

Anti-lemons: School reputation and educational quality

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- 1 Introduction
- 2 Basic setup
- 3 The wage equation
- 4 Evidence on labor and educational market predictions
- 5 Policy implications / Discussion

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- Improving school quality is a central policy challenge
 - e.g., Sebastián Piñera, President of Chile:
 - “...nuestro sistema educacional—digámoslo con todas sus letras—no da una educación de calidad a todos ...”
 - “...en vez de corregir las desigualdades sociales, muchas veces las perpetúa, traspasándolas de generación en generación.”
- There is no clear road map as to how to address this challenge
 - One approach is to identify effective inputs
 - Hanushek (1996), Duflo and Kremer (2003)
 - Here our focus is on market design

- Individuals face two choices:
 - ① How many years of schooling to complete?
 - ② At which school?
- Question 1 is one of *vertical differentiation*
 - Becker (1964): Individuals of diff. ability get diff. amounts of schooling
 - Spence (1973): Return to schooling may include a signaling component
 - Card (1999): Positive causal returns with little evidence of signaling
- Question 2 is one of *horizontal differentiation*
 - Conditional upon years of schooling ...
 - ... earnings may vary with the school attended
- We introduce a model that explains this variation and ...
 - ...analyzes how competition affects school system performance

- There is a general sense that reputation enhances market performance
 - Friedman (1962): Sellers' concern for their *reputation* ensures that an unfettered market is efficient
 - → Vouchers would improve educational efficiency and equity
 - Akerlof (1970): Reputation can address “lemons”-type problems
- We show: In education this holds only under appropriate conditions
 - If schools are better able to observe innate ability than employers ...
 - ... and they can select students, then ...
 - ... competition plus reputation can hinder skill accumulation
 - → implications on how to ensure competition has a positive impact

- Raising school quality may require attention to market design
- Skill accumulation can be enhanced by:
 - Better individual-specific measures of skill (e.g. precise national tests)
 - Implementing school choice in ways that limit stratification
 - “Competition plus reputation” alone is not enough
 - Reducing the inter-generational transmission of innate ability
- The findings offer answers to questions like:
 - Why did Chile’s voucher scheme disappoint in terms of school quality?
 - How should Colombia best design its school and college exit exams?
 - What is the likely impact of school accountability in the region?

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- Period 0:
 - Students draw (unobserved) *innate ability*
 - Students, schools observe noisy “soft” information on innate ability
 - Student and schools matched; schools choose their *value added*
 - Students select academic *effort*
 - Innate ability, school value added, and effort determine skill
- Period 1:
 - A noisy measure of individual skill is observed
 - Employers pay wages equal to individuals’ expected skill

- Individuals maximize Cobb-Douglas-type preferences:

$$\max_{c^0, c^1, e} U = \left(\frac{c^0}{D(e)} \right)^{\gamma^0} (c^1)^{\gamma^1}$$

$$s.t. \quad c_i^0 \leq (1 - T)Y_i - p_{s_i} \quad \text{and} \quad c_i^1 \leq W_i$$

- c^0 , c^1 - consumption; $D(e)$ - cost of effort, e
- Y - exogenous income; T - tax; p_s - tuition at school s ; W - wage

- Schools provide (log) value added, β_s , at cost $C_q(\beta_s)$
 - $q \in \{q^L, q^H\}$; $q^L > q^H$
- $n > 1$ is the number of schools (individuals normalized to mass 1)
 - $n_H < n$ is the number of high productivity schools
- School profit: $\Pi_s = p_s - C_q(\beta_s)$

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- Skill is given by:

$$\Theta_i = \exp(\alpha_i + e_i + \beta_{s_i})$$

- Let \hat{e}_i be expected effort; in equilibrium $\hat{e}_i = e_i$
- We assume school productivity, β_{s_i} , is known

- Innate ability is given by:

$$\alpha_i = \zeta(y_i - \bar{y}) + \varepsilon_i^\alpha$$

where $\varepsilon_i^\alpha \sim N(0, \sigma_\alpha^2)$ and *precision* is $\rho^\alpha = \frac{1}{\sigma_\alpha^2}$

- Income, which is observable, provides a first signal of innate ability:

$$E\{\alpha_i | y_i\} = \zeta(y_i - \bar{y})$$

- In period 0, students and schools observe soft information:

$$\tau_i = \alpha_i + \varepsilon_i^\tau$$

where $\varepsilon_i^\tau \sim N(0, \sigma_\tau^2)$ and $\rho^\tau = \frac{1}{\sigma_\tau^2}$

- Expected innate ability given income and soft information:

$$E\{\alpha_i | y_i, \tau_i\} = \pi^{(\alpha)\tau} \zeta (y_i - \bar{y}) + \pi^{\alpha(\tau)} \tau_i$$

where $\pi^{(\alpha)\tau} = \frac{\rho^\alpha}{\rho^\alpha + \rho^\tau}$ and $\pi^{\alpha(\tau)} = \frac{\rho^\tau}{\rho^\alpha + \rho^\tau}$ and precision is $\rho^\alpha + \rho^\tau$

- A school's reputation is the average (log) skill of its students

$$R_s = E\{\alpha|y, \tau\} + \hat{e}_s + \beta_s$$

where a large school assumption implies $\frac{\partial R_s}{\partial e_i} = 0$

- Definition: A school is *non-selective* when

$$E\{\alpha_i|R_{s_i}, y_i\} = E\{\alpha_i|y_i\}$$

- Definition: A school is *perfectly selective* when

$$E\{\alpha_i|R_{s_i}, y_i, \tau_i\} = E\{\alpha_i|y_i, \tau_i\}$$

- Market sets wage equal to expected skill conditional on information:

$$W(l_i) = E(\Theta_i | l_i) = E\{\exp(\alpha_i + e_i + \beta_{s_i}) | l_i\}$$

- The log wage is:

$$w(l_i) = E\{\alpha_i | l_i\} + \hat{e}_i + \beta_{s_i} + \frac{\text{var}\{\theta_i | l_i\}}{2}$$

- ① Income:

$$E\{\theta|y_i\} = \zeta(y_i - \bar{y}) + \hat{e}_i + \beta_{s_i} \quad \text{or} \quad E\{\theta|y_i\} = \alpha_i + \hat{e}_i + \beta_{s_i} - \varepsilon_i^\alpha$$

- ② If schools are perfectly selective (specialize in $\tau_i = \tau_s$), reputation:

$$R_{s_i} = \tau_{s_i} + \hat{e}_{s_i} + \beta_{s_i} \quad \text{or} \quad R_{s_i} = \alpha_i + \hat{e}_{s_i} + \beta_{s_i} + \varepsilon_i^\tau$$

- ③ Finally, the market observes a (“hard”) individual measure of skill:

$$t_i = \alpha_i + e_i + \beta_{s_i} + \varepsilon_i^t$$

with precision ρ^t

- Non-selective schools:

$$w(y_i, R_{s_i}, t_i) = \pi^{(\alpha)t} E\{\theta_i | y_i\} + \pi^{\alpha(t)} t_i + \frac{1}{2\rho^{\alpha t}}$$

- $\pi^{(\alpha)t} = \frac{\rho^\alpha}{\rho^\alpha + \rho^t}$ and $\pi^{\alpha(t)} = \frac{\rho^t}{\rho^\alpha + \rho^t}$ and $\rho^{\alpha t} = \rho^\alpha + \rho^t$

- Perfectly selective schools

$$w(y_i, R_{s_i}, t_i) = \pi^{(\alpha\tau)t} R_{s_i} + \pi^{\alpha\tau(t)} t_i + \frac{1}{2\rho^{\alpha\tau t}}$$

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Model: When schools are selective, school identity affects wages ...

- Arcidiacono et al. (2009) find that AFQT performance:
 - Is not immediately reflected in wages for high school graduates
 - Is reflected in starting wages for college graduates

... and there is a wage return to going to a higher-ranked school

- Hoekstra (2009) and Saavedra (2009):
 - Better labor market outcomes for students who just make it into selective colleges in the U.S. and Colombia, respectively
 - Dale and Krueger (2002) need not be inconsistent with this implication

- Non-selective schools:

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In the model parents prefer schools with better reputations ...

- Black (1999): Parents willing to pay for higher achievement schools
- Hastings and Weinstein (2008): Parents react to data on school performance by requesting higher achievement schools

... even if there are only weak peer effects

- Oreopoulos (2003): Students randomly assigned to better neighborhoods did not have higher educational attainment
- Kling, Liebman, and Katz (2007) on *Moving to Opportunity*

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The model is consistent with the fact that parents seem to value school choice and to prefer schools with good reputations ...

- Again, Black (1999), and Hastings and Weinstein (2008)
- In Chile, unrestricted vouchers resulted in private schools' enrollment share growing from 10 to 50% (McEwan, Urquiola and Vegas, 2008)

... and yet the evidence on the impact of competition is mixed

- Neal (2008): “Measured solely by effects on achievement and attainment existing evidence does not support the view that private schools are generally superior to public schools in all settings”
- Mixed evidence on the effects of Tiebout choice
 - (Hoxby, 2000; Rothstein, 2007)
- Chile: Stratification and disappointment with the evolution of learning
 - (Hsieh and Urquiola, 2006; Gallego, 2008)

- Non-selective schools:

$$w(y_i, R_{s_i}, t_i) = \pi^{(\alpha)t} E\{\theta_i | y_i\} + \pi^{\alpha(t)} t_i + \frac{1}{2\rho^{\alpha t}}$$

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- Hoxby (2009): Colleges have “fanned out” in terms of selectivity over the past decades
 - Babcock and Mindy (2010): Hours of study at college have sharply declined in this same period
- Angrist, Dynarski, Kane, Phatak, and Walters (2010) : Student effort may be an important input in the production of skill
- Increased interest in how to manipulate student effort
 - Angrist, Lang, and Oreopoulos (2006)
 - Kremer, Miguel, and Thornton (2009)
 - Fryer (2010)
 - Oster and Millett (2010)

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Anti-lemons: Education has specific characteristics (some likely generalize)

- Schools' perceived reputation increases with the quality of their buyers
 - *By and large, I'm going to be picking from the law schools that basically are the hardest to get into. They admit the best and the brightest, and they may not teach very well, but you can't make a sow's ear out of a silk purse. If they come in the best and the brightest, they're probably going to leave the best and the brightest, O.K.?* —Antonin Scalia
- Individuals realize school membership credibly conveys information
 - *Please accept my resignation. I don't want to belong to any club that will accept me as a member.* —Groucho Marx
- More generally sellers would like to exclude some buyers:
 - *That's a good question, but what can we do? We can't forbid people from buying it.* —The director of Roederer Champagne asked if rappers' fondness for his products might be hurting the brand
- Student effort is an input into the production of skill

- Precise graduation tests → effort and skill
 - Countries with standardized graduation tests do better in international comparisons (Bishop, 1997 and Woessmann, 2007)
- Many “accountability” initiatives (e.g. *No Child Left Behind* in the U.S., the *SNED* in Chile), contain few, if any, individual incentives
- Caveat: Whether an increased emphasis on test scores is warranted depends on whether test scores are predictive of wages and growth
- Reducing the correlation between income and innate ability will increase effort and skill (ECD investments?)

- School-based control and choice should be implemented with an eye to how they will affect stratification
 - Chile's scheme resulted in massive sorting; little impact on test scores
 - Sweden funds for-profit schools in a manner quite analogous to Chile; however, schools must be operated on a "first come, first served" basis
 - U.S. charter schools face restrictions on selection and seem to have better impact (e.g., Hoxby et al., 2007; Abdulkadiroglu et al., 2009)
- Private/charter advantage may be *endogenous, context-specific*, and *respond to policy*
- Stratification may hurt the poor; once in place, hard to reverse

- Policy makers increasingly appreciate that in order to measure school quality, one must take selection into account
 - e.g., N.Y.C. and Chile disseminate data approximating value added
- What is possibly less well appreciated is that public and private objectives may be different:
 - Policy makers might want parents to focus on higher value added, β_s
 - Parents may be more interested in reputation, R_s
- It is well documented that information on absolute outcomes can affect markets; less obvious that this is also the case for value added (Rothstein, 2006, and Mizala and Urquiola, 2008)

- This paper studies interaction between labor and educational markets
 - Provides a micro-foundation for a Mincer-type wage equation
- Spence (1973): *Vertical* differentiation
 - Signaling can lead to *over investment* in education
- This paper: *Horizontal* differentiation
 - Can lead to *under production* of skill
- → Implications for school market design, e.g., to very different extents, different systems feature:
 - Public schools open to all in their jurisdictions
 - Public schools that admit based only on testing performance
 - Unsubsidized private schools that select on income and/or ability
 - Subsidized independent schools open to all (e.g. charter schools)
 - National exit exams
- Why is there such variety, and what would be an optimal system?