-monotonicities abound.

II. The Basic Harris-Todaro Model

Characterizing the HT Model:

- The general classes of models used:
  - Micromotives and macro behavior (Schelling) - Corner solutions and interior solutions.
  - A slot economy (My earliest work; Sattinger; Waldman; Milgrom and Roberts; Lazear, Shaw, and Stanton)
- Dualistic L mkt: better jobs ("modern") and worse jobs ("agriculture").
- The Harris-Todaro model – one of the best 20 papers of all time published in the AER.
- HT had all workers identical; no educational differences.

Basic Harris-Todaro Model:

- Two sectors: modern (M) and agriculture (A).
- Wage dualism: $W_M > W_A$.
- Limited number of M jobs; unlimited number of A jobs.
- Job search behavior: Income-maximizing workers. Each can search either for an M job or an A job but not both.
- Expected wage for modern sector job searchers:
  (1) $W_M \pi_M = W_M E_M / L_M$.
- Above-market-clearing wage in modern sector:
  $$W_M = \overline{W}_M > W_M^*.$$
- Expected wage for agricultural job searchers: W_A.
- Interior HT equilibrium equates $E(W_M)$ and $E(W_A)$:
  (2) $W_M E_M / L_M = W_A$.
- Critical value of L_M: (2') $L_M^* = E_M (W_M / W_A)$.

To note:

- This <u>is</u> a segmented L mkt model.
- This is <u>not</u> a competitive L mkt model.
- This is <u>not</u> a Roy model.

III. Extending the Harris-Todaro Model to Allow for Educational Differences among Workers

Features of the Extended HT Model (All Variants):

- My dissertation and beyond: some workers are better-educated ("educated") than others ("uneducated").
- The wage is set for the job, not the worker in it.
- Employers may hire the better-educated workers preferentially
  - "Bumping"
  - "Education as a Screening Device"
  - Other options are "L mkt stratification" and "pooling"
- The bumping models involve a <u>negative externality of education</u>, unlike the usual <u>positive externalities of education</u> emphasized in the literature.
- The essential externality: Because better-educated workers are hired preferentially, the presence of better-educated workers in the labor market results in fewer job opportunities for the less-educated.

The Equations of the Extended HT Model (All Variants):

- Expected wage if educated:

$$(3) \quad E(W^{ed}) = \max [W_M \, \pi_M{}^{ed}, \, W_A \, \pi_A{}^{ed}].$$

- Probability of an educated worker being hired for a modern sector job:

$$(4) \quad \pi_M{}^{ed} = 1 \text{ if } L^{ed} \leq E_M,$$
$$= E_M \, / \, L_M{}^{ed} \text{ if } L^{ed} > E_M \,.$$

- Employment of the uneducated in the modern sector:

$$(5) \quad E_M{}^{uned} = E_M - L^{ed} \quad \text{if } L^{ed} \leq E_M \,,$$
$$= 0 \text{ if } L^{ed} > E_M \,.$$

- Expected wage if uneducated:

$$(6) \quad E \, (W \, uned \,) = \max [W_M \, \pi_M{}^{ed}, \, W_A \, \pi_A{}^{ed}].$$

- Probability of an uneducated worker getting hired in the modern sector:

$$(7) \quad \pi_M{}^{uned} = E_M{}^{uned} \, / \, L_M{}^{uned} \,.$$

Closing the Model in Four Alternative Ways:

- Four variants – differ in terms of what is going on in agriculture:
    - Model 1 – Unlimited fallback options in agriculture at a constant wage
    - Model 2 – Unlimited fallback options in agriculture at a changing wage
    - Model 3 – A limited number of fallback jobs in agriculture owing to a rigid wage above the market-clearing level
    - Model 4 – Self-employment for all in agric, with educ/uned productivity and earnings differentials
- This presentation: Model 1 only.

Agricultural Sector Wage Determination in Model 1:

$$(8) \quad W_A = \text{constant}, \quad \pi_A^{ed} = \pi_A^{uned} = 1.$$

The Equations of Model 1:

$$(3) - (7) + (8)$$

IV. The Labor Market Effects of Educational Expansion in Model 1

Educational Expansion in Different Zones of Model 1:

o   Zone I - ($L^{ed} < E_M$): The number of better jobs does not increase one-to-one. In this model, no increase at all.

o   Zone II - ($E_M < L^{ed} < (W_M/W_A))E_M$: All educated workers find it advantageous to try to get hired in the better-jobs sector. Educated unemployment increases and $E(W^{ed})$ falls.

o   Zone III - ($(W_M/W_A)E_M < L^{ed}$: Now, there are even more better-educated persons. Some of the educated and all of the uneducated work in agriculture.

Showing the Several Zones in the Different Models

Example:

$W_M = \$3$

$W_A = \$1$

$E_M = 100$ jobs

Start with $L^{ed} = 0$.

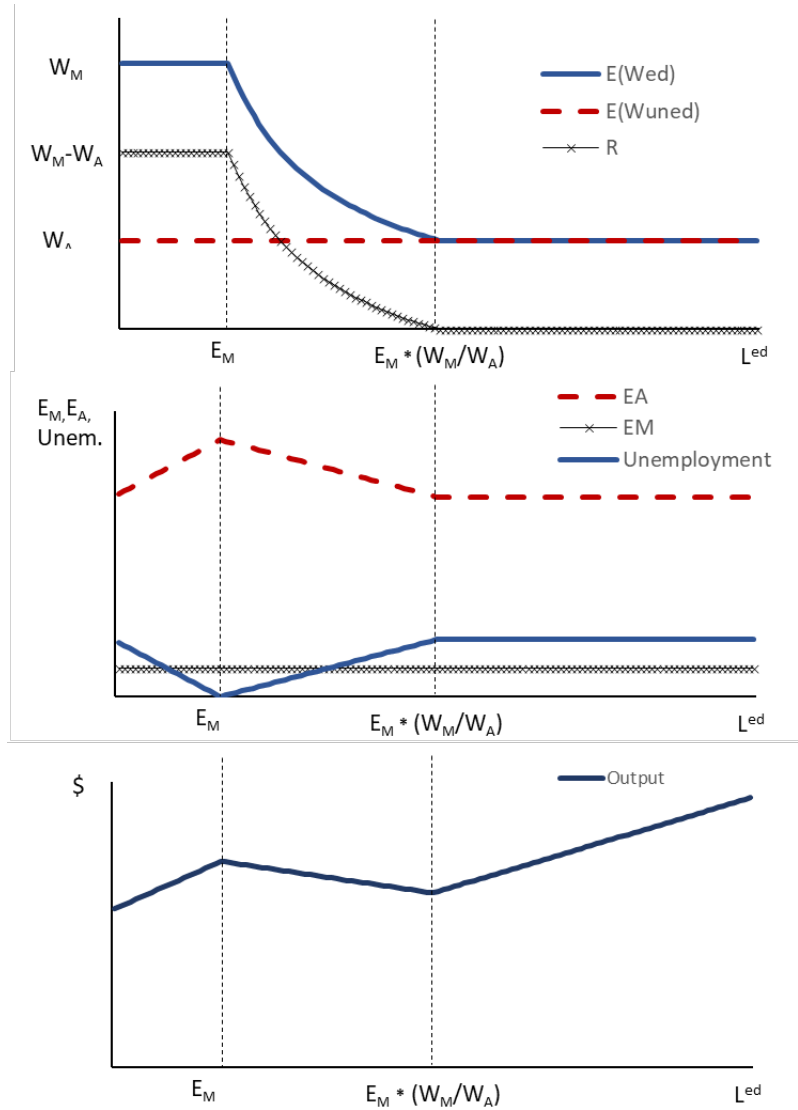Then expand the educated labor force

one worker at a time.

Full Results in Model 1 –
Unlimited Jobs in Agriculture at a Constant Wage

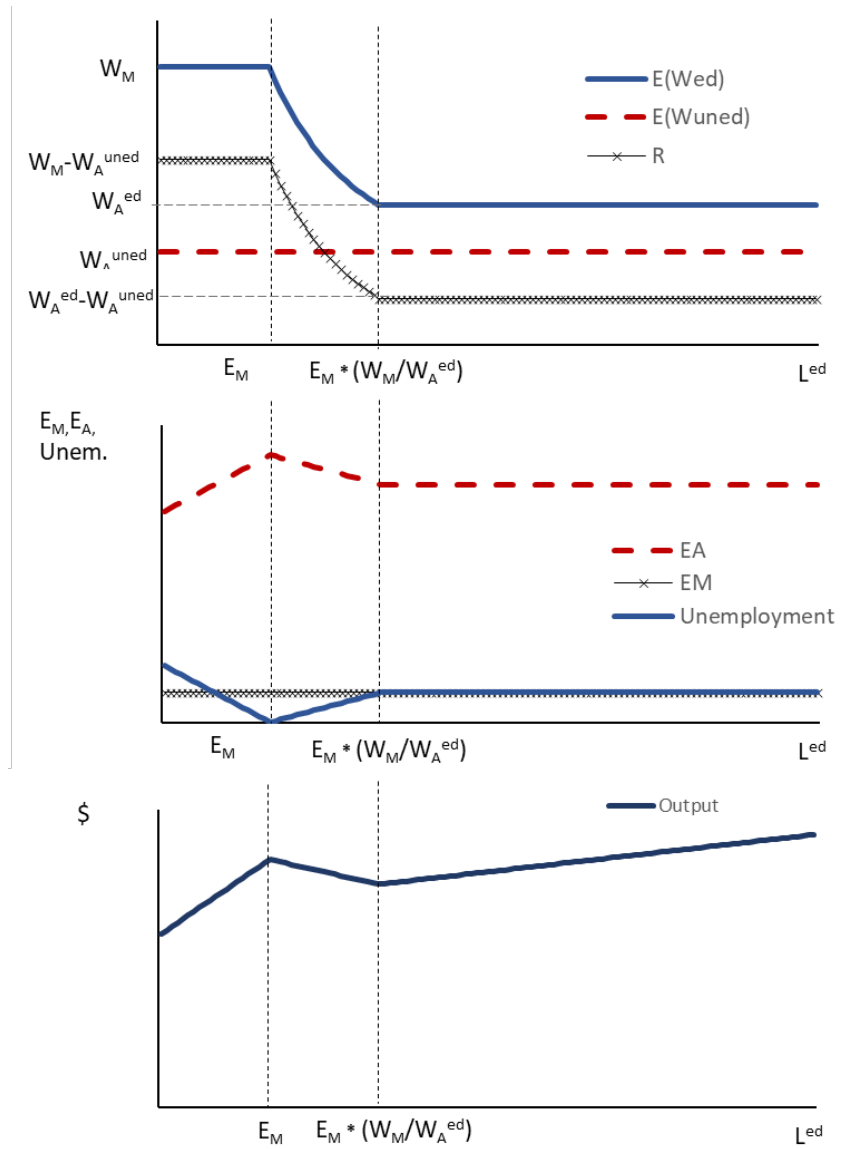# The Labor Market Effects of Educational Expansion in Model 4

Top chart — y-axis labels:

W_M

$W_M - W_A^{uned}$

W_A^{ed}

W_A^{uned}

$W_A^{ed} - W_A^{uned}$

Legend:
- E(Wed)
- E(Wuned)
- R

x-axis: E_M $E_M * (W_M / W_A^{ed})$ L^{ed}

Middle chart — y-axis label: $E_M, E_A,$ Unem.

Legend:
- EA
- EM
- Unemployment

x-axis: E_M $E_M * (W_M / W_A^{ed})$ L^{ed}

Bottom chart — y-axis label: $

Legend:
- Output

x-axis: E_M $E_M * (W_M / W_A^{ed})$ L^{ed}

V. Conclusion

- Principal contribution of this paper
  - o Examine the market-level effects of educ expansion.
  - o Put into the literature a class of models in which, as more people get educated, labor market opportunities change, not only for the <u>educated</u> but also for the <u>uneducated</u>.
  - o Explanation offered here: "bumping".
  - o In some zones: As more people are educated, more preferential hiring takes place, leaving fewer jobs for those without education. But non-monotonicities abound.

- Promising directions for future research:
  - Study fallback jobs. For whom? For all? On what terms?
  - Alternative specifications: The economy may move toward a corner solution in which everybody wants education, because employment prospects are so dismal for those who <u>don't</u> have it.
  - Build a model of "employment twist" in favor of the well-educated due both to changing occupational demand structure and to the relatively greater supply of highly-educated people.