

The Battle for Brains: How to Attract Talent

Simone Bertoli, Herbert Brücker, Giovanni Facchini,
Anna Maria Mayda and Giovanni Peri

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“I want to emphasize that to address the shortage of scientists and engineers, we must do both – reform our education system and our immigration policies. If we don’t, American companies will simply not have the talent they need to innovate and compete.”

Bill Gates, Testimony at the U.S. House of Representatives Committee on Science and Technology on March 12, 2008

1 Introduction

- OECD countries increasingly realize the economic rationale for skill-selective immigration policies
- However, only few countries have immigration policies which systematically select highly skilled immigrants in place at present
- Immigration policy reforms are characterized by a status quo bias, which may change against the background of skill-biased technological change, increasing specialization on human capital intensive activities and aging in the future

Key questions

- Which economic, legal and institutional factors determine highly skilled migration?
- What is the impact of the brain gain on economies in receiving countries?
- Why do so few countries adopt skill-selective immigration policies at present?
- What will happen if the “battle for brains” unfolds in the future? Do we need a coordination of immigration policies?

Contents

- The evolution of skill-selective immigration policies
- Stylized facts on the brain gain
- Determinants of the brain gain
- Economic benefits from the brain gain
- The political economy of skill-selective immigration policies
- Looking into the future: What happens if the “battle for brains” unfolds?

2 Skill-selective immigration policies

Two approaches

- “Immigrant driven” systems
 - The immigrant is selected on basis of desirable attributes, and he/she is admitted without necessarily having a job offer. Typically they use point systems
- “Employer driven” systems
 - The highly skilled worker is admitted only if he/she has received an offer of employment

Immigrant driven systems

- Point based systems first introduced in CA in 1967, then in AUS (1989) and NZ (1991)
- To be admitted migrants needs to meet a “pass rate”
- Typically points are attributed to five criteria
 - Education
 - Occupation
 - Work experience
 - Language proficiency
 - Age
- Additional criteria are prior work in destination country; education acquired in destination country, settlement stipulations etc.

Employer driven systems

- Employers are key players. They sponsor application for admission of a foreign worker
- Typically they need to carry out a labour market test, to establish the non-availability of a similarly skilled domestic worker
- Example: H1B visa program in USA

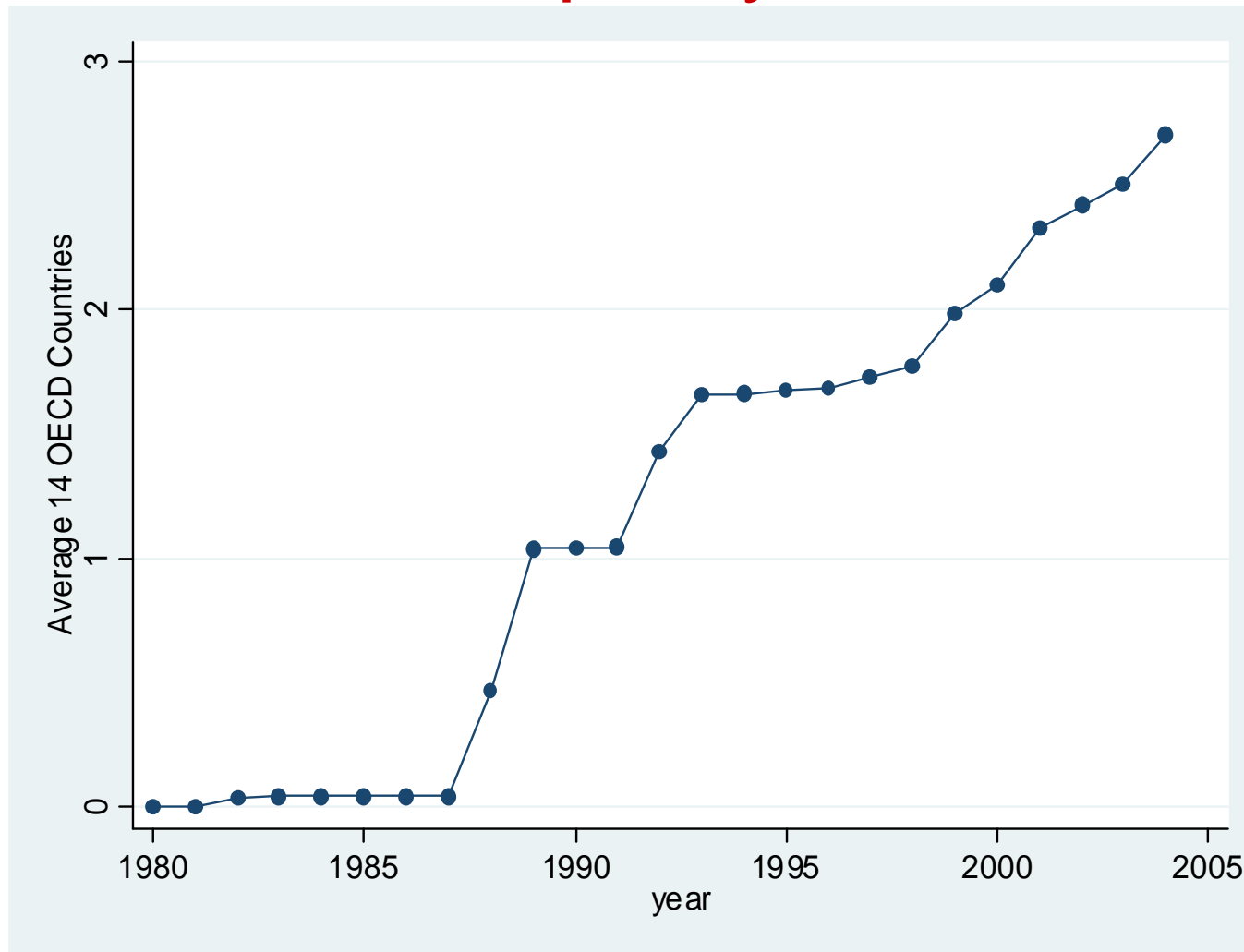
Skill selective policies in EU

- EU “blue card” initiative
 - Attempt to draft a common policy to attract highly skilled foreign immigrants, but only limited in scope. In particular, no coordination in terms of setting specific admission criteria
 - But some steps forward
 - Common broad criteria to qualify for admission under highly skilled immigration program
 - While movement within the EU of blue card holder is limited for first two years, it becomes more open thereafter

EU latecomers

- **UK** implemented two-tier point system in 2008. Under Tier 1 highly skilled can apply without job offer, under Tier 2 medium and high skilled with job offer at hand
- **Germany** has devised a “green” card program to attract highly skilled workers from abroad, but quota has never been filled
- **Italy** does not have a policy to actively select highly skilled workers. Only specific program in place is focused on domestic helpers and care workers
- **Spain** has introduced quota system in 1993, which targets specific occupations/sectors experiencing a shortage. But this policy measure has been completely overshadowed by illegal immigration

Evidence from fRDB data base: Skill-selective policy reforms



Source: Own compilation based on fRDB data base on immigration policies.

Evidence from UN survey data

- In 2007 UN have carried out survey of member countries governments to investigate nature of policies in place towards skilled immigrants
- Officials in only five countries (Bhutan, Botswana, Jordan, Saudi Arabia and UAE) report to have policies in place to reduce inflows of highly skilled workers
- 59% of respondents report to have policies to maintain current inflows of highly skilled, and 25% of respondents report instead policies which are aimed at increasing the number of skilled immigrants
- The battle for talents is beginning!

3 The size of the brain gain

- We address six questions:
 - How big is the global pool of talent?
 - Which OECD countries gain, which countries lose talent through migration?
 - Is the immigrant population favourably skill-selected with respect to the home and host population?
 - Is the admission of foreign students an important gateway for highly skilled immigration?
 - Do we observe at the top of the skill and occupational distribution different patterns?
 - Do highly skilled immigrants earn less than highly skilled natives?

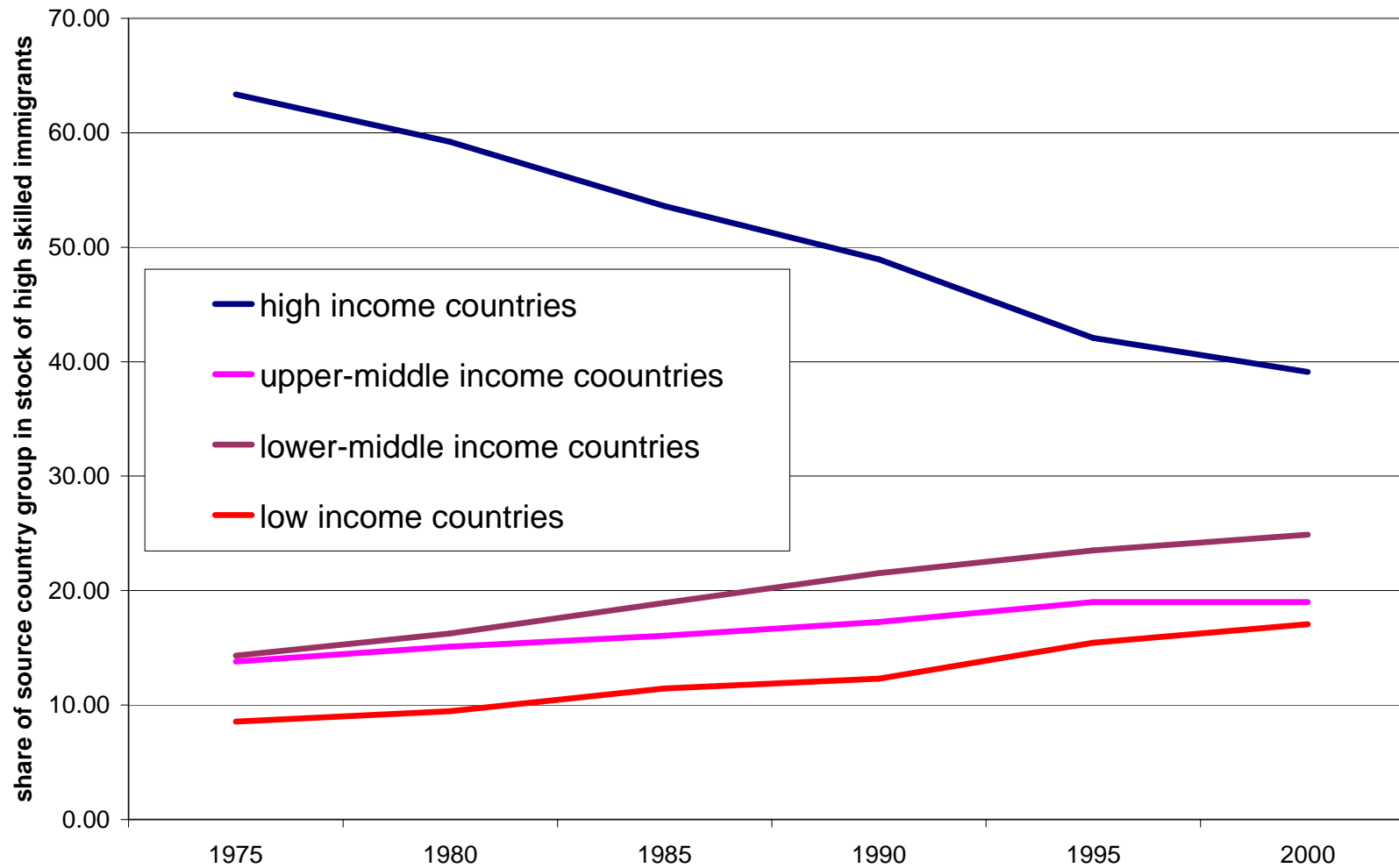
Data sources and limitations

- New data sets provide information on tertiary educational attainment of immigrants by country of origin relative to host and home population
 - Docquier/Marfouk (2006); Beine et al. (2007); Defoort (2009)
- Derived from census and LFS data
- Problems
 - Rough classification of highly skilled education level
 - Human capital partially or entirely acquired in host countries (“educational inlanders”)
 - Limited transferability of human capital
 - Latest data refer to 2000/01 census
- Complementary information on top of skill and occupational distribution from census and OECD sources used here

The global pool of talent

- About 338 million people with tertiary education
 - 191 million in high income countries
 - 29% of 25+ home population
 - 56 million in upper middle income countries
 - 12% of 25+ home population
 - 80 million in lower income countries
 - 5% of 25+ home population
 - 12 million in low income countries
 - 3% of 25+ home population
- Share of high income countries declines and that of emerging economies increases (e.g. South and East Asia)

Declining share of rich countries in global pool of highly skilled, 1975-2000

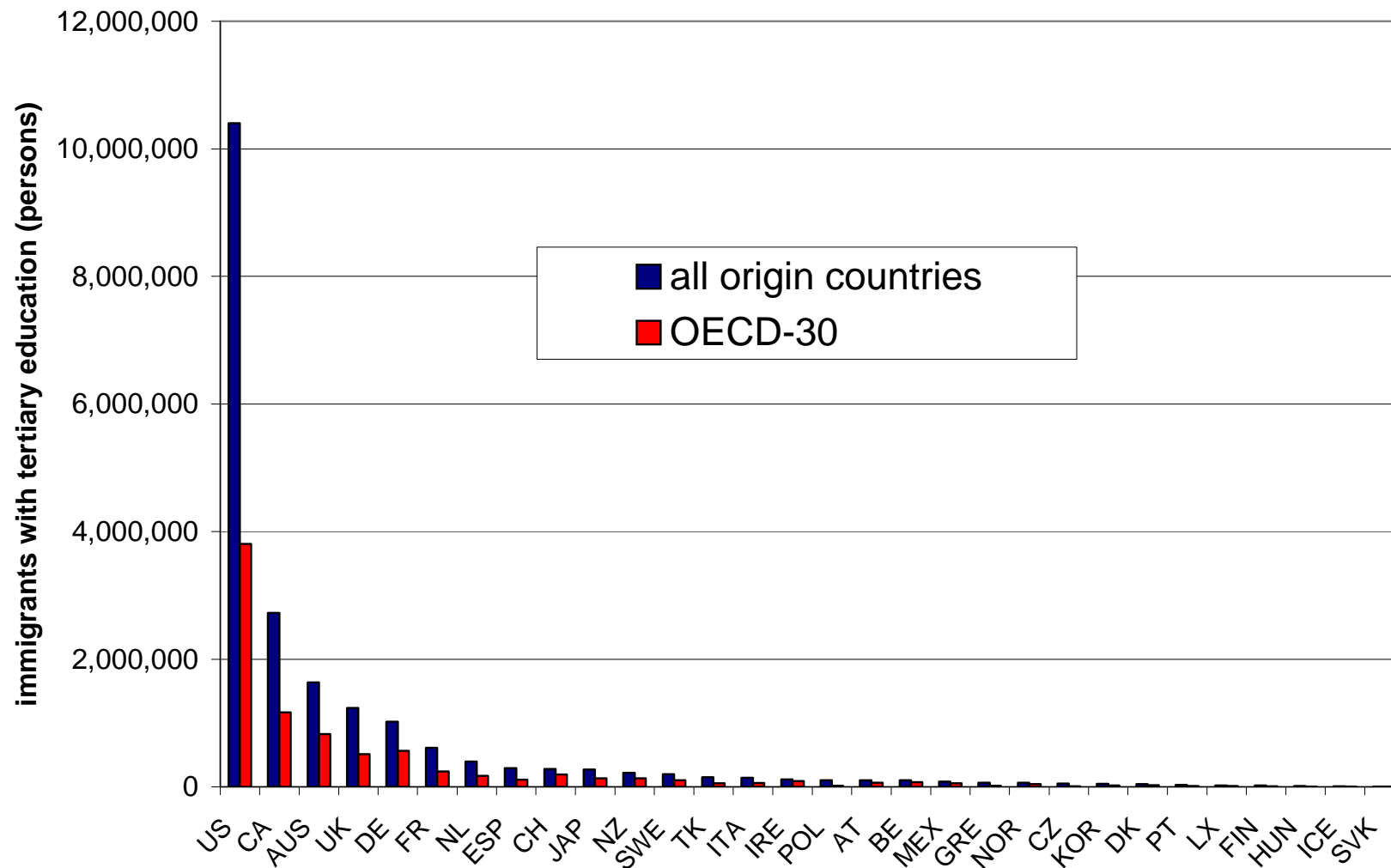


Source: Own calculations based on Defoort (2009).

Who wins, who loses?

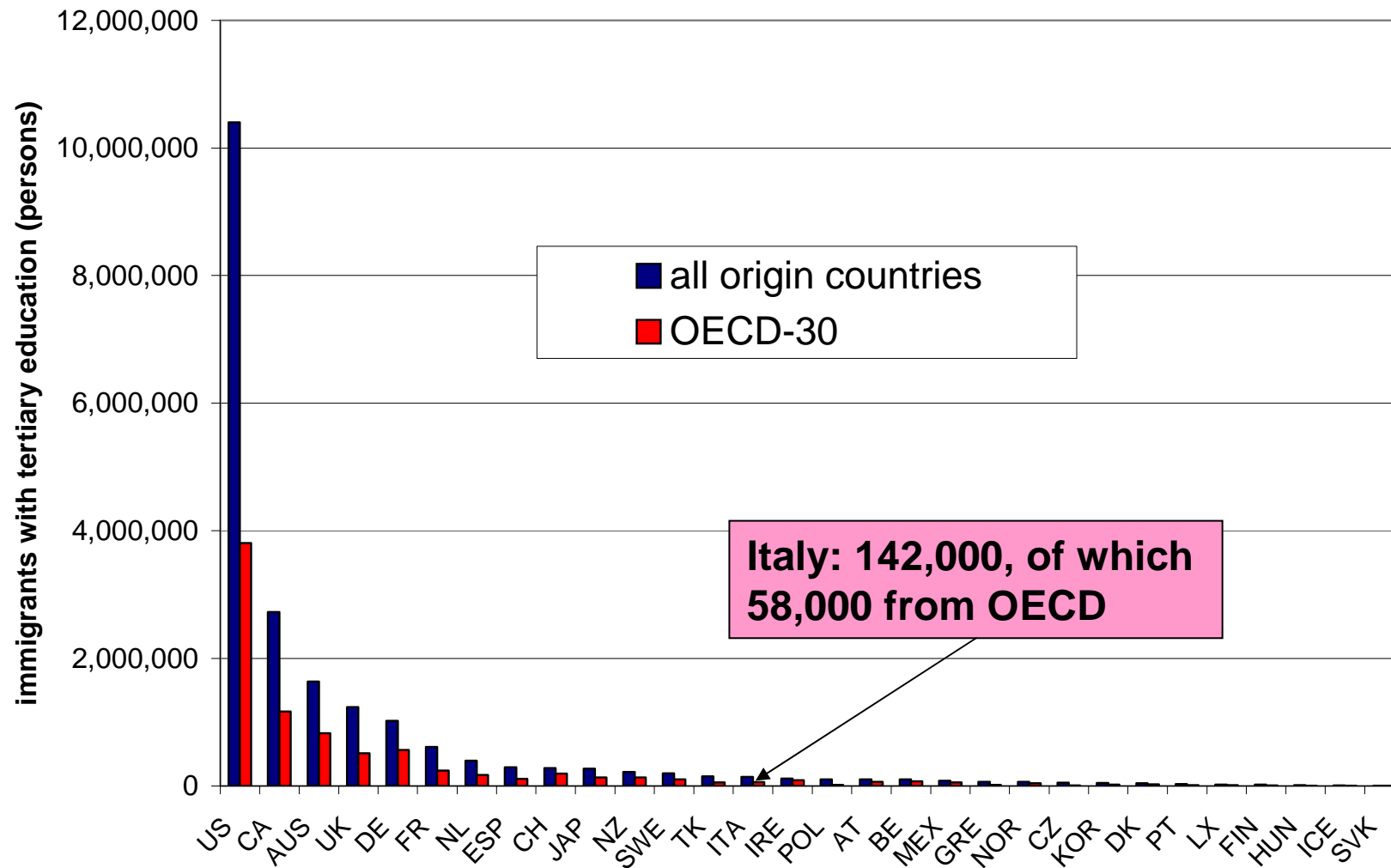
- Almost 80 % of all highly skilled immigrants in the OECD live in US, AUS, CA, UK and NZ
- Only 7 out of 30 OECD countries receive more highly skilled immigrants from OECD countries than they send to other OECD countries
- Only US, CA and AUS receive substantially more highly skilled immigrants than they send abroad
- Countries without skill-selective immigration policies and average or below average per capita GDP are main losers in the competition for talent among OECD countries
 - MEX, POL
 - ITA, DE, KOR, JAP but also UK

Immigrants with tertiary education, 2001



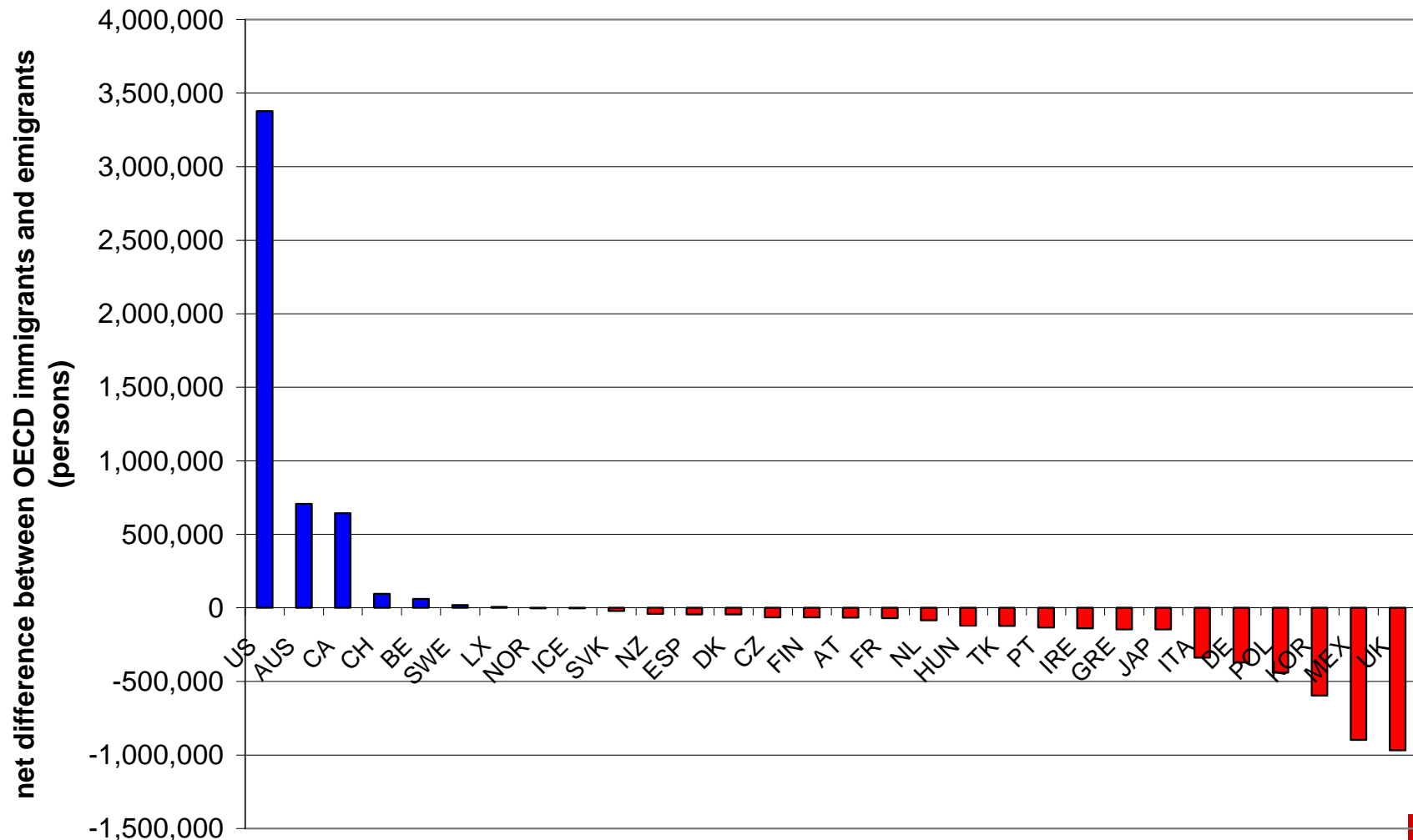
Source: Beine et al. (2007).

Immigrants with tertiary education, 2001



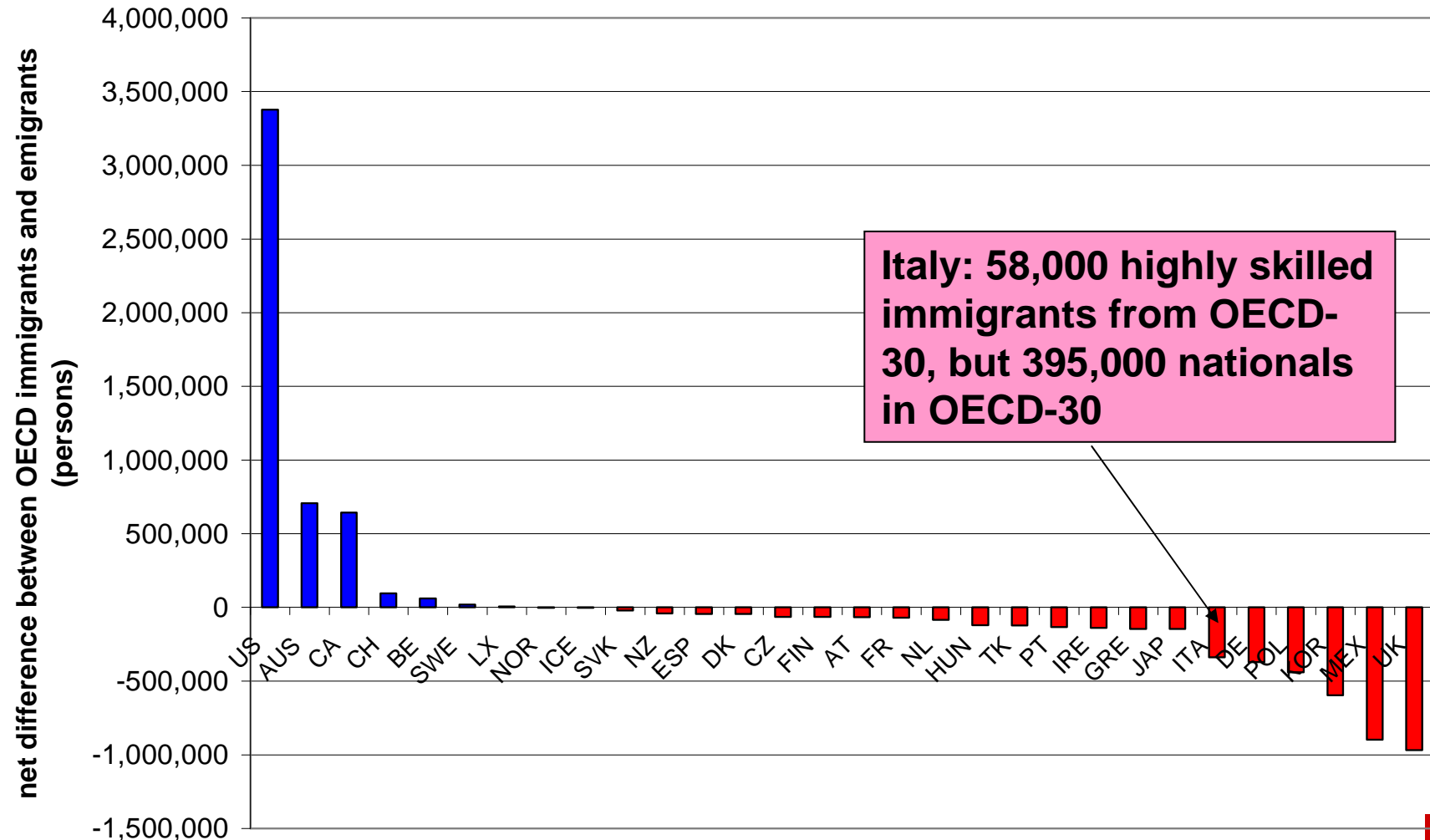
Source: Beine et al. (2007).

Difference between highly skilled immigrants from and highly skilled emigrants in OECD-30, 2001



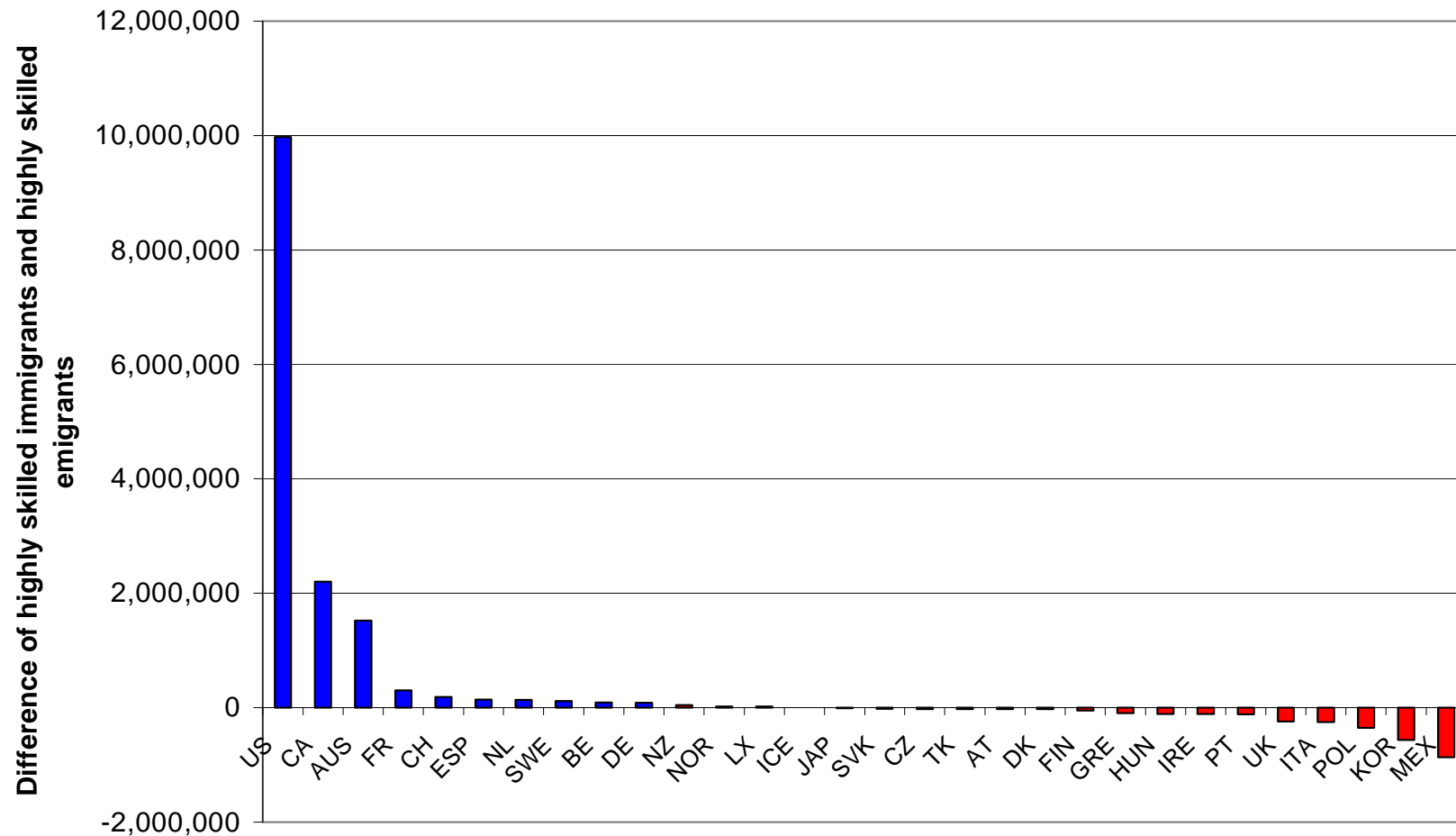
Source: Own calculations based on Beine et al. (2007).

Difference between highly skilled immigrants from and highly skilled emigrants in OECD-30, 2001



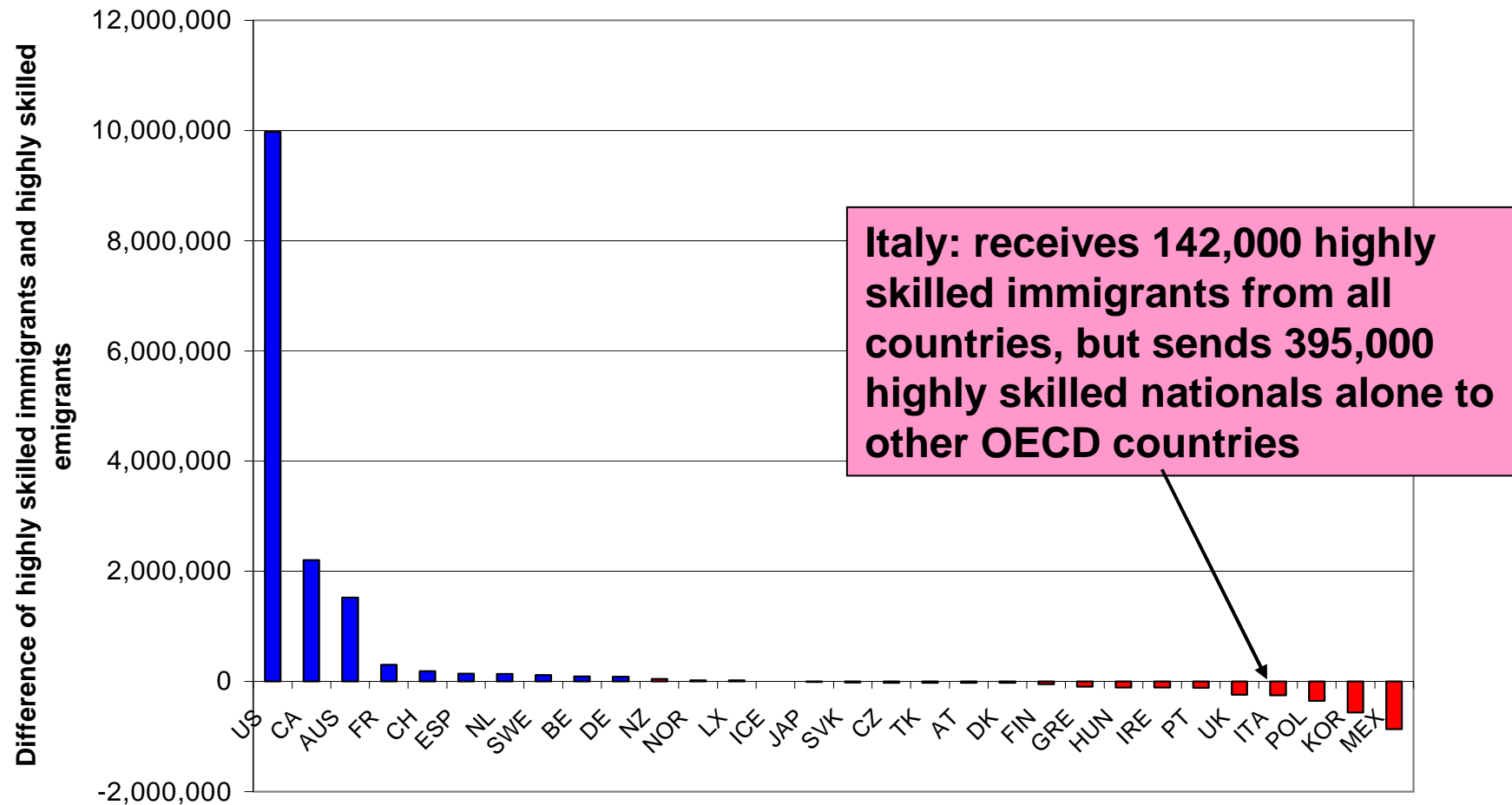
Source: Own calculations based on Beine et al. (2007).

Difference between highly skilled immigrants and highly skilled emigrants (approximation)



Source: Own calculations based on Beine et al. (2007).

Difference between highly skilled immigrants and highly skilled emigrants (approximation)

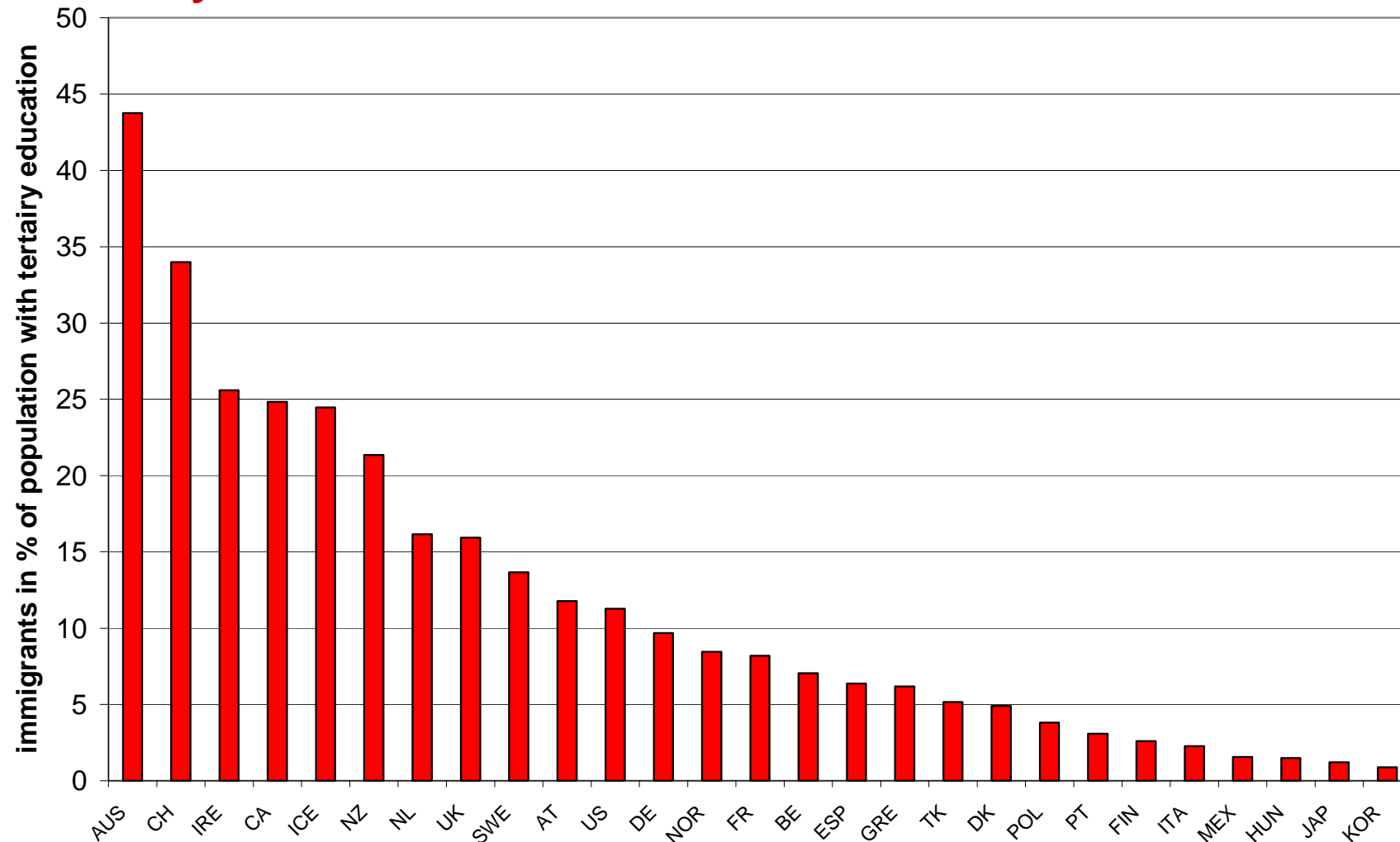


Source: Own calculations based on Beine et al. (2007).

Favourably skill selected?

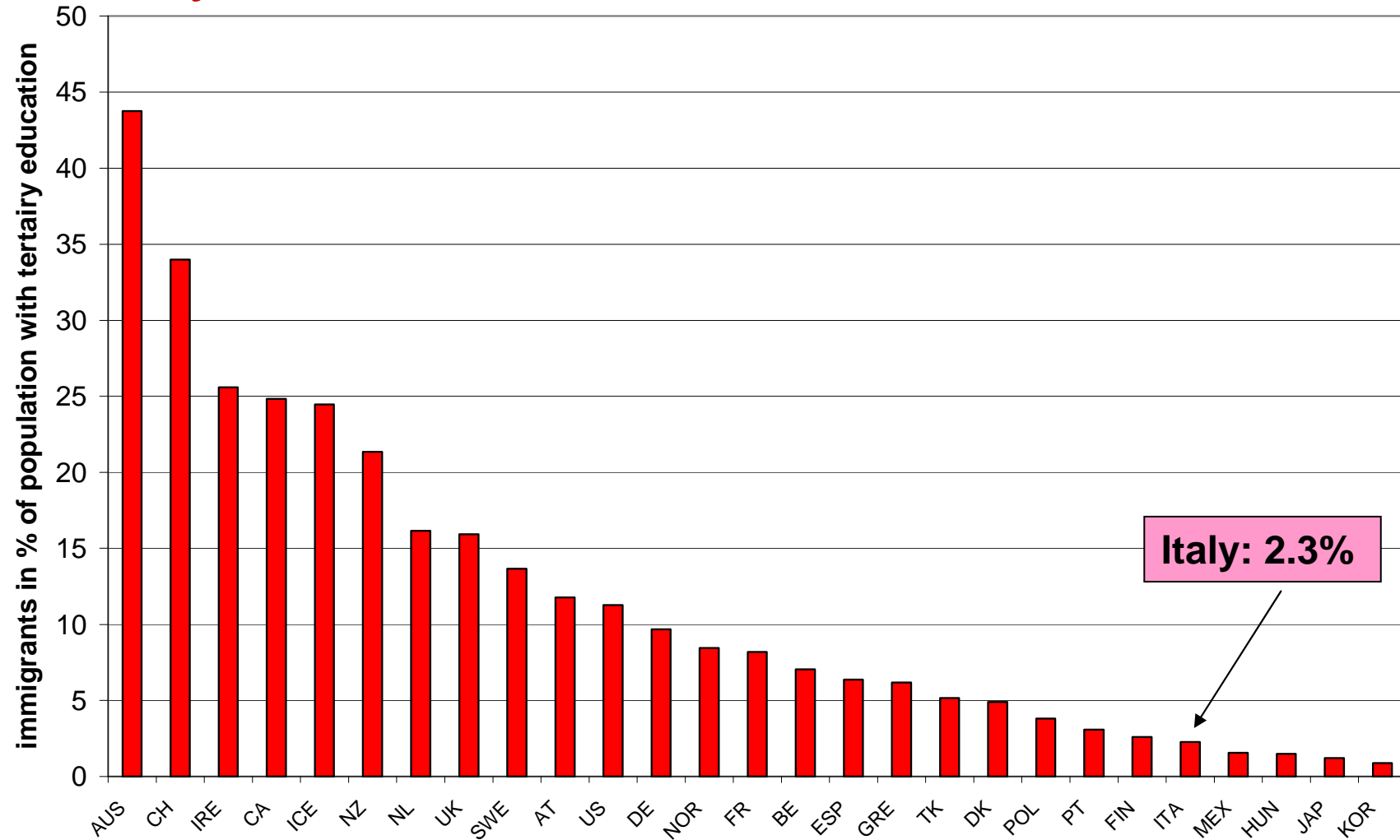
- Share of highly skilled in immigrant population exceeds that in home country population by a factor of 3.4 at OECD average
- Share of highly skilled in immigrant population exceeds that in host country population by a factor of 1.3 at OECD average
- Countries with skill-selective immigration policies and (relatively) poor countries achieve favourable skill bias of immigrant population, countries without skill-selective immigration policies and average income levels much less so

Immigrants in % of population with tertiary education, 2001



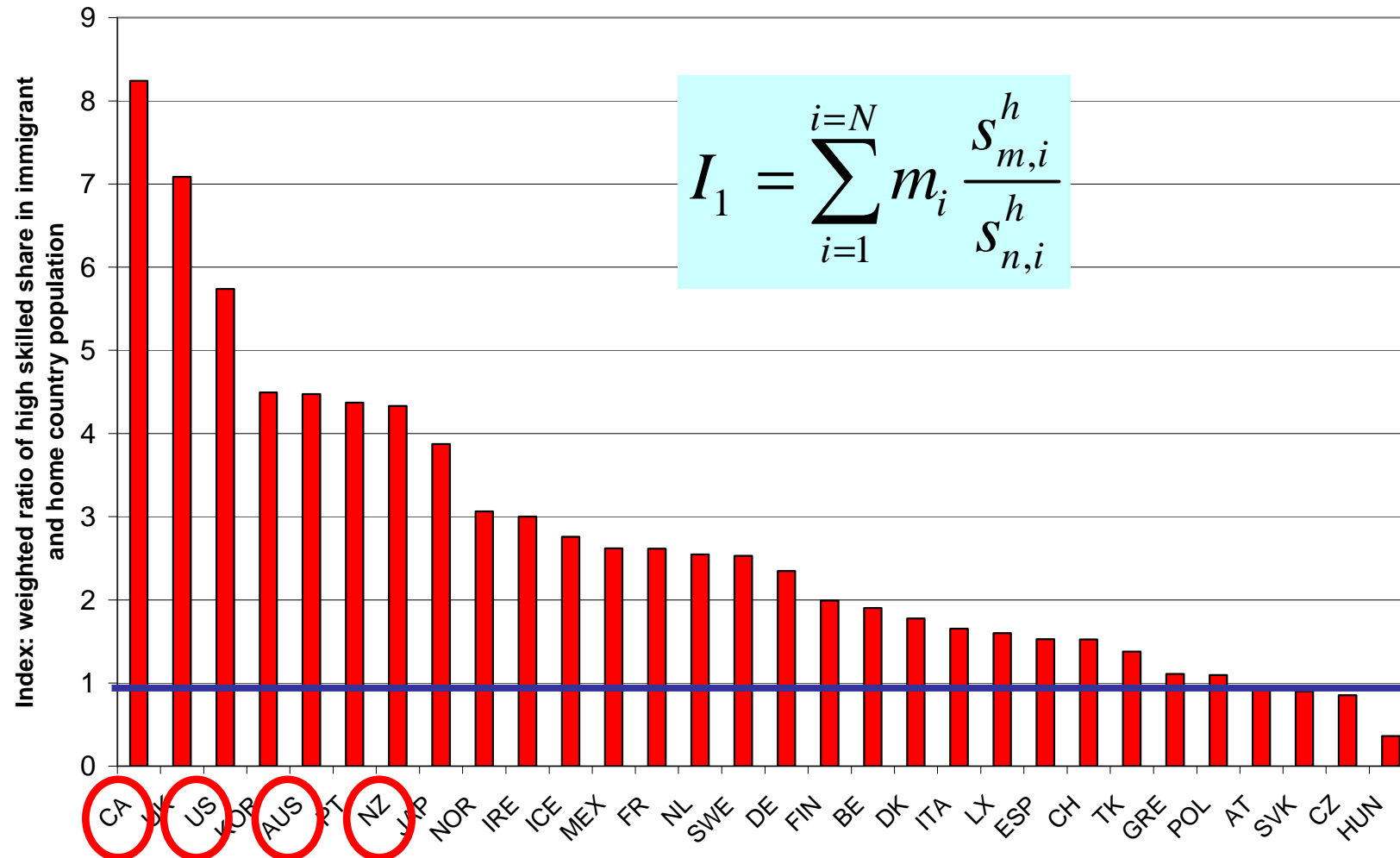
Source: Own calculations based on Beine et al. (2007).

Immigrants in % of population with tertiary education, 2001



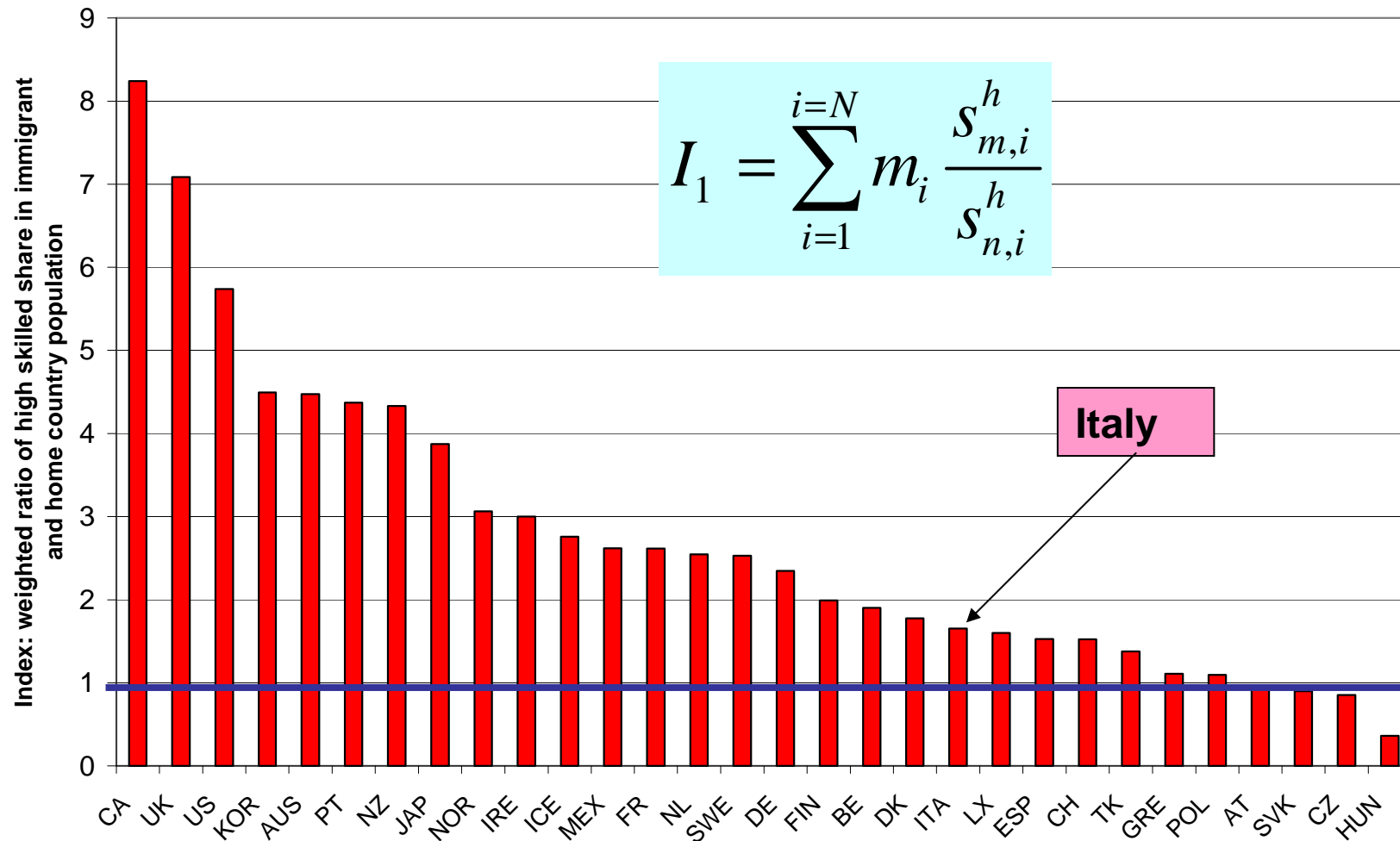
Source: Own calculations based on Beine et al. (2007).

Selection bias of immigrant population relative to home population (1 = neutral)



Source: Own calculations based on Beine et al. (2007).

Selection bias of immigrant population relative to home population (1 = neutral)

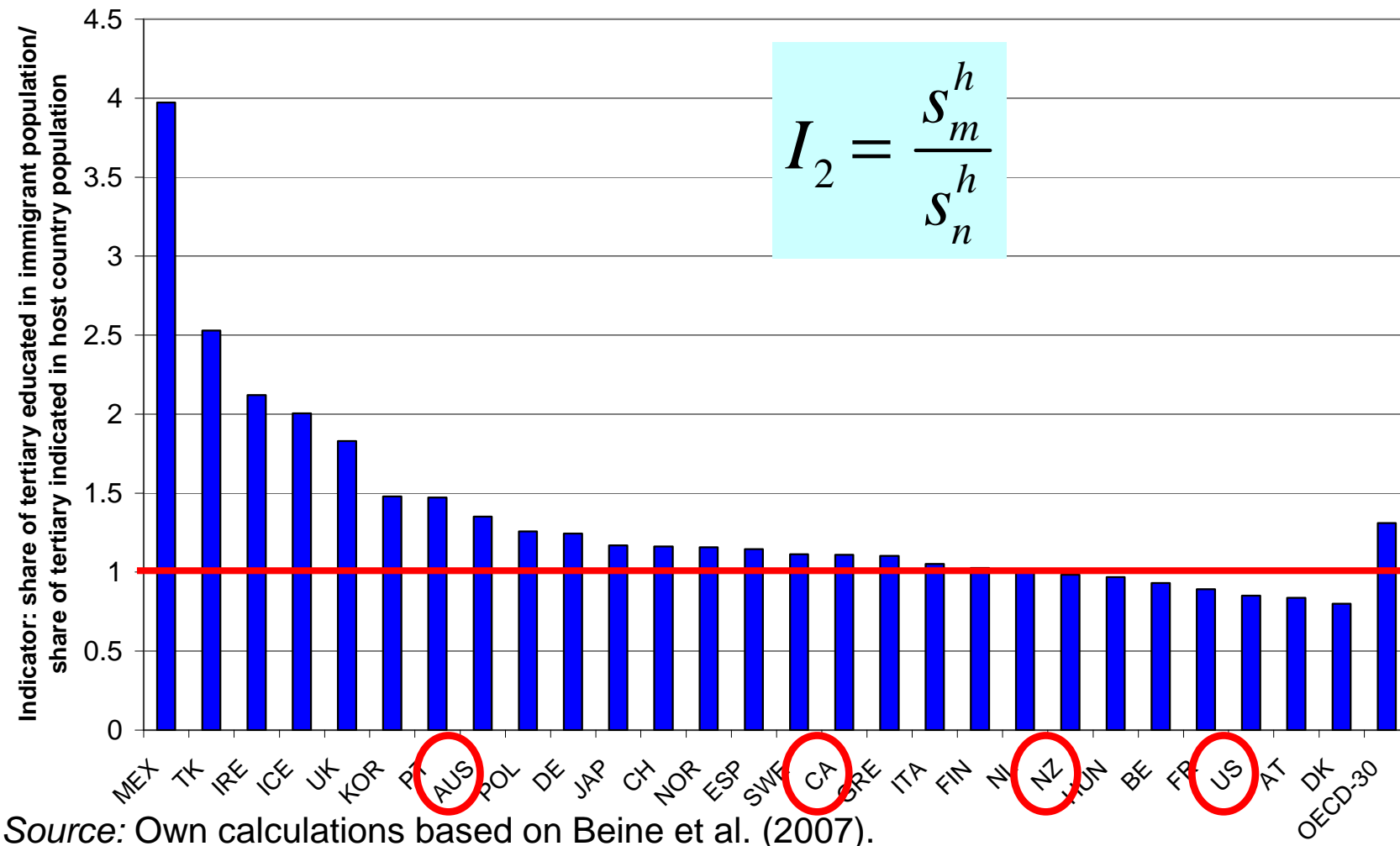


$$I_1 = \sum_{i=1}^{i=N} m_i \frac{S_{m,i}^h}{S_{n,i}^h}$$

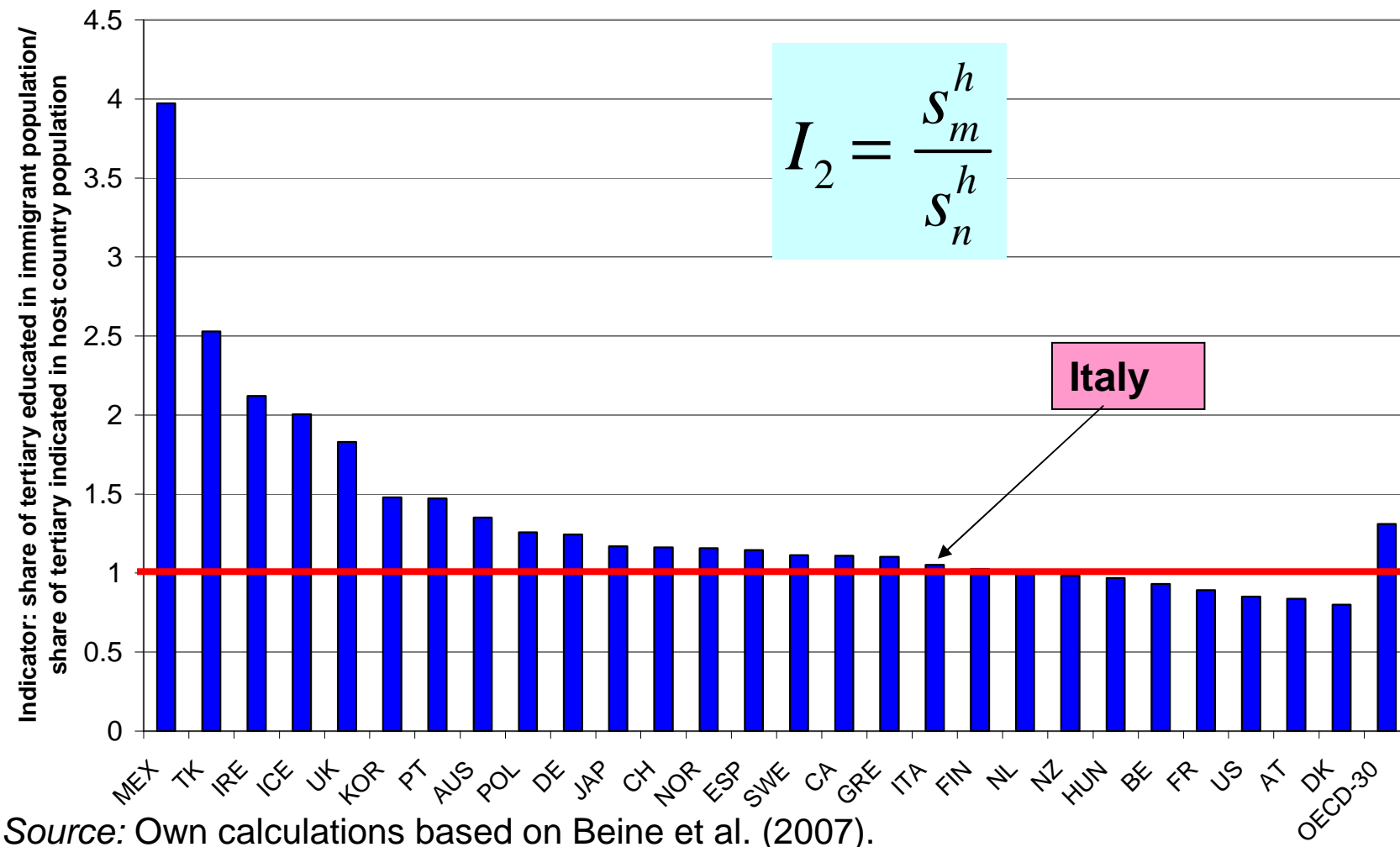
Italy

Source: Own calculations based on Beine et al. (2007).

Selection bias of immigrant population relative to host population (1 = neutral)



Selection bias of immigrant population relative to host population (1 = neutral)

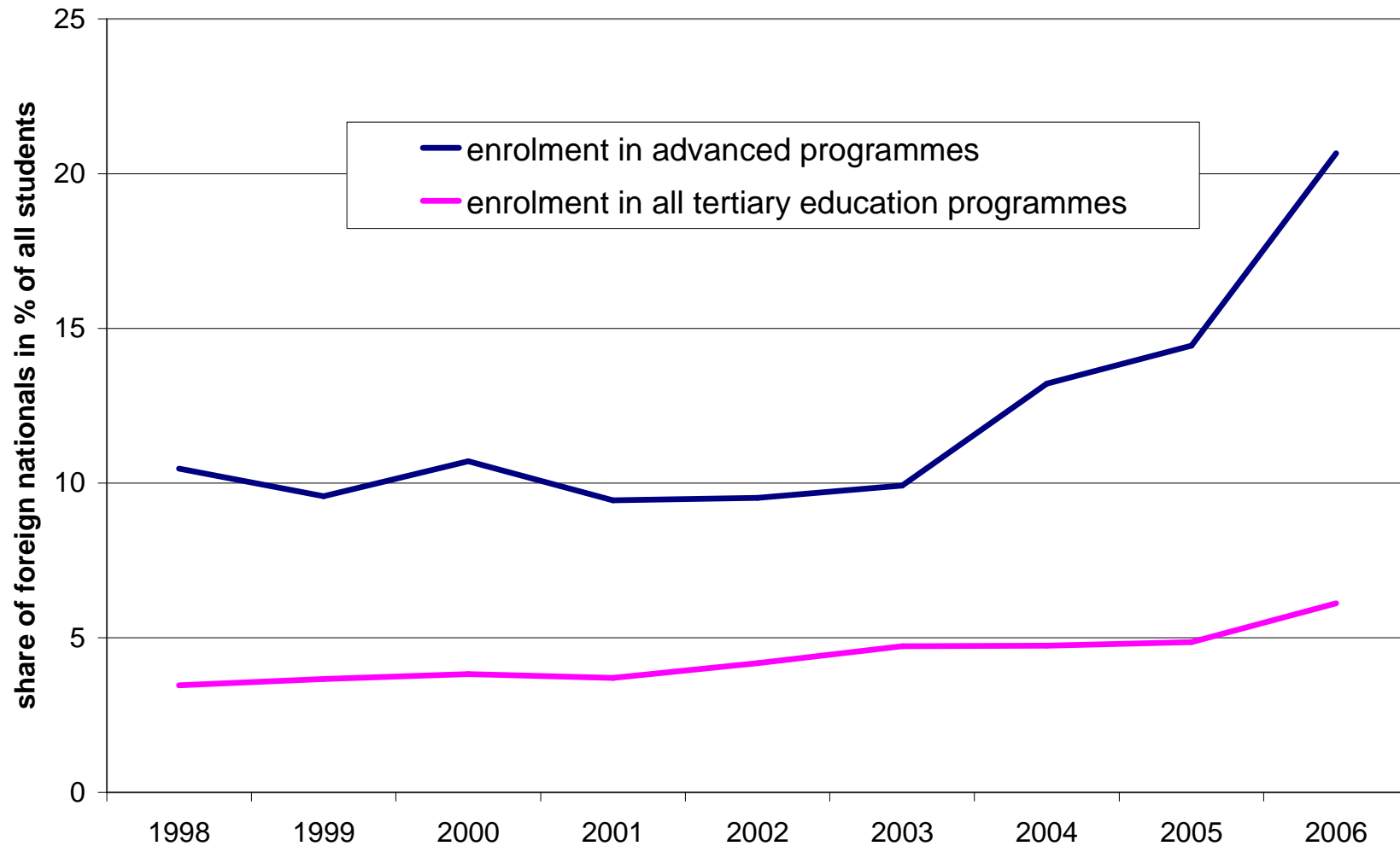


Competition for foreign students

- Receiving countries can benefit from foreign students even if not all costs for studies can be recuperated
 - Human capital and other skills (language proficiency, cultural and social skills) well adapted to host country labour markets
- More and more countries facilitated immigration of foreign students and eased labour market access
 - Bologna process and harmonization of admission of third-country students in EU
 - Trend of increasing tuition fees and some countries discriminate against foreign students (AUS, CH, NL, UK) but ease admission procedures at same time
- All in all, surge of foreign students particularly in advanced and research related programmes

Foreign students in % of all enrolled students, 1998-2006

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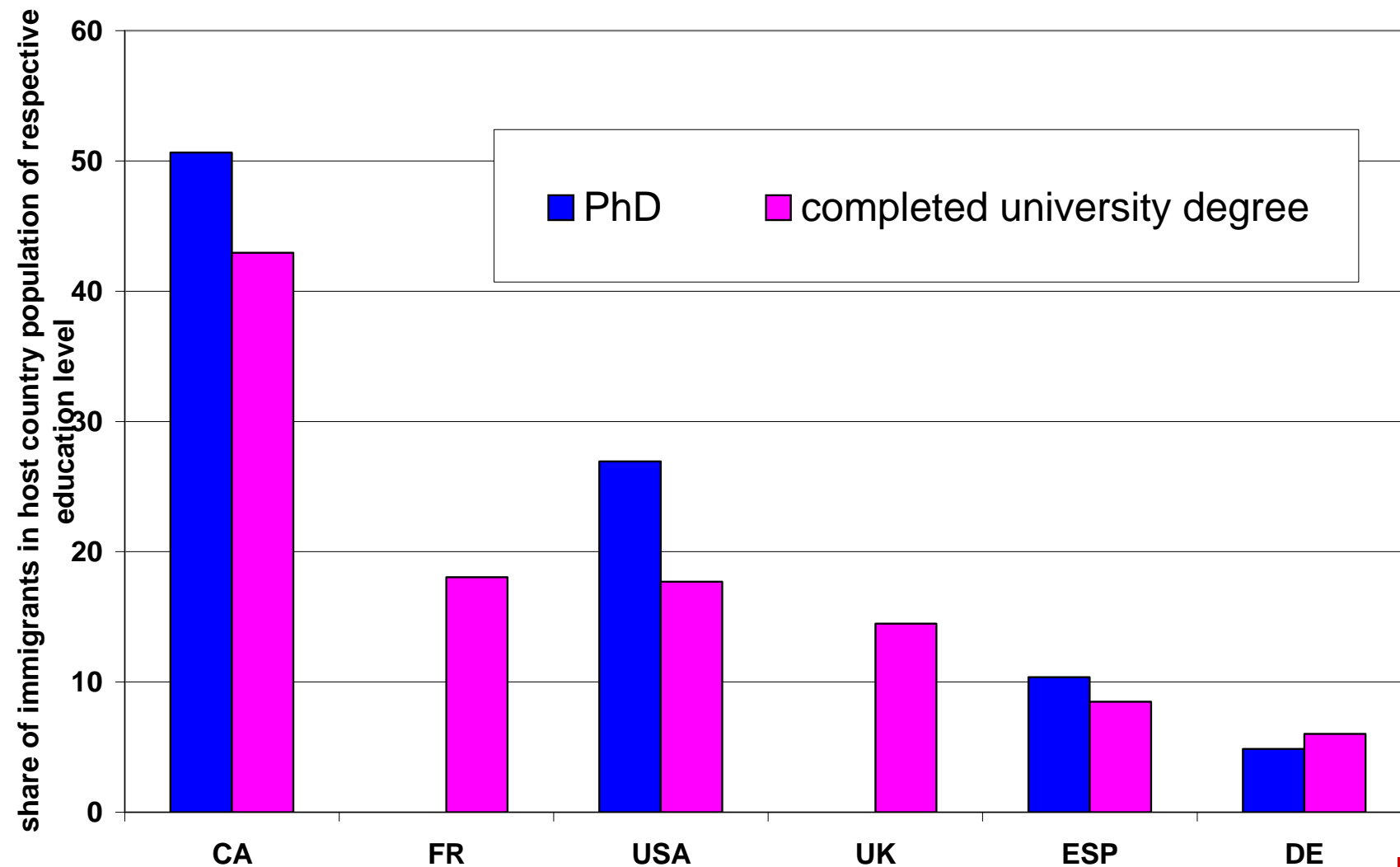


Source: Own calculations based on OECD (2009).

At the top of the skill distribution

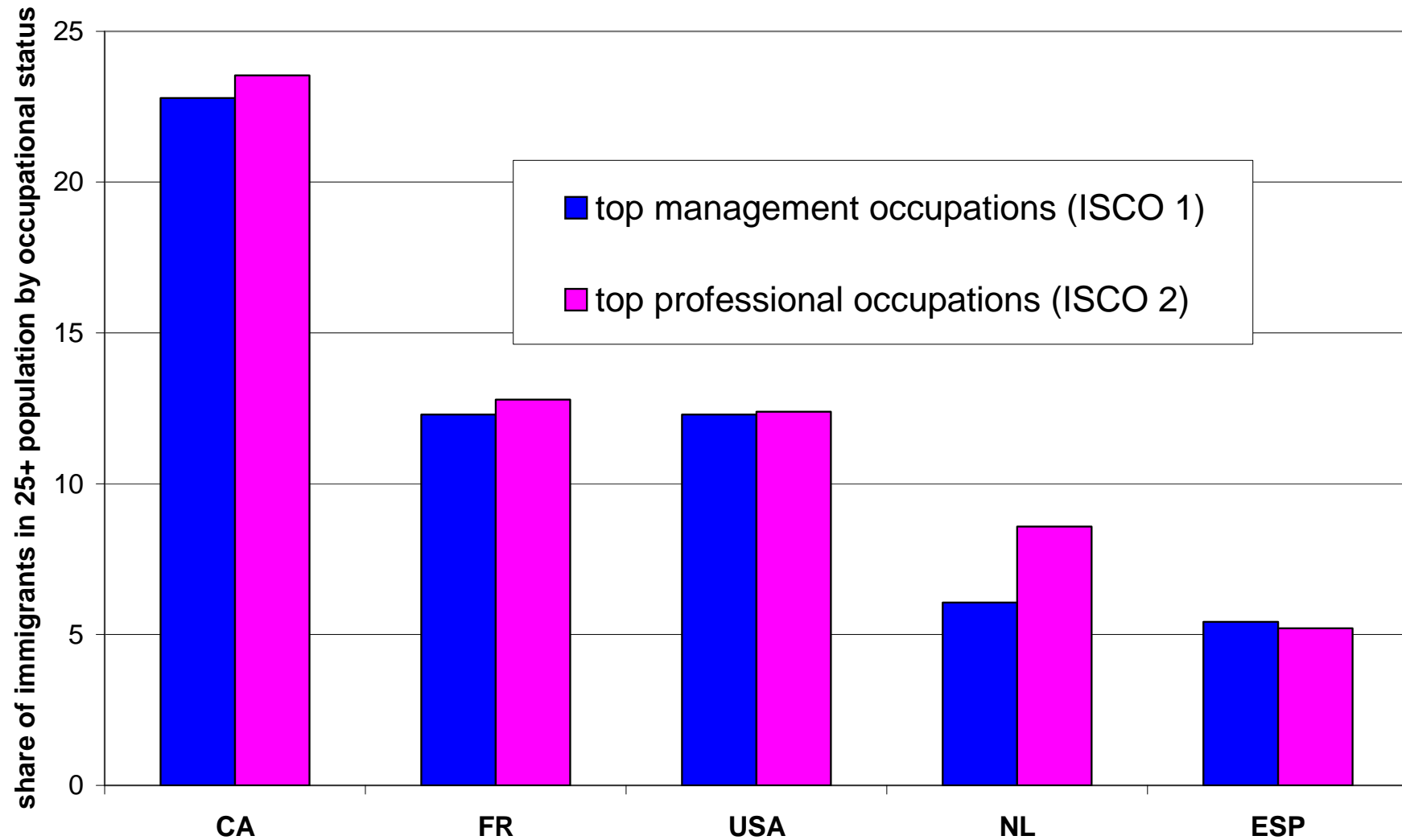
- Concentration of immigrants at top of skill distribution is higher than that at tertiary education level
 - Canada: immigrant share of 24% at tertiary education level, but 51% at PhD level
 - USA: immigrant share of 11.3% at tertiary education level, but 27% at PhD level
- Immigrant share in top management (ISCO 1) and top professional (ISCO 2) occupations is equal to share in tertiary education group, but is below that of share at the very top of skill distribution

Immigrants in % of 25+ population with PhD and university degree, 2001



Source: Own calculations based on IPUMS international and national census data.

Immigrants in % of 25+ population by occupational status, 2001



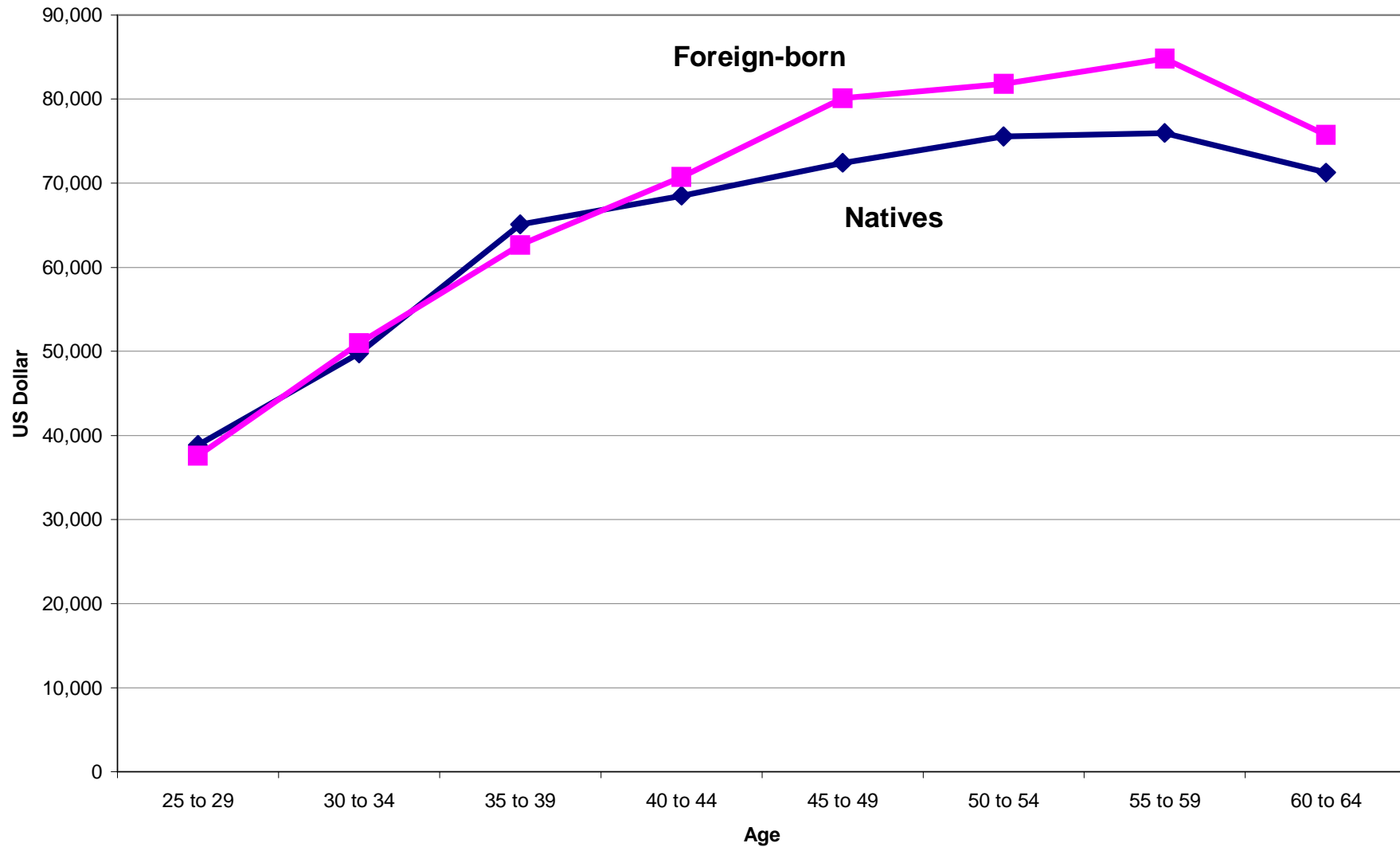
Source: Own calculations based on IPUMS international and national census data.

The native-immigrant wage gap

- Large literature on assimilation of immigrants into host country labour markets (e.g. Chiswick, 1978; Borjas, 1987; Jasso/Rosenzweig, 1985)
- Limited evidence at top of skill distribution
- Hunt (2009) finds for US that foreign university and PhD graduates (i) perform better than natives in terms of wages, patents, papers and start ups, but (ii) perform worse than natives once we control for field of study
- We find descriptive evidence that wages of foreign-born PhD graduates are higher than that of natives in the US and below that of natives in Canada

Annual wage income of PhD graduates in USA, 2000

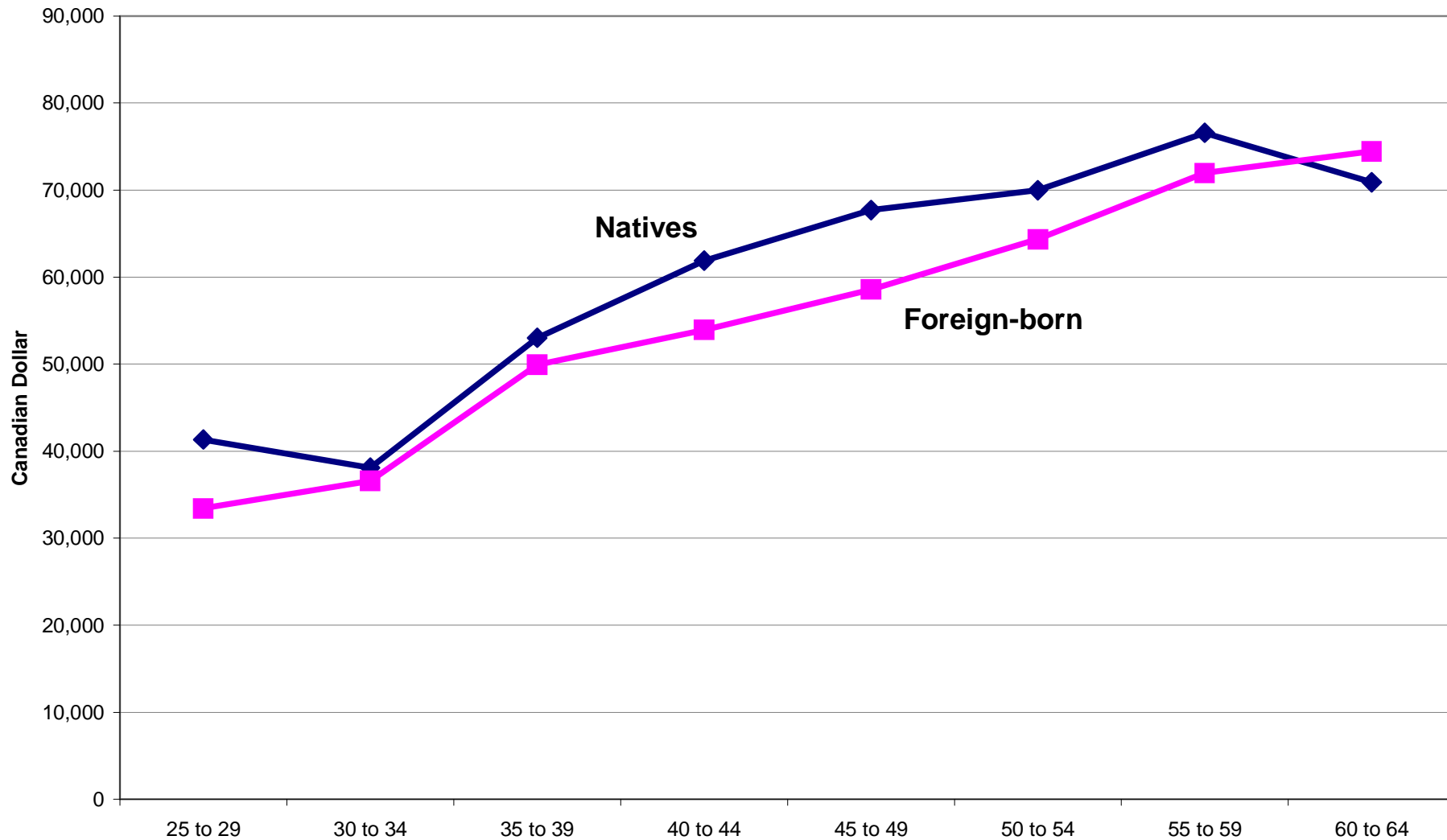
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Source: Own calculations based on IPUMS international and national census data.

Annual wage income of PhD graduates in Canada, 2000

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Source: Own calculations based on IPUMS international and national census data.

4 Determinants of highly skilled migration

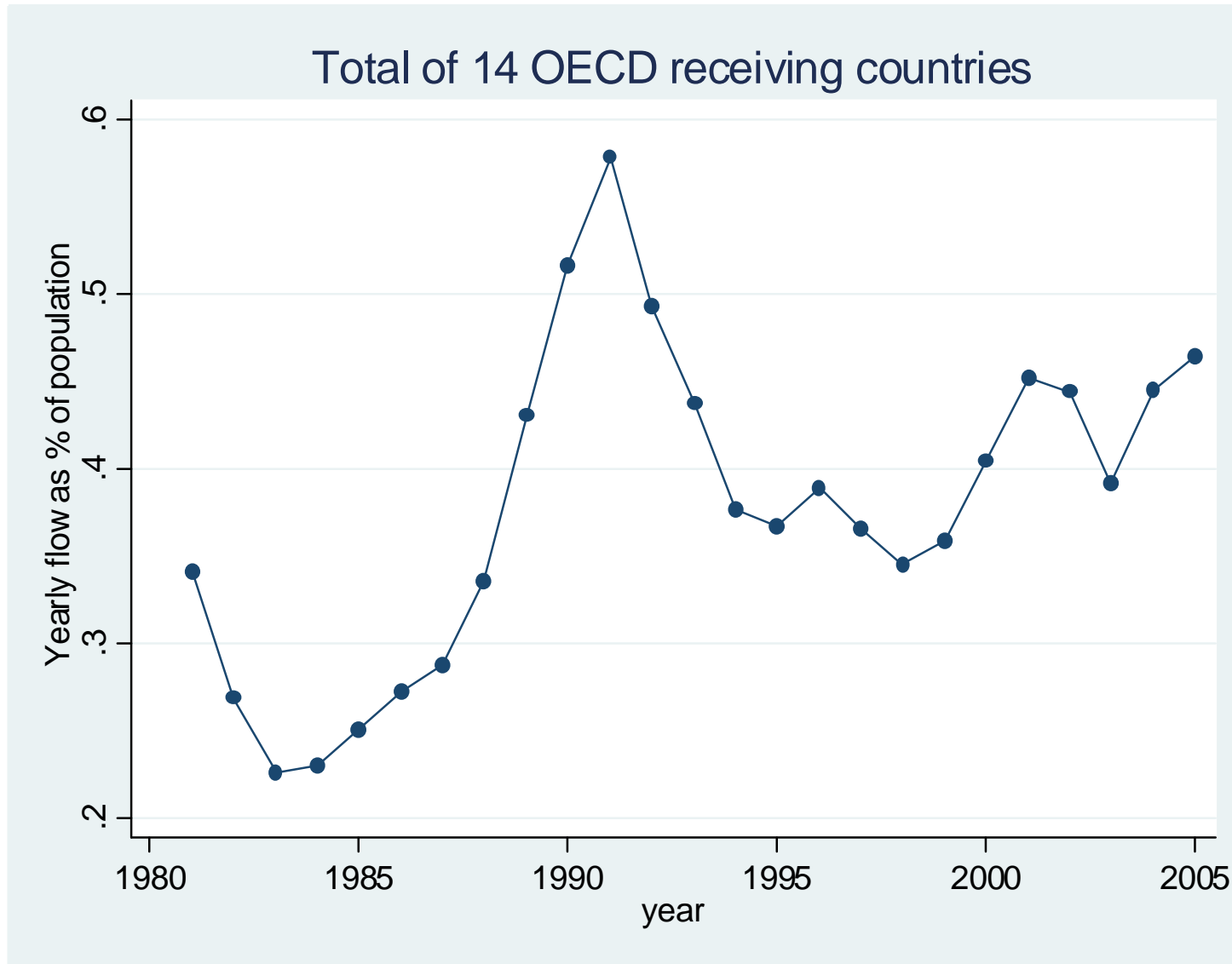
- **Objective:** to study the determinants of highly skilled migration decomposing them between:
 - wage differentials across countries
 - immigration laws in receiving countries
 - other policy variables in receiving countries
- **Method:** analyzing (i) determinants of total migration and (ii) of selection of highly educated relative to less educated based on gravity equation
- **Findings:** Important role of wage differentials and of skill-selective immigration policies, welfare benefits and labour market institutions are less important

Data

- Migration flows from 74 sending into 14 OECD destination countries, 1980-2005 (OECD 2009, Mayda 2009)
- Using the Docquier et al. (2007) data set for calculating educational levels
- Using the fRDB (2007) data base for calculation of changes in immigration legislation along 6 dimensions
- Others: GDP per capita, wage premium, generosity of welfare benefits, R&D expenditure

Annual inflows into OECD-14 in % of population, 1980-2005

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D B



Empirical framework

- Total migration equation:

$$\ln m_{odt} = D_{ot} + D_d + \beta_1 W_{dt} + \beta_2 X_{od} + \beta_3 Y_{dt} + e_{odt}, \quad [1]$$

- Selection equation:

$$\ln m_{odt}^H - \ln m_{odt}^L = D'_{ot} + \beta_1 (W_{dt}^H - W_{dt}^L) + \beta'_2 X_{od} + \beta'_3 Y_{dt} + e'_{odt}, \quad [2]$$

- m_{odt} : total flow of migrants from country o to country d in year t
- m_{odt}^H : flow of tertiary educated,
- m_{odt}^L : flow of primary educated
- D_{ot} : push-factors (we control for but don't focus on them)
- D_d : destination country fixed effect
- $W_{dt}, W_{dt}^H - W_{dt}^L$: wages and wage premium in receiving country
- X_{od} : bilateral fixed effects
- Y_{dt} : factors in receiving countries such as immigration laws

Wages and wage premium

	total migration		selection	
	pre-tax	after tax	after tax	after tax, FE
median wage: w_d	0.063*** (0.014)	0.060*** (0.012)	--	--
wage premium: $w_d^h - w_d^l$			0.01** (0.005)	0.04** (0.02)
controls	YES	YES	YES	NO
bilateral fixed effects	NO	NO	NO	YES
observations	22,662	22,662	5,486	5,486
<i>Notes:</i> Controls are log distance, land border, same language and colonial ties.-- ***, **, * denote 1%-, 5%- and 10% significance levels.				

Immigration legislation

	total migration		selection	
	(1)	(2)	(1)	(2)
median wage: w_d	0.054***	0.051***	--	--
wage premium: $w_d^h - w_d^l$	--	--	0.015***	0.016***
pro-skilled policies	-0.08	--	0.11***	0.12***
restricted benefit access	-0.07***	-0.08***	0.08***	0.08***
asylum	-0.09***	-0.09***	0.02	--
requirements for entry	0.01	--	-0.01	--
requirements for residency	-0.04	--	-0.01	--
undocumented	-0.02	--	-0.02	--
bilateral fixed effects	YES	YES	YES	YES
observations	22,662	22,662	5,419	5,419
<i>Notes:</i> ***, **, * denote 1%-, 5%- and 10% significance levels.				

Labour market institutions and benefits D B

	total immigration			selection		
	(1)	(2)	(3)	(1)	(2)	(3)
median wage: w_d	0.08***	0.09***	0.09**	--	--	--
wage premium: $w_d^h - w_d^l$	--	--	--	0.02**	0.01	0.01
minimum wages	-4.33***	-3.14***	-2.88**	0.88	1.46**	1.64**
employment protection	-0.36**	0.47	0.10	-0.57***	-0.55***	-0.54***
welfare benefits	--	0.42	0.41	--	-0.08	-0.08
immigration laws	NO	NO	YES	NO	NO	YES
bil. fixed effects	YES	YES	YES	YES	YES	YES
observations	6,544	6,486	6,387	2,376	1,689	1,689

Notes: ***, **, * denote 1%-, 5%- and 10% significance levels.

R&D expenditures

	total migration		selection	
	(1)	(2)	(1)	(2)
median wage: w_d	0.07***	0.07***	--	--
wage premium: $w_d^h - w_d^l$	--	--	0.03***	0.01*
R&D expenditure	-2.43***	-2.33***	1.29***	0.23
immigration laws	NO	YES	NO	YES
bilateral fixed effects	YES	YES	YES	YES
observations	20,335	20,335	5,320	5,320
<i>Notes:</i> ***, **, * denote 1%-, 5%- and 10% significance levels.				

Summarizing

- Significant effect of skill-premium
 - Increasing college premium by 10,000 \$ would increase inflow of highly educated relative to less educated by 40%
- Significant effect skill selective immigration policies
 - Pro-skilled immigration laws increase selection of highly skilled immigrants leaving total immigration flows unaffected
- Significant effect of laws limiting welfare benefit access
 - Reduce total immigration flows and increase share of highly skilled
- Generous welfare benefits, employment protection and low R&D spending may all worsen the skill selection of immigrants, but their effects are imprecisely estimated and not robust

5 Benefits of the brain gain

- We estimate impact of total immigration and its share of highly educated on employment, capital accumulation, productivity and income per person in the receiving country
- We use “push-factors” identified before to capture the part of immigration that is driven by “push-factors” and hence can be considered as a supply shock to receiving country
- We analyze short- and long run impact
- For the short run, we also focus on the impact when immigration takes place in a recession

Production function approach

- Destination country production function

$$Y_{dt} = A_{dt} K_{dt}^{\alpha} L_{dt}^{1-\alpha} \quad [1]$$

- Change of total income over time

$$\frac{\Delta Y_{dt}}{Y_{dt}} = \frac{\Delta A_{dt}}{A_{dt}} + \alpha \frac{\Delta K_{dt}}{K_{dt}} + (1 - \alpha) \frac{\Delta L_{dt}}{\Delta L_{dt}} \quad [2]$$

- Effect of total immigration ($\Delta F/POP$) and share of highly educated immigrants h on each component of production X (X is A , L , K):

$$\frac{\Delta X_{dt}}{X_{dt}} = D_t + \gamma_X \frac{\Delta F_{dt}}{Pop_{dt}} + \beta_X h_{Fdt} + e_{dt} \quad [3]$$

- Once we know these effects we can use the formula above to calculate impact on total income and income per capita:

$$\Delta Y_{dt} / Y_{dt} - \Delta Pop_{dt} / Pop_{dt} \quad [4]$$

Instrumental variable strategy

- In estimating the impact of immigration rates on factors and productivity of receiving country we instrument them with those obtained from prediction
 - Flow equation from previous section which omits country of destination variables (wages and policies)
- Only push factors interacted with fixed bilateral migration costs drive variation in these constructed flows
- Hence, these flows are reasonably exogenous with respect to destination country economic conditions

Short- and long-run effects (2SLS estimates)

Explained variable:	Short run		Long run	
	total immigration rate	highly skilled share	total immigration rate	highly skilled share
$\Delta L/L$	1.03***	0.03**	0.99***	0.13***
$\Delta Empl./Empl.$	1.23***	0.03***	1.14***	0.07***
$\Delta K/K$	1.42***	0.04***	1.25***	0.17***
$\Delta k/k$	0.14	0.02	0.11	0.09
$\Delta A/A$	-0.11	0.02	-0.18	0.01
$\Delta gdp/gdp$	0.60***	0.01	0.49***	0.01
observations	336		70	
<i>Notes: ***, **, * denote 1%-, 5%- and 10% significance levels.</i>				

Impact of immigration in recessions D B

<i>Specification:</i>	<i>Basic 2SLS</i>			
	Normal Times Output gap > -1 per cent		Bad Times: Output gap < -1 per cent	
<i>Explanatory variable:</i>	Immigration rate	Share of tertiary educated	Immigration rate	Share of tertiary educated
$\Delta L/L$	1.60** (0.23)	0.04** (0.01)	0.72 (0.14)	0.027** (0.012)
$\Delta \text{Employment}/\text{Employment}$	1.55** (0.19)	0.03** (0.01)	1.20** (0.11)	0.01 (0.01)
$\Delta K/K$	1.55** (0.32)	0.05** (0.02)	1.42** (0.20)	0.03** (0.01)
$\Delta \text{Capital per Worker}/\text{Capital per Worker}$	-0.01 (0.22)	0.016 (0.017)	0.22 (0.17)	0.022* (0.12)
$\Delta A/A$	-0.11 (0.10)	0.007 (0.008)	-0.16 (0.22)	0.016 (0.02)
$\Delta \text{GDP per Person}/\text{GDP per person}$	1.02** (0.19)	0.01 (0.008)	0.33** (0.15)	0.002 (0.008)
Observations	336			

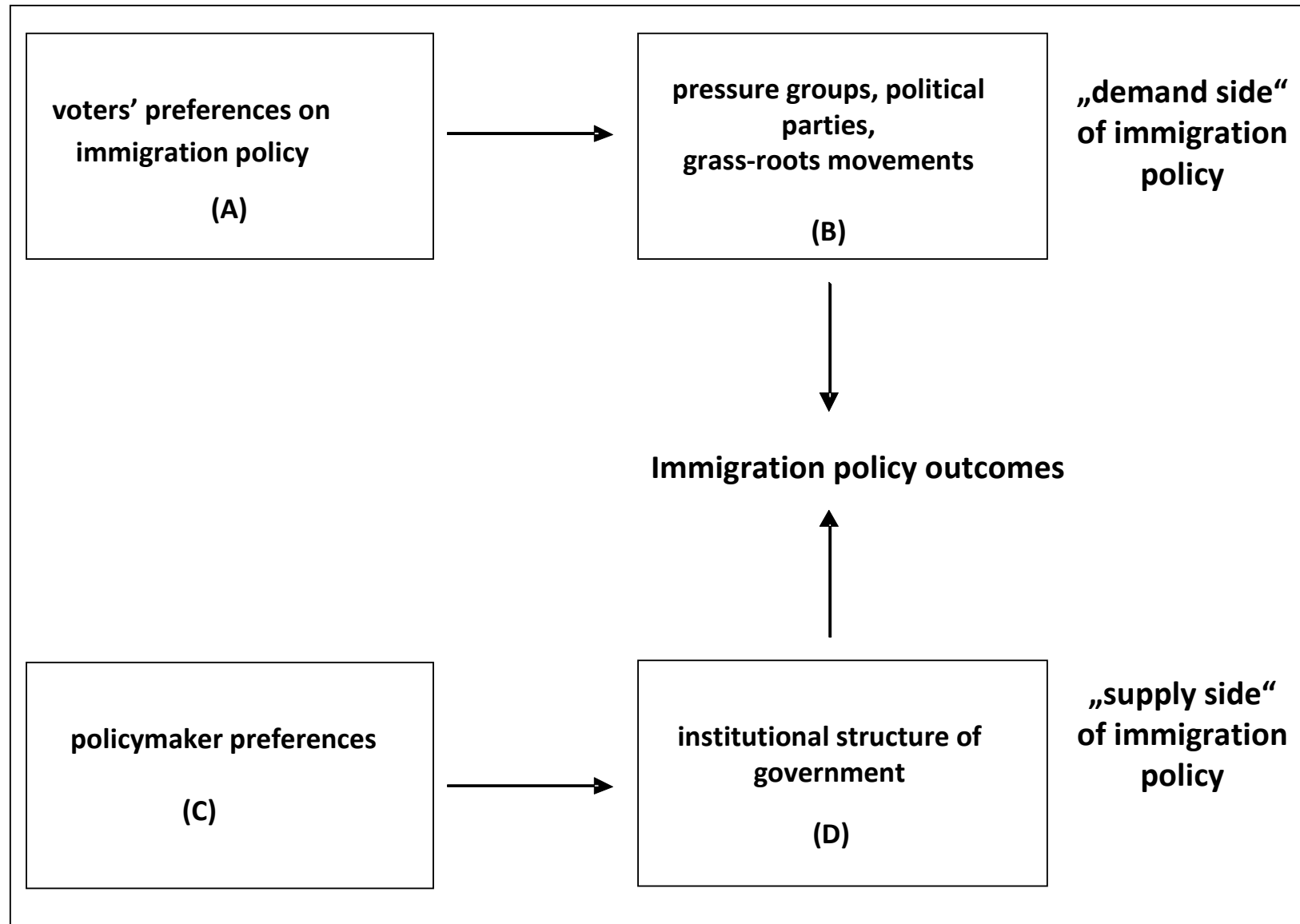
Summary of findings

- Total immigration does not displace native employment nor decreases native wages in short- or long run.
- The skill intensity of immigration has a positive additional effect on employment and capital accumulation
- This positive additional effect is present in the short- as well as in the long run
 - This effect is present even when skilled immigrants enter the receiving country in bad economic times
- The positive employment-investment effect may result from complementarities of highly educated or from a positive productivity effect in presence of elastic labour supply of natives

6 Explaining the status quo bias in skill-selective immigration policies

- We address the puzzle why so few countries adopt skill-selective immigration policies although potential gains are high
- We apply a framework where immigration policies are explained by the interaction of ‘demand’ and ‘supply’ factors
- We first analyze whether attitudes towards high skilled-immigration can be explained by self-interest of individuals
- We then explain policy outcomes by aggregating individual preferences employing a median voter and a pressure group model

Elements of a political economy model **D B**



Understanding individual attitudes D B

The labour market channel

- Factor proportions theory: If immigrants are more skilled than natives on average, then skilled natives will lose and unskilled natives will benefit, and vice versa
- Therefore, individual skill should be *negatively* correlated with pro-immigration attitudes in countries characterized by a high share of skilled immigration -- and *positively* correlated with pro-immigration attitudes in countries characterized by a high share of unskilled immigration

The welfare state channel

- **Tax adjustment model:** per capita benefits remain constant, but tax rate changes
 - Rich individuals are most affected by benefits from skilled and losses from unskilled immigrants
 - Thus, individual income is *positively* correlated with pro-immigration preferences in countries with skilled immigration and vice versa
- **Benefit adjustment model:** per capita transfers change, but taxes remain constant
 - Poor individuals are most affected by benefits and losses
 - Thus, individual income is *negatively* correlated with pro-immigration preferences in countries with skilled immigration and vice versa

Empirical implementation

- Ordered probit model:

$$Y_{id}^* = \beta_1 age_i + \beta_2 male_i + \beta_3 educ_i + \beta_4 educ_i \times s^h_d + \beta_5 income_i + \beta_6 income_i \times s^h_d + \dots + \varepsilon_{id}$$

- Y_{id}^* : outcome variable which measures pro-skilled attitudes by 5 categories;
- $educ_i$: education level of individual i ,
- $income_i$: earnings of individual i ,
- S^h_d : share of high-skilled immigrants in immigrant population of destination country d .
- S^h_d approximated by GDP per capita (Roy hypothesis).
- Data I: 1995 and 2003 waves of National Identity Module of International Social Survey Programme (ISSP).
- Data II: 2002/03 wave of the European Social Survey (ESS).

Explaining individual attitudes I

Ordered probit model with country dummies, 2003 ISSP wave

Dependent variable: Pro immigration opinion	all countries		western-type welfare states	
	(1)	(2)	(3)	(4)
education	0.057***	-0.223***	-0.697***	-0.808***
education × log gdp	--	0.028***	0.074***	0.084***
log income	0.052***	-0.084	1.783**	2.049*
log income × log gdp	--	0.014	-0.1667**	-0.192*
age, male, citizenship, parents' citizenship	YES	YES	YES	YES
other controls	NO	NO	NO	YES
observations	23,801	23,801	17,943	10,956
Pseudo R ²	0.06	0.06	0.06	0.07

Notes: ***, **, * denote 1%-, 5%- and 10% significance levels.

Explaining individual attitudes II

Ordered probit model with country dummies, 2002/3 ESS wave

Dependent variable: Pro skilled immigration opinion	(1)	(2)	(3)
education	-0.060***	-0.071***	-0.061***
real income	--	0.008**	0.015**
age, male, citizenship	YES	YES	YES
other controls	NO	NO	YES
Observations	38,785	30,975	25,378
Pseudo R ²	0.01	0.01	0.02
<i>Notes: ***, **, * denote 1%-, 5%- and 10% significance levels.</i>			

From individual preferences to immigration policy

- Median voter model
 - Benhabib (1996), Ortega (2005), Facchini and Mayda (2008)
- Interest group model
 - Facchini and Willmann (2005), Facchini, Mayda and Mishra (2009)

Does the median voter rule?

f R
D B

- We find no correlation between the policy on high skilled immigration and the opinion of the median voter on skilled immigration using the median of the *pro skilled immigration* variable in the ESS data set
- The same result emerges if we use the mean of the same variable
- Comparing this finding with that in Facchini and Mayda (2008) on total immigration, the median voter model appears to work much better in explaining overall immigration policies as compared to skill-selective immigration policies

Evidence for pressure groups?

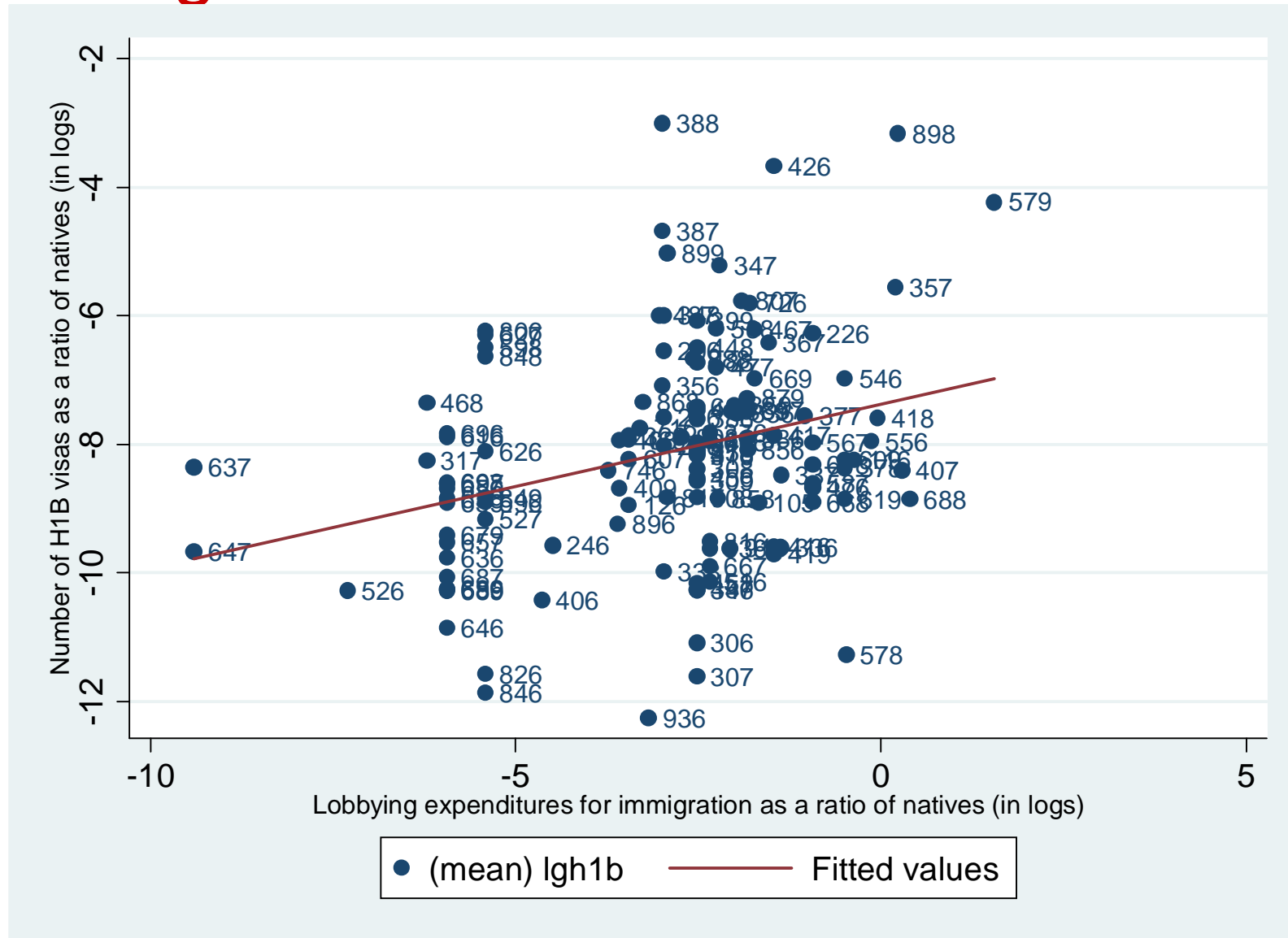
- Substantial anecdotal evidence suggesting that interest groups are actively involved in shaping policies towards immigration
 - In the US, professional associations representing highly-qualified native workers have played an important role in limiting inflows of foreign skilled migrants
 - For example, recently, the Institute of Electrical and Electronics Engineers (IEEE) has been active in demanding a reduction in both the number of H1B visas for highly skilled professionals and L1 visas for highly skilled intra-company transferees.
 - Similarly, “...the profession of medicine exerts a significant influence on the rate of skilled migration of foreign physicians” (Glied and Sarkar 2009).

Evidence for pressure groups?

f R
D B

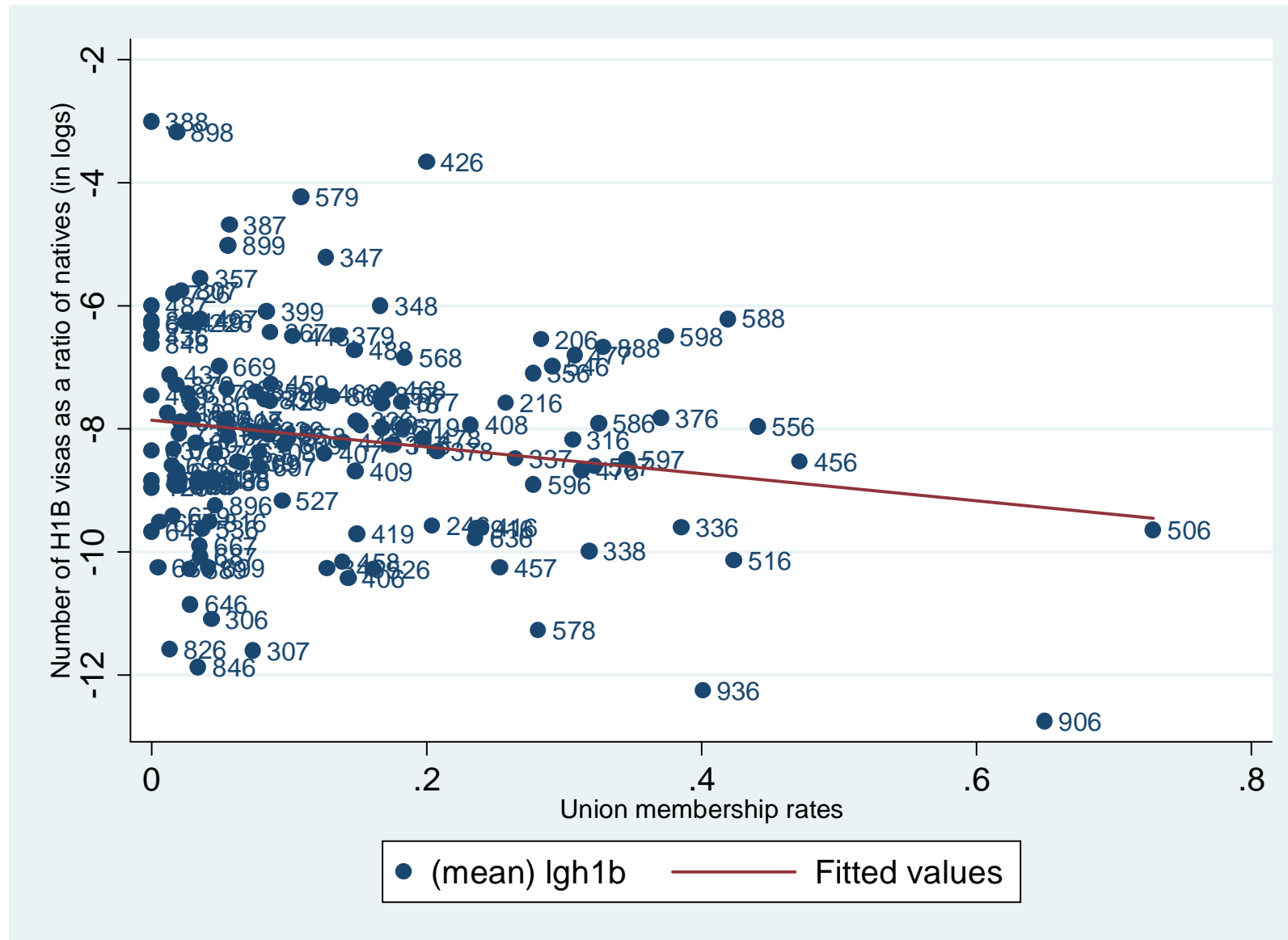
- At the same time, there is ample evidence on the efforts of pro-immigrant lobbies – representing the business sector – in shaping migration policy.
 - For example, during the boom of the late nineties, Silicon Valley entrepreneurs trooped in front of Congress asking for an increase in the number of H1B visas for highly skilled professionals, and warning of a looming Y2K disaster if the large number of foreign engineers and computer scientists they requested was not allowed to enter the country (Goldsborough 2000).

Lobbying expenditures on immigration



Union membership and H1B visas

D B



Impact of interest groups on H1B visas

dependent variable: log(H1B visas/native workers)	Coeff.	SE
log (lobbying expenditure/native worker)	0.182***	0.065
union membership rate	-3.623***	1.292
log output	-0.114	0.181
unemployment rate	1.661	4.323
log price	1.112	2.165
log capital	0.009	1.151
log FDI	0.107	0.066
shocks	-4.892**	2.444
log (US wages)	9.834***	2.951
log (US workers)	-0.169	0.198
observations	120	
R ²	0.34	

What explains the status quo bias? **D B**

- According to our analysis, skilled native workers organized in interest groups are vocal and effective in reducing number of visas for skilled migrants
- Policymakers might be reluctant to increase skilled immigration for two alternative reasons:
 - Increasing the number of skilled immigrants may involve higher total immigration since unskilled immigrants come no matter what, to which public opinion is opposed
 - If public opinion is willing to absorb only a limited number of immigrants, then increasing skilled immigration reduces the number of unskilled immigrants, which will disappoint powerful sectors relying in unskilled labour (agriculture, construction, textile and apparel)

7 Looking into the future

- The policy equilibrium may shift towards more skill-selective immigration policies for three main reasons
 - Skill-biased technological change
 - Increasing specialisation on human capital activities
 - Ageing and shortages of highly skilled labour particularly in the EU
- This shift will be structural and not marginal
 - The combined population of AUS, CA and NZ comprises less than 100 millions, that of the EU almost 500 millions
- Highly skilled immigrants will stem predominantly from emerging and developing economies in the future (e.g. South and East Asia)

Will this competition exhaust the global pool of skilled labour?

- If the “battle for brains” unfolds, it will affect destination and sending countries
- More specifically, it will redistribute costs and benefits of public investment in higher education between sending and receiving countries, which may in turn undermine capabilities and incentives to invest in higher education and hence *reduce* the global pool of highly skilled labour
- However, increasing migration opportunities for the highly skilled may raise private incentives to invest in education and hence *increase* the global pool of highly skilled labour

Predictions from two-country models

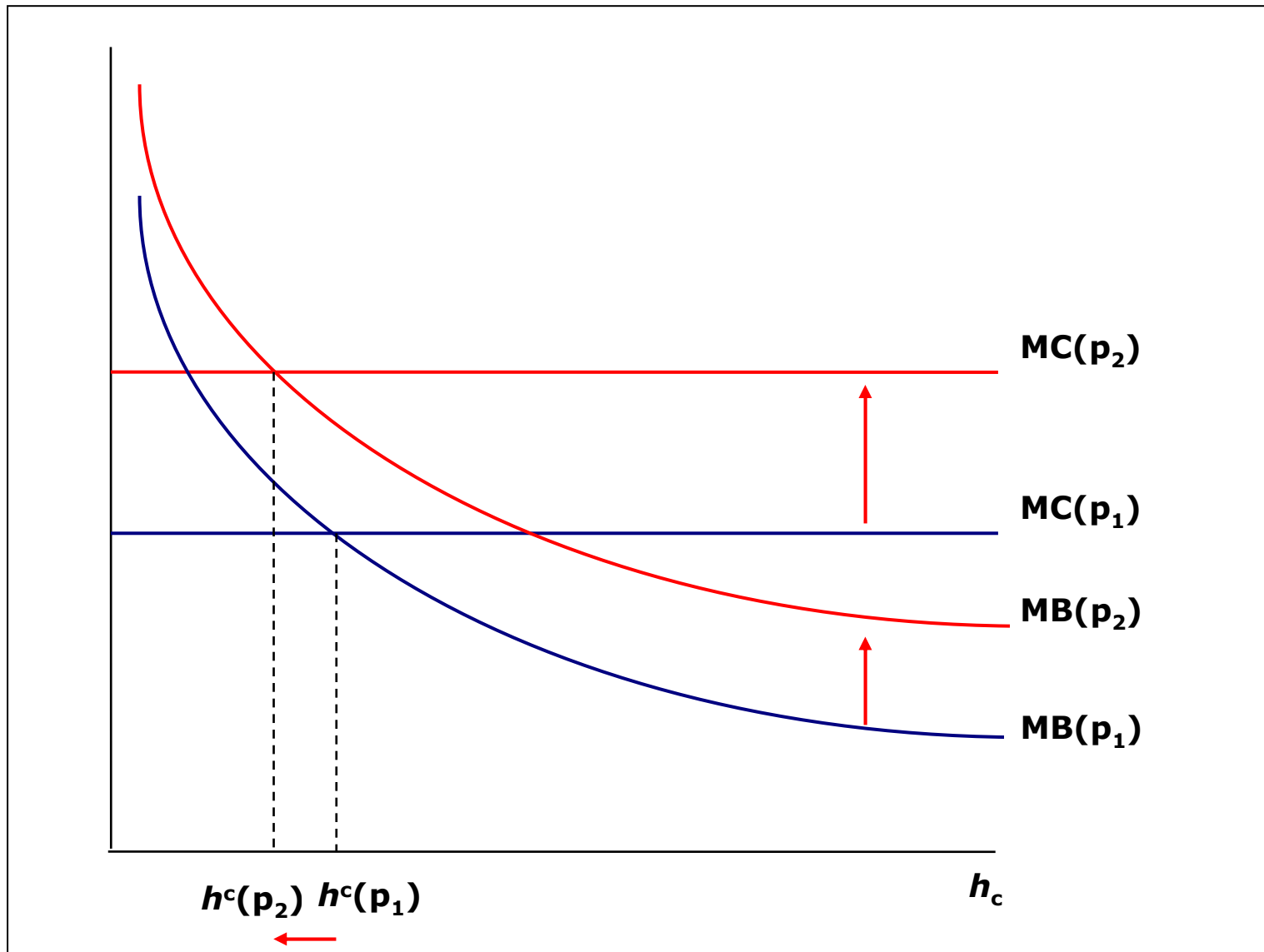
- An increased mobility of skilled workers between identical countries reduces public investment in education, and the average level of schooling of migrants (Justman and Thisse, 1997; Demange et al., 2008)
- An increased mobility of skilled workers from poor to rich countries will reduce public spending in education which offsets higher private incentives to invest in education, such that the overall share of higher educated individuals in the population of sending countries declines (Docquier et al., 2007)

Modelling the “Battle for Brains”

- Building on Docquier et al. (2008) and Stark and Wang (2002) we consider the impact of migration on (i) public and (ii) private incentives to invest in education
- We propose a three-country game, where two identical destination countries determine their optimal immigration policies, and one sending country sets the level of an educational subsidy
- The sending country governments subsidizes education through lump-sum taxes levied on domestic workers who did not migrate
- Destination countries set a quota to attract foreign workers with a high level of education, as education gives rise to a positive intra-generational externality on labour markets

Main features of the model

- Migration is driven by higher wages that prevail at destination for all skill groups since destination countries are technically superior
- Still, the government - and the would-be migrants - do not internalize the positive externalities connected to the education of its own workers that arise in the two countries of destination
- This - together with the willingness to avoid the raise in taxes that is required to balance the budget - pushes down the socially optimal level of the subsidy, driving up the private cost of education

Impact of a higher immigration quota **D B**

Results

- An increased demand for skilled migrants raises both the expected private return to education, and its private cost
- The latter effect prevails, **lowering the equilibrium level of education**, as long as the domestic *social* return to education exceeds the foreign *private* return
- The Nash equilibrium of the game between destination countries results in an inefficient immigration quota, since it does not incorporate the negative externality that one country imposes on the other one via the reduction in the human capital of migrants

Is this empirically relevant?

- The fiscal costs of the emigration of the highly skilled are substantial
 - Emigration of highly skilled from India to US amounts to 2.5% of fiscal revenues there (Desai et al., 2009)
 - Immigration of doctors from Ghana saved UK training costs of £64.5 million
- Share of private funding and tuition fees in education expenditure increase with emigration of skilled labour (Bray, 2000; Docquier et al., 2008; Johnstone, 2004)
- Thus, it is likely that more competition of the highly skilled will result in reduced public investment in education and, hence, increase private costs for education

Summary

- The *Battle for Brains* resembles the famous *Tragedy of the Commons*, as an uncoordinated setting of immigration policies can lead to an unsustainable overexploitation of the global pool of talents
- A policy shift towards skill-selective immigration policies should hence not overlook its impact on sending countries
- Matching the shift towards skill-selective immigration policies with a reduction in public funding of higher education at destination could prove to be seriously short-sighted

8 Conclusions

- Only few OECD countries systematically adopt a skill-selective immigration policy
- Only few OECD countries which are characterized by (i) a high per capita income, (ii) skill-selective immigration policies and (iii) (often) English language are net receivers of talent
- The share of highly skilled individuals in the immigrant population increases with (i) wage premium, (ii) skill-selective immigration policies, while (iii) the impact of welfare benefits, labour market institutions and R&D expenditures is not robust
- Total immigration does not replace native workers nor reduce wages. Highly skilled immigration creates additional positive effects for employment and capital accumulation, but does not increase TFP

8 Conclusions

- Despite their positive aggregate effects, highly skilled immigration is not welcomed by all groups. We find that educated individuals are less favourable towards highly skilled immigration (labour market channel), while individuals with a higher income are more favourable (tax adjustment welfare channel).
- While the median voter model can hardly explain present patterns of skill-selective immigration policies, we find evidence that organized pressure groups from both the unions/professional organisations and employers effectively affect immigration policies
- An intensified “battle for brains” may however result in an unsustainable overexploitation of the global pool of talent
- Policy coordination can hence increase welfare in both receiving and sending countries