Intellectual Property Office

Gender profiles in worldwide patenting

Analysing female inventorship

Chris Harrison
UK Intellectual Property Office
September 2016

Intellectual Property Office is an operating name of the Patent Office

Government
Office for Science

WISE

a campaign to promote women in science, technology and engineering

https://www.gov.uk/government/organisations/government-office-for-science
https://www.wisecampaign.org.uk/
https://ukmediawatch.org

Intellectual Property Office

Gender Profiles in UK Patenting

An analysis of female inventorship

Intellectual Property Office is an operating name of the Patent Office

Intellectual Property Office

GENDER ANALYSIS

13% of STEM workforce are women, but how many are inventors?

93%

7 % British inventors on GB patent applications

How do we compare?

7%

5%

13%

6%

8%

3%

16% increase in female inventors since 2005

1980

2015

Female inventors filing GB patent applications

Biotechnology 25.5%

Pharmaceuticals 24.4%

Organic Chemistry 23.4%

Top Technical Field for female inventors

Average 7.4%

Proportion of female inventors by postcode area

London 11.5%

UK region with highest proportion of female inventors

East Midlands 5.7%

UK region with lowest proportion of female inventors

2015 GB PATENT APPLICATIONS

8.0% mixed teams

3.9% female individuals

0.3% female teams

37.0%

50.8% male individuals

Previous research

- Ding et al (2006)
- Whittington et al (2008)
- Mauleón et al (2009)
- Frietsch et al (2009)
- Hunt et al (2012)
- Jung et al (2012)
- Sugimoto et al (2015)

Europäisches Patentamt
European Patent Office
Office européen des brevets

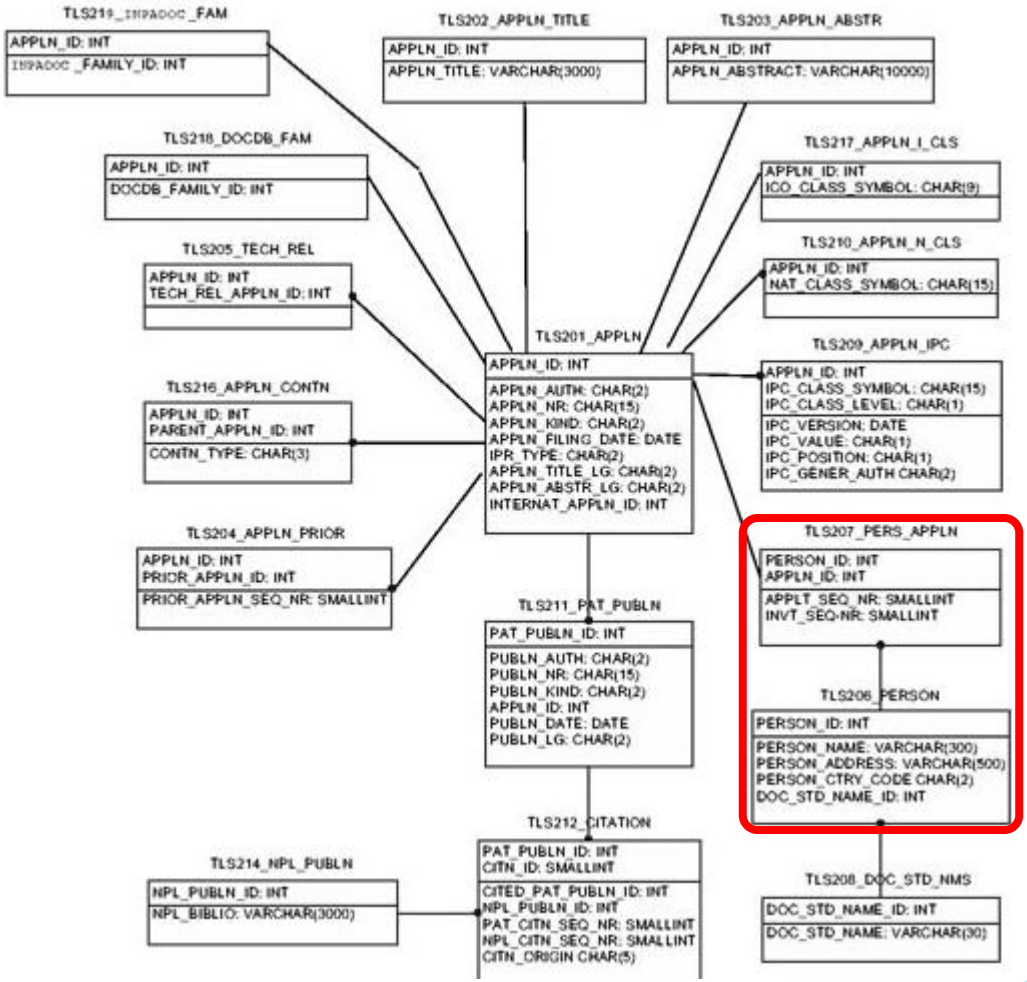
UNITED STATES PATENT AND TRADEMARK OFFICE
DEPARTMENT OF COMMERCE

https://www.visioncritical.com/
https://commons.wikimedia.org/
https://www.epo.org/index.html
https://www.uspto.gov/

EPO Worldwide Patent Statistical Database (PATSTAT)

https://commons.wikimedia.org
https://www.epo.org

PATSTAT structure



PATSTAT inventor name cleaning

person_id	patstat_name	person_ctry_code	appln_auth	person_id	AppCount
39438146	BUSSEY BUDDY H.III	US	US	39438146	1
25106778	CRUDDEN, J.	US	DE	25106778	2
35322180	DZHUMAGALIEV MURZASH D,SU		SU	35322180	1
25122	Floyd, Middleton Brawner Jr.	US	EP	25122	1
11944189	Gaddis, II, Scott Carter	US	US	11944189	4
4959514	Holman, Martin Earl, IV	US	EP	4959514	1
1357405	JANSSEN, Paul A. J. (deceased)	BE	EP	1357405	1
46550	Pugliese, Anthony V. IV	US	EP	46550	1
54801	Reddig, Wolfram, Dr.	DE	EP	54801	4
25096602	REDDY, G.	US	DE	25096602	6
54825	Schmedders, Stefan, Dipl.-Ing.	DE	EP	54825	2
9819795	Stoddard, Jr., William H.	US	US	9819795	2
77607	TAKKEN, Todd, E., c/o IBM United Kingdom Limited	GB	EP	77607	1
20608863	TISCHER,HANS-JOACHIM,DD		CS	20608863	1
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77607	TAKKEN, Todd, E., c/o IBM United Kingdom Limited	GB	EP	77607	1
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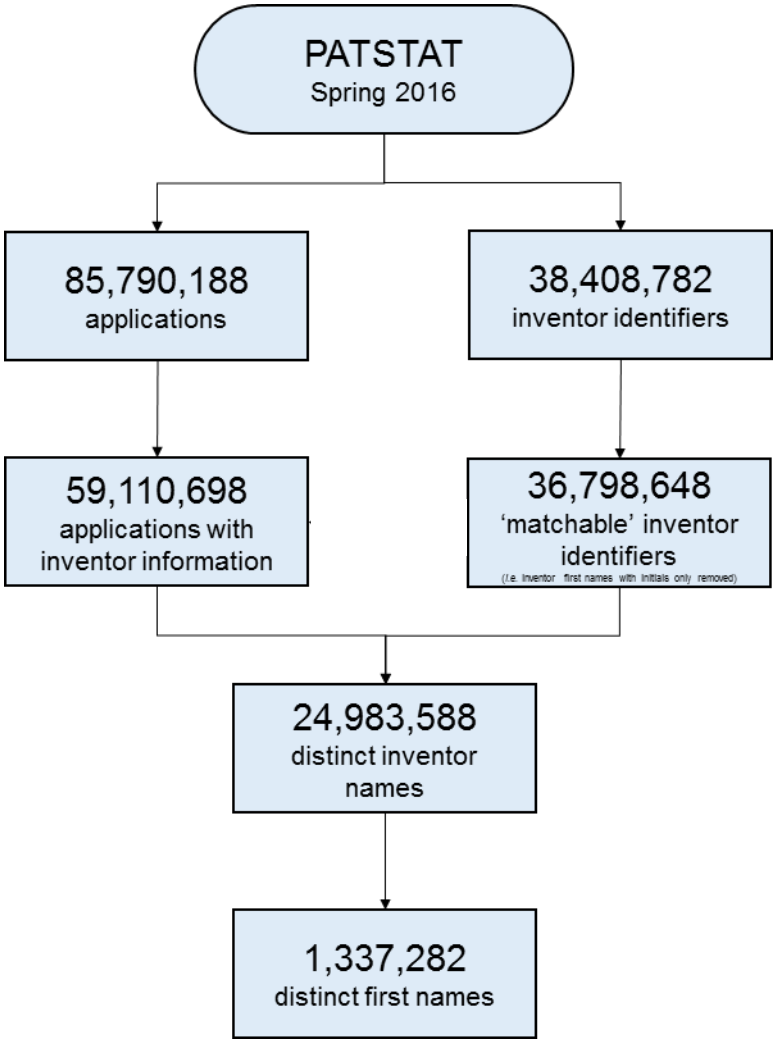
20608863	TISCHER,HANS-JOACHIM DD		CS	20608863	1
20608863	TISCHER,HANS-JOACHIM DD		DD	20608863	2

PATSTAT inventor first name extraction

person_id	patstat_name	person_ctry_code	appln_auth	person_id	AppCount
39438146	BUSSEY BUDDY H.III	US	US	39438146	1
25106778	CRUDDEN, J.	US	DE	25106778	2
35322180	DZHUMAGALIEV MURZASH D,SU		SU	35322180	1
25122	Floyd, Middleton Brawner Jr.	US	EP	25122	1
11944189	Gaddis, II, Scott Carter	US	US	11944189	4
4959514	Holman, Martin Earl, IV	US	EP	4959514	1
1357405	JANSSEN, Paul A. J. (deceased)	BE	EP	1357405	1
46550	Pugliese, Anthony V. IV	US	EP	46550	1
54801	Reddig, Wolfram, Dr.	DE	EP	54801	4
25096602	REDDY, G.	US	DE	25096602	6
54825	Schmedders, Stefan, Dipl.-Ing.	DE	EP	54825	2
9819795	Stoddard, Jr., William H.	US	US	9819795	2
77607	TAKKEN, Todd, E., c/o IBM United Kingdom Limited	GB	EP	77607	1
20608863	TISCHER,HANS-JOACHIM,DD		CS	20608863	1
20608863	TISCHER,HANS-JOACHIM,DD		DD	20608863	2

PATSTAT inventor first name extraction

person_id	patstat_name	person_ctry_code	appln_auth	person_id	AppCount	firstname
39438146	BUSSEY BUDDY H.III	US	US	39438146	1	BUDDY
25106778	CRUDDEN, J.	US	DE	25106778	2	NULL
35322180	DZHUMAGALIEV MURZASH D,SU		SU	35322180	1	MURZASH
25122	Floyd, Middleton Brawner Jr.	US	EP	25122	1	Middleton
11944189	Gaddis, II, Scott Carter	US	US	11944189	4	Scott
4959514	Holman, Martin Earl, IV	US	EP	4959514	1	Martin
1357405	JANSSEN, Paul A. J. (deceased)	BE	EP	1357405	1	Paul
46550	Pugliese, Anthony V. IV	US	EP	46550	1	Anthony
54801	Reddig, Wolfram, Dr.	DE	EP	54801	4	Wolfram
25096602	REDDY, G.	US	DE	25096602	6	NULL
54825	Schmedders, Stefan, Dipl.-Ing.	DE	EP	54825	2	Stefan
9819795	Stoddard, Jr., William H.	US	US	9819795	2	William
77607	TAKKEN, Todd, E., c/o IBM United Kingdom Limited	GB	EP	77607	1	Todd
20608863	TISCHER,HANS-JOACHIM,DD		CS	20608863	1	HANS-JOACHIM
20608863	TISCHER,HANS-JOACHIM,DD		DD	20608863	2	HANS-JOACHIM


PATSTAT
Spring 2016
85,790,188
applications
38,408,782
inventor identifiers
59,110,698
applications with
inventor information
36,798,648
'matchable' inventor
identifiers
(i.e. inventor first names with initials only removed)
24,983,588
distinct inventor
names
1,337,282
distinct first names

Name-gender dataset

firstname	count.male	count.female	Total	Majority	% male	% female	>95% certainty	Original source
Kayla	558	328362	328920	F	0%	100%	F	Matias
Bonnie	4032	324668	328700	F	1%	99%	F	Matias
Bobby	318777	9717	328494	M	97%	3%	M	Matias
Natalie	726	324103	324829	F	0%	100%	F	Matias
Vincent	321860	1369	323229	M	100%	0%	M	Matias
Phyllis	870	322256	323126	F	0%	100%	F	Matias
Bradley	320841	1314	322155	M	100%	0%	M	Matias
Anne	830	319162	319992	F	0%	100%	F	Matias
Francis	285203	28793	313996	M	91%	9%	-	Matias
Tracy	60878	250481	311359	F	20%	80%	-	Matias
Johnny	307076	3678	310754	M	99%	1%	M	Matias
Victor	304346	1792	306138	M	99%	1%	M	Matias
Phillip	304774	1332	306106	M	100%	0%	M	Matias
Martin	303637	1471	305108	M	100%	0%	M	Matias
Noah	303729	1311	305040	M	100%	0%	M	Matias
Stanley	303369	1437	304806	M	100%	0%	M	Matias
Clarence	301567	1860	303427	M	99%	1%	M	Matias

Open Gender Tracker: Global Name Data - Matias, N

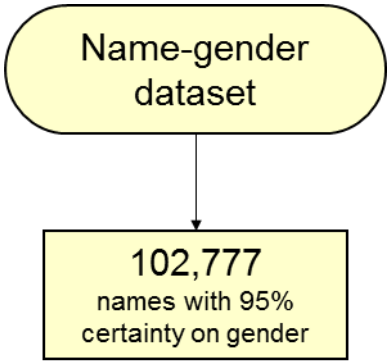
+

Tang, C. et al (2011) What's in a Name: A Study of Names, Gender Inference, and Gender Behavior in Facebook

+

IPO manual quality check data cleaning

Name-gender dataset

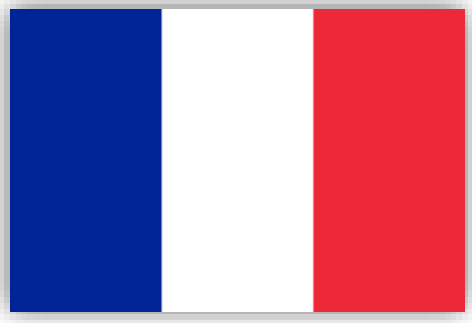


firstname	Gender	orig_source
Aaban	M	Matias
Aabha	F	Matias
Aabid	M	Matias
Aabriella	F	Matias
Aadam	M	Matias
Aadan	M	Matias

Country-specific data dictionaries

Examples include

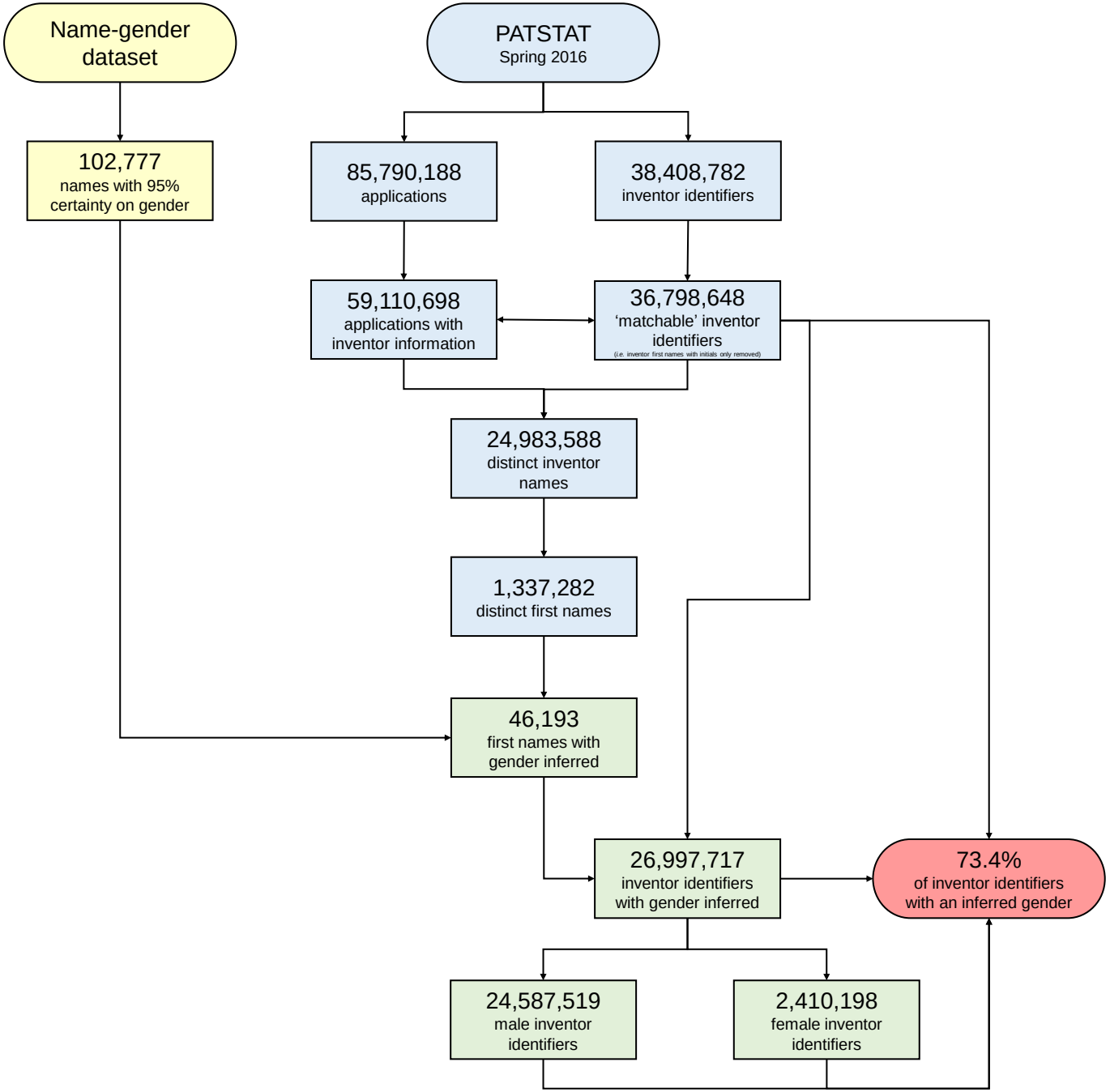
Jean



Andrea

PATSTAT inventor name matching

person_id	patstat_name	person_ctry_code	appln_auth	person_id	AppCount	firstname	firstname	gender
39438146	BUSSEY BUDDY H.III	US	US	39438146	1	BUDDY	Buddy	M
25106778	CRUDDEN, J.	US	DE	25106778	2	NULL	NULL	NULL
35322180	DZHUMAGALIEV MURZASH D,SU		SU	35322180	1	MURZASH	NULL	NULL
25122	Floyd, Middleton Brawner Jr.	US	EP	25122	1	Middleton	Middleton	M
11944189	Gaddis, II, Scott Carter	US	US	11944189	4	Scott	Scott	M
4959514	Holman, Martin Earl, IV	US	EP	4959514	1	Martin	Martin	M
1357405	JANSSEN, Paul A. J. (deceased)	BE	EP	1357405	1	Paul	Paul	M
46550	Pugliese, Anthony V. IV	US	EP	46550	1	Anthony	Anthony	M
54801	Reddig, Wolfram, Dr.	DE	EP	54801	4	Wolfram	Wolfram	M
25096602	REDDY, G.	US	DE	25096602	6	NULL	NULL	NULL
54825	Schmedders, Stefan, Dipl.-Ing.	DE	EP	54825	2	Stefan	Stefan	M
9819795	Stoddard, Jr., William H.	US	US	9819795	2	William	William	M
77607	TAKKEN, Todd, E., c/o IBM United Kingdom Limited	GB	EP	77607	1	Todd	Todd	M
20608863	TISCHER,HANS-JOACHIM,DD		CS	20608863	1	HANS-JOACHIM	Hans-Joachim	M
20608863	TISCHER,HANS-JOACHIM,DD		DD	20608863	2	HANS-JOACHIM	Hans-Joachim	M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85,790,188
applications
38,408,782
inventor identifiers
59,110,698
applications with inventor information
36,798,648
'matchable' inventor identifiers
(i.e. inventor first names with initials only removed)
24,983,588
distinct inventor names
1,337,282
distinct first names
46,193
first names with gender inferred
26,997,717
inventor identifiers with gender inferred
73.4%
of inventor identifiers with an inferred gender
24,587,519
male inventor identifiers
2,410,198
female inventor identifiers

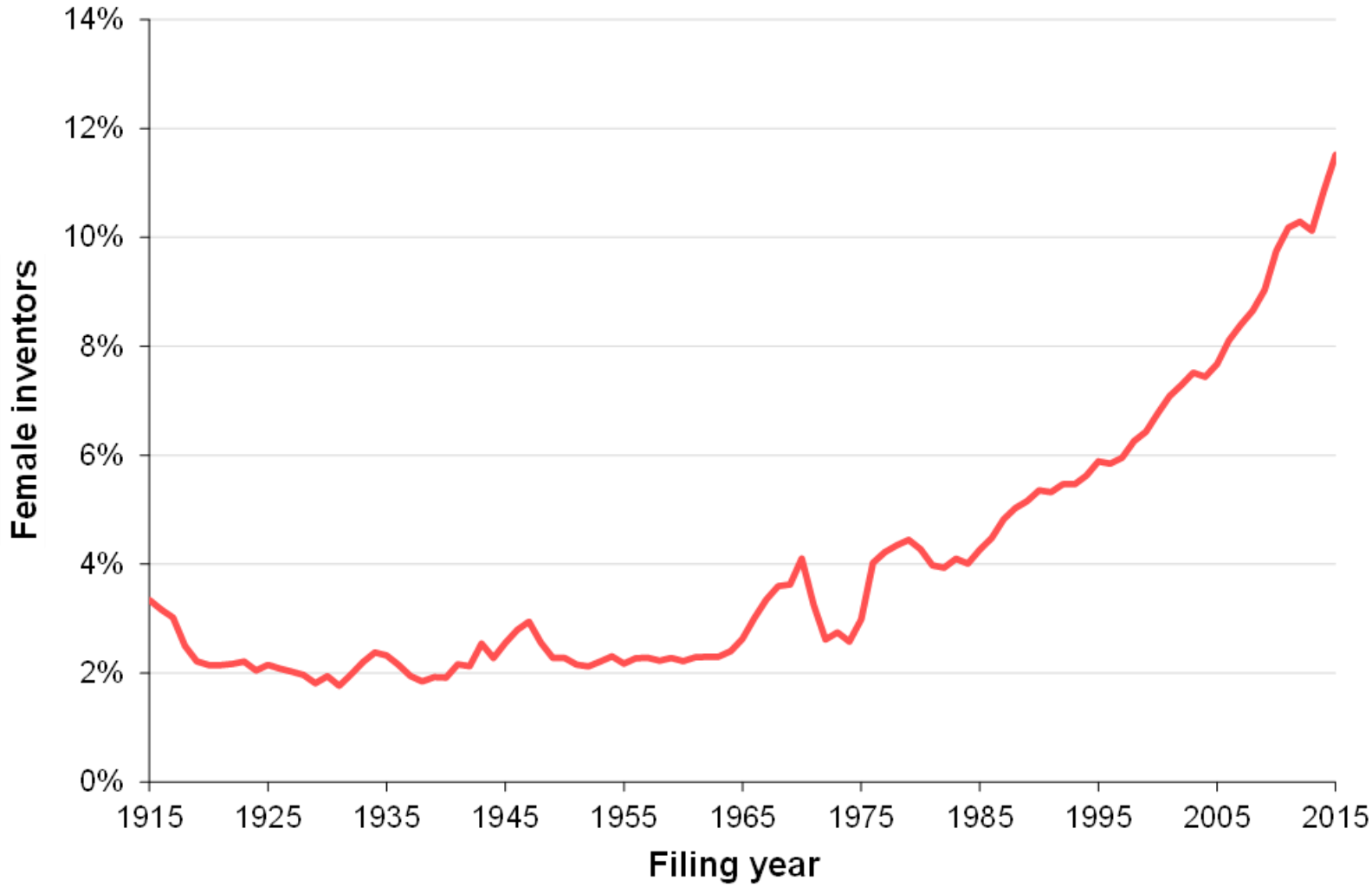
Shocking but ultimately not surprising

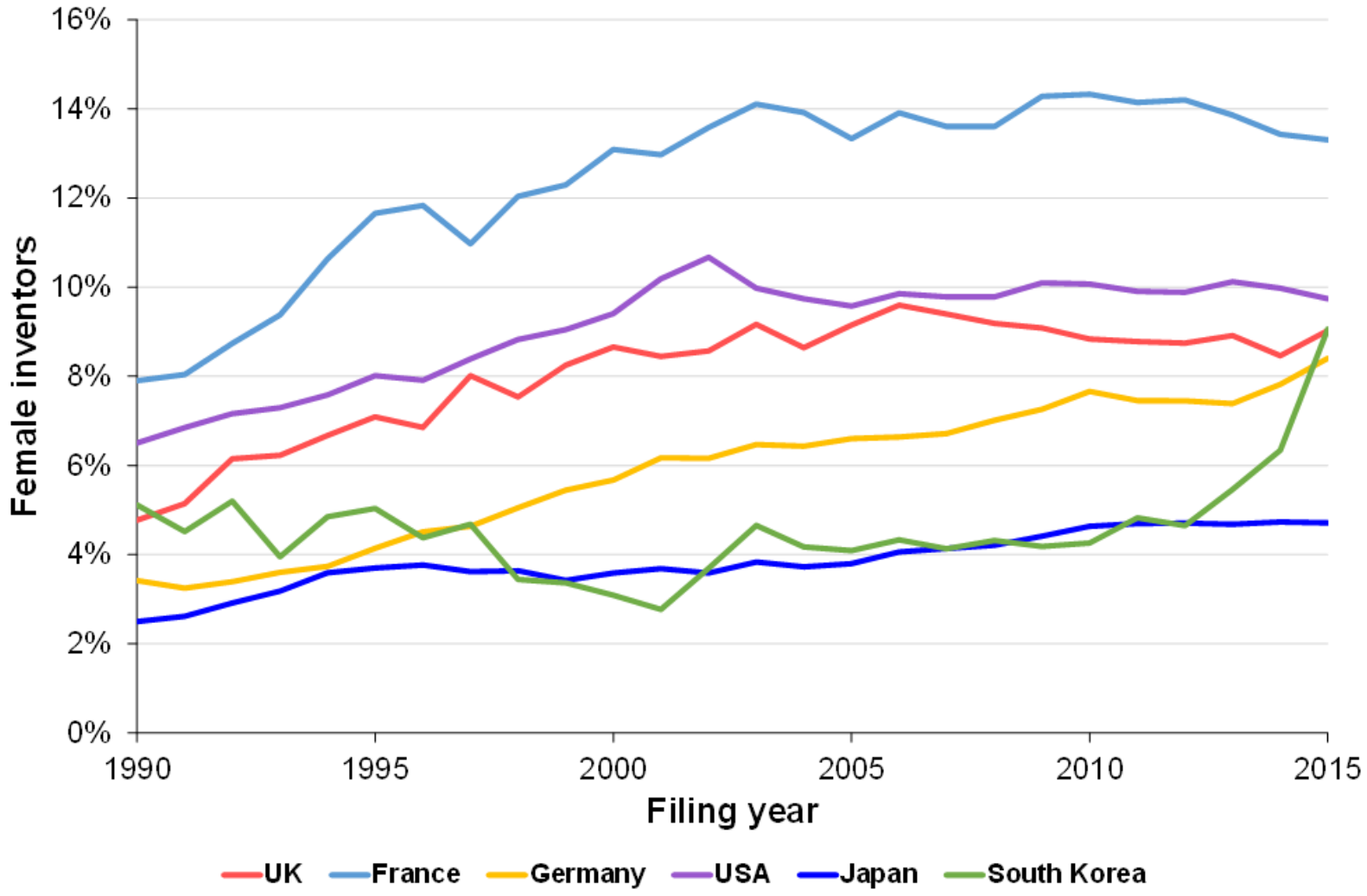
Patterns consistent with previous research

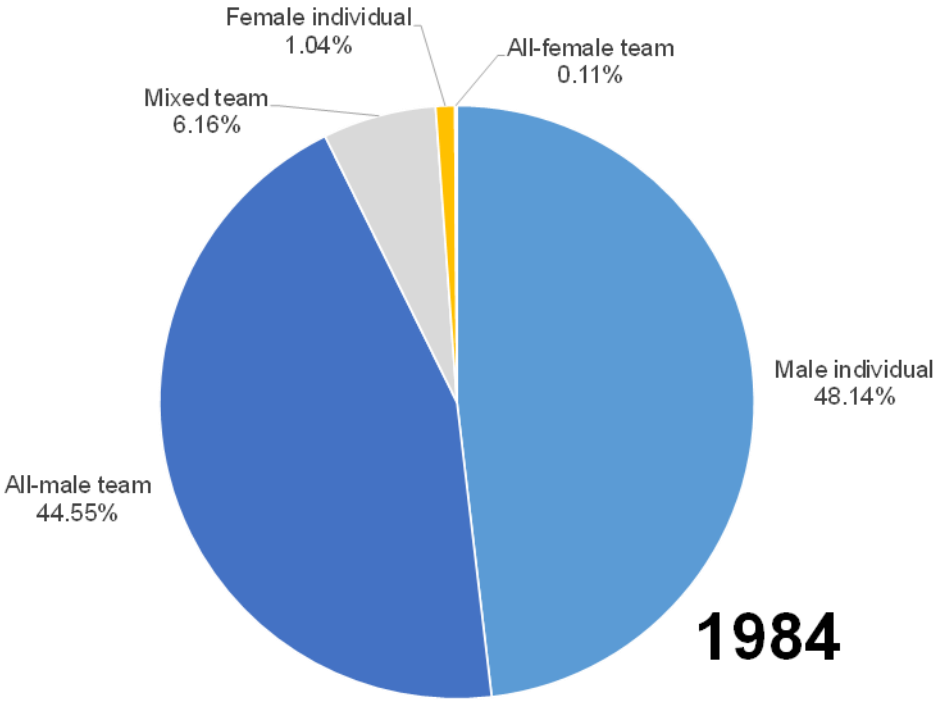
but now possible for analyse the patenting gender dimension worldwide using PATSTAT

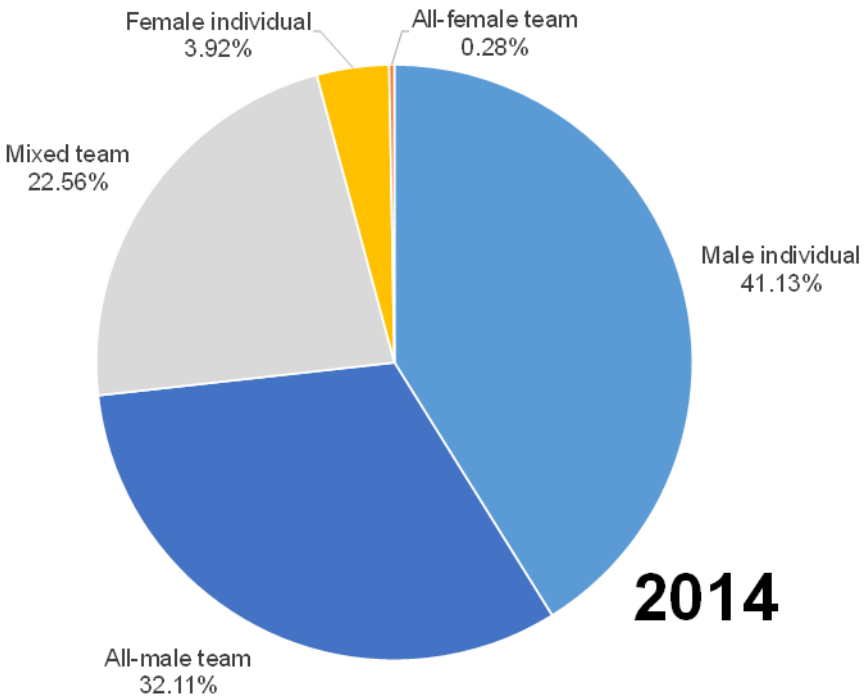
Rank	Male names	Unique inventor identifiers
1	John	475,112
2	Robert	402,528
3	Michael	390,270
4	David	383,531
5	James	306,289
6	William	287,773
7	Thomas	278,326
8	Peter	266,223
9	Richard	242,181
10	Paul	205,966
11	Charles	161,881
12	Joseph	159,530
13	Mark	158,426
14	Daniel	142,641
15	Vladimir	136,562
16	George	129,961
17	Martin	116,039
18	Frank	112,370
19	Stephen	106,879
20	Hans	106,705

Rank	Female names	Unique inventor identifiers
1	Maria	31,583
2	Elena	20,837
3	Anna	19,838
4	Susan	18,598
5	Mary	17,945
6	Galina	15,839
7	Irina	15,629
8	Barbara	14,558
9	Tatyana	14,364
10	Jennifer	14,353
11	Anne	14,192
12	Christine	13,876
13	Lyudmila	13,629
14	Elizabeth	13,556
15	Valentina	13,292
16	Karen	13,226
17	Olga	12,531
18	Nina	12,383
19	Catherine	11,820
20	Patricia	11,528


14%
12%
10%
8%
6%
4%
2%
0%
Female inventors
1915
1925
1935
1945
1955
1965
1975
1985
1995
2005
2015
Filing year


16%
14%
12%
10%
8%
6%
4%
2%
0%
Female inventors
1990
1995
2000
2005
2010
2015
Filing year
UK
France
Germany
USA
Japan
South Korea


Female individual
1.04%
All-female team
0.11%
Mixed team
6.16%
Male individual
48.14%
All-male team
44.55%
1984


Female individual
3.92%
All-female team
0.28%
Mixed team
22.56%
Male individual
41.13%
All-male team
32.11%
2014

IPC subclass			Male inventors	Female inventors
Top 10	A41C	Wearing Apparel -> Corsets; Brassieres	62.8%	37.2%
	A61Q	Medical Or Veterinary Science; Hygiene -> Use Of Cosmetics Or Similar Toilet Preparations	76.6%	23.4%
	A41B	Wearing Apparel -> Shirts; Underwear; Baby Linen; Handkerchiefs	77.2%	22.8%
	C12N	Biochemistry; Beer; Spirits; Wine; Vinegar; Microbiology; Enzymology; Mutation Or Genetic Engineering -> Micro-Organisms Or Enzymes; Compositions Thereof; Propagating, Preserving, Or Maintaining Micro-Organisms; Mutation Or Genetic Engineering; Culture Media	79.0%	21.0%
	A47D	Furniture; Domestic Articles Or Appliances; Coffee Mills; Spice Mills; Suction Cleaners In General -> Furniture Specially Adapted For Children	79.6%	20.4%
	C12Q	Biochemistry; Beer; Spirits; Wine; Vinegar; Microbiology; Enzymology; Mutation Or Genetic Engineering -> Measuring Or Testing Processes Involving Enzymes Or Micro-Organisms; Compositions Or Test Papers Therefor; Processes Of Preparing Such Compositions; Condition-Responsive Control In Microbiological Or Enzymological Processes	79.6%	20.4%
	A21D	Baking; Equipment For Making Or Processing Doughs; Doughs For Baking -> Treatment, E.G. Preservation, Of Flour Or Dough For Baking, *e.g.* By Addition Of Materials; Baking; Bakery Products; Preservation Thereof	79.8%	20.2%
	A41G	Wearing Apparel -> Artificial Flowers; Wigs; Masks; Feathers	80.0%	20.0%
	A01H	Agriculture; Forestry; Animal Husbandry; Hunting; Trapping; Fishing -> New Plants Or Processes For Obtaining Them; Plant Reproduction By Tissue Culture Techniques	80.1%	19.9%
	C07K	Organic Chemistry -> Peptides	80.4%	19.6%
Bottom 10	F02B	Combustion Engines; Hot-Gas Or Combustion-Product Engine Plants -> Internal-Combustion Piston Engines; Combustion Engines In General	98.1%	1.9%
	D03C	Weaving -> Shedding Mechanisms; Pattern Cards Or Chains; Punching Of Cards; Designing Patterns	98.1%	1.9%
	F02N	Combustion Engines; Hot-Gas Or Combustion-Product Engine Plants -> Starting Of Combustion Engines; Starting Aids For Such Engines, Not Otherwise Provided For	98.2%	1.8%
	B61B	Railways -> Railway Systems; Equipment Therefor Not Otherwise Provided For	98.2%	1.8%
	F02D	Combustion Engines; Hot-Gas Or Combustion-Product Engine Plants -> Controlling Combustion Engines	98.2%	1.8%
	F01L	Machines Or Engines In General; Engine Plants In General; Steam Engines -> Cyclically Operating Valves For Machines Or Engines	98.3%	1.7%
	G21B	Nuclear Physics; Nuclear Engineering -> Fusion Reactors	98.3%	1.7%
	B60T	Vehicles In General -> Vehicle Brake Control Systems Or Parts Thereof; Brake Control Systems Or Parts Thereof, In General; Arrangement Of Braking Elements On Vehicles In General; Portable Devices For Preventing Unwanted Movement Of Vehicles; Vehicle Modifications To Facilitate Cooling Of Brakes	98.4%	1.6%
	G10B	Musical Instruments; Acoustics -> Organs; Harmoniums	98.6%	1.4%
	F02P	Combustion Engines; Hot-Gas Or Combustion-Product Engine Plants -> Ignition, Other Than Compression Ignition, For Internal-Combustion Engines; Testing Of Ignition Timing In Compression-Ignition Engines	98.6%	1.4%

WIPO technology field	Male inventors	Female inventors
Chemistry: Biotechnology	80.2%	19.8%
Instruments: Analysis of biological materials	81.8%	18.2%
Chemistry: Pharmaceuticals	83.6%	16.4%
Chemistry: Food chemistry	83.7%	16.3%
Chemistry: Organic fine chemistry	87.1%	12.9%
Chemistry: Basic materials chemistry	89.7%	10.3%
Chemistry: Micro-structural and Nanotechnology	90.2%	9.8%
Instruments: Medical technology	90.9%	9.1%
Electrical engineering: IT methods for management	91.6%	8.4%
Other fields: Other consumer goods	91.7%	8.3%
Chemistry: Macromolecular chemistry, polymers	92.1%	7.9%
Chemistry: Chemical engineering	93.4%	6.6%
Other fields: Furniture, games	93.5%	6.5%
Chemistry: Materials, metallurgy	93.9%	6.1%
Electrical engineering: Digital communication	94.0%	6.0%
Chemistry: Surface technology, coating	94.1%	5.9%
Mechanical engineering: Textile and paper machines	94.1%	5.9%
Chemistry: Environmental technology	94.2%	5.8%
Electrical engineering: Computer technology	94.2%	5.8%
Instruments: Measurement	95.1%	4.9%
Mechanical engineering: Other special machines	95.2%	4.8%
Instruments: Control	95.3%	4.7%
Electrical engineering: Semiconductors	95.4%	4.6%
Instruments: Optics	95.5%	4.5%
Electrical engineering: Telecommunications	95.6%	4.4%
Electrical engineering: Electrical machinery, apparatus,	95.8%	4.2%
Mechanical engineering: Handling	95.8%	4.2%
Other fields: Civil engineering	96.2%	3.8%
Electrical engineering: Audio-visual technology	96.3%	3.7%
Mechanical engineering: Thermal processes and apparatus	96.5%	3.5%
Mechanical engineering: Machine tools	96.7%	3.3%
Mechanical engineering: Transport	97.2%	2.8%
Electrical engineering: Basic communication processes	97.2%	2.8%
Mechanical engineering: Mechanical elements	97.3%	2.7%
Mechanical engineering: Engines, pumps, turbines	97.5%	2.5%

person_id	firstname	gender
37738986	Miles	M
37738987	Ian	M
37738988	Thomas	M
37738989	Stefanie	F
37739003	Selden	M
37739004	Pamela	F
37739005	Constance	F
37739006	Andrew	M
37739019	Flint	M
37739020	Milind	M
37739021	Robert	M
37739022	John	M
37739023	Denis	M
37739036	Michel	M
37739037	Michael	M
37739038	Sue	F
37739039	Paul	M
37739053	Bradley	M
37739054	ARIE	M
37739055	George	M
37739070	Lehman	M
37739071	James	M
37739072	Dale	M
37739073	Allan	M
37739086	Wes	M
37739087	Roger	M
37739088	Richard	M
37739103	Diana	F
37739104	Harry	M
37739105	William	M
37739120	Howard	M
37739121	Joshua	M
37739122	Marilyn	F
37739123	Thomas	M
37739136	Michael	M
37739137	David	M

Limitations and improvements

‘Western-bias’ affects non-Latin alphabet names

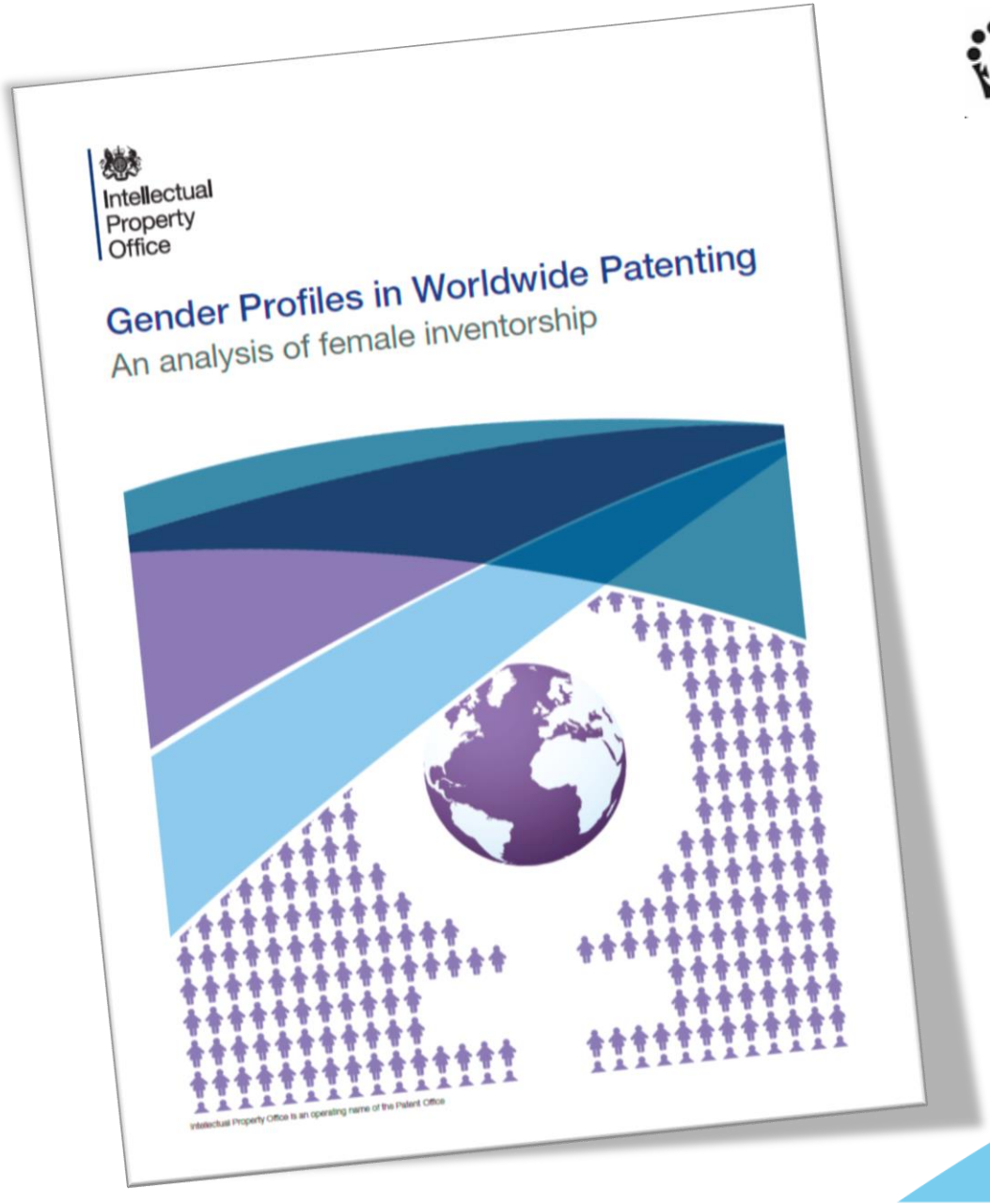
Local knowledge

- Unisex names
- Inferring gender or cross-checking using surname data

Family data

Gender migration

http://blog.commlabindia.com/



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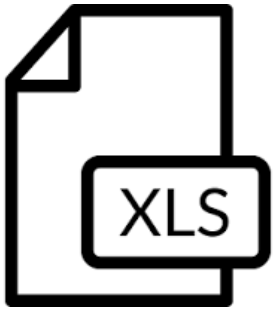

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Intellectual Property Office

Thank you

christopher.harrison@ipo.gov.uk

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