

HUMAN DEVELOPMENT AND GENDER EQUITY IN SCIENCE

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RESEARCH QUESTIONS

WHAT IS THE RELATIONSHIP BETWEEN **GENDER, SCIENTOMETRIC MEASURES** (PRODUCTIVITY, COLLABORATION, IMPACT) AND MEASURES OF **HUMAN DEVELOPMENT**?

WHAT IS THE RELATIONSHIP BETWEEN , **GENDER, SCIENTOMETRIC MEASURES** AND MEASURES OF **GENDER EQUALITY**?



SCIENTOMETRIC MATERIALS AND METHODS

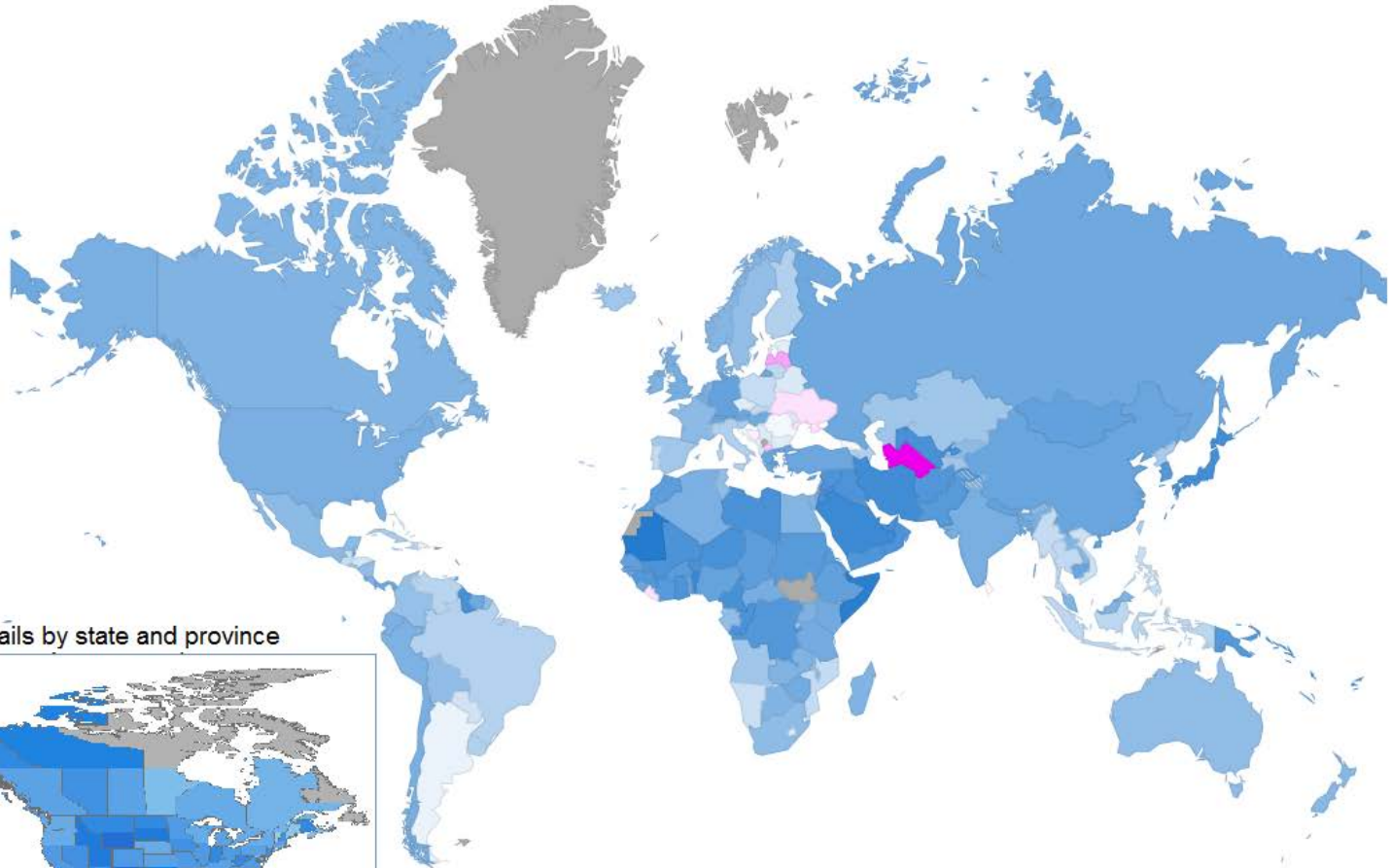
- **DATA:**
 - Publications from WoS (2008-2012): 5,423,287 articles
- **PRODUCTIVITY**
 - Female to male output (fractionalized)
- **COLLABORATION**
 - Country assigned by “affiliation”
 - Count of papers with at least one female and at least one male (nonexclusive)
- **IMPACT**
 - Field normalized citation impact (average of relative citations [ARC])

GENDER ASSIGNMENT

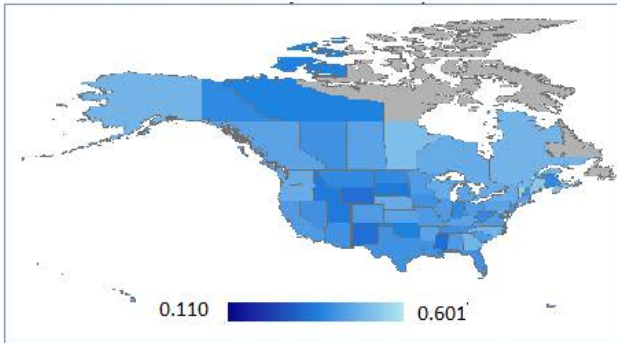
- **Data**
 - 27,037,168 authorships (not unique people)
- **US CENSUS**
 - Proportion of names associated with each gender (at least 10x more frequently)
 - Classed unisex
- **Other universal lists**
- **Country-specific name lists**
 - Canadian university professors' given names by gender
 - Quebec's newborns by gender
- **Manual coding by native speakers**
 - China
 - Taiwan

81% of papers had a least one author with assigned gender; **86%** of author-paper combinations were located

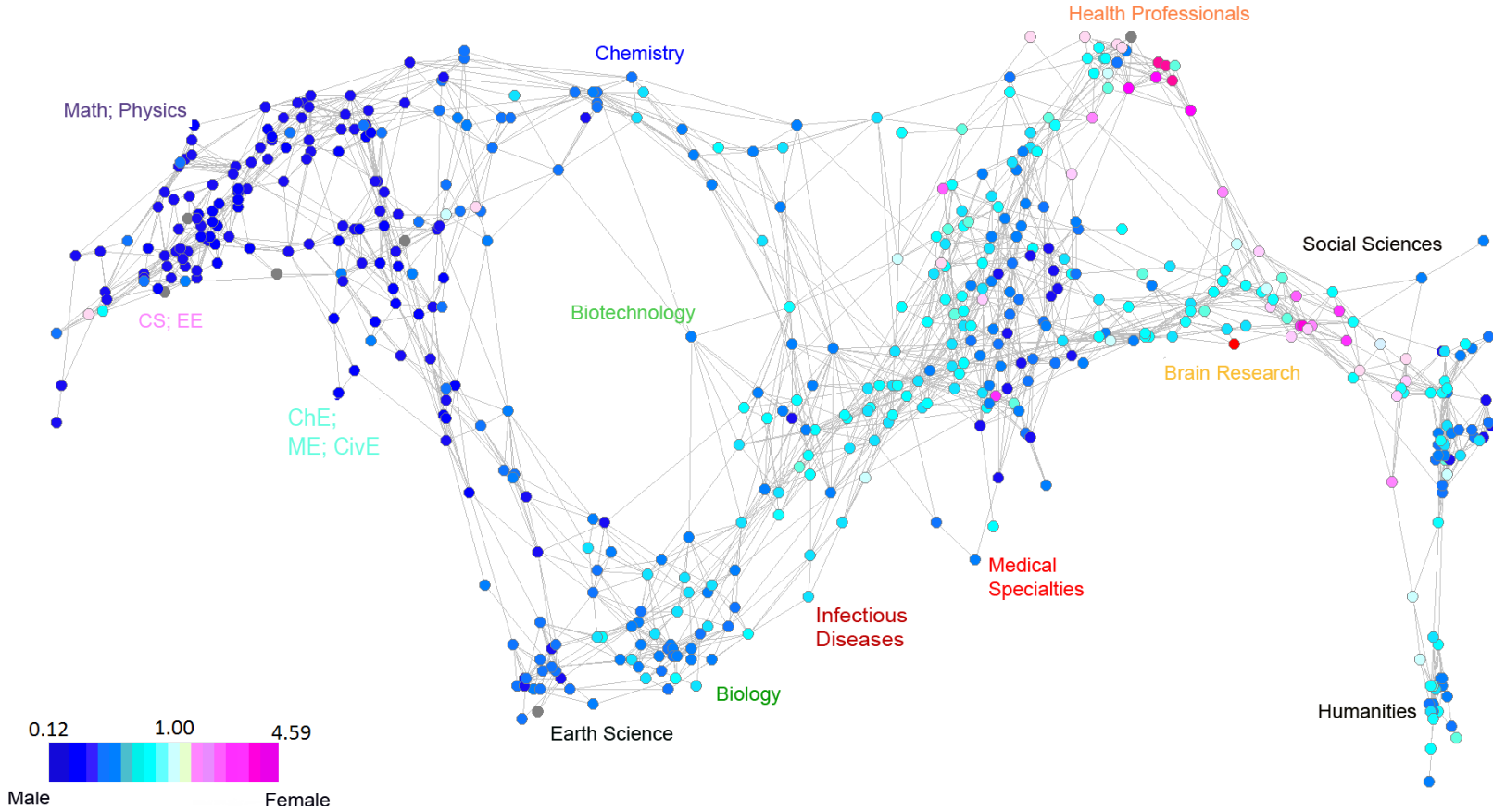
F/M PRODUCTIVITY BY COUNTRY



North America details by state and province



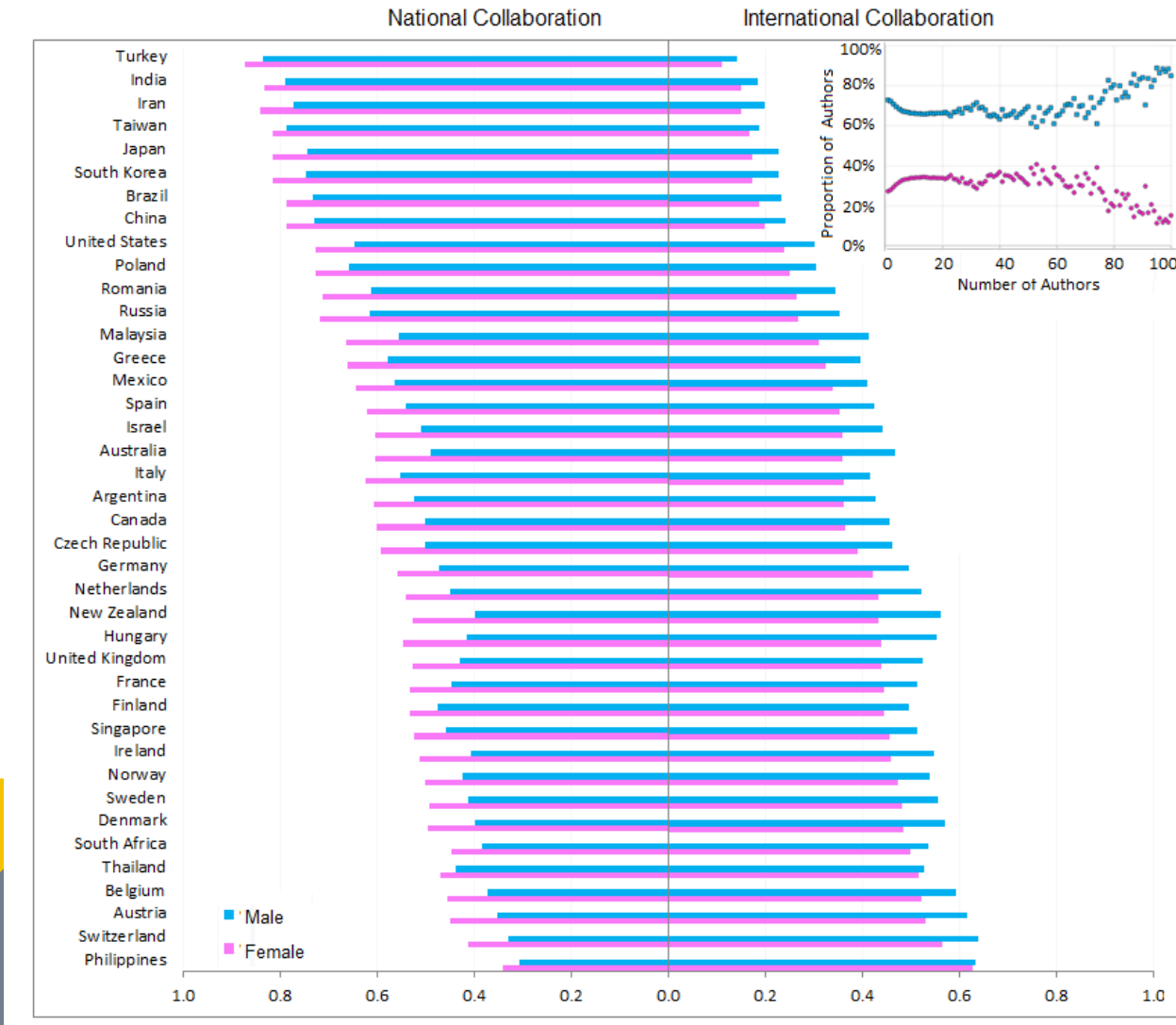
F/M PRODUCTIVITY BY DISCIPLINE



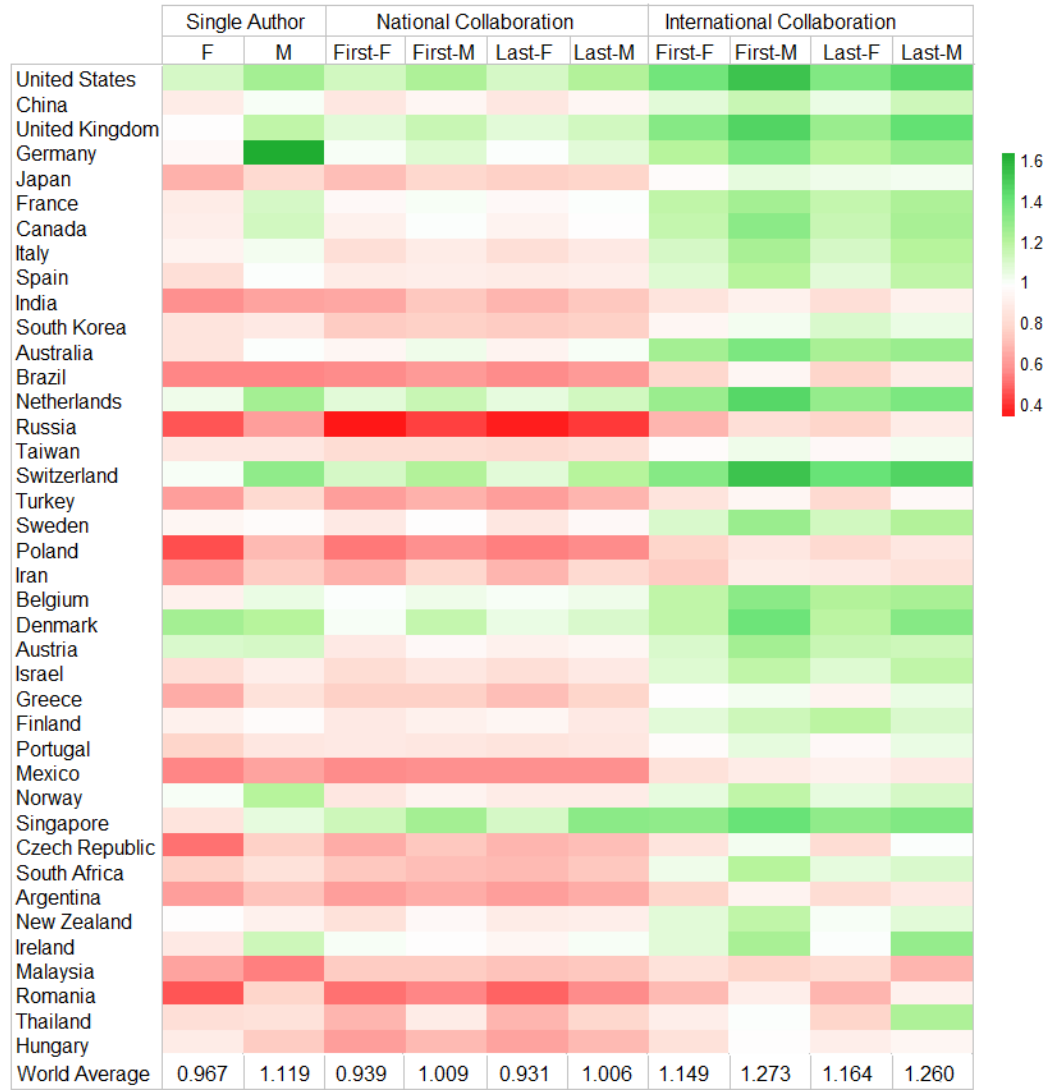
A LITTLE DATA ABOUT PHYSICS...

Subfield	% papers with F	% papers with M
Astronomy & Astrophysics	55%	96%
High Energy Physics	40%	96%
Molecular Physics	52%	96%
Plasma Physics	39%	94%
Nuclear Physics	38%	90%
Applied Geophysics	45%	96%
Physics, Current Developments	51%	95%

COLLABORATION BY GENDER



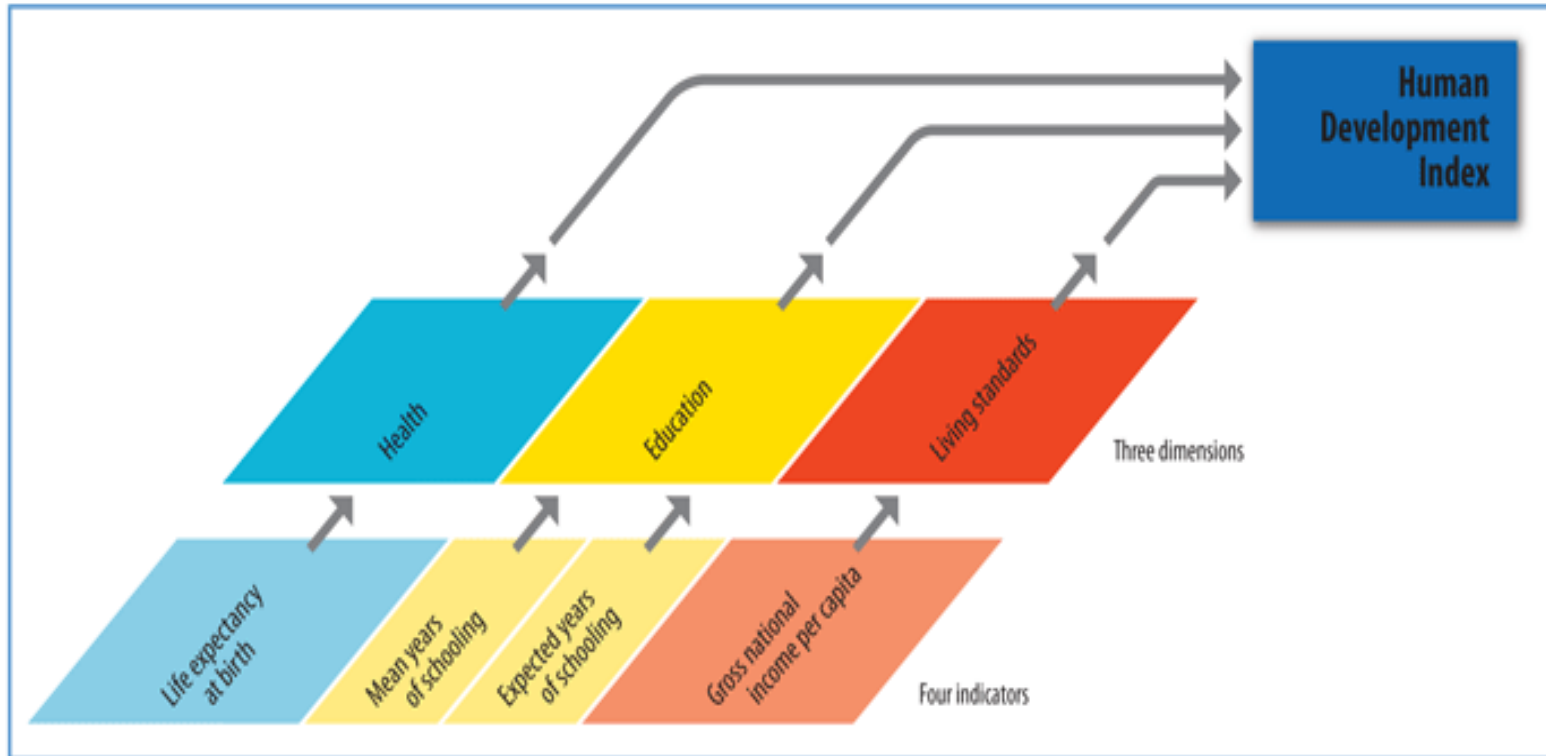
IMPACT BY GENDER



HUMAN DEVELOPMENT INDEX

Components of the Human Development Index

The HDI—three dimensions and four indicators



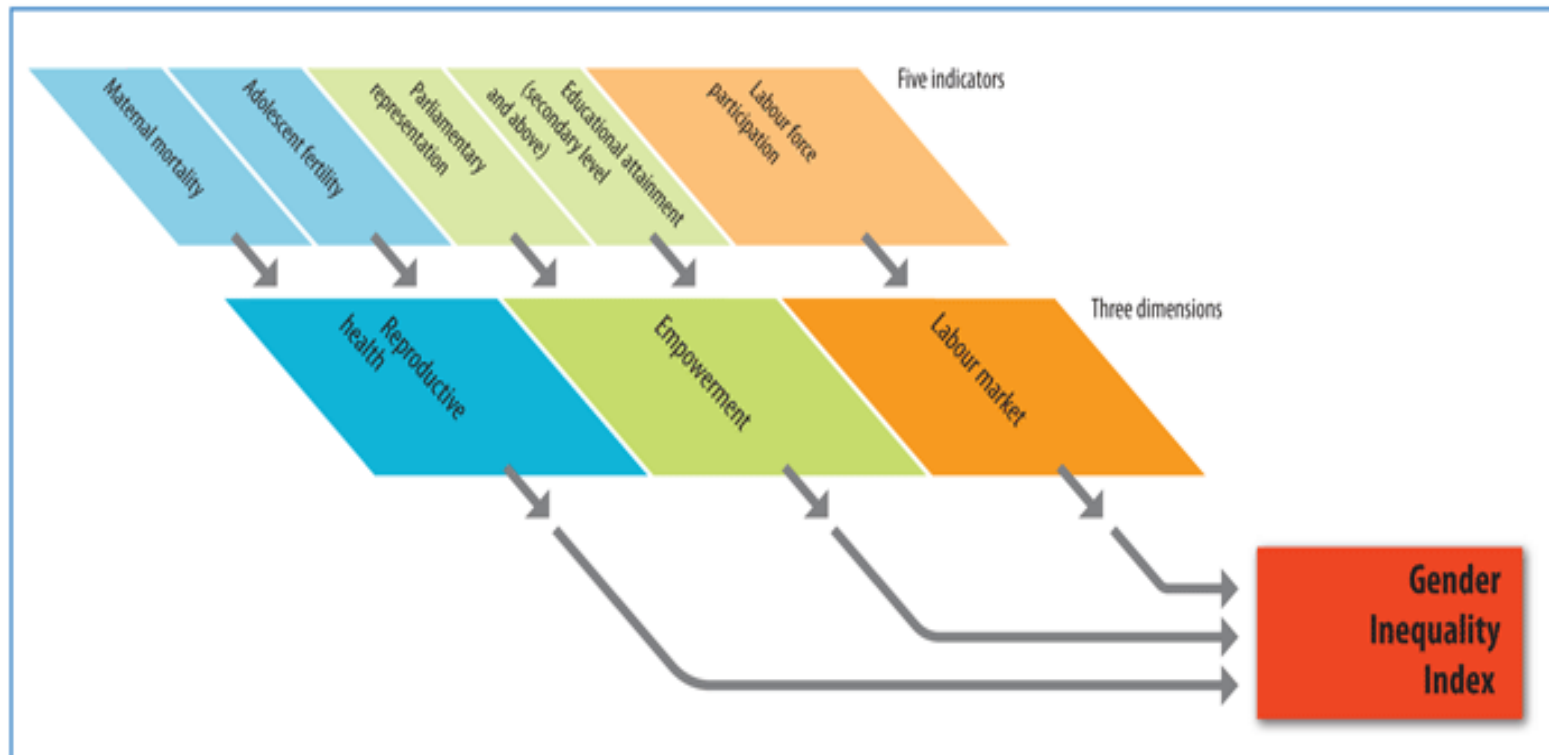
Note: The indicators presented in this figure follow the new methodology, as defined in box 1.2.

Source: HDRO.

GENDER INEQUALITY INDEX

Components of the Gender Inequality Index

GII—three dimensions and five indicators

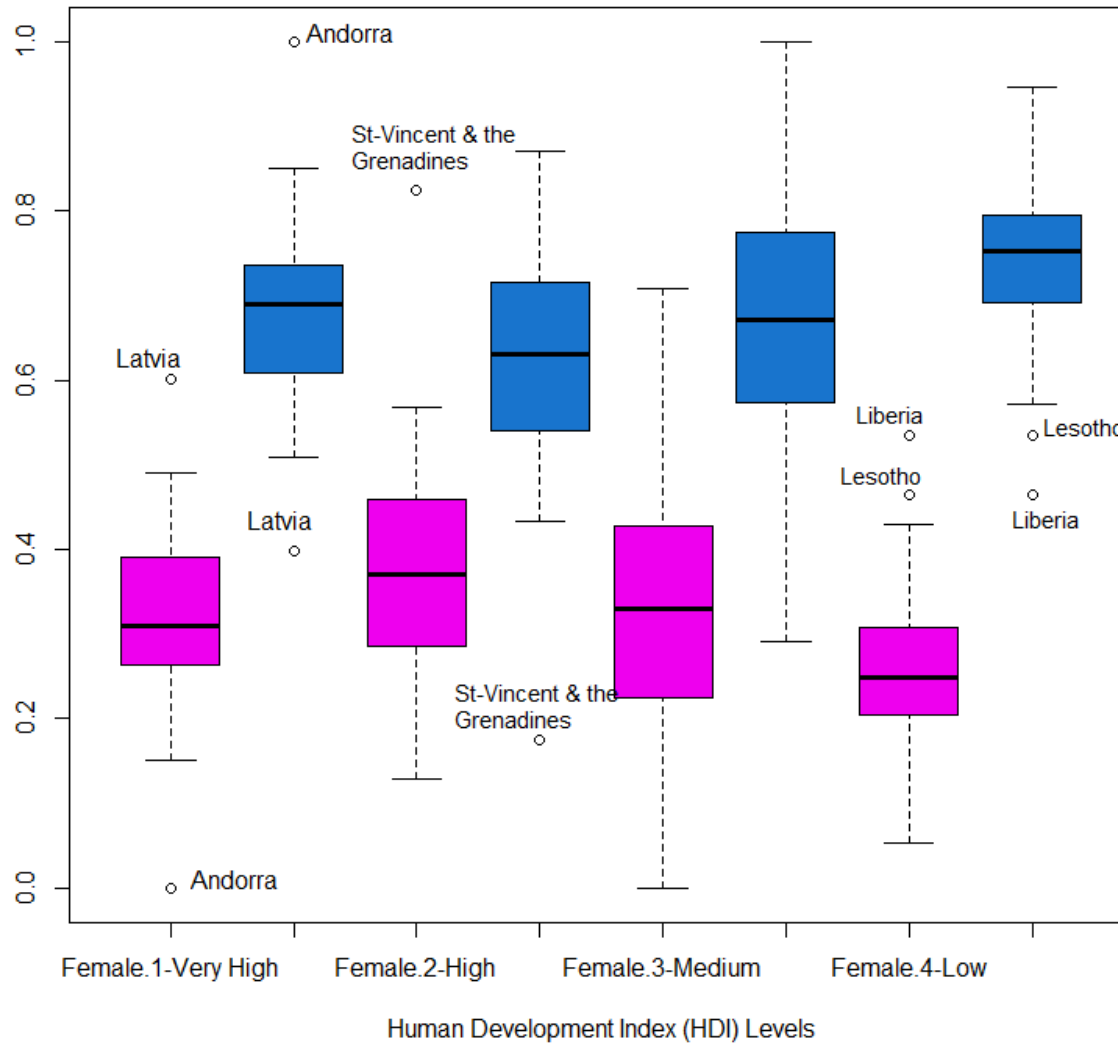


Note: The size of the boxes reflects the relative weights of the indicators and dimensions.

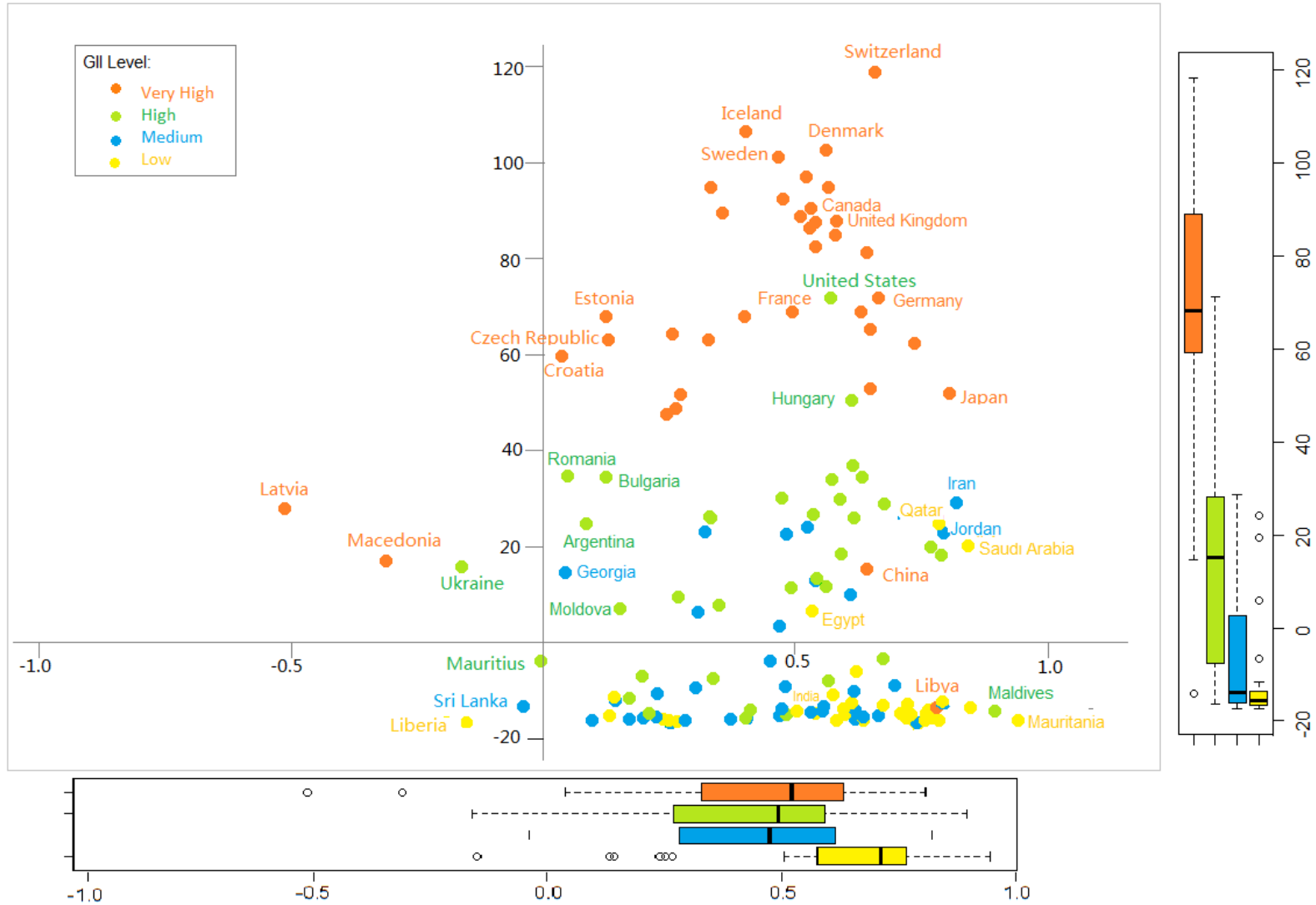
Source: HDRO.

GENDER PRODUCTIVITY & HDI

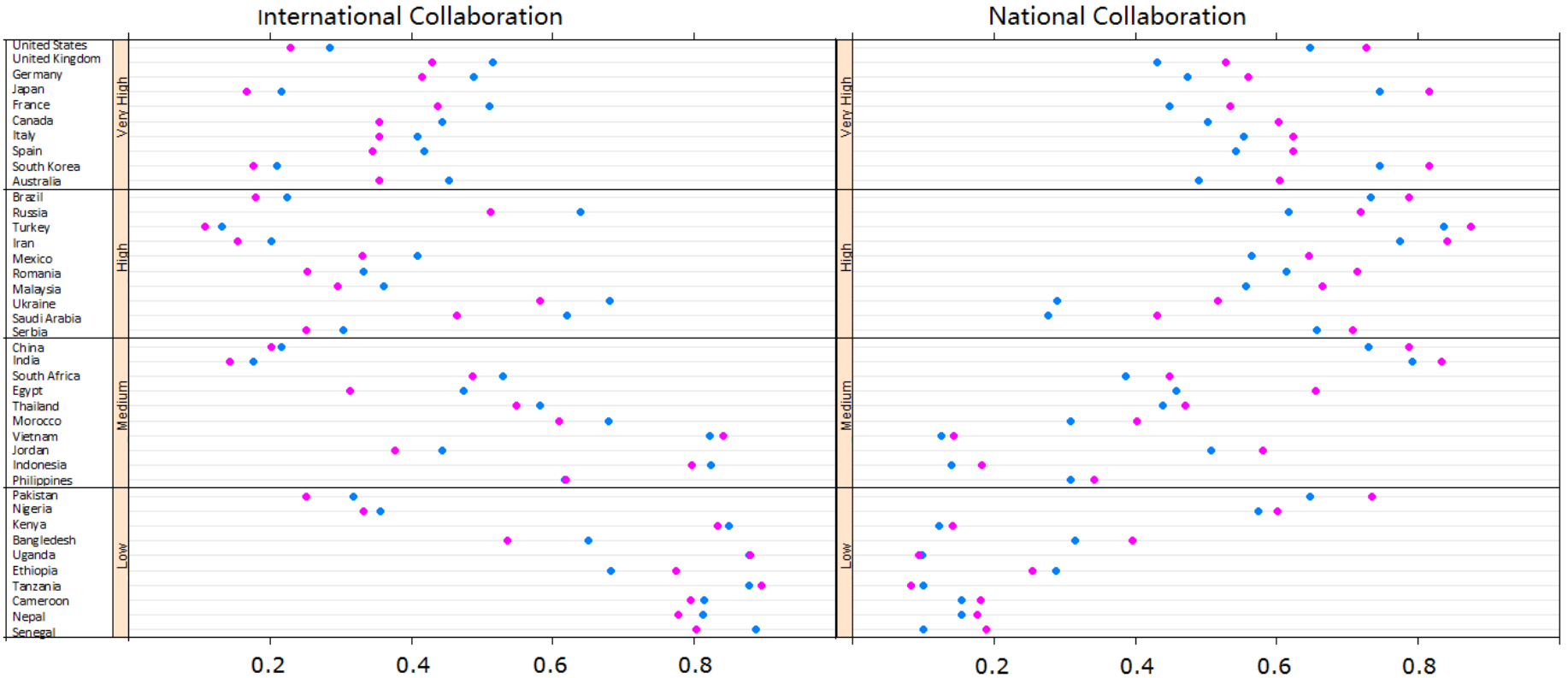
Female/Male Productivity by HDI Level



PRODUCTIVITY & GII

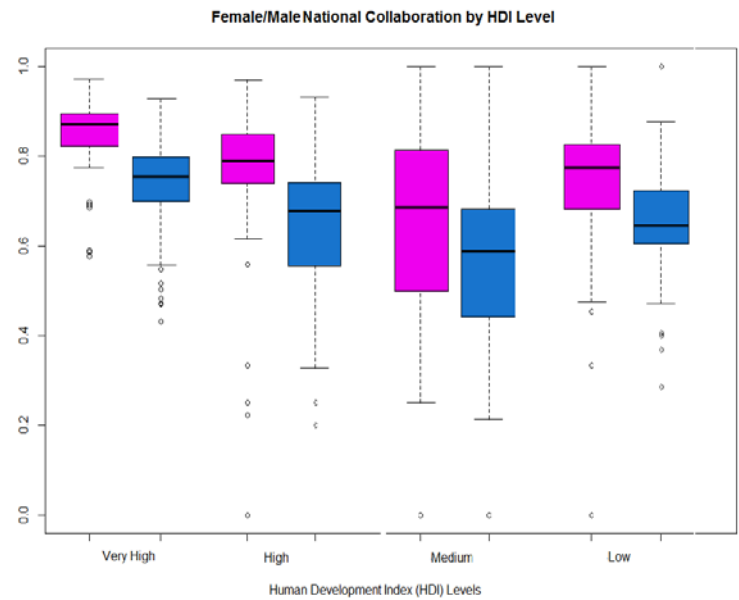
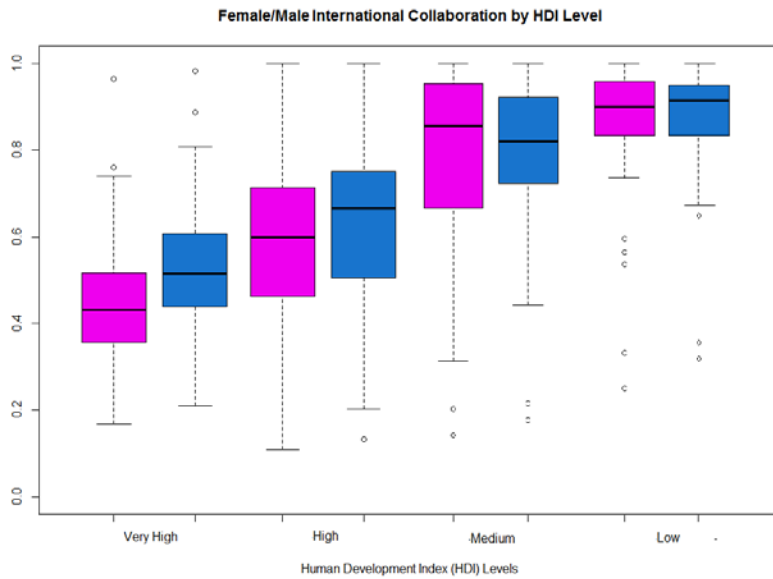


COLLABORATION, GENDER AND HDI

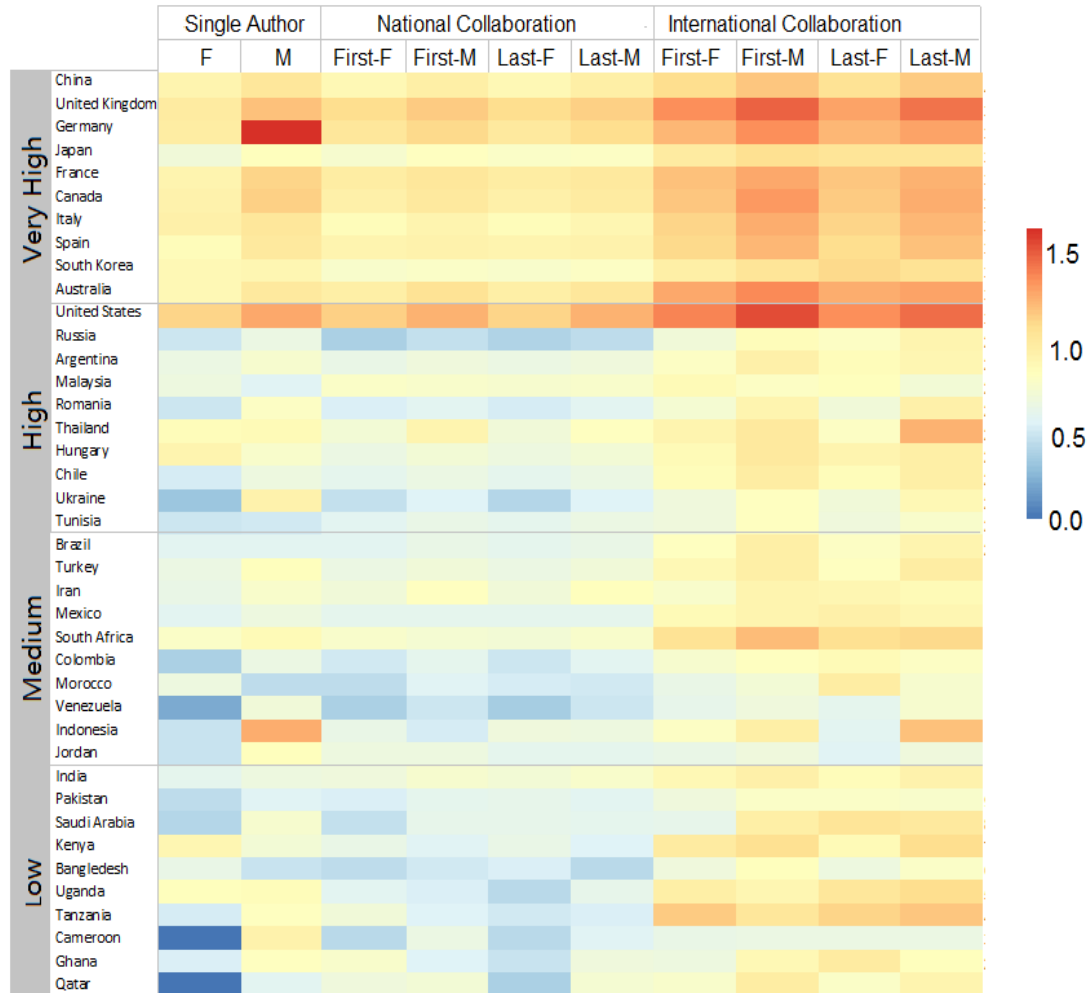


International and National Collaboration of Female/Male by HDI

COLLABORATION, GENDER AND HDI

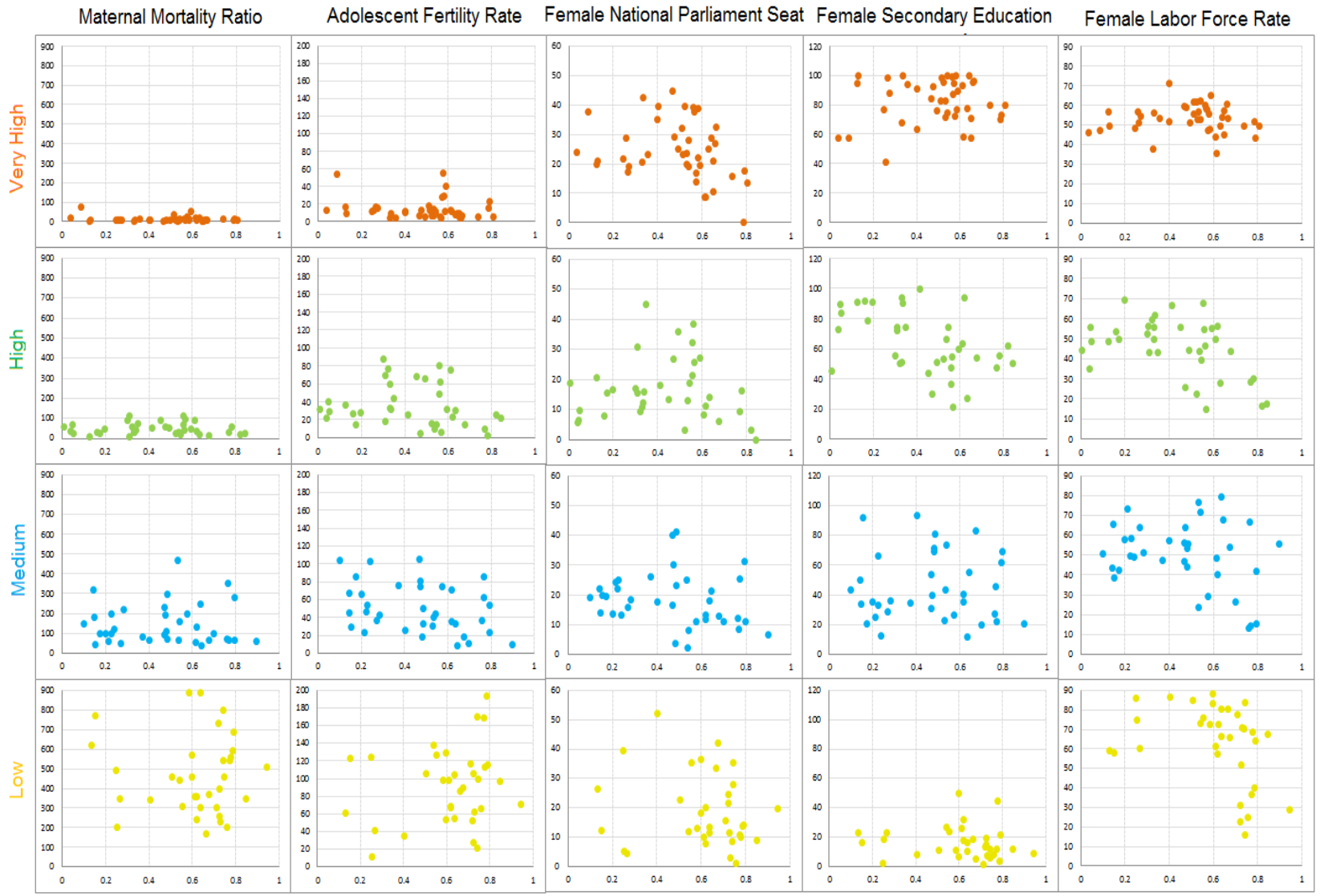


IMPACT, GENDER, AND GII LEVEL



Average citations of top10 countries (by productivity) in each GII level

CORRELATIONS



REGRESSIONS

Dependent variable: Closeness to Equality

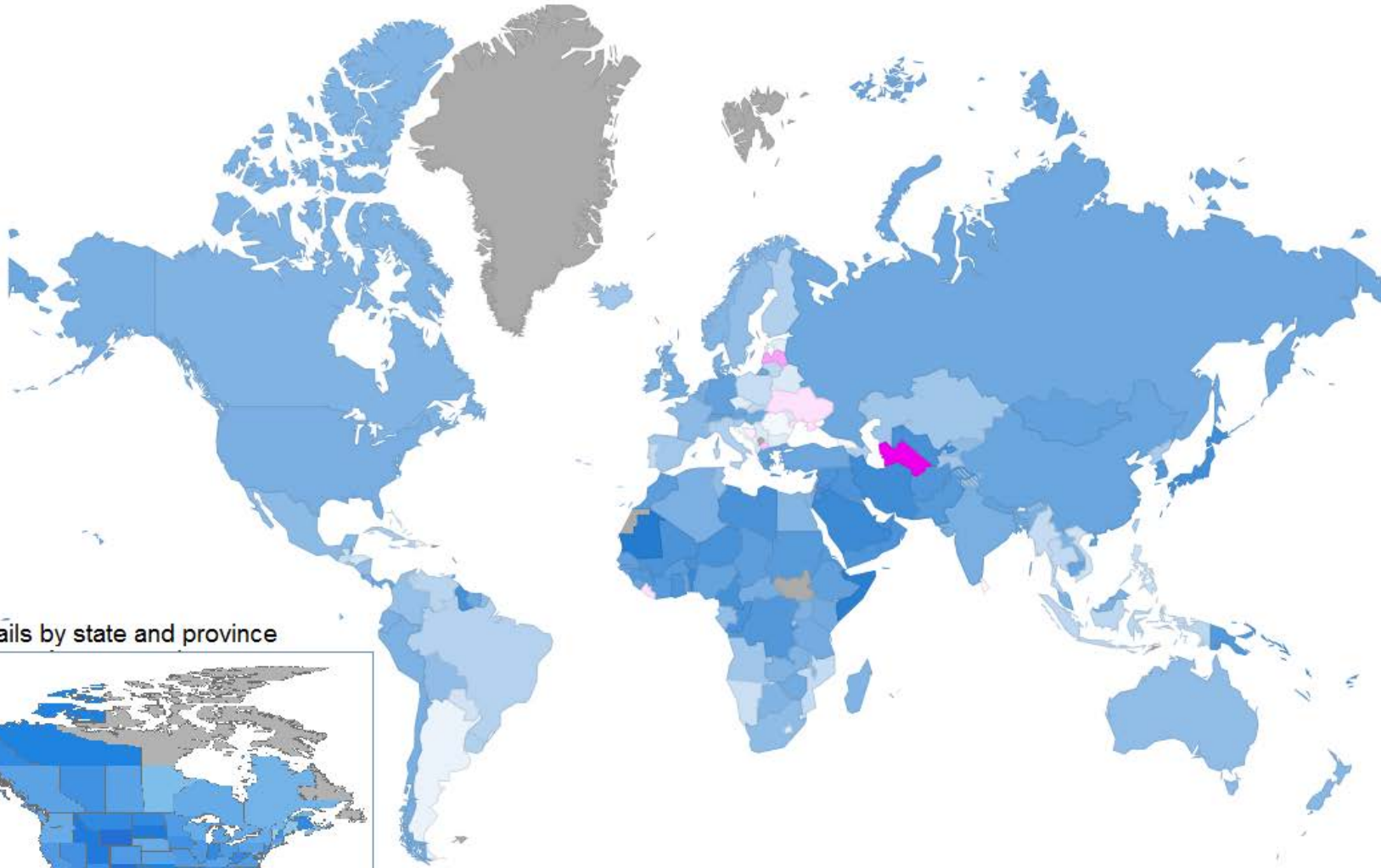
Independent variables: 5 indicators of GII

	All HDI Level	Very High	High	Medium	Low
Intercept	0.729**	0.426*	0.91**	0.935**	0.935**
MaterMortaRatio	0.241*	0.011	-0.055	0.205	-0.083
AdoFertRate	-0.129	-0.183	-0.031	-0.441**	0.196
FemaleNatParliamentSeat	-0.077	-0.382*	-0.039	-0.061	-0.073
FemaleSecEdu	-0.18	0.073	-0.373*	-0.127	-0.072
FemaleLabForceRate	-0.195*	0.142	-0.238	-0.393*	-0.328*
R ²	0.145	0.138	0.292	0.271	0.181

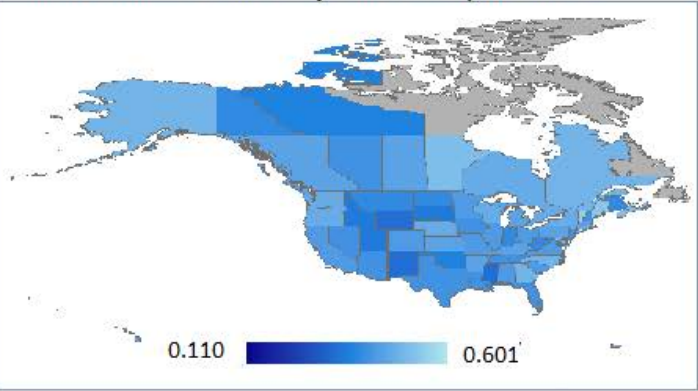
**Significant at .01 level

* Significant at .05 level

ONE WORLD, MANY STORIES



North America details by state and province





THANK YOU! QUESTIONS?

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WITH QUESTIONS**



NUMBER AND PERCENTAGE OF FULL NAMES AND GIVEN NAMES ASSIGNED A GENDER

Gender	Full names			Given names		
	N	% of all	% (All - Initials)	N	% of all	% (All - Initials)
Female	1,194,340	25.0%	35.0%	209,737	25.3%	25.8%
Male	1,642,066	34.4%	48.1%	256,166	30.8%	31.5%
Unisex	123,023	2.6%	3.6%	23,919	2.9%	2.9%
Unknown	456,020	9.6%	13.4%	323,687	39.0%	39.8%
Initials	1,354,802	28.4%	-	16,945	2.0%	-
All	4,770,251	100.0%	-	830,454	100.0%	-

#/% DISTINCT PAPERS AND AUTHOR-PAPERS ASSIGNED A GENDER

Gender	Distinct papers		Author-paper combinations		
	N	% of all	N	% of all	% (All - Initials)
Female	2,719,838	50.2%	5,457,987	20.3%	26.8%
Male	4,071,895	75.1%	12,072,598	44.9%	59.3%
Any gender	4,408,685	81.3%	17,530,585	65.2%	86.1%
Unisex	491,862	9.1%	555,278	2.1%	2.7%
Unknown	1,525,835	28.1%	2,264,613	8.4%	11.1%
Initials	1,142,353	21.1%	6,553,857	24.4%	-
N papers	5,423,287	100.0%	26,904,333	100.0%	-

VALIDATION STUDY

Category	# and % identified	# and % female (of identified)	# and % male (of identified)
Initials	839 (83.9%)	198 (23.6%)	641 (76.4%)
Unknown	890* (89.0%)	282 (31.7%)	607 (68.2%)
Unisex	540 (54.0%)	113 (20.9%)	427 (79.1%)
Male	605 (60.5%)	10 (1.7%)	595 (98.3%)
Female	830 (83.0%)	720 (86.7%)	110 (13.3%)

Table 1 HDI report for 2008-2012 time period (see HDI2008-2012.xlsx file for details)

	# countries	#HDI level change countries
2008	168	NA
2009	169	2
2010	169	0
2011	187	30(12 changed, 18 newly added)
2012	187	8

LINEAR REGRESSION – GENDER PRODUCTIVITY

- Dependent variable: FMRatio
- 14 Independent variables: HDI, GII, IT trends (i.e., computer, internet), and population trends (fertility rate, male to female births)
- Outliers detected using Cook's distance and removed
- R-squared: 0.3312
- Significant variables:
 - HDI: GNIPer Capita (sig. 0.01)
 - PT: TotalFertilityRate (sig. 0.01)
 - GII: FMLabForceRate (sig. 0.05)

LINEAR REGRESSION – INTERNATIONAL COLLAB.

- Dependent variable: F to M international collaboration rate
- 14 Independent variables: HDI, GII, IT trends (i.e., computer, internet), and population trends (fertility rate, male to female births)
- Outliers detected using Cook's distance and removed
- R-squared: 0.3246
- Significant variables:
 - HDI: LifeExpBirth (sig. 0.05)
 - HDI: SchoolMeanYear2010 (sig. 0.01)
 - HDI: ExpectedMeanSchoolYear2011 (sig. 0.01)
 - HDI: GNIPerCapita (sig. 0.05)
 - HDI: NonincomeHDI (sig. 0.01)