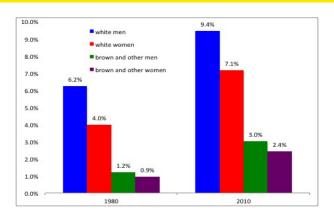
The Allocation of Talent in Brazil and India

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Motivation



High-skill occupations are lawyers, doctors, engineers, scientists, architects, mathematicians and executives/managers.

Figure: Share of Each Group in High Skill Occupations

Goal

Suppose distribution of talent for each occupation is identical for whites, browns, men and women.

Then there was a misallocation of talent in 1980 and 2010.

The goal is to determine the effect of missallocation of talent on productivity in Brazil and India.

Literature

Gender and racial wage gap and earnings inequality in Brazil: Telles (2006), Osorio (2008), Lovell (1993), Arabsheibani et al. (2003), Arcand, D'hombres (2004).

Caste system and labor outcome in India: Deshpande and Kerbo (2010), Das, Dutta (2007), Borooah, Iyer (2005), Hnatkovska et al. (2011), Deshpande et al. (2015).

Misallocation: Hsieh and Klenow (2009), Restucia et al. (2008), Gollin et al. (2007), Adamopoulos, Restuccia (2014) and Hsieh et al. (2013).

Model

N occupations.

Individuals draw talent in each occupation ϵ_i .

$$F(\epsilon_1, \epsilon_2,, \epsilon_N) = exp\{-[\sum_i T_{ig}\epsilon_i^{-\theta}]^{1-\rho}\}$$
 (Frechet)

Individuals then choose occupation (i) and human capital (s, e).

Preferences: $U = c^{\beta}(1-s)$

Production function of human capital: $h = s^{\phi_i} e^{\eta} \epsilon$

Budget constraint: $c = (1 - \tau_{ig}^w)w\epsilon h - (1 + \tau_{ig}^h)e$

Production function: $Y = (\sum_{i=1}^{N} (A_i H_i)^{\frac{\sigma-1}{\sigma}})^{\frac{\sigma}{\sigma-1}}$

Solution to household problem

$$\begin{split} &U(\tau_{ig},w_{i},\epsilon_{i}) = \max_{c,e,s}(1-s)c^{\beta} \text{ s.t. } c = (1-\tau_{ig}^{w})w\epsilon h - (1+\tau_{ig}^{h})e\\ &s_{i}^{*} = \frac{1}{1+\frac{1-\eta}{\beta\phi_{i}}}\\ &e_{ig}^{*}(\epsilon) = (\frac{\eta w_{i}s_{i}^{\phi_{i}}\epsilon}{\tau_{ig}})^{\frac{1}{1-\eta}}\\ &c_{ig}^{*}(\epsilon) = (\frac{w_{i}s_{i}^{\phi_{i}}\epsilon}{\tau_{ig}})^{\frac{1}{1-\eta}}\\ &U(\tau_{ig},w_{i},\epsilon_{i}) = (\frac{w_{i}s_{i}^{\phi_{i}}(1-s_{i})^{\frac{1-\eta}{\beta}}\epsilon_{i}\eta^{\eta}(1-\eta)^{1-\eta}}{\tau_{ig}})^{\frac{\beta}{1-\eta}}\\ &\tau_{ig} = \frac{(1+\tau_{ig}^{h})^{\eta}}{1-\tau^{w}} \end{split}$$

Occupational choice problem

$$U(\tau_{ig}, w_{i}, \epsilon_{i}) = \left(\frac{w_{i}s_{i}^{\phi_{i}}(1-s_{i})^{\frac{1-\eta}{\beta}}\epsilon_{i}\eta^{\eta}(1-\eta)^{1-\eta}}{\tau_{ig}}\right)^{\frac{\beta}{1-\eta}}$$
Proposition 1:
$$\rho_{ig} = \frac{\tilde{w}_{ig}^{\theta}}{\sum_{s=1}^{N}\tilde{w}_{sg}^{\theta}}$$
where
$$\tilde{w}_{ig} = \frac{T_{ig}^{1/\theta}w_{i}s_{i}^{\phi_{i}}(1-s_{i})^{\frac{1-\eta}{\beta}}}{\tau_{ig}}$$

Occupational wage gaps

Proposition 2:
$$\bar{w}_{ig} = (1 - \tau_{ig}^{w})w_{i}E[h_{i}\epsilon_{i}] = (1 - s_{i})^{-1/\beta}(\sum_{s=1}^{N} \tilde{w}_{sg}^{\theta})^{\frac{1}{\theta}} \frac{1}{1-\eta}$$

$$\frac{\bar{w}_{ig}}{\bar{w}_{i,wm}} = (\sum_{s=1}^{N} \tilde{w}_{sg}^{\theta})^{\frac{1}{\theta}} \frac{1}{1-\eta}$$

$$\frac{p_{ig}}{p_{i,wm}} = \frac{T_{ig}}{T_{i,wm}}(\frac{\tau_{ig}}{\tau_{i,wm}})^{-\theta}(\frac{\bar{w}_{g}}{\bar{w}_{wm}})^{-\theta(1-\eta)}$$

$$\tilde{\tau}_{ig} = \frac{\tau_{ig}}{T_{i}}(\frac{T_{ig}}{T_{i}})^{\frac{1}{\theta}} = (\frac{p_{ig}}{p_{i}})^{-\frac{1}{\theta}}(\frac{\bar{w}_{g}}{\bar{w}_{wm}})^{-(1-\eta)}$$

Representative firm

$$\max_{H_i} \left(\sum_{i=1}^{N} (A_i H_i)^{\frac{\sigma-1}{\sigma}} \right)^{\frac{\sigma}{\sigma-1}} - \sum_{i=1}^{N} w_i H_i$$

$$H_i = \sum_{g=1}^{G} q_g p_{ig} E[h_{ig} \epsilon_{ig}]$$

Equilibrium

The general equilibrium of the model is $\{p_{ig}, H_i^{supply}, H_i^{demand}, w_i\}$ and Y s.t.:

$$p_{ig} = rac{ ilde{w}_{ig}^{ heta}}{\sum_{s=1}^{N} ilde{w}_{sg}^{ heta}}$$

$$H_{i}^{supply} = \gamma \bar{\eta} w_{i}^{\theta-1} (1-s_{i})^{(\theta(1-\eta)-1)/\beta} s_{i}^{\theta\phi_{i}} \sum_{g} q_{g} T_{ig} \frac{(1-\tau_{ig}^{w})^{\theta-1}}{(1+\tau_{ig}^{h})^{\eta\theta}} (\sum_{i=1}^{N} \tilde{w}_{sg}^{\theta})^{\frac{1}{\theta} \frac{1}{1-\eta}-1}$$

$$H_i^{demand} = (rac{A_i^{rac{\sigma-1}{\sigma}}}{w_i})^{\sigma} Y$$

$$H_i^{supply} = H_i^{demand}$$



Data

- General Census of Brazil: 1980, 1990, 2000 and 2010 Population Census.
- 67 consistent occupations
- Four restrictions are made:
- 1) race (blacks, browns and whites)
- 2) age (25 and 55)
- 3) occupation (active military duty)
- 4) employment status (unemployed).

Summary statistics

	1980	1990	2000	2010
Sample size	5503600	7990100	9502500	9087200
white	0.5459	0.5096	0.5310	0.4703
black	0.0588	0.0506	0.0617	0.0704
indigenous	0.0002	0.0021	0.0045	0.0054
asian	0.0056	0.0039	0.0041	0.0103
brown	0.3853	0.4305	0.3916	0.4435
unknown	0.0043	0.0034	0.0072	0.0001

Table: Share of groups in sample

Occupational similarity index

$$\Phi_g = 1 - \frac{1}{2} \sum_{i=1}^{N} |p_{i,wm} - p_{ig}|$$

$$p_{ig} = \frac{N_{ig}}{N_g}$$

Occupational similarity index

	1980	1990	2000	2010
white women	0.46	0.50	0.51	0.55
brown and other men	0.78	0.80	0.82	0.83
brown and other women	0.45	0.45	0.42	0.47

Table: Occupational similarity index, Relative to white man

Wage gaps across groups

$$log(wage) = \beta_1 + \sum_g \beta_{2g} D_{ig} + \sum_j \beta_{3j} E_i^j + \sum_l \beta_{4l} H_{il} + \beta_5 S_i + \sum_k \beta_{6k} O_{ik} + \epsilon_i$$
$$D_g\text{- group dummies};$$

 E_{i} - years of experience;

 H_{ii} - dummy for hours worked per week;

 S_{i} - years of schooling;

 O_{ik} - occupation dummies.

Wage gaps across groups

	1980	1990	2000	2010
white women	-0.51	-0.32	-0.34	-0.27
brown and other men	-0.23	-0.24	-0.25	-0.21
brown and other women	-0.76	-0.55	-0.54	-0.43

Table: Conditional log difference in wages relative to white man

Main results

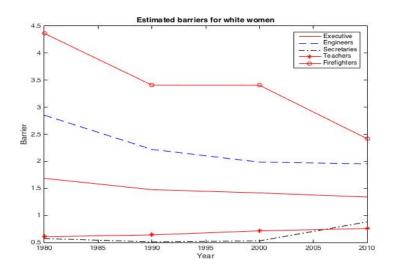
$$\tilde{\tau}_{ig} = \frac{\tau_{ig}}{\tau_{i,wm}} \left(\frac{T_{ig}}{T_{i,wm}}\right)^{\frac{1}{\theta}} = \left(\frac{\rho_{ig}}{\rho_{i,wm}}\right)^{-\frac{1}{\theta}} \left(\frac{\bar{w}_{ig}}{\bar{w}_{iwm}}\right)^{-(1-\eta)}$$

Baseline parameter values

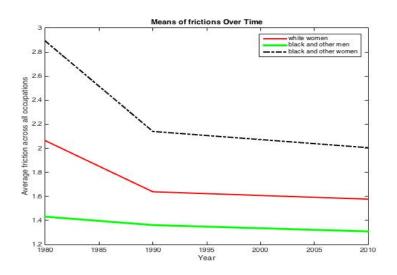
	Parameter	Value
Elasticity of substitution	σ	3
Skill dispersion parameter	θ	3.44
Elasticity of human capital	η	0.25
Parameter in the utility	β	0.693

Table: Baseline parameter values

Estimated Barriers (τ_{ig}) for White Women

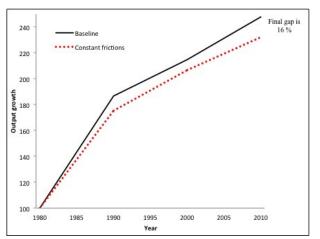


Average Values of τ_{ig} over Time

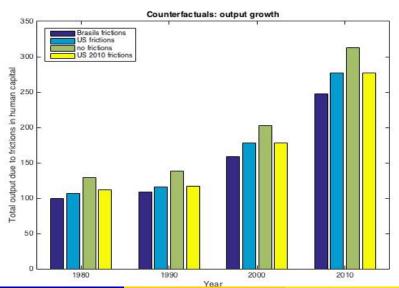


Productivity gains: output growth due to A, ϕ versus τ^h

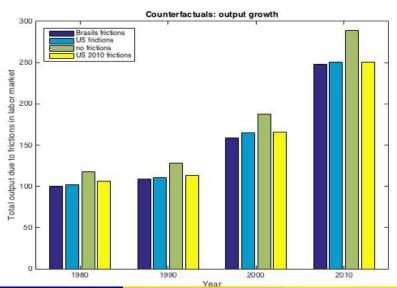
The change in occupational frictions explains 7 % of overall output growth over the 30 years.



Counterfactuals: τ^h case



Counterfactuals: τ^w case



Robustness: τ^h case

$\sigma = 3$	$\sigma = 0.1$	$\sigma = 0.5$	$\sigma = 10$
1.3078	1.3149	1.3125	1.3104
$\theta = 3.40$	$\theta = 4.16$	$\theta = 6.61$	$\theta = 8.41$
1.3169	1.3175	1.3170	1.3177
$\eta = 0.25$	$\eta = 0.10$	$\eta = 0.15$	$\eta = 0.35$
1.3112	1.3153	1.3151	1.3159
$\beta = 0.69$	$\beta = 0.50$	$\beta = 0.70$	$\beta = 0.80$
1.3158	1.3123	1.3117	1.3144

Table: Output growth in 2010 due to eliminated frictions (frictions in human capital)

Robustness: τ^w case

$\sigma = 3$	$\sigma = 0.1$	$\sigma = 0.5$	$\sigma = 10$
1.1933	1.1950	1.1944	1.1940
$\theta = 3.40$	$\theta = 4.16$	$\theta = 6.61$	$\theta = 8.41$
1.1955	1.1881	1.1704	1.1626
$\eta = 0.25$	$\eta = 0.10$	$\eta = 0.15$	$\eta = 0.35$
1.1942	1.1580	1.1703	1.2203
$\beta = 0.69$	$\beta = 0.50$	$\beta = 0.70$	$\beta = 0.80$
1.1952	1.1944	1.1943	1.1949

Table: Output growth in 2010 due to eliminated frictions (frictions in labor market)

Conclusion

- Model predicts that reduction of frictions explains 7-8 % of aggregate output growth in Brazil.
- Reduction of frictions to zero in one year may increase output by 20-30 %.

Next steps

Investigate the productivity gain from reallocation of talent in India.

Sample statistics in India

	1999	2004
Scheduled tribe	0.084	0.103
Scheduled caste	0.203	0.271
Other backward class	0.424	0.369
Others	0.289	0.257

Table: Data from National Sample Survey (NSS) of India

Wage gaps in India

	All	Highly-	Less
		educated	educated
Scheduled tribe men	-0.272	-0.148	-0.251
Scheduled tribe women	-0.635	-0.363	-0.593
Scheduled caste men	-0.16	-0.156	-0.124
Scheduled caste women	-0.649	-0.573	-0.595
Other backward class	-0.136	-0.131	-0.108
men			
Other backward class	-0.688	-0.621	-0.635
women			
Other women	-0.537	-0.458	-0.515

Table: Wage gap relative to other men in 2004

Share of groups in high-skilled occupations

