The Aggregate Productivity Effects of Internal Migration: Evidence from Indonesia. (JPE 2019)

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Research Question & Value Added

- What are the effects of reducing barriers to mobility on aggregate productivity and output? (Not welfare)
- Extant literature: Gollin, Lagakos, Waugh (2014) , Bryan, Chowdhury, Mobarak (2014)
- Value added I: Models explicitly the role of selection. Migration increases productivity because
  - More people move to more productive locations
  - Individuals sort into locations where they are personally more productive
  - *Novel insight*: The next migrant may not be as productive as the last
- Value added II: Writes down a model that allows for relatively easy parameter identification
- Value added III: Comes up with the micro data that allow for estimation

Main Lessons from Counterfactuals

- Aggregate productivity increases due to greater mobility are not large (compared to most results in the extant literature)
  - 7% when moving costs drop to US levels
  - 22% when moving costs go to zero
- Large heterogeneity in wage gains
- The quantitative effect of sorting is substantial. When shutting down selection, gains drop substantially

Structure of the paper

- Reduced form evidence hinting that selection may be quantitatively relevant
- Structural model
- Identification conditions
- Estimation
- Counterfactuals

Data

- For a large representative set of people:
  - Location of birth
  - Current work location
  - Monthly earnings
- Source: 1995 Intercensal Population Survey and 2011-2012 National Socioeconomic Surveys
- Location: 281 regencies, that aggregate to 25 provinces

Reduced form analysis: 5 conditional correlations

1. Gravity: Movement costs affect location choice. Elasticity of -0.7

$$\ln(\pi_{dot}) = \delta_{dt} + \delta_{ot} + \beta \ln(dist_{do}) + \epsilon_{dot}$$

2. People that migrate farther have higher wages on average

$$\ln(\overline{wage}_{dot}) = \delta_{dt} + \delta_{ot} + \beta \ln(dist_{do}) + \epsilon_{dot}$$

3. Selection: More migrants from the same origin are associated with lower wages

$$\ln(\overline{wage}_{dot}) = \delta_{dt} + \delta_{ot} + \beta \ln(\pi_{dot}) + \epsilon_{dot}$$

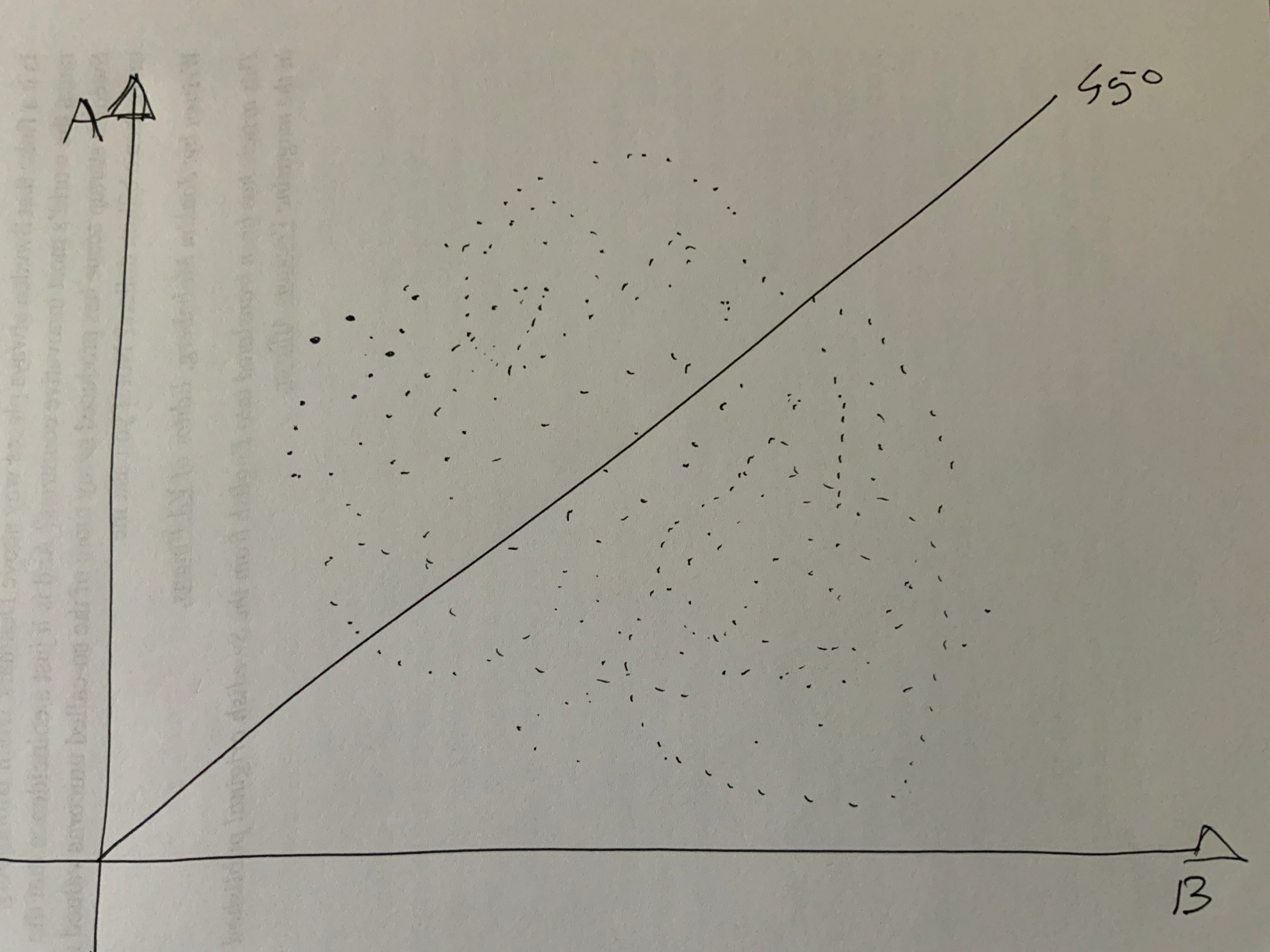
Reduced form analysis: 5 conditional correlations – continued

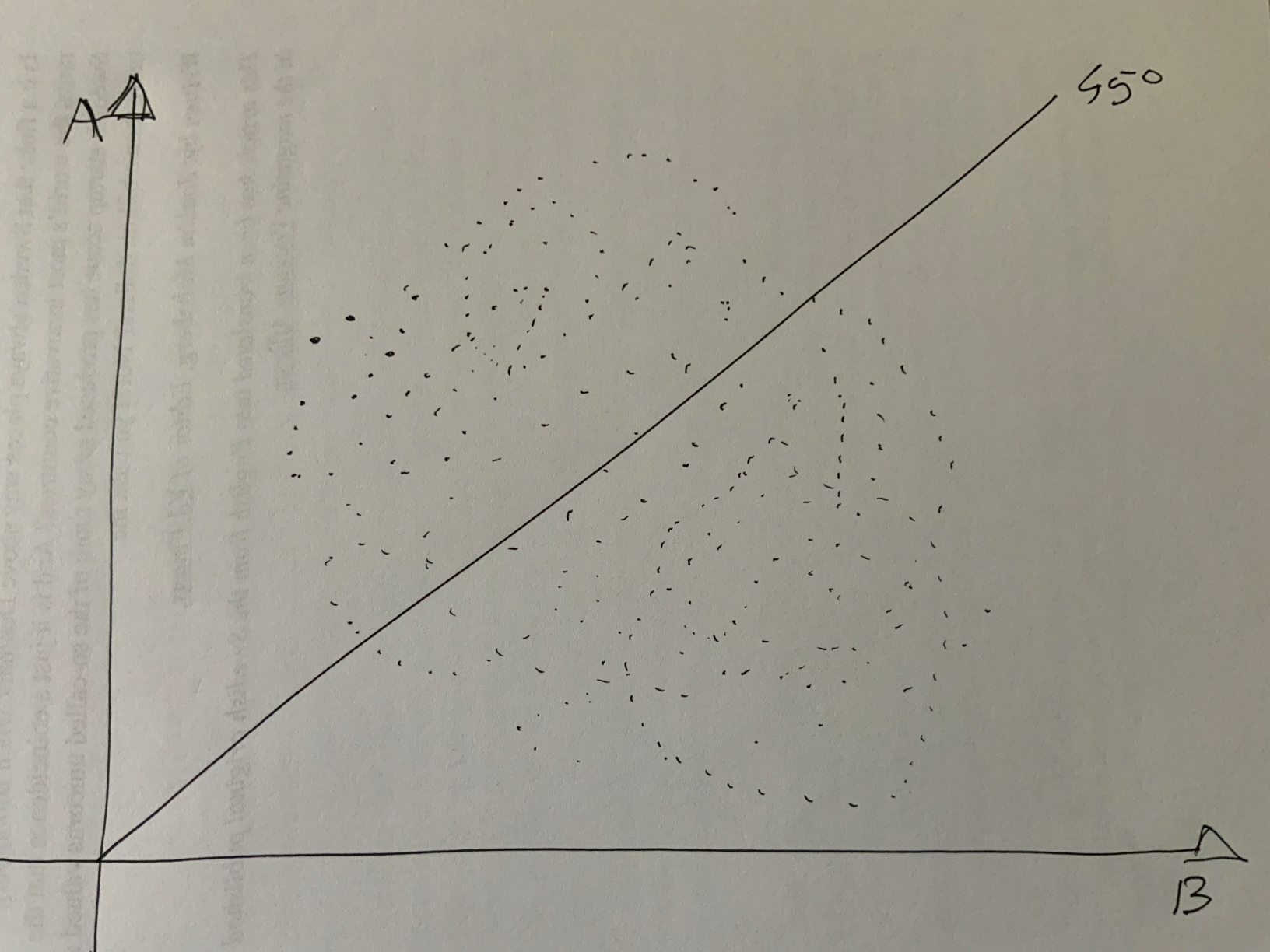
4. Movement costs reduce wages mostly via selection

$$\ln(\overline{wage}_{dot}) = \delta_{dt} + \delta_{ot} + \beta \ln(\pi_{dot}) + \gamma \ln(dist_{do}) + \epsilon_{dot}$$

5. More amenities are associated with lower wages

$$\ln(\overline{wage}_{dot}) = \delta_{dt} + \delta_{ot} + \beta \ln(amen_{dt}) + \epsilon_{dot}$$


A
45°
B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Model

- Static, general equilibrium, with linear utility and linear production
- N locations
- Workers are born in a particular location (o), draw a skill for each destination (d) and sort optimally across destinations
- Skills are drawn from a multivariate Frechet distribution

$$F(s_1, ..., s_N) = \exp\left\{ - \left[\sum_{d=1}^{N} s_d^{-\frac{\tilde{\theta}}{1-\rho}} \right]^{1-\rho} \right\}$$

Wages, amenities, moving costs

- Indirect utility of individual i, born in location o, when living in location d:

$$U_{ido} = \alpha_d \epsilon^{\alpha}_{do} (1 - \tau_{do}) w_d \epsilon^{w}_{do} s_{id} q_o.$$

  - $\alpha_d = \bar{\alpha}_d L_d^{\lambda}$ – Amenities in location d
  - ϵ^{α}_{do} – Differences in amenities that depend on location or origin
  - τ_{do} – Moving costs
  - $w_d = \bar{A}_d H_d^{\gamma}$ – Aggregate productivity in location d
  - ϵ^{w}_{do} – Origin-specific labor demand shifter
  - q_o – Quality of education at origin o

Frechet Magic at work

- Let $\theta \equiv \tilde{\theta}/(1-\rho)$. Fraction of people moving from o to d

$$\pi_{do} = \frac{\tilde{w}_{do}^{\theta}}{\sum_{j=1}^{N} \tilde{w}_{jo}^{\theta}}, \quad \tilde{w}_{do} = \alpha_d \epsilon_{do}^{\alpha} (1-\tau_{do}) w_d \epsilon_{do}^{w}$$

- The average skill of workers that move from o to d

$$E(s_d|\text{choose } d) = \pi_{do} \Gamma \left(1 - \frac{1}{\theta(1-\rho)}\right)$$

- Average wage of workers that move from o to d

$$\overline{wage}_{do} = w_d \epsilon_{do}^{w} q_o E(s_d|\text{choose } d) = w_d \epsilon_{do}^{w} q_o \pi_{do} \Gamma \left(1 - \frac{1}{\theta(1-\rho)}\right)$$

Production

- Firms in each location produce a location-specific variety. Profits:

$$\Pi_{jd} = p_d A_d h_{jd} - w_{jd} h_{jd}$$

- In equilibrium: $w_{jd} = w_d$ and $w_d = p_d A_d$
- The final good is traded at no cost and produced according to:

$$Y = \left\{ \sum_{d=1}^{N} y_d^{\frac{\sigma-1}{\sigma}} \right\}^{\frac{\sigma}{\sigma-1}}$$

- Agglomeration externalities: $A_d = H_d^{\gamma}$
- Congestion externalities: $\alpha_d = \bar{\alpha}_d L_d^{\lambda}$

Identification

- To be estimated: $\{\theta, \rho, q_o, w_d, \alpha_d, \tau_{do}\}$. The rest is calibrated.
- Frechet parameter $\{\theta\}$

$$\ln(\overline{w_{do}}) = \ln(\bar{\Gamma}) + \ln(w_d) - \frac{1}{\theta} ln(\pi_{do}) + \ln(q_o) + \ln(\epsilon_{do}^w)$$

- To separate θ and ρ, they use another property of the Frechet distribution

$$\frac{w_{do}}{\overline{wage}_{do}} = \frac{\Gamma(1 - 2/(\theta(1-\rho)))}{\Gamma(1 - 1/(\theta(1-\rho)))} - 1$$

Estimates

TABLE 4
ESTIMATED FRÉCHET PARAMETERS

	Indonesia (1)	United States (2)
ρ (correlation)	.74***	.90***
	(.029)	(.015)
θ (dispersion)	12.5***	27.6***
	(1.36)	(3.29)
$\tilde{\theta} = \theta(1 - \rho)$	3.18	2.69
Mean migration cost (iceberg)	.39	.15

SOURCE.—Estimates from structural estimation of model.

NOTE.—Transport costs estimated nonparametrically. Bootstrapped standard errors reported.

*** Significant at the 1 percent level.

Estimated moving costs and Euclidean distance

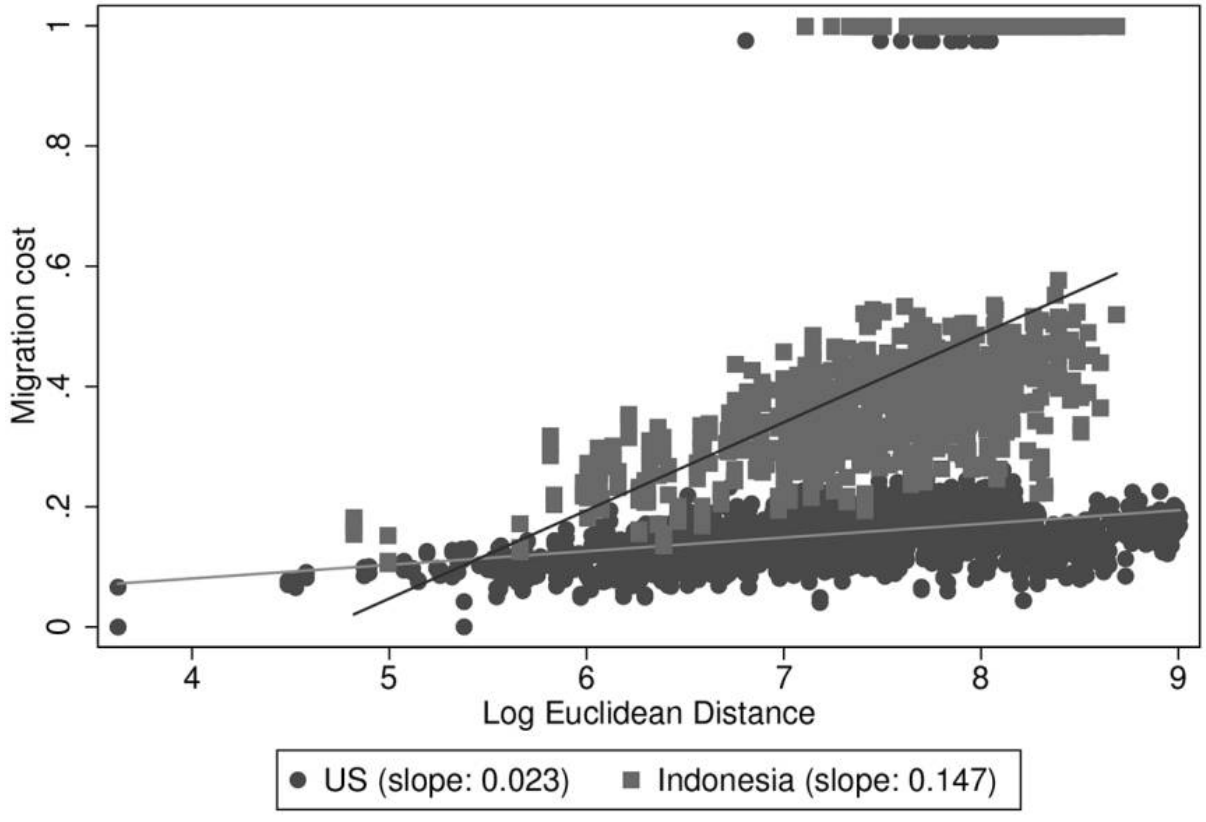

FIG. 3.—Relationship between iceberg costs and distance in Indonesia and the United States. Data from 1990 and 2010 for the United States; from 1995, 2011, and 2012 for Indonesia.

Estimated moving costs and measures of social distance

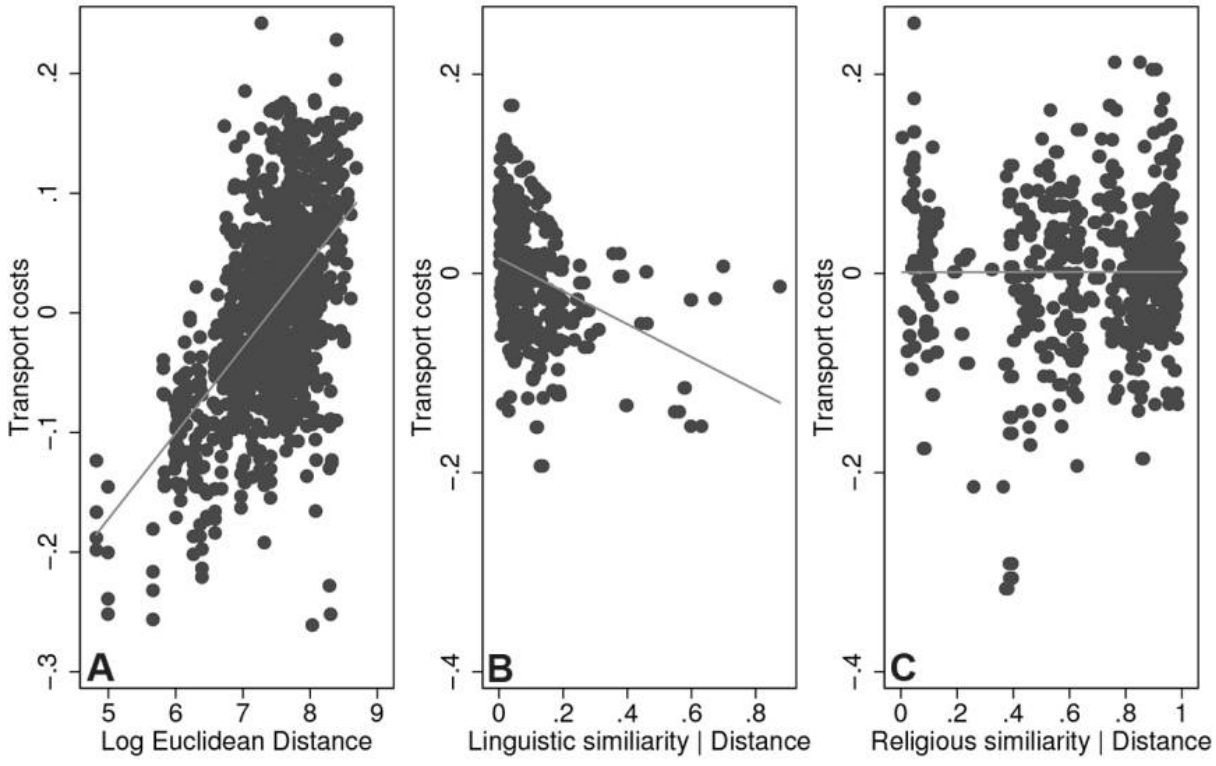

FIG. 4.—Correlates of iceberg costs in Indonesia. Data, demeaned by year, from 1995, 2011, 2012. Graphs show intensive margin transport costs (less than upper bound). *A*, Distance, $\beta = 0.072$, *t*-statistic = 31. *B*, Language, $\beta = -0.17$, *t*-statistic = −8.2. *C*, Religion, $\beta = 3.0 \times 10^{-4}$, *t*-statistic = 0.037.

Counterfactuals

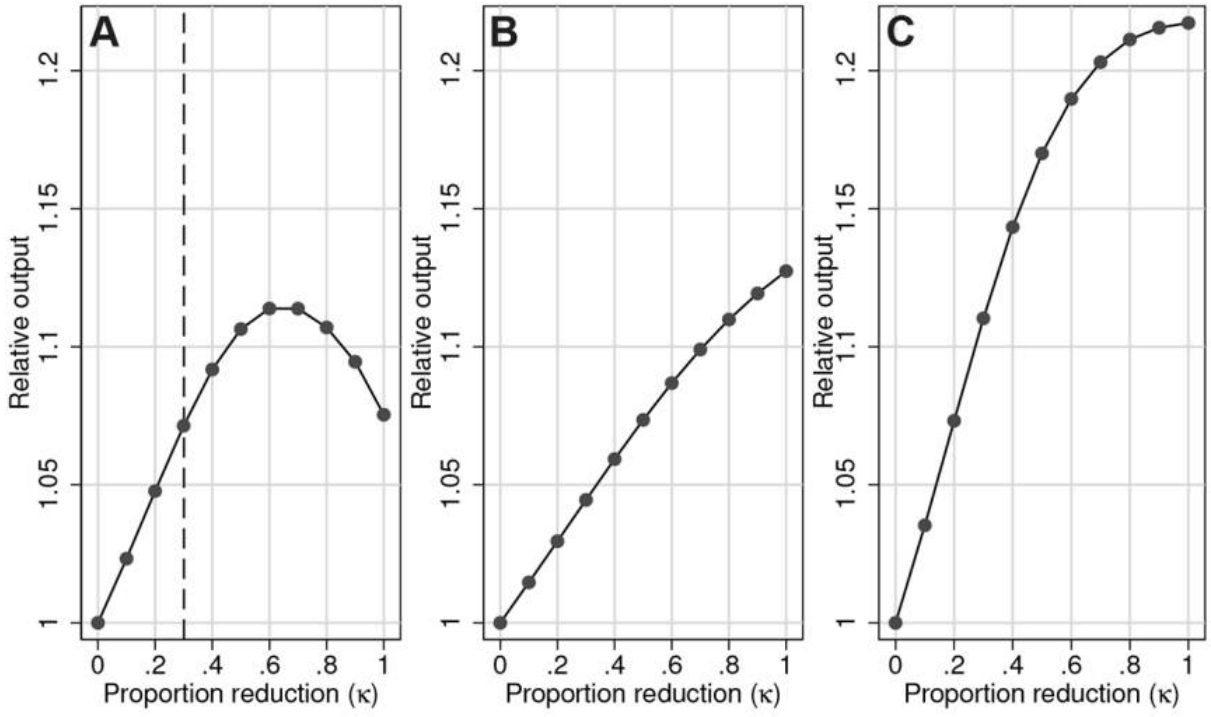

FIG. 7.—Output gains from reducing barriers to movement. Data are average across 1995, 2011, 2012 for Indonesia. The proportion reduction, κ, is defined in the text. The dashed line shows the US level of migration costs. *A*, Migration cost. *B*, Amenities. *C*, Migration cost and amenities.

Counterfactuals

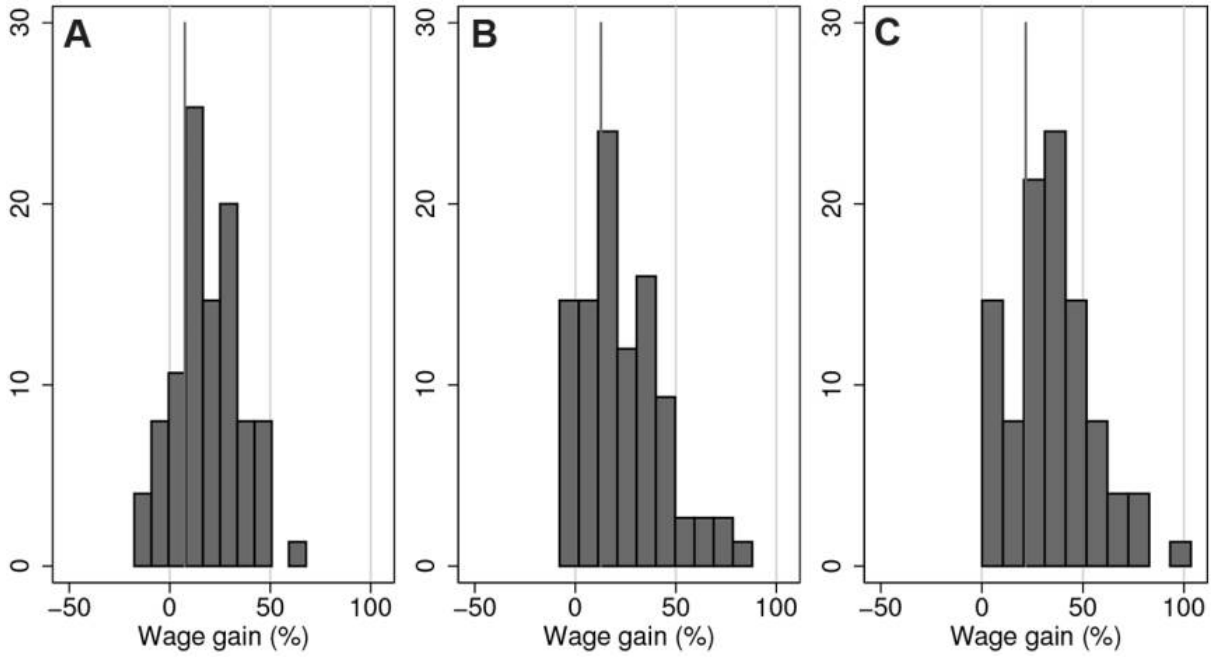

FIG. 8.—Distributional effects of fully reducing barriers to migration in Indonesia. Panels show average wage gain. The unit of observation is an origin-year. National average (weighted by population) shown by the line. A cost reduction of 100 percent is shown. Data from 1995, 2011, 2012. *A*, Migration cost. Mean, minimum, and maximum are 7.5, −17.6, 67.8. *B*, Amenities. Mean, minimum, and maximum are 12.7, −7.8, 88.0. *C*, Migration cost and amenities. Mean, minimum, and maximum are 21.7, 0.1, 103.5.