Gender Bias and the Female Brain Drain
by

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This paper contributes to the emerging literature on gender differences in the causes and consequences of brain drain. Differentiating between gender bias in the access to economic opportunities and gender differentials in economic outcomes, we find that differences in access have a significant impact on the emigration of highly-skilled women relative to that of men. However, differentials in outcomes do not have a significant impact. Additionally, the structure of political institutions in the source countries does not have a significant impact on the difference in emigration rates.

Gender bias and the female brain drain

1. Introduction

The onset of globalization has seen a rejuvenation of interest in the causes and consequences of brain drain (Commander *et al.*, 2004). Yet with few exceptions (Docquier *et al.*, 2009; Dumont *et al.*, 2007), the gender dimensions of the phenomenon remain relatively unexplored.[1] Given the serious consequences of female migration on the countries of origin, and given the myths that propagate about the adverse selection of female migrants, the importance of taking a gendered perspective on the migration of highly-skilled labor can hardly be overstated.

A pioneering contribution towards developing such a perspective is Docquier *et al.* (2009), who develop a dataset of migration to OECD countries by country of residence, place of birth, level of education, and gender; and find that emigration rates for highly-skilled women are, on the average, higher than emigration rates for comparably educated men. This paper investigates the role of cultural and institutional factors that influence the observed *brain drain gap*.

We find that *bias in access to economic opportunities*, captured by the fertility rate and differences in schooling and literacy, account for a significant part of the brain drain gap. Variables that capture *differentials in observed economic outcomes*, such as labor force participation, share of income, and rates of female representation in government, do not have a significant impact. Nor does our analysis support the conjecture that political institutions impact men and women differently; and hence provide different incentives to emigrate. Distinguishing between multiple dimensions of

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[1] The literature on internal migration has long acknowledged the need to look into gender differences. See Agesa and Agesa (1999, 2005).

institutional character (Bang and Mitra, 2010), namely, *credibility*, *transparency*, *democracy*, and *security*; we find that none of these have a significant impact on the difference in emigration rates for highly-skilled women and men.

An contribution in this context is Dumont *et al.* (2007) who confirm the existence of the brain drain gap and find that the emigration rate of highly-skilled women decreases with the level of per capita GDP in the source country; the infant mortality rate; the child mortality rate; and female secondary school enrollment rate. Our paper is concerned with *differences* in emigration rates for highly-skilled men and women, and to the best of our knowledge, it is the only attempt to investigate the impact of gender bias, both as a cultural practice and as codified in the institutional structure of a country, on the observed brain drain gap.

2. Gender and International Migration

Studies that investigate gender differences in international migration pursue two different agenda. The first investigates factors that lead to gender differentials in economic outcomes once the migrants reach the host country. Thus, many immigrant women who work in the stereotypical low-skill occupations in developed countries may do so only because they migrate with family visas; which in many cases do not allow the right to work in occupations that are better suited to their skills (Cerutti and Massey, 2001). In the same vein, Chiswick and Miller (1999) find that foreign-born women who do not speak the local language suffer a greater penalty to their earnings than foreign born men in the same position.[2] Validating narratives that emphasize the salience of host country-specific factors is the finding that countries with overall low educational

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[2] In contrast to studies documenting less favorable outcomes for immigrant women, Adsera and Chiswick (2007) find that women immigrants to the EU perform better than their male counterparts, compared to the native born of the same gender.

attainment tend to have *even lower* levels of educational attainment for women. Thus, the emigration *rates* of highly-educated women are, in fact, higher than those of highly-educated men (Docquier *et al.*, 2009).

By contrast, the second set of studies relates gender differentials in immigrant outcomes to pre-existing differences in the countries of origin. Antecol (2000) attributes the gender gap in labor force participation rates of US immigrants primarily to that prevailing in the source countries and uses this to assert the importance of cultural differences in explaining gender differentials in immigrant outcomes. Pfeiffer *et al.* (2007) emphasize the role of cultural factors that create different incentives to migrate for men and women of comparable skill. In looking at the influence of cultural and institutional characteristics on the brain drain gap, our study is also related to this branch of the literature.

3. Gender Bias and the Brain Drain Gap

Our data for emigration rates to OECD countries by gender and educational attainment come from Docquier *et al.* (2009). Our dependent variable, the *brain drain gap* is the difference between the female and male tertiary educated emigration rates. To test for factors that affect the brain drain gap, we estimate a model that includes GDP per capita, population, and unemployment rates in the countries of origin as controls, and measures of institutional quality and gender bias as our variables of interest. The dimensions of institutional quality that we consider are democracy, transparency, credibility, and stability; the dimensions of gender bias we consider are differentials in access and differentials in outcomes.

Acknowledging the fact that many of the variables that proxy for these dimensions of institutional quality and gender equity are either highly correlated or do not uniquely measure a single aspect of these concepts, we perform a factor analysis on 15 separate measures of institutional quality and stability along with six separate measures of gender bias. The institutional characteristics we consider in our factor analysis are: indexes of internal conflict, external conflict, ethnic tensions, corruption, bureaucratic quality, government stability, investment profile, and democratic accountability from the International Country Risk Guide; the Polity IV democracy index and regime durability from the Polity IV project; and the legislative and executive indexes of electoral competition, government fractionalization index, degree of polarization between the executive and legislative branches, electoral fraud, and the number of checks in government from the Database of Political Institutions. The measures of gender equity that we consider are: women's share of income, fraction of women in parliament, the male-female literacy rate gap, and the male-female secondary enrollment gap from the Human Development Report; and the fertility rate and female labor force participation rate from the World Development Indicators. Summary statistics are reported in table 1.

Since parliamentary representation and income shares of women are not available prior to 1994, we run the factor analysis for 1994-2000 using all of the variables and again for 1990-2000 using only those variables for which data are available. The factor loadings for both factor analyses are reported in table 2, with variables with factor loadings greater than 0.4 highlighted. In both table 2a and 2b four institutional variables stand out: Democracy (determined by the indices of electoral

competition, polity index, democratic accountability, and government fractionalization); security (internal and external conflict, and ethnic tension); transparency (corruption, bureaucratic quality, and durability); and credibility (investment profile and government stability).[3] A priori, there is no reason to think that institutional conditions will have differential impacts on the migration of high-skill men and women.

For the gender factors, the 1990-2000 sample (which excludes parliamentary representation and income shares) shows just one dimension of gender equality, which we interpret as 'equality in access' (literacy, enrollment, and fertility). These variables represent conditions that are necessary for equal performance. Literacy and school enrollment represent access to the education, whereas fertility is a proxy for the cultural attitudes that support access to work. For the shorter sample (which includes all six gender variables), two factors emerge: 'access', defined the same as before; and 'equality in outcomes' (labor force participation, income share, and parliamentary representation). These variables represent the outcomes of more equal opportunities for women in society. Our hypothesis is that gender differentials in *access* and *outcomes* will affect the incentive to migrate differently, but it is not clear which will have the stronger impact. On the one hand, access differentials are likely to indicate a systematic bias against women. On the other hand, differentials in outcomes indicate a more immediate concern that can be resolved quickly by migrating.

To determine the impact of gender bias in explaining the disparity between the emigration rates of high-skill women and men from developing countries to OECD countries, we estimate the following equation:

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[3] For this last factor, the interpretation may require a brief explanation. Investment profile measures the protection against the risk of expropriation and the security of property rights. Government stability measures the extent to which the government is able to carry out is stated policies.

(1) $\text{gap}_{it} = \beta_0 + \beta_1 \text{gdpc}_{it} + \beta_2 \text{population}_{it} + \beta_3 \text{unemployment}_{it} + \beta_4 \text{democracy}_{it} +$

$$\beta_5 \text{credibility}_{it} + \beta_6 \text{transparency}_{it} + \beta_7 \text{security}_{it} + \beta_8 \text{access}_{it} + \beta_9 \text{outcomes}_{it} + u_{it}.$$

We estimate equation (1) using a generalized method of moments technique that accounts for endogeneity in GDP per capita using energy consumption per capita as an instrument. This approach yields consistent, asymptotically efficient, and asymptotically normal estimates when the distributions of the errors (u_{it}) are unknown.

The results of our regression analysis, reported in table 3, support the hypothesis that differentials in access have a more substantial and significant impact relative to differentials in outcomes. In fact, for every specification, the only factor that comes up as statistically significant is the equal-access factor. Neither equality in outcomes, nor any of the measures of institutional quality, nor any of the controls come up as significant. Thus, we conclude that cultural preconditions of gender equality in access to education and work are the most significant factor in determining the female brain drain uniquely from males.

4. Conclusion

Female immigrants from developing countries bring higher abilities than traditional stereotypes acknowledge. While there is evidence that female immigrants are, on average, less educated than males, there is also evidence that educated women are the ones with the greatest incentive to emigrate.

We find that bias in access explains a significant portion of the gap between female and male high-skilled emigration rate. Countries that give women more access to opportunities in terms of education and have lower fertility rates experience lower rates of female brain drain. However, observable outcomes of gender bias, such as lower

labor force participation, lower shares of income, and lower rates of representation in government do not have a significant impact. Finally, while institutional quality is likely to impact the brain drain generally, its impacts are not 'gendered.'

Although our analysis suggests that gender bias influences the female brain drain, it is not clear whether this phenomenon would be increased or diminished by more migration, since the long-run effects of brain drain are unsettled. One policy issue in host countries is the fact that fewer female immigrants than male immigrants have access to legal work status because family visas that have allowed more women to migrate also forbid them from working, leaving them to seek informal work in less-skilled occupations. Removing this restriction on family visas would allow immigrant women to find better jobs matches and send more remittances, as well as increase incentives for families to invest in educating their daughters.

More work needs to be done looking at the factors that affect female migration and the role of gender inequities in shaping the pattern of immigration and immigration policy. This analysis adds to the growing literature on gender issues in international migration and is by no means the final word in a very important discussion.

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Table 1. Descriptive Statistics

	Mean	Std. Dev.	Mean	Std. Dev.
Brain Drain Gap	0.022	0.034	0.014	0.031
GDP per Capita	10,415	10,428	10,155	11,179
Energy Consumption	2,471	2,082	2,667	2,387
Population	61,100,000	179,000,000	46,700,000	133,000,000
Unemployment	7.838	5.576	8.310	5.347
Democracy (1990-2000 sample)	0.275	0.754	0.442	0.662
Transparency (1990-2000 sample)	0.179	0.990	-0.130	0.822
Credibility (1990-2000 sample)	-0.519	0.659	0.584	0.562
Security (1990-2000 sample)	-0.168	0.994	-0.168	0.662
Access (1990-2000 sample)	0.082	0.830	0.275	0.632
Democracy (1994-2000 sample)			0.132	0.892
Transparency (1994-2000 sample)			-0.074	0.850
Credibility (1994-2000 sample)			0.443	0.588
Security (1994-2000 sample)			-0.273	0.799
Access (1994-2000 sample)			0.291	0.739
Performance (1994-2000 sample)			-0.048	0.850
Observations	41		65	

Table 2a. Rotated Factor Loadings, 1990-2000 Sample (Rotation Method: Oblimin)

	Democracy	Security	Transparency	Access	Credibility	6	7
Government Stability	0.2494	0.1766	-0.0262	0.1023	0.6953	-0.0327	-0.006
Investment Profile	0.3976	0.1489	0.1849	0.0714	0.6474	0.0374	0.0109
Internal Conflict	0.3955	0.7067	0.229	0.0833	0.1524	0.0042	-0.0202
External Conflict	0.4301	0.5956	0.0132	0.1296	0.0133	0.0561	0.0622
Corruption	0.444	0.2882	0.5408	0.1184	-0.0292	0.206	-0.0153
Ethnic Tension	0.2964	0.6278	0.0824	0.2297	0.1619	-0.047	-0.0282
Bureaucratic Quality	0.5457	0.2262	0.6021	0.0857	0.116	-0.0735	0.0127
Democratic Accountability	0.8142	0.1007	0.3436	0.0556	0.0739	0.0542	-0.0148
Polity IV	0.887	0.0278	0.0284	0.1305	-0.0106	0.1189	-0.0378
Durability	0.2786	0.111	0.5482	0.0509	0.0827	-0.0683	0.048
Legislative Electoral Competition	0.8553	0.0205	-0.1534	-0.1578	0.0516	-0.0959	-0.1935
Executive Electoral Competition	0.8637	-0.0378	-0.132	-0.0111	-0.01	0.1012	-0.1434
Fractionalization	0.8543	0.0269	-0.0958	-0.0195	0.0368	-0.1387	0.0826
Polarization	0.6485	-0.0289	0.1919	0.1035	0.0378	-0.0211	0.3538
Checks and Balances	0.7986	-0.0087	0.041	0.0005	-0.0328	0.0047	0.2628
Literacy Gap	0.5611	0.1752	0.0967	0.6778	0.0614	-0.0259	0.0018
Fertility Rate	-0.5774	-0.2399	-0.1848	-0.4949	-0.123	0.1986	0.0299
Enrollment Gap	0.3496	0.1764	-0.0057	0.6013	0.0909	0.1504	0.0369
Labor Force Participation Gap	0.3457	0.055	0.0742	0.0314	-0.0065	0.3613	-0.01

Figure 2. Rotated Factor Loadings, 1994-2000 Sample (Rotation Method: Oblimin)

	Democracy	Transparency	Performance	Access	Credibility	Security	7
Government Stability	0.0549	-0.0064	0.0260	0.1318	0.7773	-0.1106	0.0395
Investment Profile	0.3063	0.2516	-0.0038	0.0333	0.6904	0.1278	-0.0401
Internal Conflict	0.1410	0.5624	0.0675	0.0727	-0.0009	0.5271	-0.0696
External Conflict	0.2413	0.2151	0.1498	0.0386	-0.1232	0.5883	0.1770
Corruption	0.3339	0.7120	0.1500	0.0390	-0.0414	0.1737	0.1380
Ethnic Tension	0.1164	0.2632	-0.0443	0.2218	0.0627	0.6051	-0.0769
Bureaucratic Quality	0.3799	0.7702	0.0605	0.1124	0.0519	-0.0144	-0.0904
Democratic Accountability	0.6959	0.4858	0.0695	0.1410	0.0686	0.0311	-0.1269
Polity IV	0.8606	0.1971	0.1405	0.1606	0.0311	0.0164	0.0168
Durability	0.1874	0.6137	0.0501	-0.0019	0.1112	0.0006	0.0669
Legislative Electoral Competition	0.8157	-0.0136	0.0358	-0.1482	0.1164	0.0979	0.0199
Executive Electoral Competition	0.7949	-0.0272	0.2552	0.0429	-0.0062	-0.0033	-0.1022
Fractionalization	0.7857	0.0950	-0.0820	0.0084	0.0103	-0.0208	0.1412
Polarization	0.5772	0.2986	-0.0348	0.1171	-0.0422	-0.1327	0.2055
Checks and Balances	0.7167	0.1361	0.0865	0.0562	-0.0200	0.0797	-0.0368
Literacy Gap	0.4319	0.3572	0.0366	0.6805	0.1001	0.0835	-0.0205
Fertility Rate	-0.3508	-0.5009	0.0707	-0.5302	-0.1407	-0.0572	0.1401
Enrollment Gap	0.2584	0.1685	0.0326	0.5446	0.1293	0.1873	0.3176
Labor Force Participation Gap	0.2589	0.1344	0.8170	0.0928	0.0142	0.0200	-0.0068
Female Income Share	0.2170	0.1056	0.8051	-0.1004	0.0009	0.0281	0.0091
Female Parliamentary Rep.	0.1923	0.5086	0.3814	0.1445	0.0581	0.0636	0.3702

Table 3. Regression Results (Dependent Variable = Brain Drain Gap)[a]

	(1) Pooled	(2) 1990(a)	(3) 2000(a)	(4) 2000(b)
GDP per Capita	9.78e-08	-5.97e-07	1.22e-06	1.17e-06
	(7.44e-07)	(1.84e-06)	(1.23e-06)	(1.11e-06)
Population	0	0	-0	-0
	(0)	(0)	(0)	(0)
Unemployment	-9.70e-05	0.000114	-0.000148	-6.94e-05
	(0.000799)	(0.00117)	(0.00102)	(0.00107)
Democracy	-0.00140	-0.000254	-0.00395	-0.00225
	(0.00486)	(0.0174)	(0.00777)	(0.00507)
Credibility	-0.00535	0.00925	-0.00738	-0.0109
	(0.00449)	(0.00999)	(0.00998)	(0.00942)
Transparency	-0.00750	0.000514	-0.0221	-0.0239*
	(0.00674)	(0.00938)	(0.0140)	(0.0137)
Security	-0.00386	-0.00932	-0.00768	0.00226
	(0.00469)	(0.00922)	(0.00990)	(0.00578)
Access	-0.00981**	-0.00174	-0.0192**	-0.0175**
	(0.00496)	(0.00758)	(0.00855)	(0.00799)
				-0.00169
				(0.00460)
	0.0189	0.0288	0.0110	0.0125
	(0.0133)	(0.0235)	(0.0214)	(0.0170)
Observations	106	41	65	65
R^2	0.121	0.143	0.128	0.144
Uncentered R^2	0.315	0.392	0.281	0.294
Adjusted R^2	0.0488	-0.0713	0.00303	0.00418
F	2.191	0.807	1.802	1.696
Anderson Identification LR Statistic	33.94	7.413	19.26	18.52
P-Value	5.68e-09	0.00648	1.14e-05	1.68e-05
Hansen's J-Statistic	0	0	0	0

[a] Robust standard errors in parentheses.

** Denotes significance at the 5% level; * Denotes significance at the 10% level.