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The Invernizzi Center for Research on Innovation, Organization and Strategy

Faculty of Geosciences

Andrea Morrison

Migration and Innovation in the Age of Mass Migration: an evolutionary perspective

John von Neumann University
Kecskemét, 18–19 October 2018

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What is the impact of migration on economic performance?

The New York Times

Donald Trump Wants to Cut Visa Program He Used for His Own Models

By Ron Nixon

Aug. 16, 2016

WASHINGTON — On the campaign trail, Donald J. Trump has excoriated the nation's visa program for high-skilled workers as a job killer, pledging to end it with

Rising number of international students 'worrying' – Dutch student union

SI NEWS

By Study International Staff (https://www.studyinternational.com/news/author/study-international-staff/) | March 11, 2018

92
SOCIAL BUZZ

Dutch student union LSVb has criticised the rising intake of international students into the Netherlands this year, calling it a "worrying" trend.

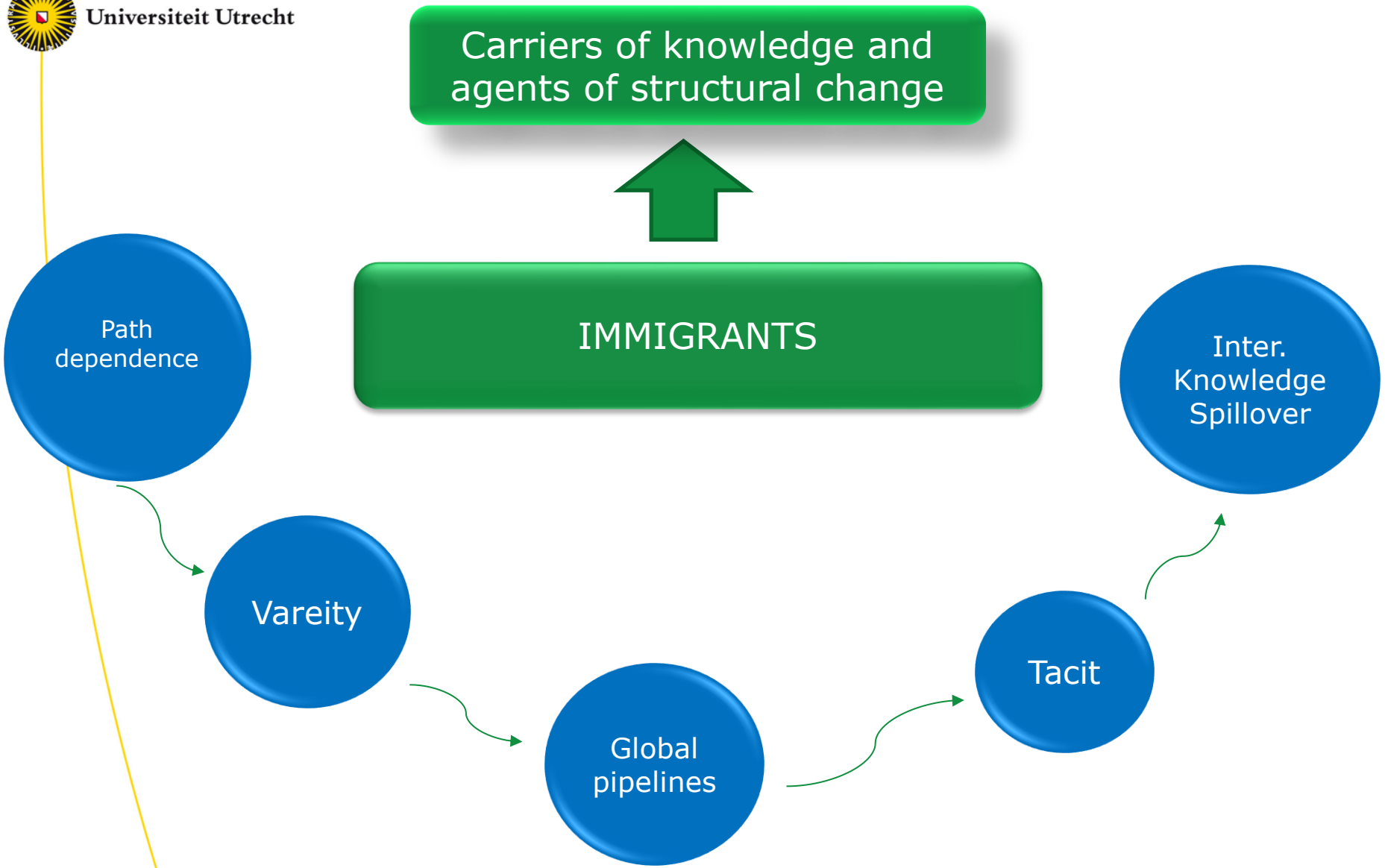
Born Hungarian, died US

Economic reasoning

Crowding-out

- Immigration increases labour supply, and reduces wages / productivity
- Native reacts to inflow of immigrant by moving out the labour market (competition effect)

  - Borjas, 2003


Carriers of knowledge and agents of structural change
IMMIGRANTS
Path dependence
Vareity
Global pipelines
Tacit
Inter. Knowledge Spillover

Age of Mass migration - US

- Between 1860 and 1920 more than 30 millions Europeans migrated to the US (Ward, 1987)
- 40% of today US population descends from these waves of immigrants (Bandiera el al 2013)
- Different waves:
  - 1st 1830s/40s: northern Europeans (e.g. Ireland, Germany and England)
  - 2nd 1850s/80s: German and Scandinavian
  - 3rd >1880 till 1920: South and Eastern European (e.g. Italian, Russian), 40% of total foreign born
- Foreign born population from 5% to 14% (1850-1920)

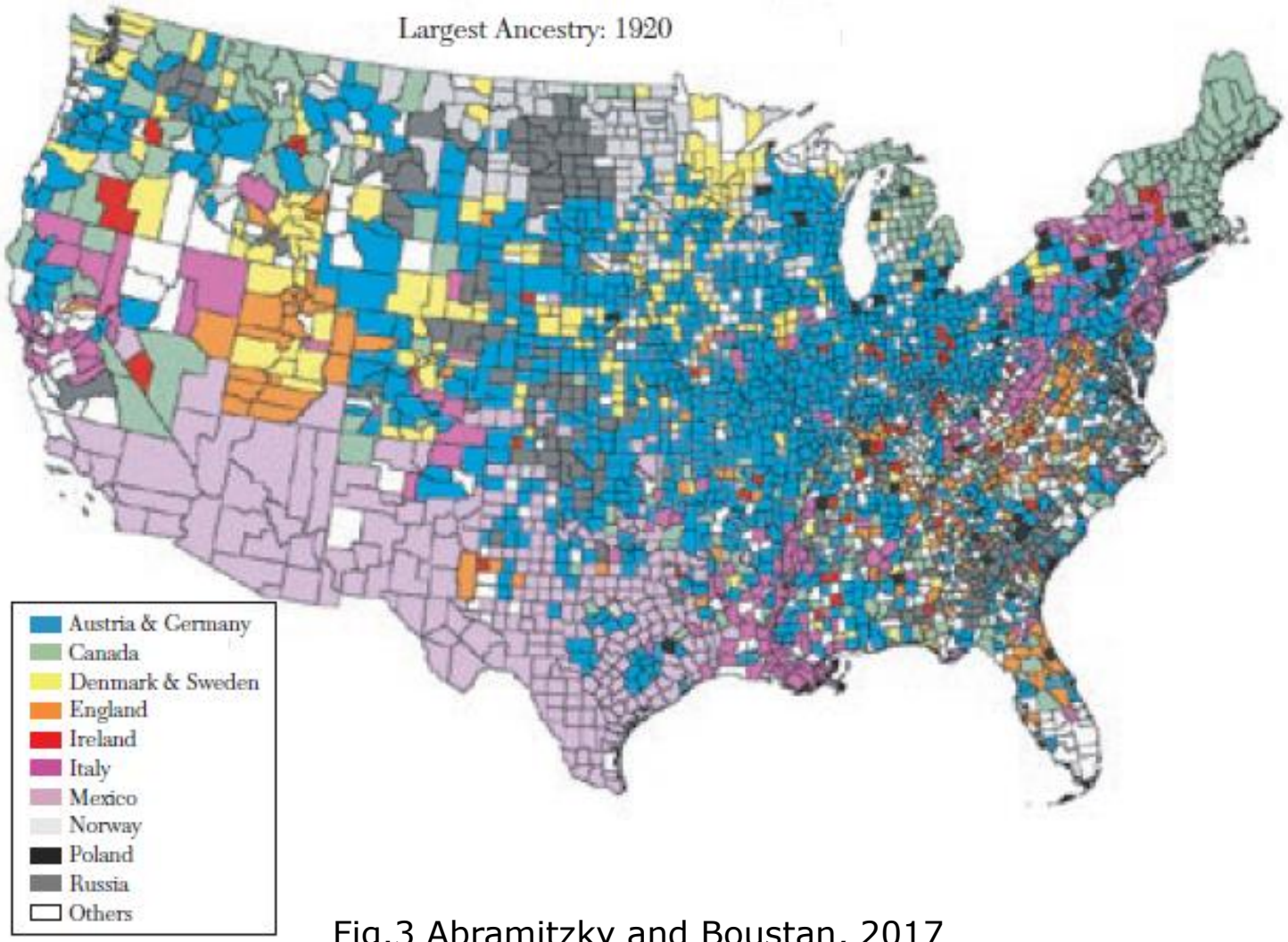


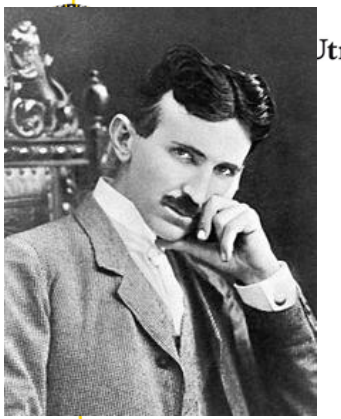
Fig.3 Abramitzky and Boustan, 2017

- Immigrants clustered in space

Economic impact of immigration

- Mass immigration affected the diversity of the working population (Hatton and Williamson, 1998)
- Cities with higher share of immigrants performed better (Rodriguez-Pose and Berlepsch 2014; Siqueira et al. 2017)
- Cultural diversity of immigrants favoured output growth (Ager and Bruckner, 2013)
- Immigrant impacted positively on natives employment and occupational standing (Tabellini, 2017)

➢ Inventor immigrants contributed to the long term development of emerging technological fields (Akcigit et al. 2017)



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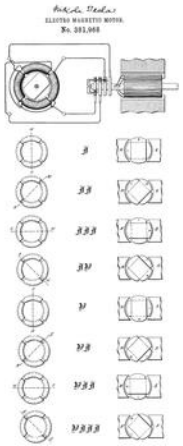
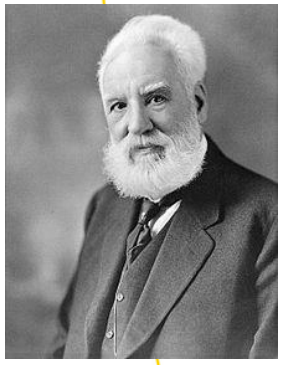
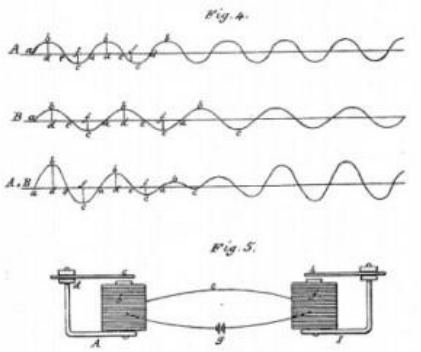


Nikola Tesla, Serbian

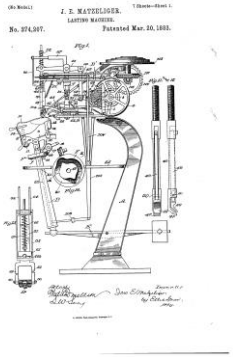
U.S. Patent 381,968,
alternating induction motor





Alexander Graham Bell, Scottish

1876 U.S. Patent No. 174465,
Improvement in Telegraphy



Jan Ernst Matzelige, Dutch

US patent No. 274207
'lasting' machine 1883

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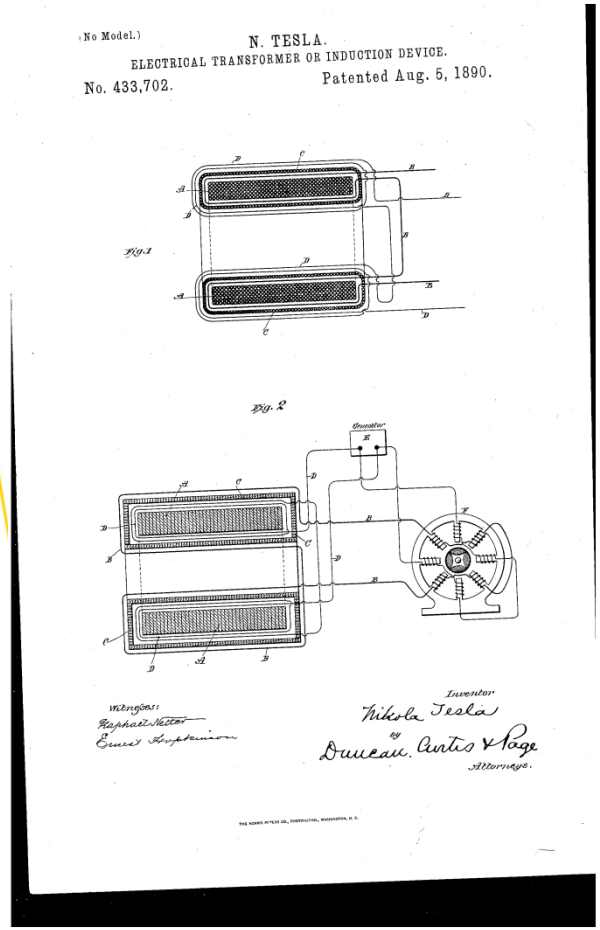
HistPat-InvMig



(No Model.)

N. TESLA.

ELECTRICAL TRANSFORMER OR INDUCTION DEVICE.

No. 433,702. Patented Aug. 5, 1890.

Fig. 1

Fig. 2

Witnesses:
Raphael Netter
Emil Kupferman

Inventor
Nikola Tesla
by
Duncan, Curtis & Page
Attorneys.

To all whom it may concern:

Be it known that I, NIKOLA TESLA, a subject of the Emperor of Austria-Hungary, from Smiljan, Lika, border country of Austria-Hungary, residing at New York, in the county and State of New York, have invented certain new and useful Improvements in Electrical Transformers or Induction Devices, of which the following is a specification, reference being had to the drawings accompanying and forming a part of the same.

- Foreign nationality
- US residency
- 55,000 patents;
- 25,000 inventors

Extracted from Histpat (Petralia, Balland & Rigby, 2016)

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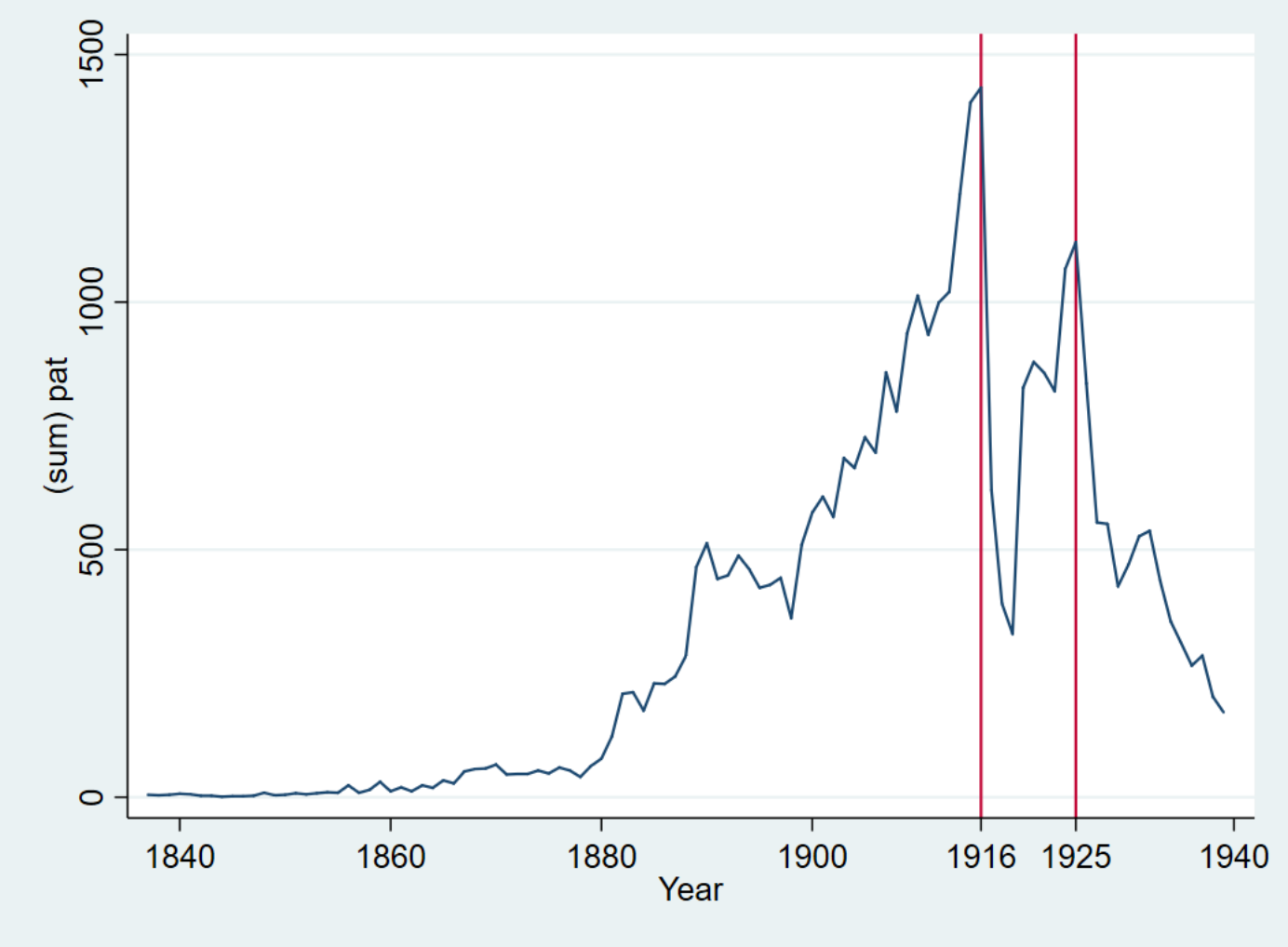
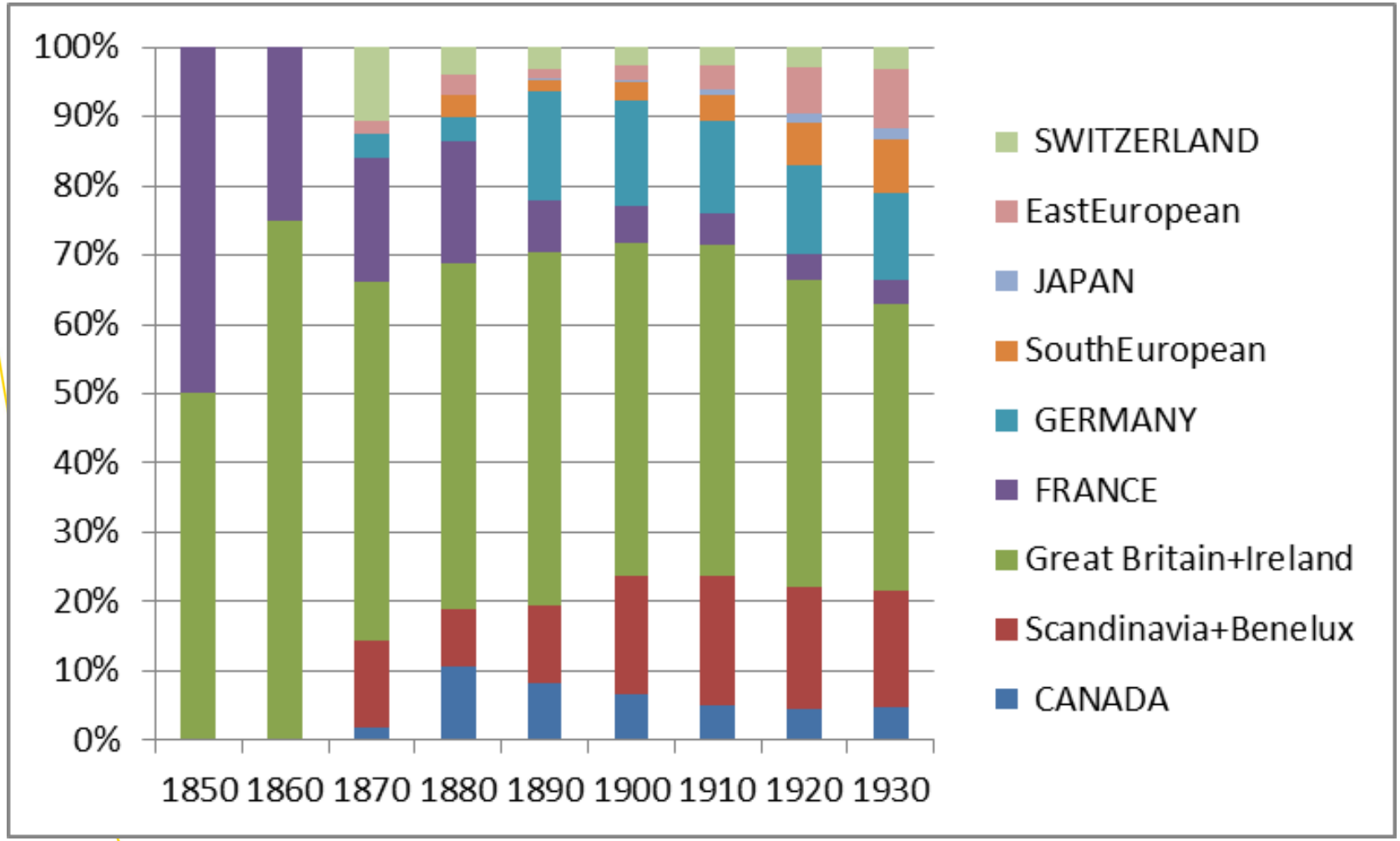
Yearly patenting



Immigrants patenting by decade & country of origin



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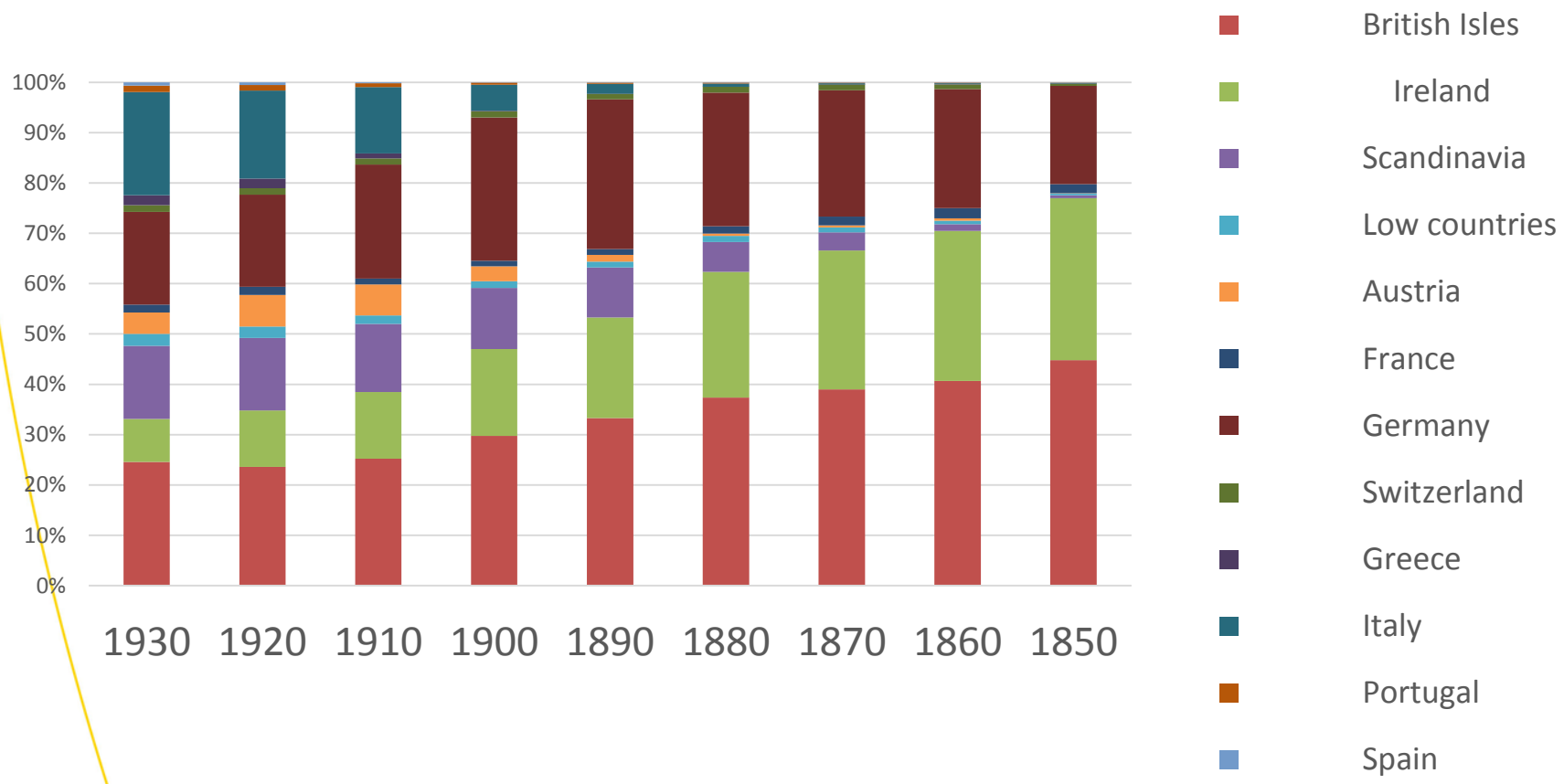
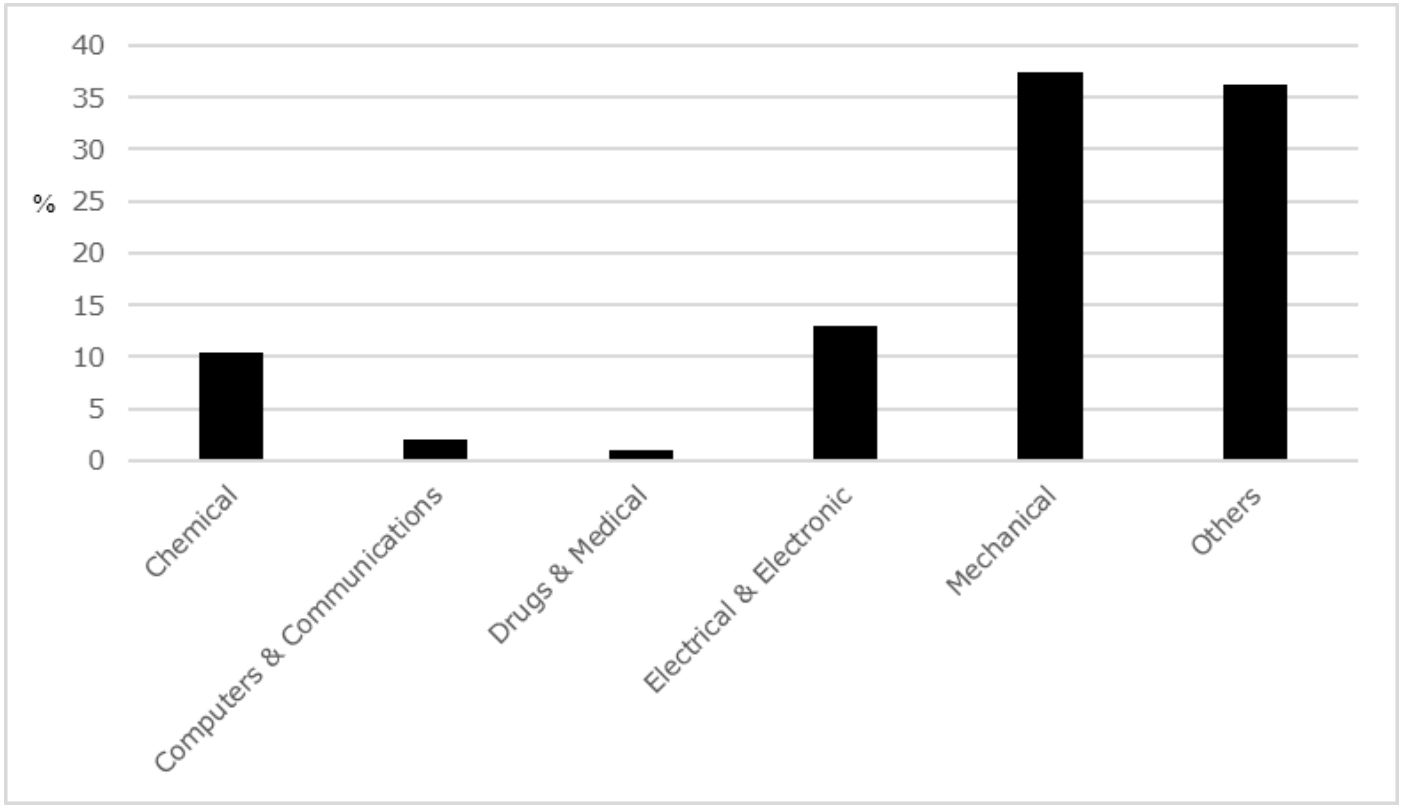
Waves of migration



Top patenting countries

Country	N	%
GB	17795	46.16
Germany	6188	16.05
Sweden	2753	7.14
Russia	2494	6.47
Austria	1828	4.74
Italy	1420	3.68
Switzerland	1041	2.70
Norway	858	2.23
Denmark	840	2.18
Canada	800	2.08

Patenting of immigrant inventors by NBER sector



Top tech. classes of inventor migrants

Classes	Specialization
Electrical & Electronic	1.64
Computers & Communications	1.22
Chemical	1.14
Mechanical	1.09
Drugs & Medical	1.03
Others	0.86

Do immigrants affected US innovation performance?

$$lnPat_{nat,krt} = \beta_1 lnPat_{mig,krt} + \beta_2 Pop_{rt} + \gamma_t + \varphi_{kr} + \varepsilon_{krt},$$

- Pat_{nat}= number of patents by natives
- Pat_{mig}= number of immigrant inventors patents
- γ_t= year fixed effects
- φ_{kr} = technological class(k)*(r)region fixed effects

Identification - Bartik shift-share IV

$$\sum_{c=1}^{C} ShareMigrants_{c,r,t-1} MigrantInventors_{c,k,t}$$

- $ShareMigrants_{c,r,t-1}$ = share of non-inventors immigrant from country *c* to location *r*
- $MigrantInventors_{k,t}$ = change of immigrant inventors to the US in tech class *k*

Share immigrants of top ranked inventors cities

City	%	Rank inventors
New York	42,08	1
Chicago	41,82	2
Detroit	36,78	6
San Francisco	35,30	7
Boston	34,8	3
Worcester	31,6	8
Pittsburgh	27,8	5
Philadelphia	26,46	4
Albany	26,13	9
Los Angeles	20,47	10

The relationship between US and immigrant patenting

	OLS		IV	
	Pat_{nat}		Pat_{nat}	1^{st} $stage_{nat}$
VARIABLES	1	2	3	4
$lnPat_{mig}$	0.384***	0.360***	0.846***	
	[0.0483]	[0.0419]	[0.0718]	
lnPop		7.08e-11***	-0	2.59e-10***
		[0]	[0]	[1.59e-11]
Iv				0.158***
				[0.0097]
Observations	8,063	8,063	5,426	5,426
R-squared	0.838	0.839	0.818	

Did they bring knowledge from their home country?

$$lnPat_{i,kr,t+1} = \beta_1 E_{krt} + \beta_2 Pat_{krt} + \gamma_t + \varphi_{kr} + \varepsilon_{krt}$$

$$\Delta lnPat_{i,kr\{t \to t+1\}} = \beta_1 E_{krt} + \beta_2 Pat_{krt} + \gamma_t + \varphi_{kr} + \varepsilon_{krt}$$

- $lnPat_{i,kr,t+1}$= total and natives patent in t+1
- $E_{mig,krt}$= Expertise of inventor immigrants
- $\Delta lnPat_{tot,kr\{t \to t+1\}}$ = Total patent growth rate
- γ_t= year fixed effects
- φ_{kr} = region*technological class fixed effects

National Expertise

$$E_{krt} = \sum_{c=1}^{C} \frac{P_{ckt}}{P_{ct}} M_{crt}$$

- $\frac{P_{ckt}}{P_{ct}}$ = share of patents in tech class *k* of <u>foreign</u> inventors from country *c*
- M_{crt} = inventor migrants of country *c* in location *r* at time *t*

  - see also Akgicit et al 2017;

The relationship between foreign expertise and US total patenting

	Total Patents$_{t+1}$		
	OLS		IV
VARIABLES	1	2	3
Foreign expertise	0.0307***	0.0157***	0.0167***
	[0.00899]	[0.00471]	[0.00333]
Patents$_t$		0.00343***	0.00342***
		[0.000824]	[0.000484]
Observations	162,007	162,007	121,659
R-squared	0.781	0.782	0.803

The relationship between foreign expertise and US native patenting

	Native Patents$_{t+1}$		
	OLS		IV
VARIABLES	1	2	3
Foreign expertise	0.0222***	0.0109***	0.0111***
	[0.00670]	[0.00325]	[0.00220]
Patents$_t$		0.00266***	0.00217***
		[0.000754]	[0.000381]
Observations	161,783	161,783	121,436
R-squared	0.787	0.787	0.810

The relationships between foreign expertise and total patent growth

	Total Patent Growth		
	OLS		IV
VARIABLES	1	2	3
Foreign expertise	0.00660***	0.0132***	0.0125***
	[0.00169]	[0.00286]	[0.00313]
$Patents_t$		-0.00268***	-0.00303***
		[0.000384]	[0.000782]
Observations	1,881	1,881	1,545
R-squared	0.622	0.632	0.646

Conclusion

- Immigrant inventors have a positive impact on US inventive activity:
  - they bring knowledge from their home country;
  - they generate new knowledge in the host country
  - ➢ they increase the productivity of US native inventors.

Open issues

- Impact at destination still debated
  - Additional evidence (beyond US)
- Long term impact is only partially addressed
  - Matching individual census-patent data
- Composition of HS immigration
  - Polarization vs diversity
- Policy
  - "Industrial" selective policies to attract HS migrants?
  - Impact on sending countries: brain gain/drain debate

Thank you

a.morrison@uu.nl

Morrison,Petralia and Diodato 2018

http://econ.geo.uu.nl/peeg/peeg.html

Rank of immigrant inventors by country of origin

Country	% inventors	Rank
GREAT BRITAIN	28,89	1
GERMANY	14,02	2
SWEDEN	10,89	3
AUSTRIA	8,24	4
RUSSIA	7,56	5
ITALY	6,88	6
CANADA	4,43	7
POLAND	3,22	8
FRANCE	3,08	9
SWITZERLAND	2,84	10
DENMARK	2,46	11
JAPAN	1,83	12
GREECE	0,89	13
CZECHOSLOVAKIA	0,85	14

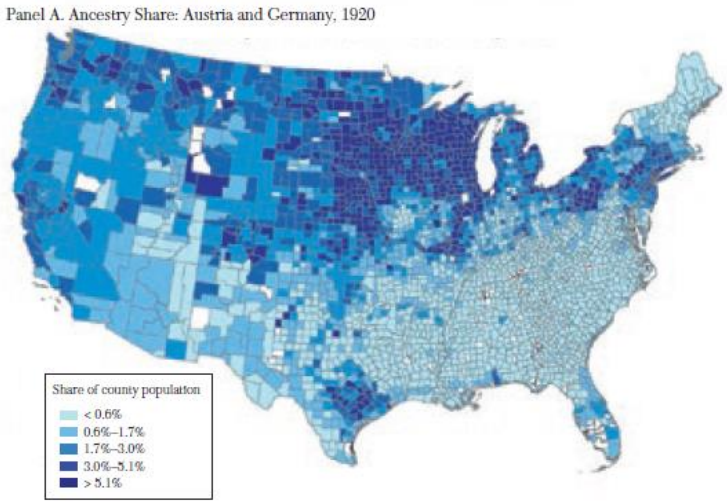
Top US inventive states

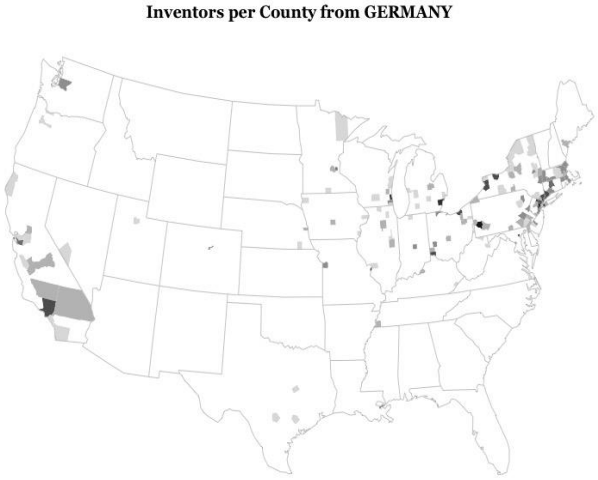
State	% patents	rank
New York	38,42	1
Pennsylvania	10,32	2
Illinois	9,39	3
Massachusetts	7,95	4
New Jersey	7,34	5
California	4,39	6
Michigan	3,86	7
Ohio	3,72	8
Connecticut	2,38	9
Wisconsin	1,96	10

Top inventors by country of origin

Name	N	Country
Ernest Wildhaber	302	Switzerland
Charles P Steinmetz	188	Germany
Edward Weston	184	GB
Bengt M W Hanson	182	Sweden
Kurowski Alfred G F	167	Germany
Lindenblad Nils E	130	Sweden
Ernst F W Alexanderson	125	Sweden
Jonas Northrop	124	GB
Chilton Roland	122	GB
Zublin John A	116	Switzerland
Nicolson Alexander Mclean	116	GB
Nikola Tesla	96	Austria

Germans





Italians

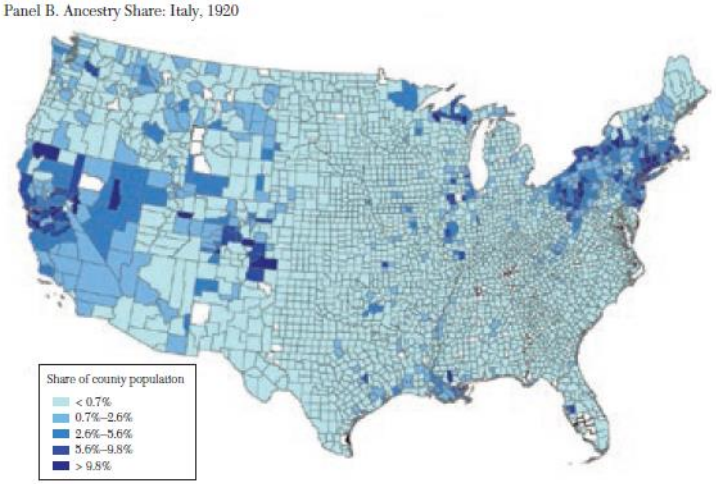


Fig.4 Abramitzky and Boustan, 2017

Data

- HistPat (Petralia, Balland & Rigby, 2016)
  - Number of tech classes: 436
  - Number of counties: around 3,000
  - Around 3,000,000 US patents from 1836 to 1975
  - Building HistPat
    - Identify location in digitized patents (from Google Patents)