The allocation of Talent in Brazil and India

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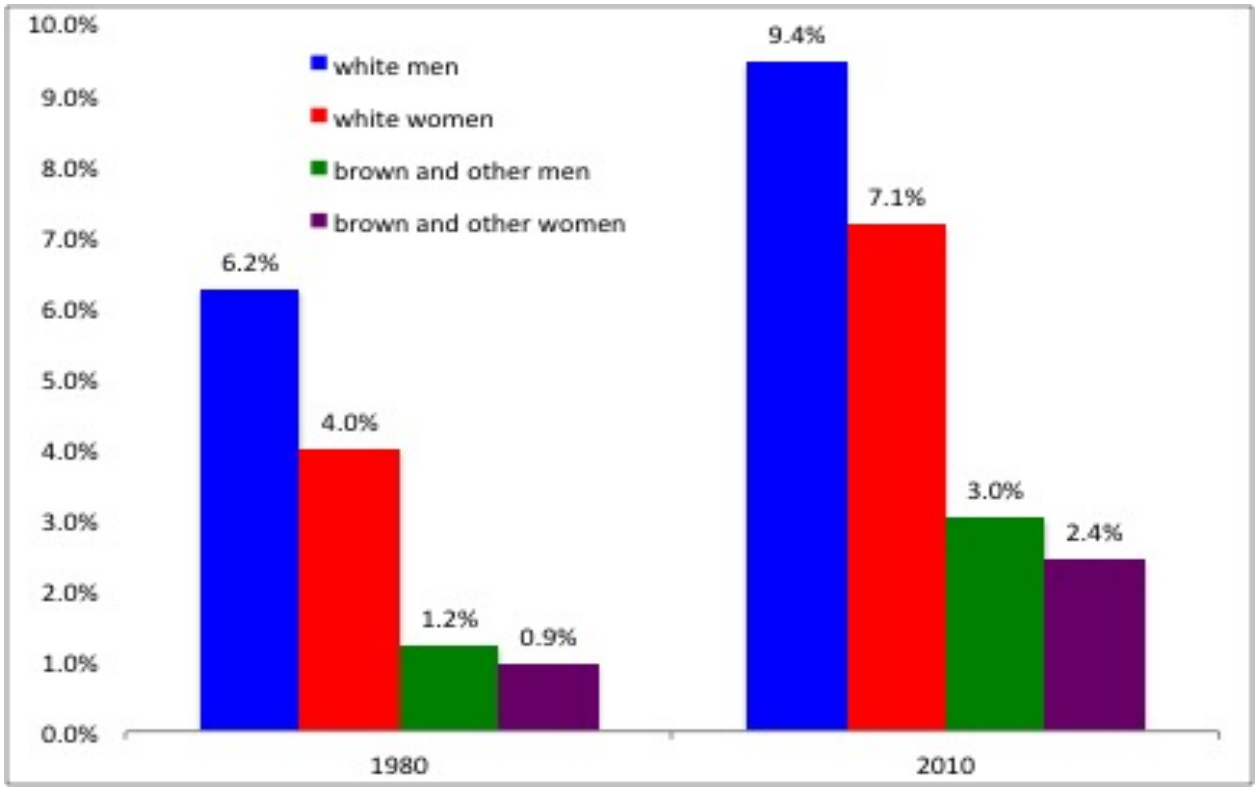
Motivation



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), 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.

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

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

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

Barriers

τ_{ig}^{w}- Discrimination in the labor market.

τ_{ig}^{h}- Family background, Quality of public schools, Discrimination in school admissions

Solution to household problem

$$U(\tau_{ig}, w_i, \epsilon_i) = \max_{c,e,s}(1-s)c^{\beta} \text{ s.t. } c = (1-\tau_{ig}^{w})w\epsilon h - (1+\tau_{ig}^{h})e$$

$$s_i^* = \frac{1}{1+\frac{1-\eta}{\beta\phi_i}}$$

$$e_{ig}^*(\epsilon) = \left(\frac{\eta w_i s_i^{\phi_i}\epsilon}{\tau_{ig}}\right)^{\frac{1}{1-\eta}}$$

$$c_{ig}^*(\epsilon) = \left(\frac{w_i s_i^{\phi_i}\epsilon}{\tau_{ig}}\right)^{\frac{1}{1-\eta}}$$

$$U(\tau_{ig}, w_i, \epsilon_i) = \left(\frac{w_i s_i^{\phi_i}(1-s_i)^{\frac{1-\eta}{\beta}}\epsilon_i\eta^{\eta}(1-\eta)^{1-\eta}}{\tau_{ig}}\right)^{\frac{\beta}{1-\eta}}$$

$$\tau_{ig} = \frac{(1+\tau_{ig}^{h})^{\eta}}{1-\tau_{ig}^{w}}$$

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: $p_{ig} = \frac{\tilde{w}_{ig}^{\theta}}{\sum_{s=1}^{N} \tilde{w}_{sg}^{\theta}}$

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: $\bar{w}_{ig} = (1-\tau_{ig}^{w}) w_i E[h_i \epsilon_i] = (1-s_i)^{-1/\beta} \left(\sum_{s=1}^{N} \tilde{w}_{sg}^{\theta}\right)^{\frac{1}{\theta}\frac{1}{1-\eta}}$

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

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

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

Problem of a representative firm

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

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

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 by race

	1960	1980	1990	2000	2010
Sample size	2813800	5503600	7990100	9502500	9087200
white	0.6292	0.5459	0.5096	0.5310	0.4703
black	0.0877	0.0588	0.0506	0.0617	0.0704
indigenous	0.0002	0.0002	0.0021	0.0045	0.0054
asian	0.0084	0.0056	0.0039	0.0041	0.0103
brown	0.2739	0.3853	0.4305	0.3916	0.4435
unknown	0.0007	0.0043	0.0034	0.0072	0.0001

Table: Share of race 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- group dummies;

E_i- years of experience;

H_{il}- 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

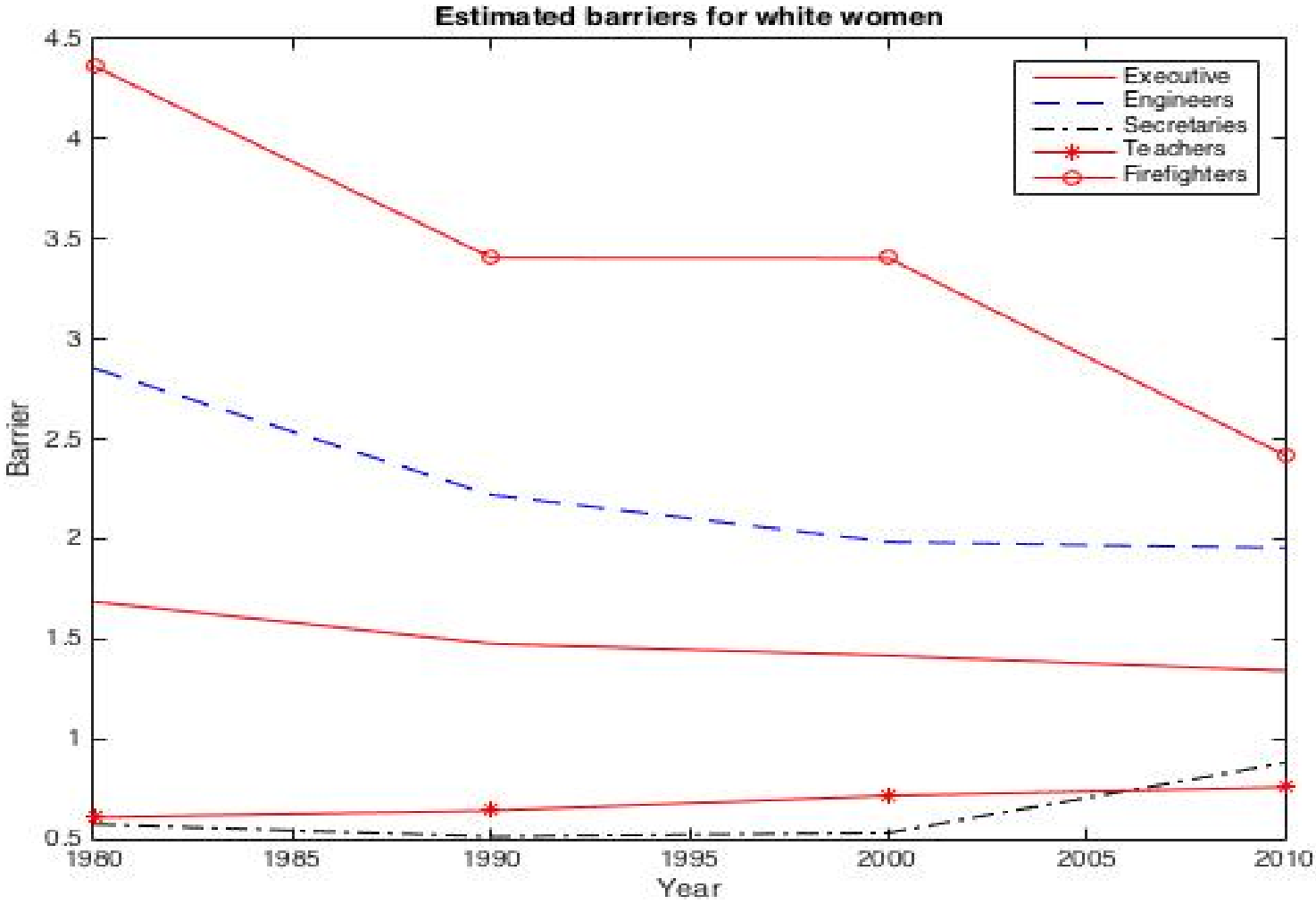
$$\tilde{\tau}_{ig} = \frac{\tau_{ig}}{\tau_{i,wm}}\left(\frac{T_{ig}}{T_{i,wm}}\right)^{\frac{1}{\theta}} = \left(\frac{p_{ig}}{p_{i,wm}}\right)^{-\frac{1}{\theta}}\left(\frac{\bar{w}_{ig}}{\bar{w}_{iwm}}\right)^{-(1-\eta)}$$

Baseline parameters

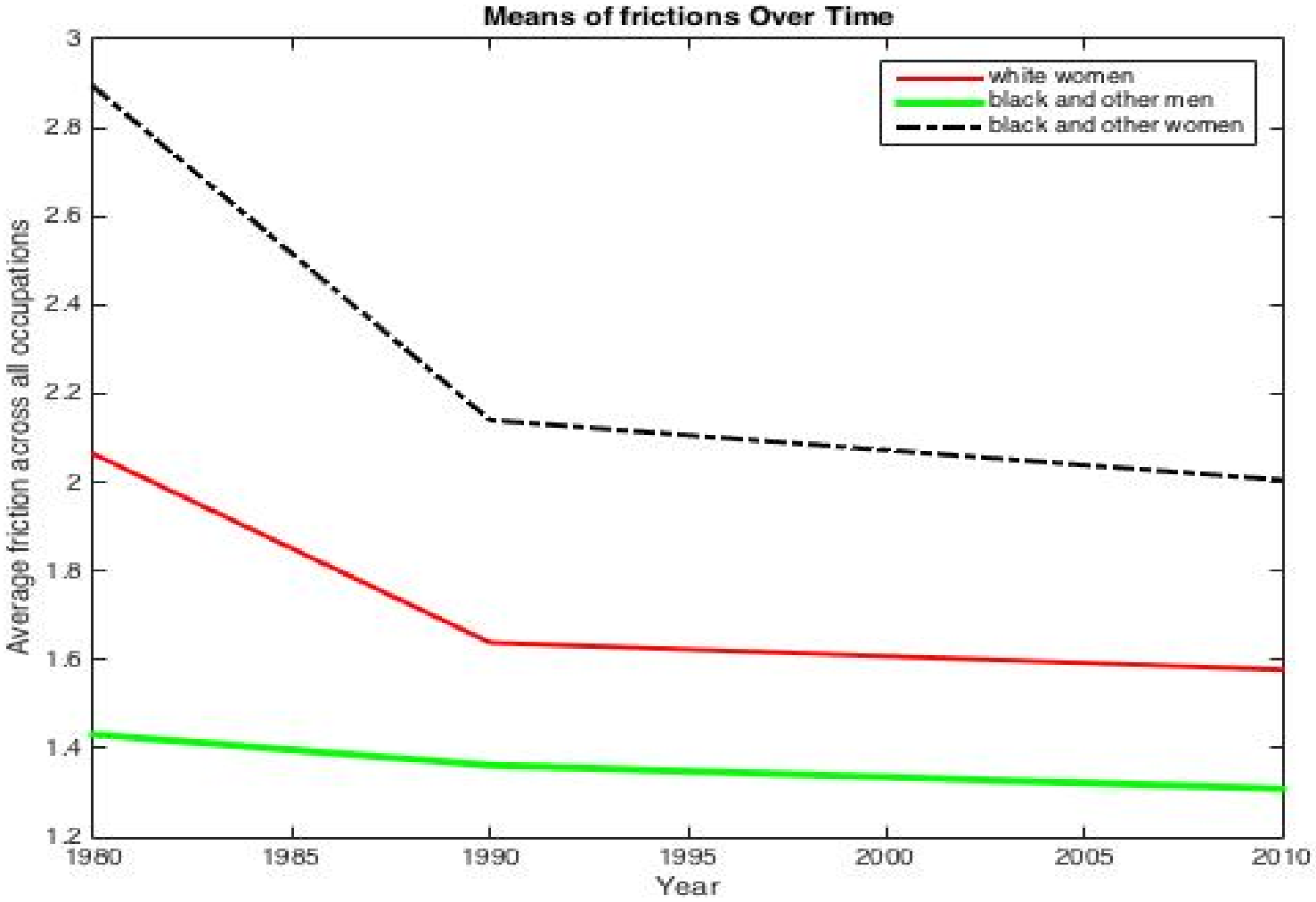
	Parameter	Value
Elasticity of substitution	σ	3
Skill dispersion parameter	θ	3.44
Elasticity of human capital	η	0.25
Parameter in the utility	β	0.693

Table: Baseline parameter values

Estimated Barriers (τ_{ig}) for White Women

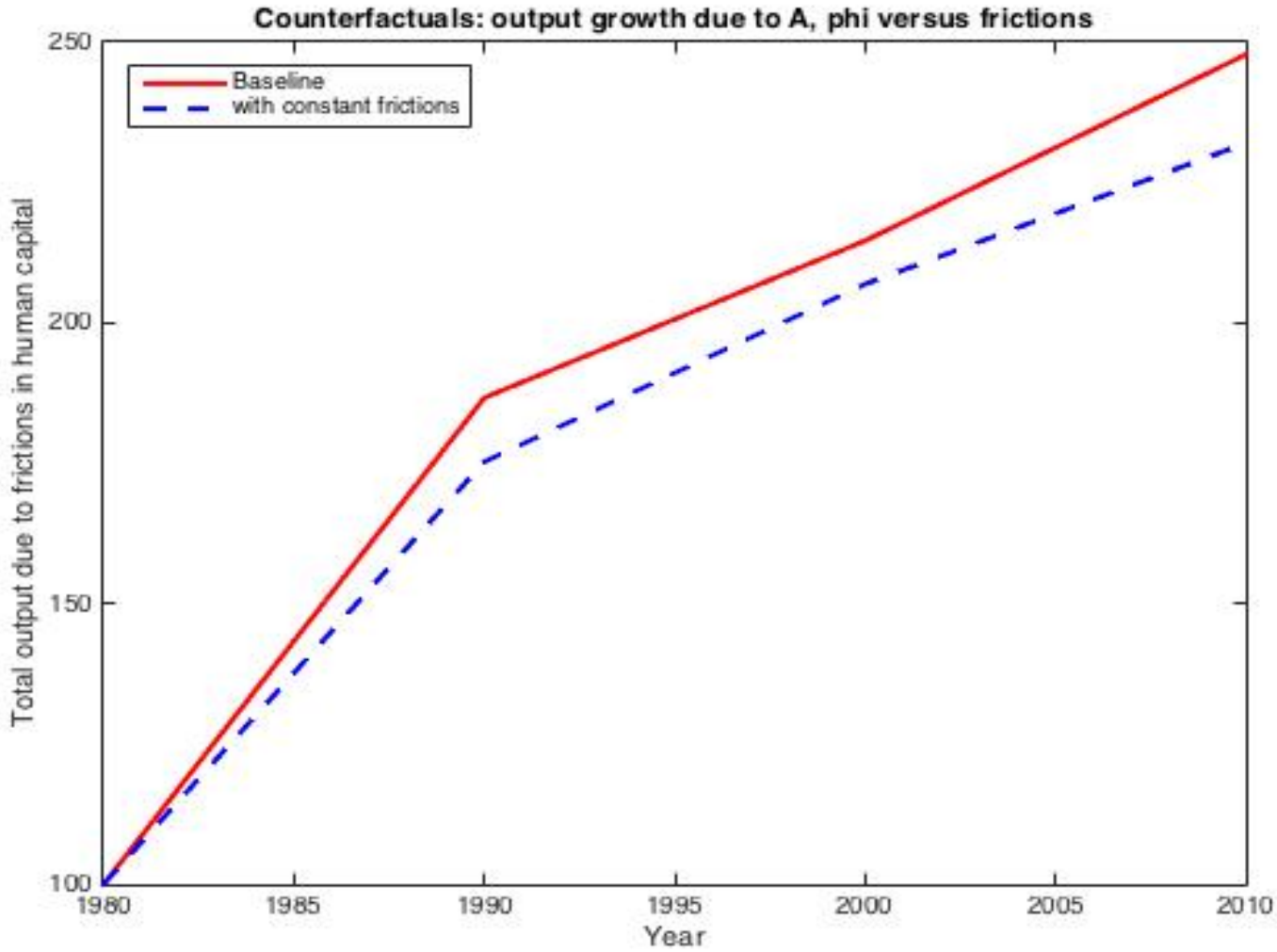


Average Values of τ_{ig} over Time

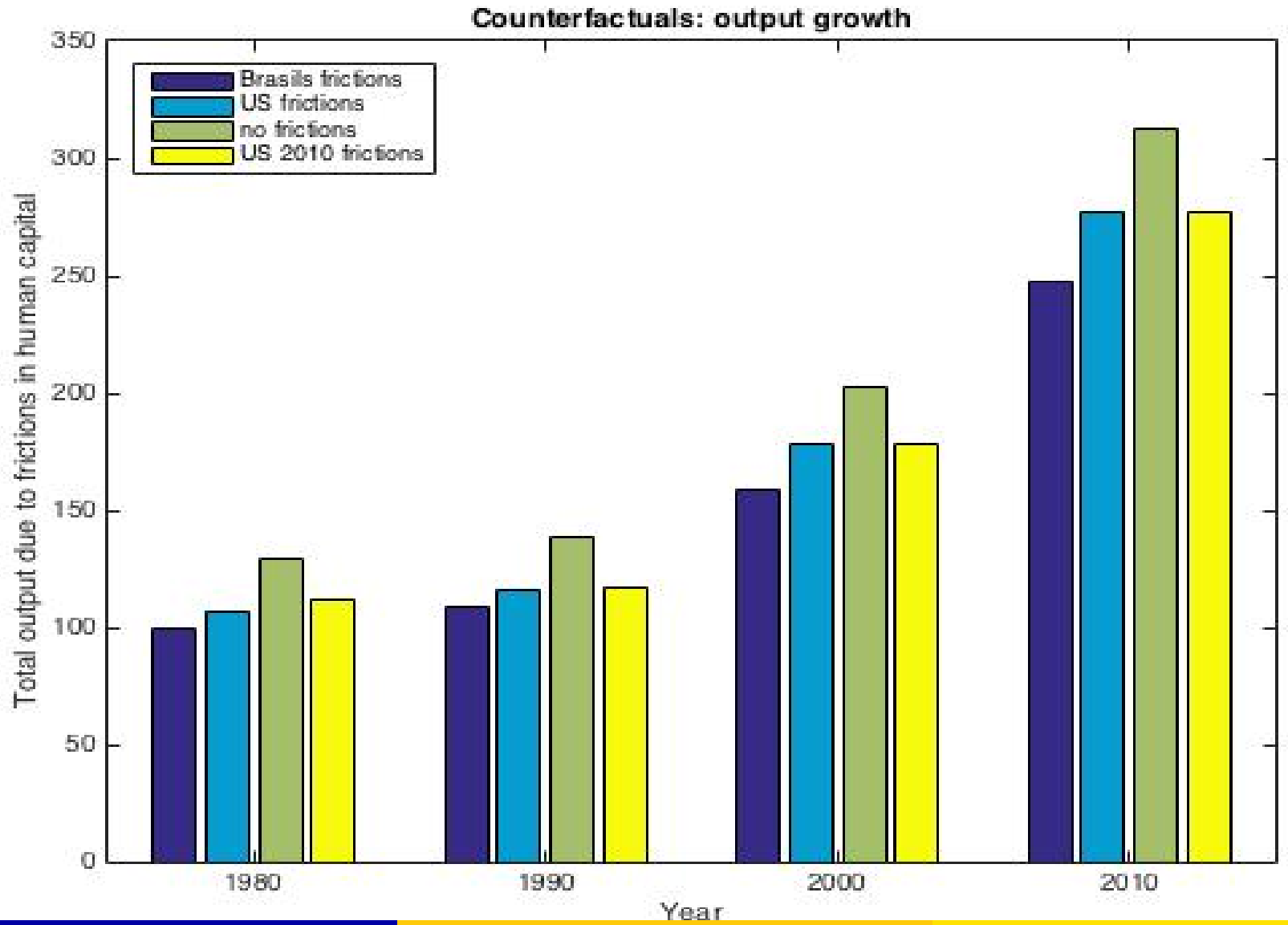


Explanation of growth

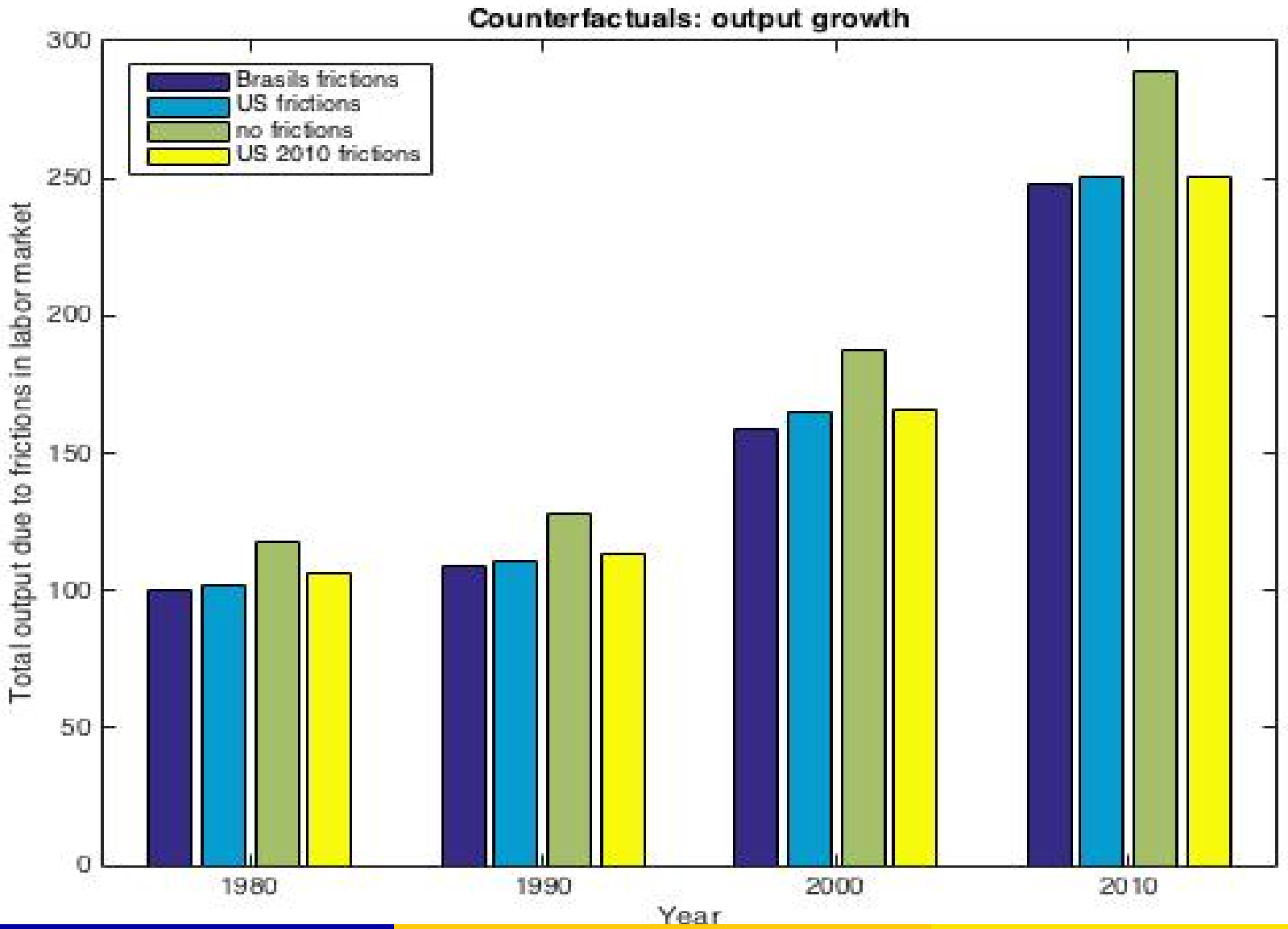
The change in occupational frictions explain 7 %.



Counterfactuals: τ^h case



Counterfactuals: τ^w case



Robustness: τ^h case

$\sigma = 3$	$\sigma = 0.1$	σ =0.5	σ =10
1.3078	1.3149	1.3125	1.3104
θ =3.40	θ =4.16	θ =6.61	θ =8.41
1.3169	1.3175	1.3170	1.3177
η =0.25	η =0.10	η =0.15	η =0.35
1.3112	1.3153	1.3151	1.3159
β =0.69	β =0.50	β =0.70	β =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

$\sigma = 3$	$\sigma = 0.1$	σ =0.5	σ =10
1.1933	1.1950	1.1944	1.1940
θ =3.40	θ =4.16	θ =6.61	θ =8.41
1.1955	1.1881	1.1704	1.1626
η =0.25	η =0.10	η =0.15	η =0.35
1.1942	1.1580	1.1703	1.2203
β =0.69	β =0.50	β =0.70	β =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: Sample statistics

Wage gaps in India

	All	Highly-educated	Less 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 men	-0.136	-0.131	-0.108
Other backward class women	-0.688	-0.621	-0.635
Other women	-0.537	-0.458	-0.515

Table: Wage gap relative to other men in 2004

Share of groups in high-skilled occupations

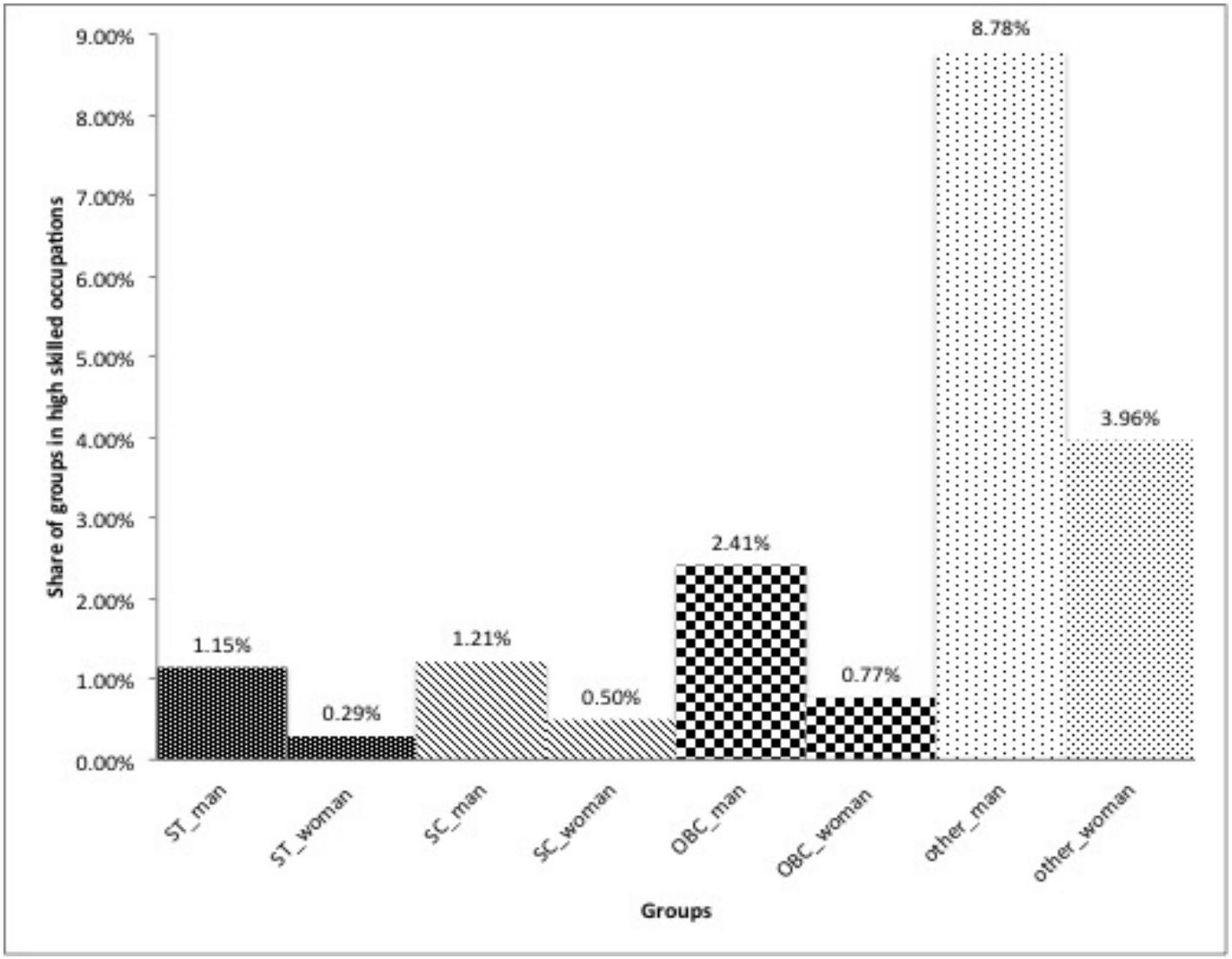


Figure: Share of groups in high-skilled occupations

OSI in India

	All	Highly-educated	Less educated
Scheduled tribe men	0.551	0.681	0.556
Scheduled tribe women	0.412	0.562	0.484
Scheduled caste men	0.64	0.747	0.719
Scheduled caste women	0.433	0.515	0.491
Other backward class men	0.782	0.832	0.834
Other backward class women	0.523	0.548	0.552
Other women	0.591	0.593	0.582

Table: Occupational similarity index relative to other men in 2004