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# **The Labor Market Effects of Educational Expansion: The Harris-Todaro Case**

**Gary S. Fields**  
**Cornell University, IZA, and WIDER**

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# 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.”



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## **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.



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**Question addressed in this paper:** Extending the Harris-Todaro labor market model to allow for educational difference 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 productivity
- 4) Unemployability

**Answers (one-liner):** Looking at three alternative variants within the extended HT class, effects vary a) within a model across zones, and b) across models. Non-monotonicities abound.



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## II. The Basic Harris-Todaro Model



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## 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; Lazear, Shaw, and Stanton)
- Dualistic L mkt: better jobs (“modern”) and worse jobs (“agric”).
- 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.
- An unlimited number of agricultural sector jobs.
- Job search behavior: either M or A 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:  
 $W_M = \bar{W}_M > W_M^*$ .
- 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')  $L_M^* = E_M (W_M / W_A)$ .



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To note:

- This is a segmented L mkt model.
- This is not a competitive L mkt model.
- This is not a Roy model.



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



## Features of the Extended HT Model

- My diss. 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 negative externality of education, unlike the usual positive externalities of education 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:

- Expected wage if educated:

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

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

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

- Employment of the uneducated in the modern sector:

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

- Expected wage if uneducated:

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

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

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



## **Closing the Model in Three Alternative Ways:**

- Three variants – differ in terms of what is going on in agric:
  - 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
- Note: Fallback options are underexplored in L mkt modeling.



## The Equations Differentiating the Three Models:

### Model 1: A Model with Unlimited Fallback Options in Agric at a Constant Wage

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

### Model 2: A Model with Unlimited Fallback Options in Agric at a Changing Wage

$$(8') W_A = f(L_A), f' < 0.$$

$$E_A = L_A.$$

$$\therefore \pi_A^{\text{ed}} = \pi_A^{\text{uned}} = 1.$$

A further particularization:

$$(8'') W_A = \bar{Q}_A / L_A.$$



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### **Model 3: A Model with a Limited Number of Fallback Jobs in Agric in Which the Better-Educated are Hired Preferentially**

$$\begin{aligned} (8'') \quad & W_A = \text{constant} \\ & W_A = \bar{W}_A > W_A^* \\ & E_A < L_A \\ & \therefore \pi_A < 1 \\ & \pi_A^{\text{ed}} \geq \pi_A^{\text{uned}} \end{aligned}$$



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# **IV. The Labor Market Effects of Educational Expansion: Results for the Three Models**



## Educational Expansion in Different Zones (with boundaries for Model 1):

- Zone I - ( $L^{ed} < E_M$ ): The number of better jobs does not increase one-to-one.
- 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. But because the size of the less-educated labor force decreases, the wages of the less-educated may rise (in Models 2 and 3).
- Zone III -  $(W_M/W_A)E_M < L^{ed}$ : Now, there are even more better-educated persons. They are using their education to get hired preferentially for lower-level jobs. Workers who lack this level of education take what's left.
- Zone IV – In Model 3 only -  $((W_M/W_A)E_M + E_A^{max}) < L^{ed}$ : So many educated workers are available that they get hired for all of the existing jobs. As a group, all of the less-educated workers are unemployable.



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## Showing the Several Zones in the Different Models

**Example:**

$$W_M = \$3$$

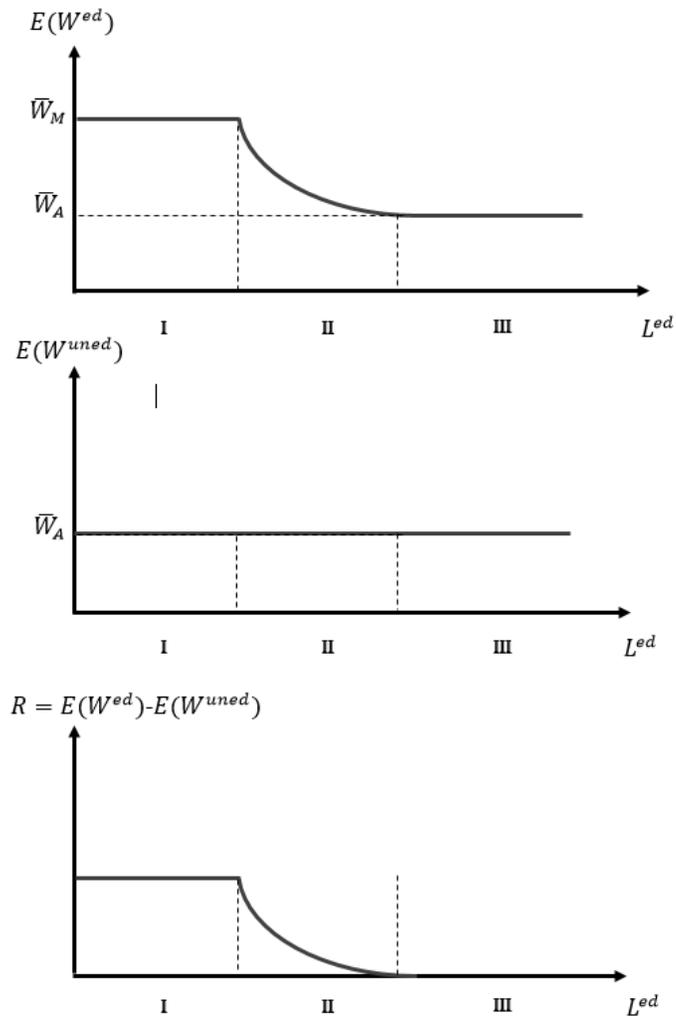
$$W_A = \$1$$

$$E_M = 100 \text{ jobs}$$

**Start with  $L^{\text{ed}} = 0$ . Then expand educated labor force  
one worker at a time.**

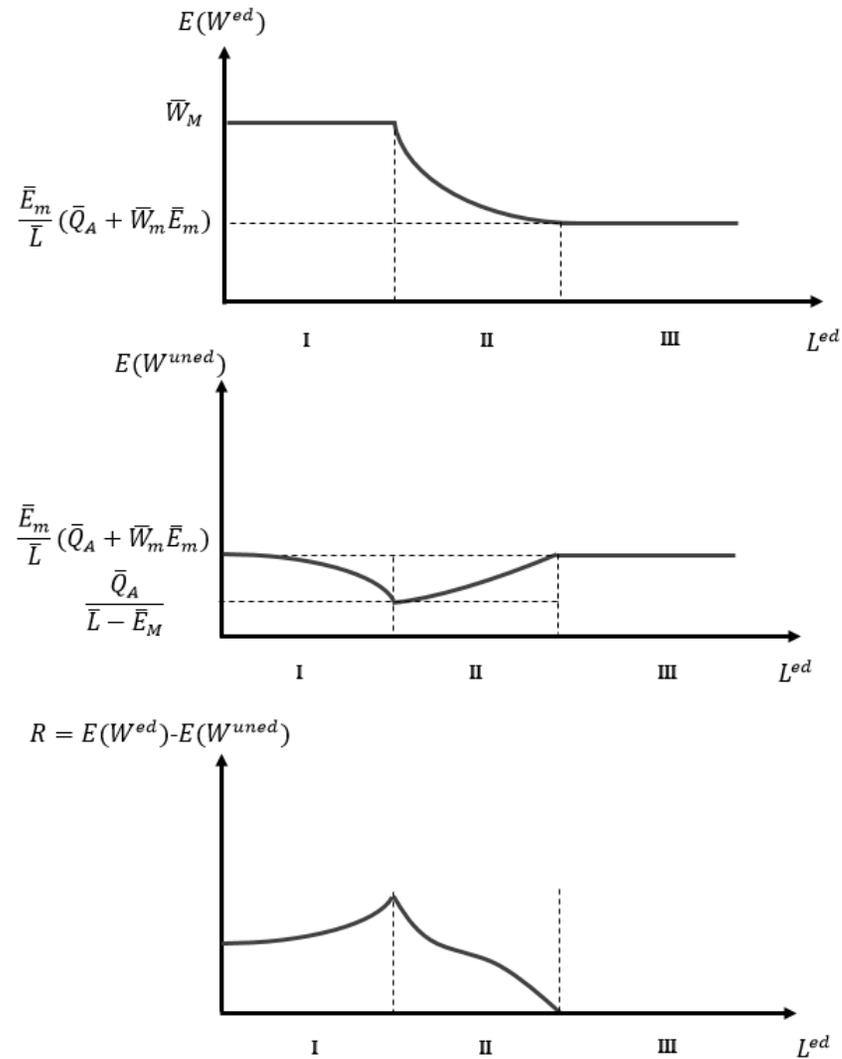


**Model 1- A Model with Unlimited Fallback Options in Agriculture at a Constant Wage**



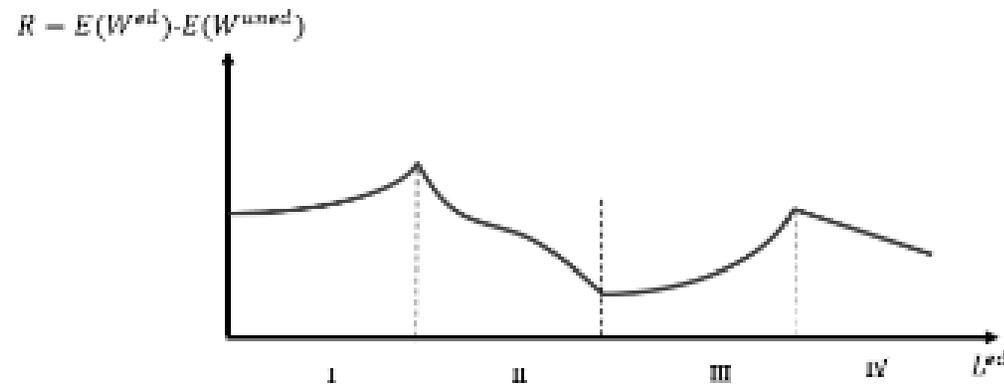
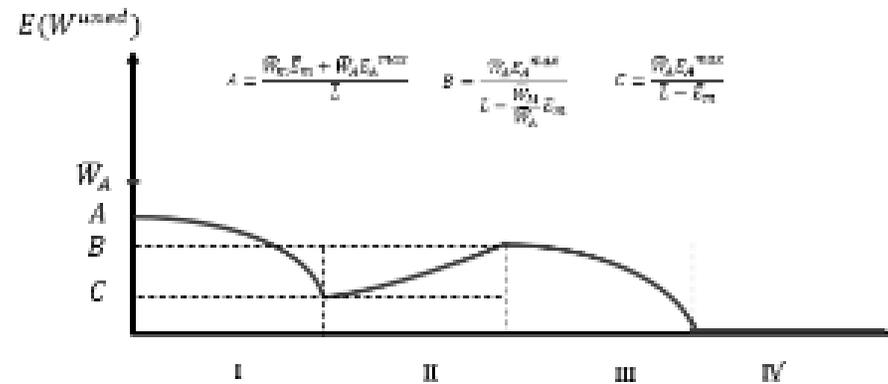
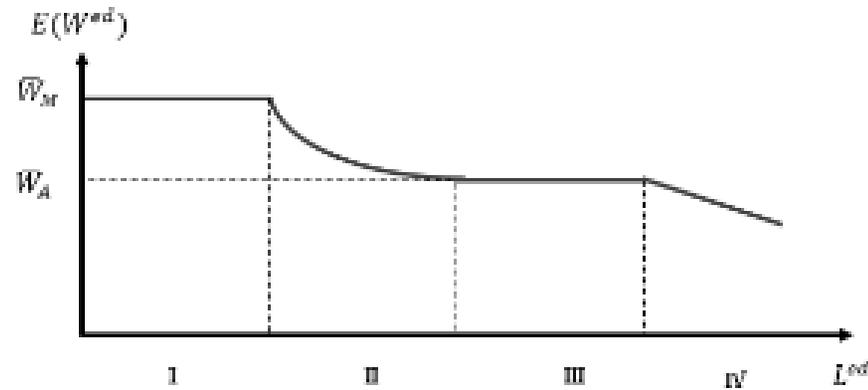


**Model 2- A Model with Unlimited Fallback Options in Agriculture at a Changing Wage**





**Model 3- A Model with a Limited Number of Fallback Jobs in Agriculture in which the Better-Educated are Hired Preferentially**

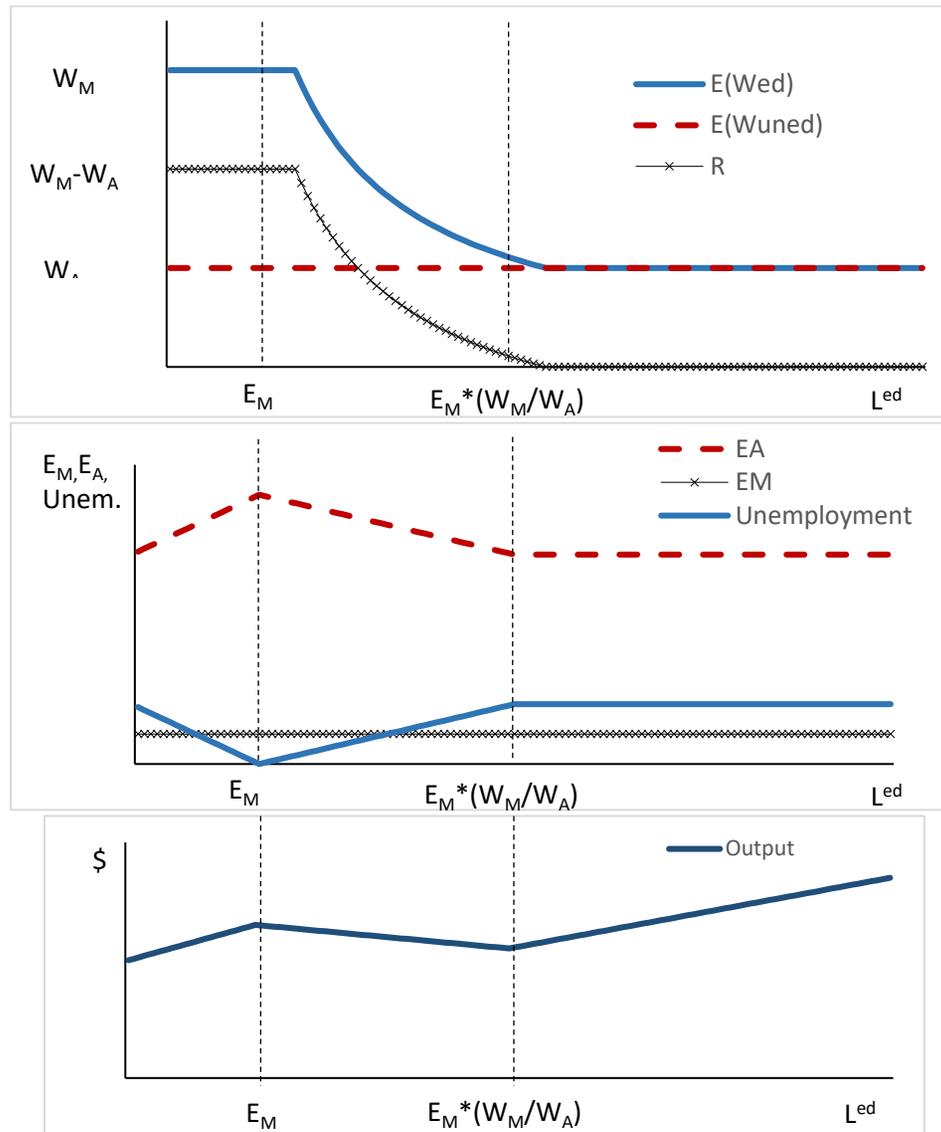
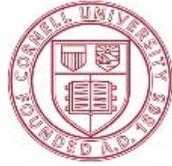




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## **Full Results in Model 1 – Unlimited Jobs in Agriculture at a Constant Wage**





## Additional Results:

- Unemployment vs. unemployability
  - Models 1 and 2: There is no unemployability, but there is unemployment because of risk-taking search
  - Model 3:
    - First three zones have unemployability of some individuals because of deficient demand for L in the economy
    - Zone IV of Model 3: Unemployability of all of the least-educated
- Increasing and decreasing educational wage premiums
  - Model 1: Only constant or decreasing
  - Models 2 and 3: Increasing, decreasing, or constant. What produces an increasing zone in these models:
    - Never rising wages for the better-educated
    - Falling wages for the less-educated



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## V. Conclusion



- Principal contribution of this paper
  - Examine the market-level effects of educ expansion.
  - Put into the literature a class of models in which, as more people get educated, labor market opportunities change, not only for the educated but also for the uneducated.
  - Explanation offered here: “bumping”.
  - In some zones: As more people are educated, more preferential hiring takes place, leaving fewer jobs for those without education. But non-monotonicities abound.
  - The economy may move toward a corner solution in which everybody wants education, because employment prospects are so dismal for those who don't have it.



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- Promising directions for future research:
  - Study fallback jobs. For whom? For all?
  - 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.