



EDSD 11/2022 Barcelona – Digital Demography Using bibliometric data for demographic research

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Welcome and introduction





Use of bibliometric data for demographic research and study of scholarly migration at the MPIDR:

- Zhao, X., Aref, S., Zagheni, E., & Stecklov, G. (2022). Return migration of German-affiliated researchers: Analyzing departure and return by gender, cohort, and discipline using Scopus bibliometric data 1996-2020. Scientometrics
- Kashyap, R., Rinderknecht, R. G., Akbaritabar, A., Alburez-Gutierrez, D., Gil-Clavel, S., Grow, A., Kim, J., Leasure, D. R., Lohmann, S., Negraia, D. V., Perrotta, D., Rampazzo, F., Tsai, C.-J., Verhagen, M. D., Zagheni, E., & Zhao, X. (2022). Digital and Computational Demography. SocArXiv. https://doi.org/10.31235/osf.io/7bvpt
- Zhao, X., Aref, S., Zagheni, E., & Stecklov, G. (2021a). International Migration in Academia and Citation Performance: An Analysis of German-Affiliated Researchers by Gender and Discipline Using Scopus Publications 1996-2020. ArXiv:2104.12380 [Cs]. http://arxiv.org/abs/2104.12380
- Subbotin, A., & Aref, S. (2021). Brain drain and brain gain in Russia: Analyzing international migration of researchers by discipline using Scopus bibliometric data 1996–2020. Scientometrics. https://doi.org/10.1007/s11192-021-04091-x
- Miranda-González, A., Aref, S., Theile, T., & Zagheni, E. (2020). Scholarly migration within Mexico: Analyzing internal migration among researchers using Scopus longitudinal bibliometric data. EPJ Data Science, 9(1), 34. https://doi.org/10.1140/epjds/s13688-020-00252-9
- Aref, S., Zagheni, E., & West, J. (2019). The Demography of the Peripatetic Researcher: Evidence on Highly Mobile Scholars from the Web of Science. In I. Weber, K. M. Darwish, C. Wagner, E. Zagheni, L. Nelson, S. Aref, & F. Flöck (Eds.), Social Informatics (pp. 50-65). Springer International Publishing. https://doi.org/10.1007/978-3-030-34971-4_4
- Alburez-Gutierrez, D., Zagheni, E., Aref, S., Gil-Clavel, S., Grow, A., & Negraia, D. V. (2019). Demography in the digital era: New data sources for population research.
- Abel, G. J., Muttarak, R., Bordone, V., & Zagheni, E. (2019). Bowling Together: Scientific Collaboration Networks of Demographers at European Population Conferences. European Journal of Population, 35(3), 543-562. https://doi.org/10.1007/s10680-018-9493-1



Bibliometric data for migration research

Emilio Zagheni, MPIDR





HUMAN BIOLOGY

a record of research DECEMBER, 1934

VOL. 6



No. 4

FERTILITY OF THE SOCIAL CLASSES IN THE NATIVE WHITE POPULATION OF COLUMBUS AND SYRACUSE¹

BY FRANK W. NOTESTEIN AND CLYDE V. KISER
Milbank Memorial Fund

NE of the neglected aspects of the much discussed decline in the birth rate is the problem of the incidence of the decline in constituent classes of the population. We know that the birth rate has dropped more rapidly in the foreign

than in the native population. But within the native group we know little enough of the nature of the changes that have taken place. Has the decline fallen with full force on the established families which have remained unbroken? Within this group are the birth rates declining with greater rapidity in some classes than in others, and if so, are these differences tending to strengthen or weaken the well-established inverse relation between social status and fertility?





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ECONOMIC, FINANCIAL AND TRANSIT DEPARTMENT



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The Future Population of Europe and the Soviet Union

Population Projections

BY

FRANK W. NOTESTEIN

IRENE B. TAEUBER

DUDLEY KIRK

ANSLEY J. COALE

LOUISE K. KISER

OF THE OFFICE OF POPULATION RESEARCH
PRINCETON UNIVERSITY

LEAGUE OF NATIONS, GENEVA, 1944



A SIMPLE IDEA

Changes in institutional affiliations can be used to infer changes in residence over time for individual scholars and for populations

A SCALABLE IDEA: THE SCOPUS DATABASE





Data accessed via:

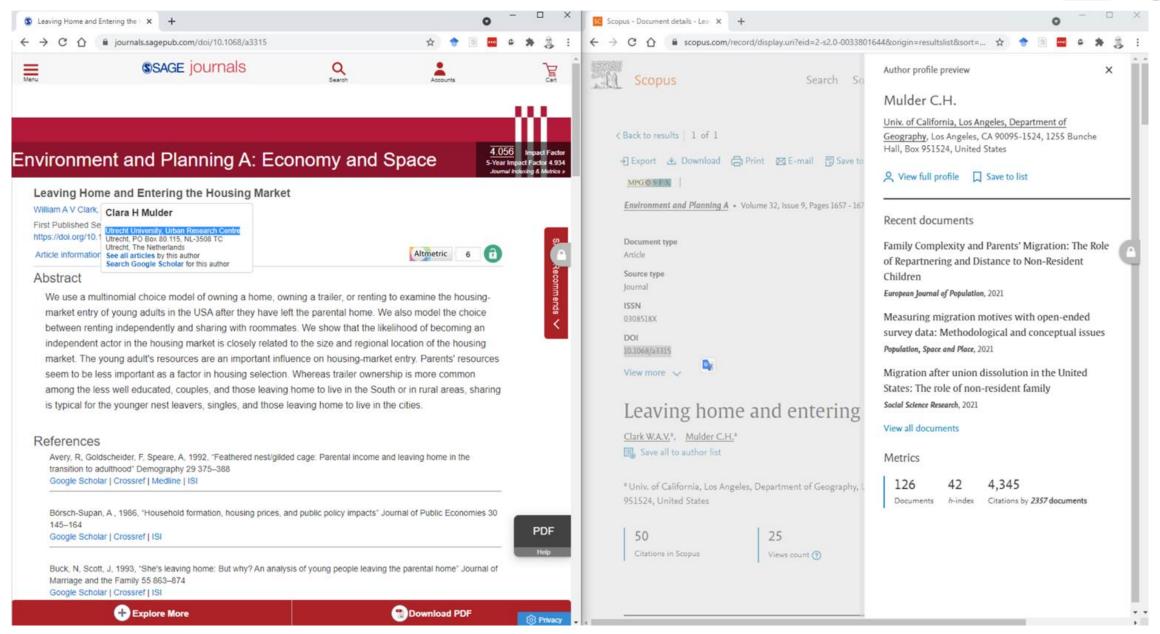




A publication on publisher's website (left) and Scopus (right)









DATA QUALITY

Author disambiguation in Scopus:

98.1% of author profiles do not include publications written by someone else**;

94.4% of author profiles include all publications written by the author.

Organization disambiguation:

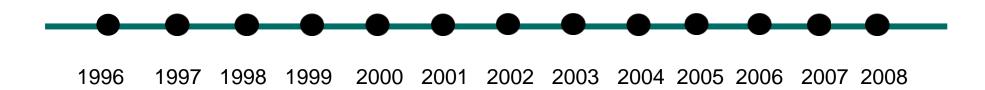
Research Organization Registry (ROR) API

Subset of data with the highest quality:

Period:1996-2020; Type of publications: Articles and Reviews;

→ 36+ Million publications for 16+ Million unique authors







Maria's first

publications are

with a Canadian

affiliation in 1998

CAN

Maria's country of "academic" birth is

Canada, regardless of her citizenship or

country of actual birth

affiliation in 1998

CAN

1996 1997 1998 1999 2000 2001 2002 2003 2004 2005 2006 2007 2008

The country of residence is inferred as the modal country of publications in a given year

MAX PLANCK INSTITUTE FOR DEMOGRAPHIC RESEARCH



Maria changes residence
from Canada to the US
between 2001 and 2002

CAN CAN CAN CAN USA USA USA USA USA USA USA

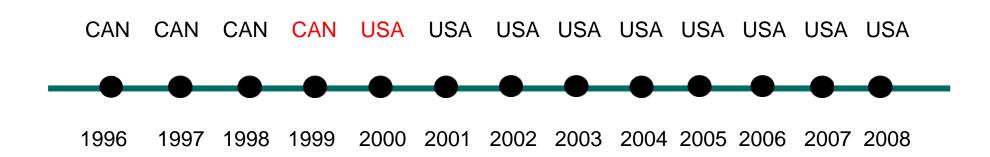
1996 1997 1998 1999 2000 2001 2002 2003 2004 2005 2006 2007 2008

Maria's modal countries of publications over time





We impute the country values for up to 2 years from the closest observation with backward or forward filling





For Joe, we may have a leftcensoring issue: we do not
know if he published and/or
moved before 1996

CAN CAN CAN CAN USA USA USA USA USA USA USA USA

1996 1997 1998 1999 2000 2001 2002 2003 2004 2005 2006 2007 2008





Trends of return international migration worldwide

Tom Theile, MPIDR





Longitudinal and cross-sectional

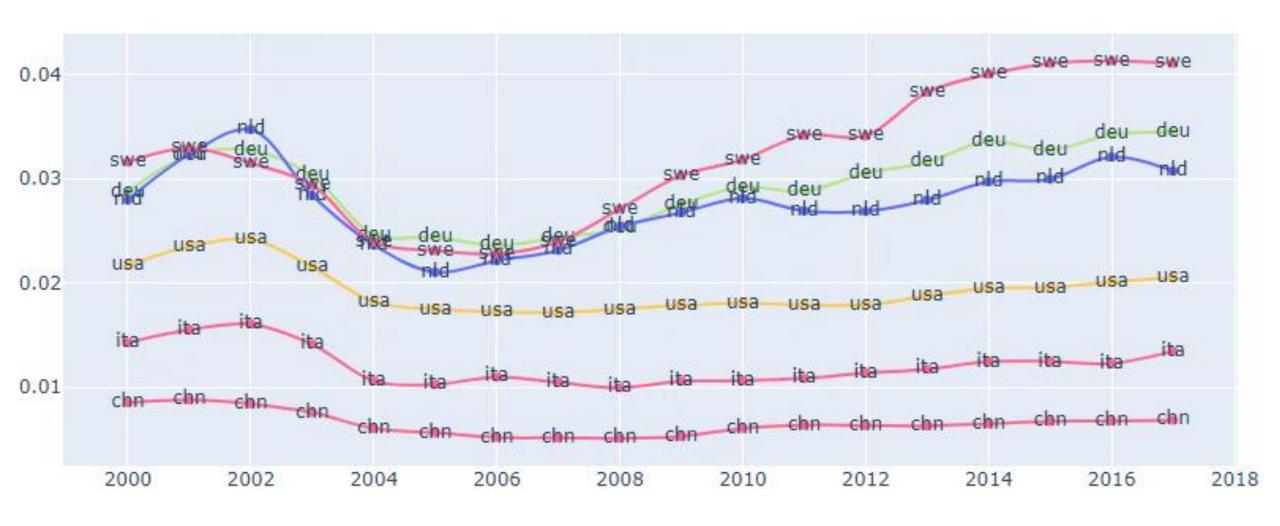
- The decision to migrate is done by each individual scholar for individual reasons
- Fortunately, we can look into the migration history of more than 17 (7.4) million published scholars!
- 760 000 of them moved at least once from one country to another.
- How many of those return to their country of academic birth? Are there differences by country?

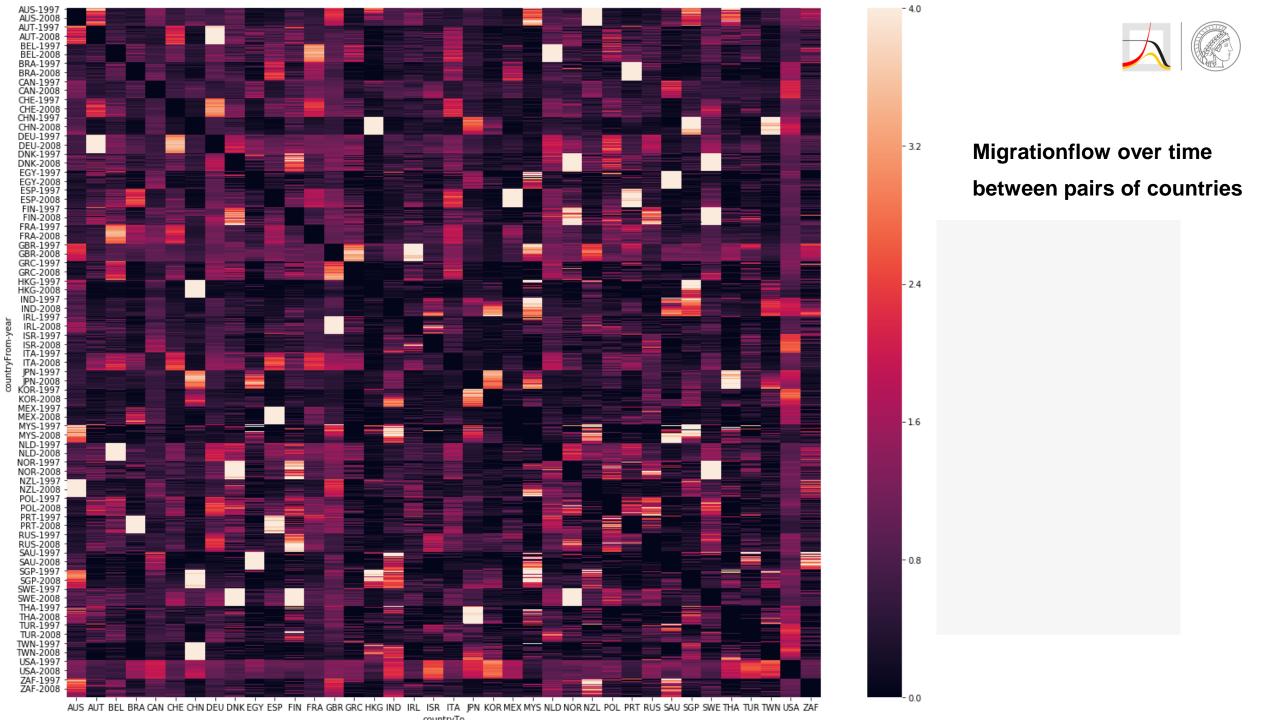
author_id	1997.0	1998.0	1999.0	2000.0	2001.0	2002.0	2003.0	2004.0	2005.0	2006.0	2007.0	2008.0	2009.0	2010.0	2011.0	2012.0	2013.0	2014.0	2015.0	2016.0	2017.0	2018.0	2019.0	2020.0	2021.0
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6503845527.0)					usa	gbr	gbr	usa																
6503845550.0	ind	ind					ind	ind	ind																
6503845626.0)					egy	egy	egy				egy	egy	egy		sau	sau	sau							
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6503845736.0)						nld	nld	nld	nld															
6503845768.0)					deu	deu	deu			che	che	che												
6503845799.0	idn									idn															
6503845890.0)			ita	ita	ita					ita	ita	ita												
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6503845988.0)												ita												
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6503846006.0)					isr	isr	isr		grc	grc	grc		grc	grc	grc	grc	grc							
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6503846140.0)			bgd	bgd	bgd		can	can	can	can	can	can	usa	usa	usa	mys	mys	mys	mys	mys	sau	gat		
6503846174.0)		esp		esp				esp																
6503846212.0)				nld	nld	nld		nld	nld	nld	usa	usa	usa	usa	usa	usa	nld	nld	1		1			
6503846248.0)					bra	bra	bra							bra	bra	bra	bra		bra	bra	bra	bra	bra	bra
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6503846448.0						tza	tza	tza	tza	tza	tza														



Examples of aggregated data

Inmigration rates for selected countries







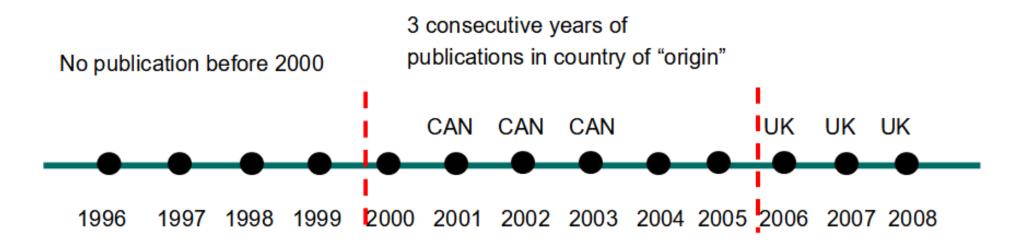
Return Migration Examples of aggregated data

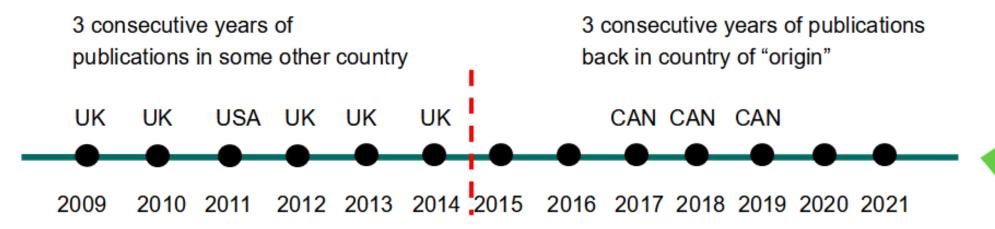


Adapted from: Author et al. (YYYY or publication status), Journal



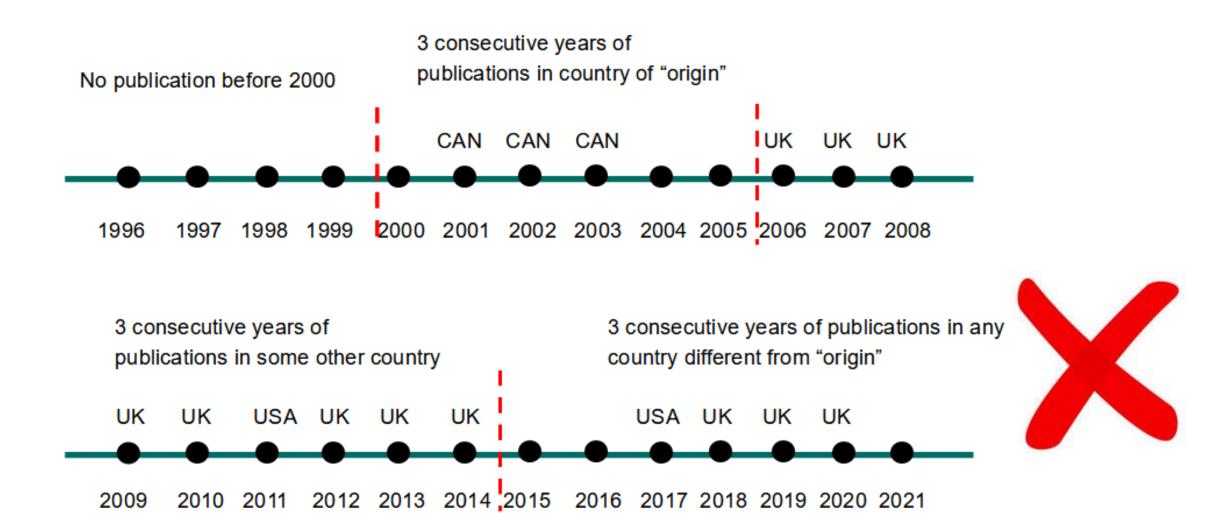
Return Migration - Identifying return migration - Numerator







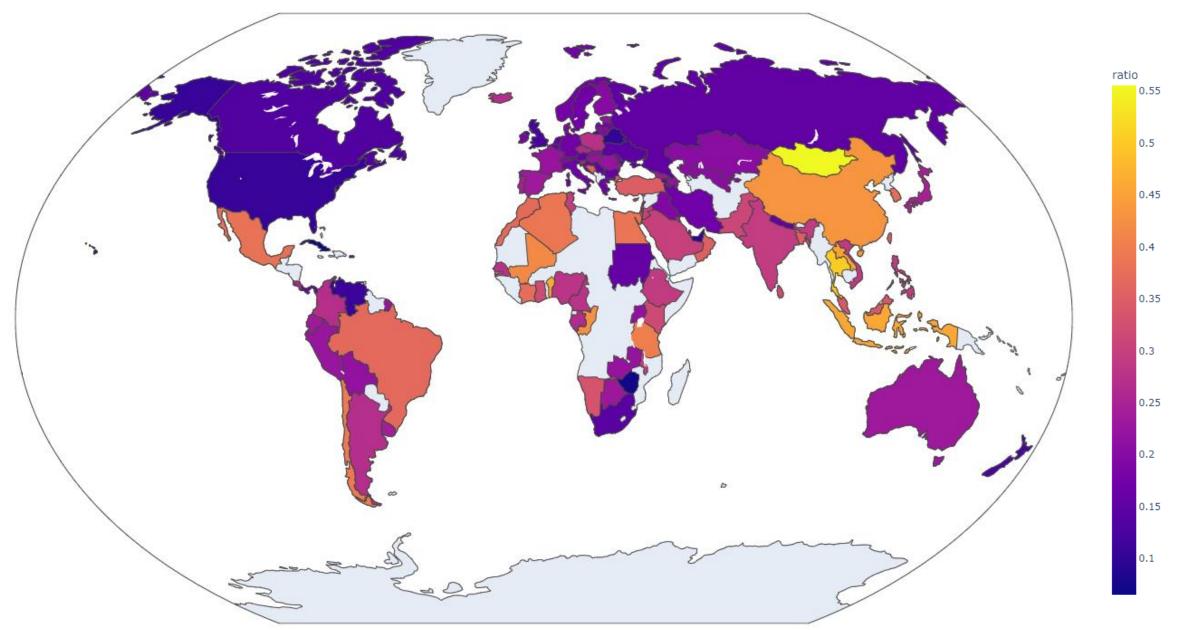
Return Migration - Identifying return migration - Denominator



Return Migration - Results



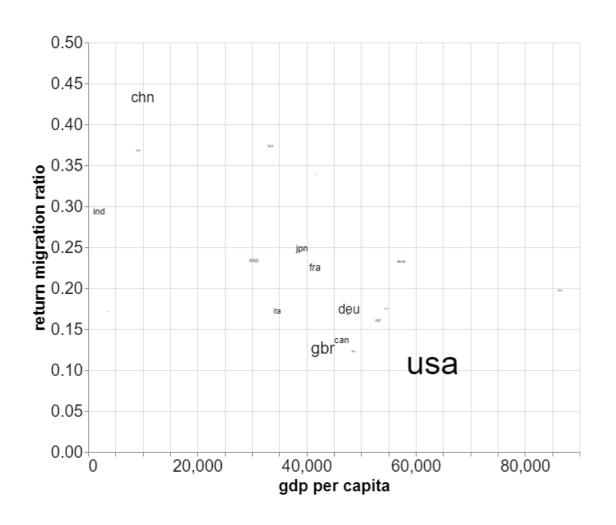


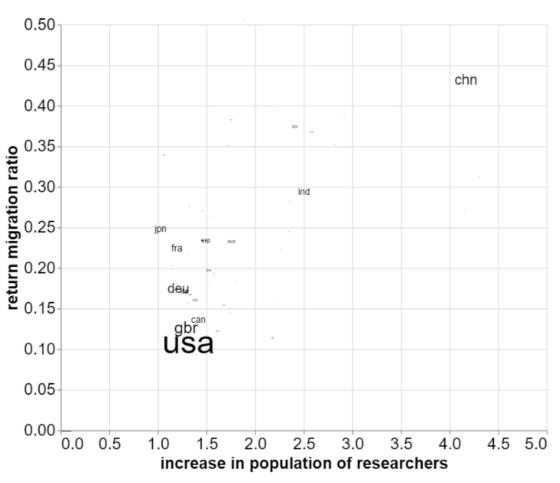






Return Migration - Results & Conclusion













Internal migration in Mexico

Andrea Miranda Gonzalez, UC-Berkeley

@Andrea_MirandaG







Andrea Miranda Gonzalez, UC-Berkeley: Internal migration of scholars in Mexico

Question: How has migration of scholars within Mexico changed **over time** and **between regions**?

- Why internal migration?
 - Lots of research on *international* migration, but we know that internal migration is more common
 - Provide framework to assess sub-national estimates of migration of scholars
 - **Policy:** Understanding where people move to and from allows us to identify regional deficits and areas of progress for investment in human capital.



Data:

Scopus authorship records with affiliations in Mexico (1.1M, 1996-2018)



Data processing: identify state of affiliation using rulebased algorithm and neural network



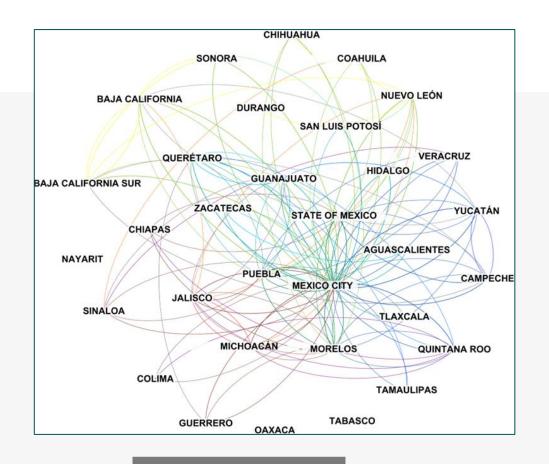
Migration rates and measures of redistribution

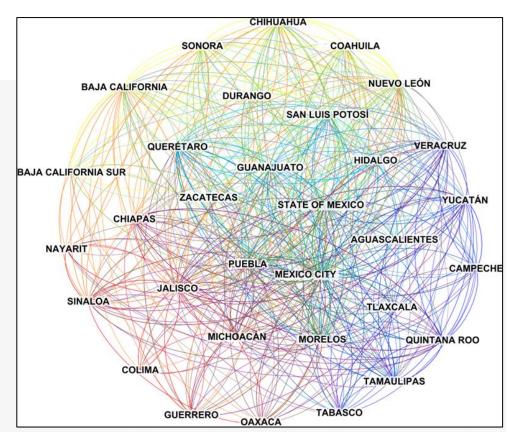
Migration networks and detection of communities





Migration as a network





1997-1998

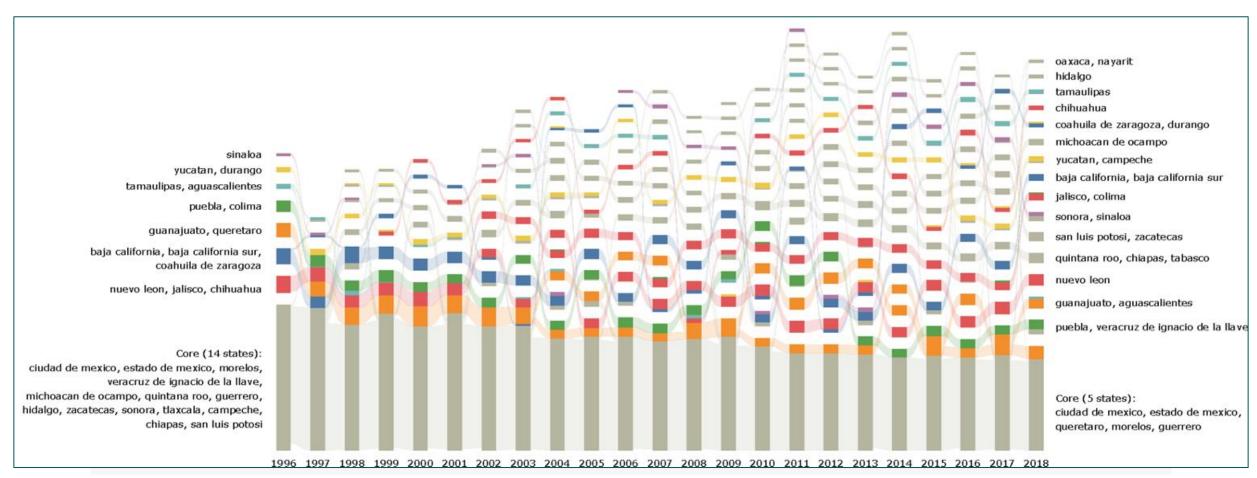
2017-2018

Adapted from: Miranda-González et al. (2020) EPJ Data Science





Detection of communities and changes over time: core and periphery



Adapted from: Miranda-González et al. (2020) EPJ Data Science



Conclusion

- We suggest a <u>framework to repurpose bibliometric data</u> and obtain migration estimates at a <u>sub-national level</u>
- We find that
 - There is heterogeneity in migration rates and patterns
 - Many mobile authors move to or through Mexico City during their academic life course, but there are other regions were mobility has increased
 - More communities and evidence of core-periphery structure.

The availability of large-scale bibliometric data allows us to track the migration of researchers in a way that has not been possible with traditional sources of migration data, like censuses and surveys.



Brexit's effect on scholarly migration to and from the UK

Asli Ebru Sanlitürk, MPIDR





Asli Ebru Sanlitürk, MPIDR: Brexit's effect on scholarly migration to and from the UK

Question: How did the Brexit referendum affect scholarly mobility patterns?

- The main aim is to analyze the scholarly migration patterns before and after the Brexit referendum (2016)
- Based on available data, we set the time frame of analysis as 2013-2019
- As we are focusing on the most recent part of data, right-censoring created an issue. To overcome this issue, we focus on *active researchers*, i.e. researchers whose residence country can be determined for each year between 2013-2019.
- N = 45,316. Selection criteria:
 - Internationally mobile
 - Ties with UK
 - Active researchers
- Random effects logistic regression model



Entering the UK



Descriptive analysis

Without restricting to active researchers

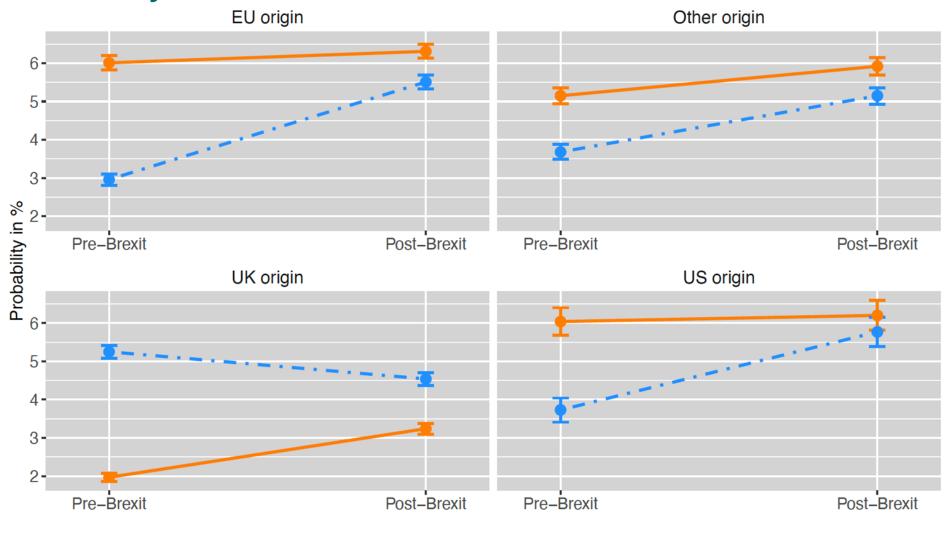
Leaving the UK Entering the UK Leaving the UK 50 -6000 -Number of Researchers Share of Researchers (%) Brexit referendum Brexit referendum Brexit referendum Brexit referendum 10-05 06 07 08 09 10 11 12 13 14 15 16 17 18 19 05 06 07 08 09 10 11 12 13 14 15 16 17 18 19 2013 2014 2015 2016 2017 2018 2019 2013 2014 2015 2016 2017 2018 2019 Year Year EU Country - Other — UK - USA EU Country • Other — UK • - USA

Change in the share of active researchers





Statistical analysis



Entering the UK - Leaving the UK



Conclusion

In our analysis on internationally mobile active researchers we do not observe a brain drain as an initial reaction to the result of the referendum, but a compositional change, which if continues, may diminish the academic diversity in the UK.

- Among the active researchers; the probability of leaving the UK increases after Brexit for all academic origin groups except for the UK academic origin.
 - EU academic origin: probability increases from 3% to 5,5% (increase by ~86%)
 - UK academic origin: probability decreases from 5,3% to 4,5% (decrease by ~14%)
- Probability of entering the UK increases for active researchers with UK academic origin (moving back to the UK) from near 2% before- to 3,2% after Brexit referendum (increase by ~65%).



Development and international scholarly migration

Maciej J. Dańko, MPIDR

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0



Maciej J. Dańko, MPIDR: Development and international scholarly migration

Question: Does economic development increase or decrease emigration rate of academic scientists?

Extensively studied relationship between level of development and emigration rate of entire populations

First emigration rate increases, but then it decreases with income / GDP (inverse U-pattern, e.g.
 Clemens and Mendola 2020).

However, migration processes are heterogeneous

Different population groups may have different patterns of emigration with income / GDP

Here we focus on one specific group

Active academic scientists vs. different measures of GDP

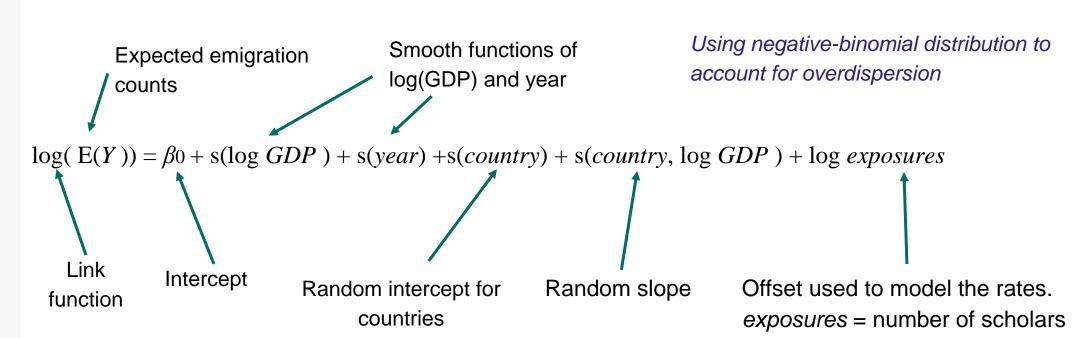




Statistical analysis

Goal: Estimate "baseline" pattern of emigration rate against log GDP using GAMM that "controls" for time and country-specific (random) effects.

Method: Generalized Additive Mixed Model (GAMM) allows to model non-linear relationships using penalized smooth functions "s()":



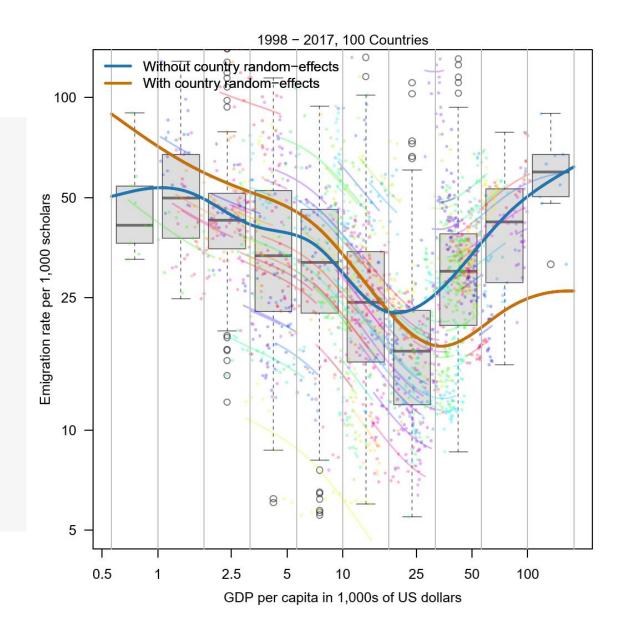




Main result

1998-2017 averaged emigration rates predicted by the model as a function of GDP per capita measured in 2017 constant international dollars at purchasing power parity.

The combined data for each year and country is plotted as a box plot, while the country- and year- specific data are plotted using colored dots. Each color represents a separate country.





Conclusion

We observe **opposite pattern** of emigration rates with GDP per capita among scholars than it was observed in total populations.

- First emigration rate decreases, but then it increases (U-pattern).
- Hypothesis:
 - Researchers living in poor countries are more willing to move to richer countries.
 - Richer countries offer relatively bigger number of available positions, promote hiring researches from poor countries, but also have higher circulation of researchers (e.g., due to short term positions).

Future research: role of gender, type of institutions, etc.





Gender perspective in international scholarly migration

Xinyi Zhao, MPIDR





• Xinyi Zhao, MPIDR: Gender perspective in international scholarly migration

Question: To what extent does gender inequality in international migration of German-affiliated researchers?



Xinyi Zhao, MPIDR: Gender perspective in international scholarly migration

Question: To what extent does gender inequality in international migration of German-affiliated researchers?

Research population: German-affiliated published researchers during the 1996–2020 period

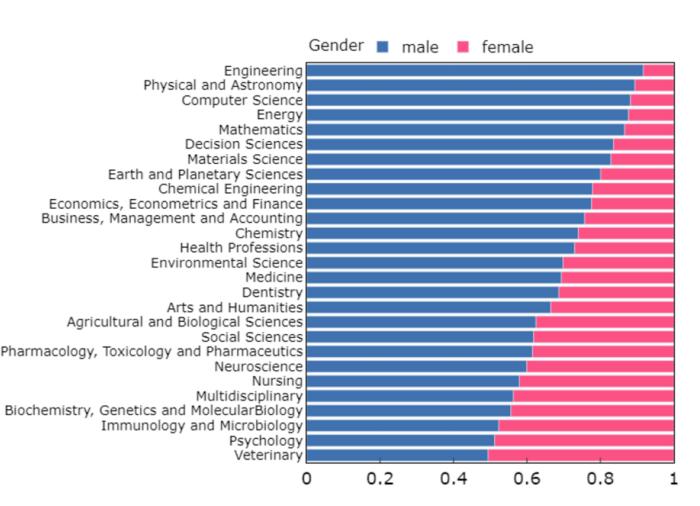
Process:

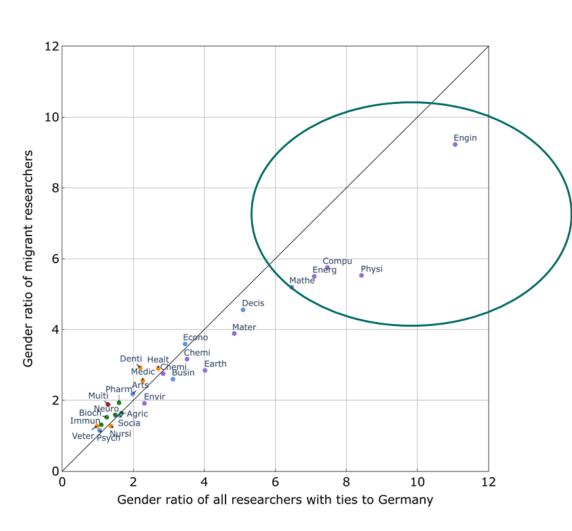
- Gender inference: Genderize.io
- Academic life: starting from the first publication
- International migrant: authors who have published in another country outside their country of origin
 - Outward researchers (origin: Germany; current country: not Germany)
 - *Returnees* (origin and current country: Germany; but with another country being the researcher's mode country at some point in time)
- Discipline inference:
 - All Science Journal Classification (ASJC) codes: 26 academic disciplines
 - o Topic modeling by inferring the latent topical structure of textual bibliometric data





Main result





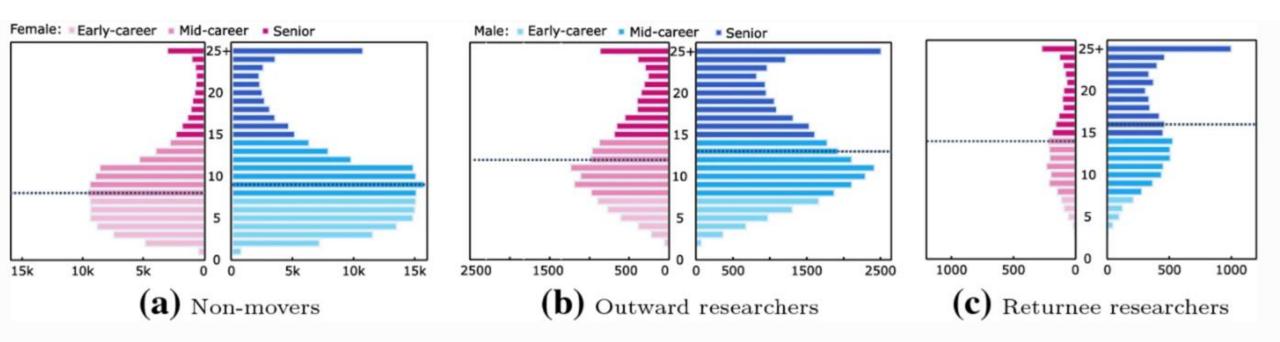
Zhao, X.Y., Aref, S., Zagheni, E., and Stecklov, G. (2021). "International migration in academia and citation performance: an analysis of German-affiliated researchers by gender and discipline using Scopus publications 1996-2020" In: Proceedings of the 18th International Conference on Scientometrics and Informetrics (ISSI 2021), Leuven, Belgium, July 12-15, 2021. Leuven: ISSI. https://arxiv.org/abs/2104.12380

 $gender ratio = \frac{Number of male researchers}{Number of female researchers}$





Main result



Composition of academic age and gender for non-movers, outward researchers, and returnees. Magnify all figures on the screen for higher resolution and more details



Conclusion

- We observed a majority of disciplines are dominated by male researchers in Germany, however,
 international mobility may play in helping to moderate some of the most extreme gender disparities.
- Male researchers always have longer academic life than females, however, international migration, especially returning after the experience of international migration will help prolong the academic life of female researchers in Germany.
- Both the outward and the returnee subpopulations in most disciplines were more male-dominated,
 female migrant researchers are less likely to return to Germany relative to their male counterparts.





Integrating internal and international scholarly migration worldwide

Aliakbar Akbaritabar, MPIDR

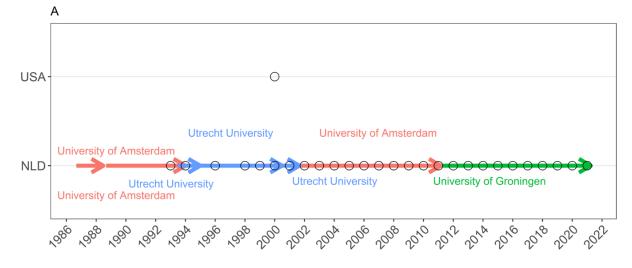
Aliakbar Akbaritabar, MPIDR: Integrating internal and international scholarly migration worldwide

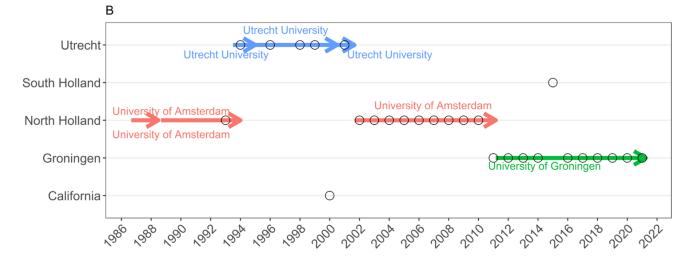


Question:

Do scholars have a higher propensity to migrate inside the countries or to international

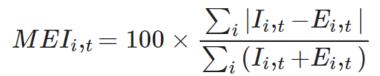
destinations?

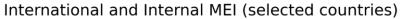


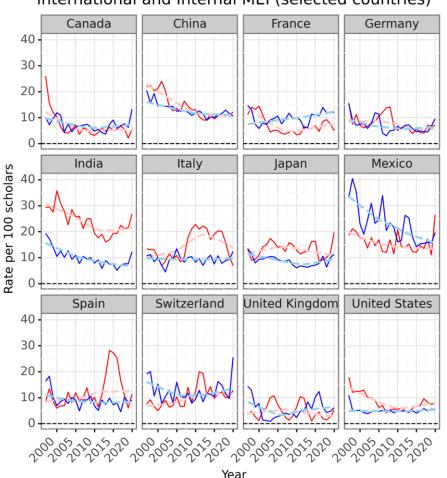


Internal scholarly migration is more effective in some countries

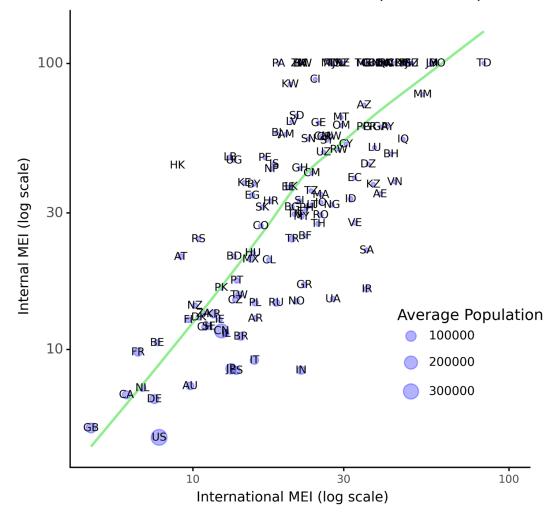








International and Internal MEI (worldwide)







Conclusion

- A macro and micro global database of scholarly mobility is built.
- Internal and/or/versus international scholarly mobility investigated together.
- Disambiguation of authors and organization names (and addresses) are crucial.
- Collaboration and internationalization are extremely effective.
- Gender and Disciplinary differences needs to be investigated (e.g., if women have higher propensity for internal migration?).
- Individual level comparison of CV profiles using ORCID vs. Scopus will be the next step.
- Higher intensity does not always mean higher effectiveness
- Scholarly migration is clearly more an internal phenomenon than international

IN THE PIPELINE... DATA FOR ALL!





Scholarly Migration Database

Quantifying the Mobility of Scholars





IN THE PIPELINE...

- We will announce SMD's beta website using participants' emails
 - So please share your email address with us (write to:
 scholarlymigration@demogr.mpg.de
 and include "[sign-up for
 SMDatabase]" in subject line), if we do not have it yet!





