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GLOBAL SKILL-BASED IMMIGRATION POLICIES AND ISRAEL'S BRAIN DRAIN

Abstract

US attracts more high skill immigrants than Europe. One key factors is US research centers. US universities and research centers, funded directly and indirectly by the US federal and state governments, attract talented researchers from all over the world. Many of them remained in the US after completing their original term of education, training or research. Many became citizens. In the confines of the generous welfare state, low skill immigrants impose fiscal burden on the native born. In contrast, high-skill immigrants help in relieving the burden. This is the economic rationale behind skill-based immigration policies. The other side of the skill bias in immigration policy is that the international migration of skilled workers (the so-called brain drain) deprives the origin country from its scarce resource—human capital. Israel supply of high skill workers is unique. Today, Israel ranks third in the world in the number of university graduates per capita, after the United States and the Netherlands. It possesses the highest per capita number of scientists in the world, The paper links Israel’s brain drain to skill-based immigration policies, prevailing in the advanced economies. The paper links Israel’s brain drain to skill-based immigration policies, prevailing in the advanced economies.

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Global Skill-Based Immigration Policies and Israel's Brain Drain

by

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Abstract

The paper links Israel's brain drain to skill-based immigration policies, prevailing in the advanced economies.

Economic basic principles imply that high-skill immigration enriches the workforce, thereby allow for a more finely graded specialization that raises average productivity, and living standards. Diverse workforces are likely to be more productive, especially in industries where success depends on specific knowledge, such as computing, health care and finance. By easing labor bottlenecks, low-skilled migrants help to keep down prices of goods and services. In a generous welfare state, low skill immigrants impose fiscal burden on the native born. In contrast, high-skill immigrants help in relieving such burden. This is the rationale behind skill based immigration policies. The other side is that international migration of skilled workers (the so-called brain drain) deprives the origin country from its scarce resource—human capital.

The skill composition of immigrants to OECD countries other than the US, Australia, Canada and Ireland is skewed towards the low education group, thanks to the less rigorous screening of immigration policies. This is shown in Table 1.

Table 1: Skill composition of immigration

Country of Immigration	Low Education as % of total Immigration in 2000[1]	High Education as % of total Immigration in 2000[1]
Austria	47.5	12.7
Belgium	65.7	18.3
Denmark	44.8	17.3
Finland	48.7	23.8
France	74.6	16.4
Germany	65.9	21.8
Greece	44.5	15
Ireland	13.6	41.1
Italy	52.9	15.4
Netherlands	50.2	22
Norway	22	28.7
Portugal	59.7	18.6
Spain	28.7	18.5
Sweden	34.1	25.7
Switzerland	54.9	18.6
UK	34.1	34.9
Average EUROPE	***46.37***	***21.8***
Australia	35.3	40.3
Canada	29.6	58.8
USA	37.9	42.7
Average AUS, CAN & US	***34.27***	***47.27***

Sources: [1]Docquier and Marfouk (2006).

US attracts more high skill immigrants than Europe. US universities and research centers funded directly and indirectly by the US federal and state governments, attracted talented researchers from all over the world. Many of them remained in the US after completing their original term of education, training or research. Many became citizens. By the mid- of 1990s, 30% of documented immigrants to the US were high-skill. In setting up a migration policy, one is certainly concerned by the skill composition of immigrants is a crucial factor. Naturally, highly-skilled immigrants are more attractive to the destination countries than low-skilled, immigrants for a variety of reasons are. For instance, highly- skilled immigrants are expected to pay more in taxes to the Fisc in excess of what the Fisc provides them with. In addition, these immigrants are also expected to boost the technological edge of their destination countries. In contrast, low-skilled immigrants tend to depress the low-skill wages of the native-born, and they are deemed to impose a burden on the fiscal system. However, if a migration policy that favors the highly-skilled is coupled with a generous family-unification policy, then an influx of low-skilled migration takes place too. The 1990 US Immigration Act increased the number of temporary visas to highly -skilled workers. In addition during those decades, the US universities and research centers—, funded, significantly, funded directly and indirectly by the US federal and state governments—,attracted talented researchers from all over the world. Many of them remained in the US after completing their original term of education, training or research. Many became citizens. By the mid- of 1990s, 30% of documented immigrants to the US were high-skill.[1]

Scientists, Technology professionals, Engineers, and Mathematicians (STEM workers) are fundamental inputs in scientific innovation and technological adoption, the main drivers of productivity growth in the U.S. Peri et al (2014) identify the effect of STEM worker growth on the wages and employment of college and non-college educated native workers in 219 U.S. cities from 1990 to 2010. In order to identify a supply-driven and heterogeneous increase in STEM workers across U.S. cities, Peri and use the distribution of foreign-born STEM workers in 1980 and exploit the introduction and variation of the H-1B visa program granting entry to foreign-born college educated (mainly STEM) workers. We find that H-1B-driven increases in STEM workers in a city were associated with significant increases in wages paid to college-educated natives. Wage increases for non-college educated natives are smaller but still significant. We do not find significant effects on employment. We also find that STEM workers increased housing rents for college graduates, which eroded part of their wage gains. Together, these results imply a significant effect of foreign STEM on total factor productivity growth in the average US city between 1990 and 2010.

The paper is organized as follows. Section 1 provides some theoretical underpinnings of high-skill based immigration policy. Section 2 apply the model to analyze, empirically, key determinants of the skill composition of immigration to the advanced economies. Section 3 describes brain

[1] Universities and colleges are the other important gatekeepers through their selection of individuals for the F1 (student) or J1 (exchange visitor) visas (see Kerr et al (2016)). While these visas do not offer long-term employment, US firms often recruit graduates of US schools using visas like the H-1B. An advantage of employment-based immigration- policy regime compared to a points-based approach is that the job-market search process is more efficient in the former case. The employer-employee match is guaranteed to connect the immigrant talent with a productive and adequate job.

drain in selected group of countries. Section 4 concludes with the discussion of Israel's top-talent drain.

1. Understanding Skill-Based Immigration Policy

How does the size of the welfare state affect the skill composition of immigration? A more generous welfare state is more attractive to low-skilled immigrants, known as the magnet effect (Borjas 1999). This is a supply-side explanation for the different composition of immigrants in the US and Europe. Europe, with its generous welfare states, is an attractive destination for low-skilled immigrants, but far less so for high-skilled immigrants who are likely to be net fiscal contributors. Indeed, the demand for immigrants, however, goes in the opposite direction. A more generous welfare state (particularly with an aging population) has financing needs that immigrants could fill. With high-skilled immigrants more likely to pay in rather than draw on the welfare state, more generous welfare states are more inclined to try to attract high skilled.2

To highlight the demand side forces this subsection present a minimalist model that features two migration regimes: free-migration and policy-controlled migration regimes. In summary, the

[2] Why have European countries been unsuccessful in either encouraging high-skill immigration or in limiting the size of their welfare state? Razin and Sadka (2014) take a page out of the vast work on tax competition to provide insights. They argue that fiscal independence in a migration union like Schengen leads to policy distortions. Schengen members do not fully internalize the degree to which their generous welfare states attract immigrants, as the costs of immigration are borne by the union as a whole. This the need for fiscal unity in a common immigration zone is novel. See Ilzetzki (2016).

policy-controlled migration regime leads to a positive effect of the welfare benefits on the skill composition of migration rates, because voters will internalize the fact that skilled migrants will be net contributors to the system (i.e., the fiscal burden effect), whereas unskilled migrants will be net beneficiaries (i.e., the social magnet effect). Under the free-migration regime, unskilled migrants will gravitate to a generous welfare state, while skilled migrants will be deterred.

1.1 A Minimalist Model

We assume a Cobb–Douglas production function, with two labor inputs, skilled and unskilled:

$$Y = AL_{\mathrm{e}}^{\alpha}L_{\mathrm{u}}^{1-\alpha}, \quad 0 < \alpha < 1. \quad (1)$$

Here, Y is the GDP, A denotes a Hicks-neutral productivity parameter, and L_i denotes the input of labor of skill level i, where $i =$ e, u for skilled and unskilled, respectively. Wages, w_i, are competitive and equal to the marginal productivity of L_i.

Aggregate labor supply, for skilled and unskilled workers, respectively, is given by

$$L_{\mathrm{e}} = (e + \sigma\mu)l_{\mathrm{e}}, \quad (2)$$
$$L_{\mathrm{u}} = [1 - e + (1 - \sigma)\mu]l_{\mathrm{u}}. \quad (3)$$

Here, l_i denotes the individual labor supply, e denotes the share of native-born skilled workers in the total native-born labor supply, σ denotes the share of skilled migrants in the total number of migrants, μ denotes the total number of migrants, and is the labor supply of an individual with skill level i, . The total population (N) is comprised of native-born workers (which is normalized to 1) and migrants (μ).

We specify a simple welfare-state system, which levies a proportional labor income tax at the rate τ, with the revenues redistributed equally to all residents, *N*, as social benefit per capita, *b*. The social benefit captures not only a cash transfer but also outlays on public services, such as education, health, and other provisions, which benefit all workers, regardless of their contribution to the tax revenues.

The government budget constraint is therefore

$$Nb = \tau Y. \qquad (4)$$

Assume that the utility function for skill type i, $i \in \{\mathrm{e}, \mathrm{u}\}$, is

$$u_i = c_i - \frac{\varepsilon}{1+\varepsilon} l_i^{(1+\varepsilon)/\varepsilon}, \qquad (5)$$

Where c_i denotes consumption of an individual with skill level *i*, l_i denotes the individual labor supply, and $\varepsilon > 0$. The budget constraint of an individual with skill level *i* is

$$c_i = b + (1-\tau) l_i w_i. \qquad (6)$$

Individual utility-maximization yields the following labor supply equation:

$$l_i = [(1-\tau) w_i]^{\varepsilon}. \qquad (7)$$

The general equilibrium wages for skilled and unskilled workers are

$$w_{\mathrm{e}} = A(\alpha \delta^{\varepsilon} \theta^{1-\alpha})^{1/(1+\varepsilon)}, \qquad (8)$$

$$w_{\mathrm{u}} = A[(1-\alpha)\delta^{\varepsilon} \theta^{-\alpha}]^{1/(1+\varepsilon)}, \qquad (9)$$

Where,

$$\delta \equiv \alpha^{\alpha}(1-\alpha)^{1-\alpha}, \text{ and}$$

$$\theta \equiv [1 - e + (1-\sigma)\mu]/(e + \sigma\mu).$$

1.2 Immigration Policy

The host-country migration policy is to be determined by the median voter in the host country. Let us assume that the policy decisions on the tax rate τ and the total volume of migration μ are exogenous. We do this in order to focus the analysis on a single endogenous policy variable, which is the skill composition of migrants (i.e., σ). Note that once σ, μ, and τ are determined, then the social benefit per capita, *b*, is given by the government budget constraint. Thus, we denote the social benefit per capita, *b*, as $b(\sigma;\tau)$, where the exogenous variable μ is suppressed.

The indirect utility of an individual with skill level *i* is given by

$$V_i(\sigma;\tau) = b(\sigma;\tau) + \frac{1}{1+\varepsilon}[(1-\tau)w_i(\sigma;\tau)]^{1+\varepsilon}. \qquad (10)$$

Differentiating the equation with respect to σ, and employing the envelope theorem, yields

$$\frac{\mathrm{d}V_i(\sigma;\tau)}{\mathrm{d}\sigma} = \frac{\mathrm{d}b(\sigma;\tau)}{\mathrm{d}\sigma} + (1-\tau)l_i[w_i(\sigma;\tau)]\frac{\mathrm{d}w_i(\sigma;\tau)}{\mathrm{d}\sigma}. \qquad (11)$$

Thus, a policy-induced change in the share of skilled migrants in the total number of migrants, σ, affects the utility level through two channels. First, an increase in σ raises average labor productivity and thereby tax revenues. This, in turn, raises the social benefit per capita, *b*. Second, an increase in σ, which raises the supply of skilled labor relative to the supply of unskilled labor, depresses the skill premium in the labor market. If the decisive voter is unskilled, both of the above effects increase his utility. Thus, an unskilled voter would like to set the skill composition of migrants at the maximal limit, $\sigma = 1$. This means that the share of skilled migrants preferred by the decisive skilled voter is typically lower than that preferred by the decisive unskilled voter. The decisive skilled voter would like to set σ below 1 (which is equivalent to assuming that the first-order condition is met before σ reaches 1).

Let superscript i denote the choice of the skill mix of immigrants by a decisive voter i ; i = u, e. Define σ^i as the share of skilled immigrants most preferred by an individual with skill level $i = \mathrm{e}, \mathrm{u}$ in the host country, we obtain

$$\sigma^{\mathrm{e}} < \sigma^{\mathrm{u}} = 1.$$

Recall that the purpose is to find the effect of the change in the generosity of the welfare state on the migration policy concerning σ. The generosity of the welfare state, captured by the magnitude of the social benefit per capita, *b*, depends positively on the tax rate, τ (we assume that the economy is on the "correct side" of the Laffer curve). Thus, we examine the effect of an increase in τ on the change in the skill composition of the migrants, σ. It can be shown that

$$\frac{\mathrm{d}\sigma^{\mathrm{u}}}{\mathrm{d}\tau} = 0; \qquad \frac{\mathrm{d}\sigma^{\mathrm{e}}}{\mathrm{d}\tau} > 0. \qquad (12)$$

$$\frac{d\sigma^u}{dA} = 0, sign\frac{d\sigma^e}{dA} = ?.$$

This means that, if the decisive voter were an unskilled worker, an increase in the tax rate τ would leave the skill migration policy unchanged, because it is always set at the maximum possible limit. However, if the decisive voter is a skilled worker, an increase in the tax rate τ will change the policy concerning the skill composition of migrants in the direction towards a larger share of skilled migrants. The reason for this is that when the tax rate is higher, the redistribution burden upon a skilled decisive voter increases. Allowing an additional skilled migrant can ease this rise in the fiscal burden. Note also that the result applies to the skill mix of migration rates.

Under skill native-born control, the effect of domestic productivity increase on the skill mix of immigration is to improve the mix, ($sign\frac{d\sigma^e}{dA} = ?$). On one hand, the increase in the wage premium also raises tax revenues and eases the fiscal burden. This force makes unskilled migrants

less burdensome to the *Fisc*. At the same time the increase in productivity also raises the efficiency gains, and mitigate the of the skill-labor wage, which makes the influx of skilled migrants desirable.

2. Skill Composition of Immigration: Empirical Analysis

While immigration from poor countries often invokes images of large masses of unskilled laborers, in reality it has been quite skill-intensive. The composition of immigrants into high-income countries, even if they originate from countries with lower income per person, tends to be more concentrated among highly educated than among less educated, relative to the population of the country of destination (see Peri (2016)).

The explanation for the concentration of rich-country immigrants among the highly educated is the screening and selection migration policies by the destination countries.

In this context, Razin and Wahba (2015) researched two hypotheses associated with migration skill mix: The fiscal burden hypothesis and the magnet hypothesis. The former asserts that under host-country migration policy, the rise in the generosity of the welfare state will skew the skill mix towards skilled migrants because they can ease fiscal burden. The second hypothesis asserts that under free migration, would be low skilled migrants will be more attracted to the welfare state so that a more generous welfare state will have its skill mix skewed towards the low skilled migrants. Accordingly, they investigate the effect of welfare state generosity on the difference between skilled and unskilled migration rates, and the role of mobility restriction in shaping this effect. They utilize the free labor movement within the European Union plus Norway and Switzerland (EUROPE) and the restricted movement from outside the EUROPE in order to compare the free-migration regime to the controlled-migration regime. Using bilateral migration movements, and

splitting the sample among flows within EUROPE, and flows from outside EUROPE, they identify the migration regime effect. In Table 2 the dependent variable is the share of skilled migrants in the migrant population, and the main explanatory variable is "benefits per capita" –a measure of the generosity of the welfare state. The hypothesis is that under free migration the coefficient of this variable is negative whereas under controlled migration coefficient of "benefits per capita multiplied by R" is positive. The indicator X is a dummy variable: R=1, if migration is controlled, whereas R=0, if migration is free. Recall the bi lateral migration flows within EUROPE are referred to as free migration, whereas bi lateral migration flows where the SOURCE is outside and the DESTINATION is inside EUROPE are referred to as controlled migration. Appendix 10A includes some robustness tests of the model.

Table 2: Skill Composition of Immigration: OLS Estimates

Dependent Variable: Skill Difference in Migration Rates in 2000

	EUR & DC to EUR			EUR & LDC to EUR		
Welfare generosity						
benefits per capita (logs) 1974-90 (host)	-0.110 (0.057)*	-0.112 (0.056)**	-0.116 (0.047)**	-0.115 (0.056)**	-0.136 (0.053)**	-0.131 (0.047)***
benefits per capita (logs) 1974-90 (host) X R	0.113 (0.053)**	0.137 (0.064)**	0.132 (0.055)**	0.102 (0.065)	0.101 (0.079)	0.110 (0.066)*
Lagged migration rates						
low-skilled migration rate 1990	-0.719 (0.133)***	-0.719 (0.129)***	-0.710 (0.140)***	-0.612 (0.128)***	-0.611 (0.129)***	-0.609 (0.137)***
low-skilled migration rate 1990 x R	1.723 (0.173)***	1.751 (0.169)***	1.723 (0.171)***	0.278 (0.196)	0.560 (0.234)**	0.552 (0.226)**
high-skilled migration rate 1990	1.062 (0.150)***	1.061 (0.147)***	1.049 (0.155)***	0.963 (0.145)***	0.959 (0.146)***	0.957 (0.153)***
high-skilled migration rate 1990 x R	-0.725 (0.149)***	-0.726 (0.144)***	-0.712 (0.151)***	-0.481 (0.157)***	-0.627 (0.170)***	-0.623 (0.173)***
Returns to skills						
high-low labor ratio in 1990 - (host)		-0.484 (0.237)**			0.309 (0.326)	
high-low labor ratio in 1990 (host) X F		0.309 (0.500)			0.019 (0.656)	
high-low wage diff. in 1995 (host)			0.003 (0.002)			0.001 (0.003)
high-low wage diff. in 1995 - (host) X F			-0.007 (0.003)**			-0.005 (0.003)*
Gini in 1990 (source)		0.012 (0.004)***	0.013 (0.004)***		0.011 (0.004)**	0.011 (0.005)**
Gini in 1990 (source) X R		-0.012 (0.005)***	-0.014 (0.005)***		-0.010 (0.005)**	-0.010 (0.005)*

High-low unemp. rate diff. in 1990 (host)		0.002 (0.002)	0.001 (0.002)		0.003 (0.002)	0.006 (0.002)
High-low unemp. rate diff. in 1990 - (host) X F		-0.002 (0.004)	-0.004 (0.004)		-0.005 (0.005)	-0.008 (0.005)*

Immigration policies

Total migrant stock in 1990	-0.001 (0.001)	-0.001 (0.001)	-0.001 (0.001)	-0.002 (0.001)***	-0.002 (0.001)**	-0.002 (0.001)**
Share of refugees in 1990	-2.079 (2.803)	-1.023 (3.237)	-3.904 (3.403)	-0.238 (2.145)	-1.945 (2.477)	-1.297 (3.007)
Observations	384	384	360	601	570	534
R-squared	0.864	0.870	0.874	0.832	0.809	0.814

Notes: F=Free migration; R=Restricted migration. Regressions include log distance, dummy for same language in host and source, strong dummy between host and source, & real GDP per capita in host and in source countries. Robust standard errors in parentheses; * significant at 10%; ** significant at 5%; *** significant at 1%.

In the regression analysis (see also the Appendix) Razin and Wahba (2015) control for differences in educational quality and returns to skills in source and host countries, and for endogeneity bias (by using instrumental variables). Overall, the fiscal burden and the magnet hypotheses, tested with the coefficient of social benefit in the regressions, are statistically significant.[3] Therefore, regression findings yield support for the magnet hypothesis under the free-migration regime, and to the fiscal burden hypothesis, under the restricted-migration regime.

[3] See Appendix A for some robustness tests.

3. Brain Drain: international comparison

Gould and Moav (2007) focus on 28 countries which represent the largest exporters of immigrants to the United States. The sample includes mostly advanced economies. Table 2 shows that the average index of emigration, i.e., the number of emigres per 10,000 residents, is 33.36, with the index for Israel being nearly three times as high: 95.51. Only two countries have a higher index—Ireland (143.9) and Portugal (99.21). When examining the index for educated émigrés, i.e., those with a college degree, the average index is 12.41 and Israel's index is more than three times higher, 41.45. Using this index, Israel is now higher than Portugal and the gap between Israel and Ireland (49.09) narrows considerably. (See Table 8.2).

Table 3 presents international indicators selective indicators of Emigration to the US by Education Attainment. Israel is ranked at the very top for college graduate emigres per 10000 residents to the US; with number of about 41. Only Ireland with a number 49 is ranked above Israel. South Korea, suffering also from brain drain, has only about 25 college graduate emigres per 10000 of its residents.

Table 3: Indicators of Emigration to the US by Education Attainment

Country of origin	Number of 30-50 years old emigres	Percentage college graduates	Number of college graduates	Population of country of origin	Emigres for 10000 residents	College graduate emigres per 10000 residents
Denmark	10,275	52	5,329	5,368,854	19.14	9.93
Finland	8,170	55	4,487	5,172,033	15.80	8.68
Norway	9,030	55	4,943	5,183,545	17.42	9.54
Sweden	17,174	56	9,584	8,876,744	19.35	10.80
Great Britain*	307,694	42	128,600	59,778,002	51.47	21.51
Ireland	55,877	34	19,061	3,883,159	143.90	49.09
Belgium	12,034	53	6,397	10,274,595	11.71	6.23
France	89,213	47	42,323	59,765,983	14.93	7.08
Netherlands	34,318	49	16,691	16,067,754	21.36	30.39
Switzerland	17,295	60	10,300	7,301,994	23.69	14.11
Greece	70,825	27	19,366	10,645,343	66.53	18.19
Italy	147,789	27	39,532	57,715,625	25.61	6.85
Portugal	100,044	10	9,700	10,084,245	99.21	9.62
Spain	46,564	39	18,020	40,077,100	11.61	4.50
Austria	15,936	43	6,877	8,169,929	19.51	8.42
Czechoslovakia	19,990	41	8,230	10,256,760	19.49	8.02
Germany	429,158	34	145,130	83,251,851	51.55	17.43
Hungary	20,498	39	7,969	10,075,034	20.35	7.91
Poland	176,737	27	47,587	38,625,478	45.76	12.32
Romania	48,294	43	20,877	22,317,730	21.64	9.35
USSR/Russia	271,364	53	143,202	144,978,573	18.72	9.88
China	709,415	55	387,900	1,284,303,705	5.52	3.02
Japan	225,484	48	108,981	126,974,628	17.76	8.58
South Korea	388,783	45	173,128	70,548,195	55.11	24.54
Thailand	57,733	35	19,987	62,354,402	9.27	3.21
India	667,434	65	432,037	1,045,845,226	6.38	4.13
Israel/Palestine	57,589	43	24,994	6,029,529	95.51	41.45
Turkey	39,649	45	17,974	67,308,928	5.89	2.67

England, Scotland and Wales.*

Source: Gould and Moav (2007).

Kerr et al (2016) observe that the number of migrants with a tertiary degree rose by nearly 130 percent from 1990 to 2010, while low-skill (primary educated) migrants increased by only 40 percent during that time. High-skilled migrants are departing from a broader range of countries and heading to a narrower range of countries—in particular, to the United States, the United Kingdom, Canada, and Australia.[4] At the policy level, they compare the points-based skilled migration regimes as historically implemented by Canada and Australia with the employment-based policies used in the United States through visa-control mechanisms, like the H-1B visa program. Because of the links of global migration flows to employment and higher education opportunities, firms and universities also act as important conduits, making employment and admission decisions that deeply affect the patterns of high-skilled mobility.

4. Israel's Brain Drain

Today, Israel ranks third in the world in the number of university graduates per capita, after the United States and the Netherlands. It possesses the highest per capita number of scientists in the world, with 135 for every 10,000 citizens (compared to 85 per 10,000 in the United States), (6) and publishes the highest number of scientific papers per capita. According to one recent survey, almost 81 percent of Israelis own cell phones, placing it sixth in the world. Another survey found

[4] Kerr et al (2015) give suggestive examples showing how global migration may be most pronounced for those at the very outer tail of the talent distribution.

that 54 percent of Israelis own personal computers, in comparison to only 42 percent of U.S. respondents.

As for the brain drain in academia, Ban David (2008) demonstrates how differences between universities are inducing a massive academic migration from Israel to the United States. The magnitude of this scholarly brain drain is unparalleled in the western world. (See Figures 1 and 2). European Commission (2003) reported that 73% of the

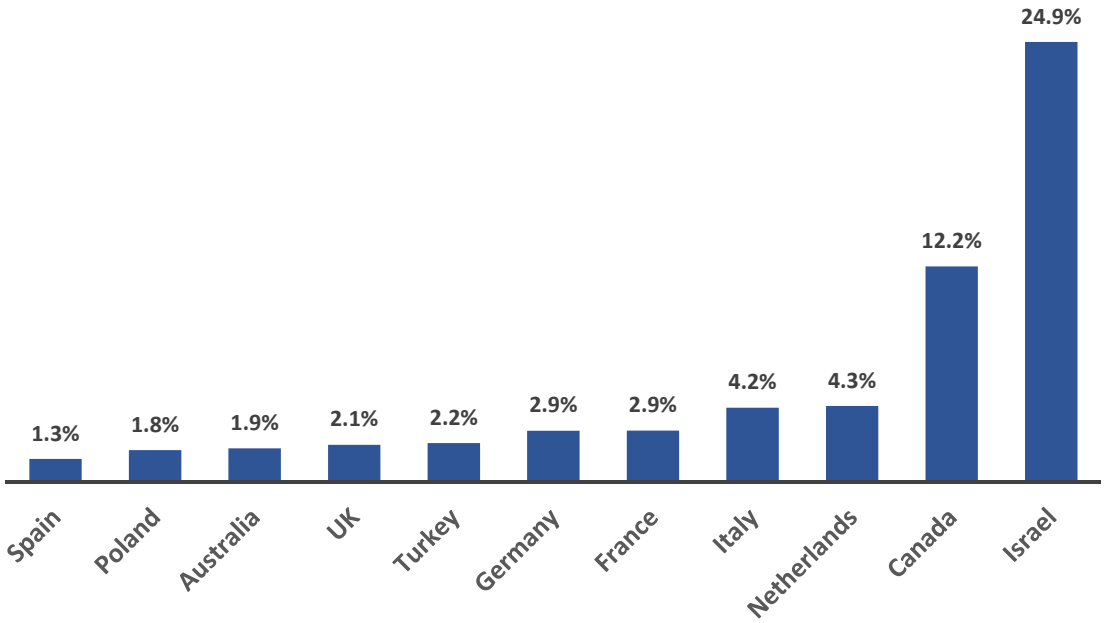
15,000 Europeans who studied for their PhD in the States between 1991 and 2000 plan to remain in America. If Europeans are concerned about the migration of their academics to the States, then Israelis should be nothing less than alarmed.

US serves as a magnet for top scientific immigrants. US immigrants hold a disproportionate share of jobs in science, technology, engineering, and math (STEM) occupations in the United States (see Hanson and Slaughter (2016)). Top talent drain from Israel is disproportionately high among the high-end immigrants.

In general, the ratio of foreign scholars in America to scholars in the home country ranged from 1.3% in Spain to 4.3% in the Netherlands (Figure 1). At 12.2%, Canada was an outlier, though this is much more of a two-way street than in any of the other cases. While Canada is an outlier, Israeli scholars in America are in a class by themselves. The Israeli academics residing in the States in 2003-2004 represented 24.9% of the entire senior staff in Israel's academic institutions that year – twice the Canadian ratio and over five times the ratio in the other developed countries.

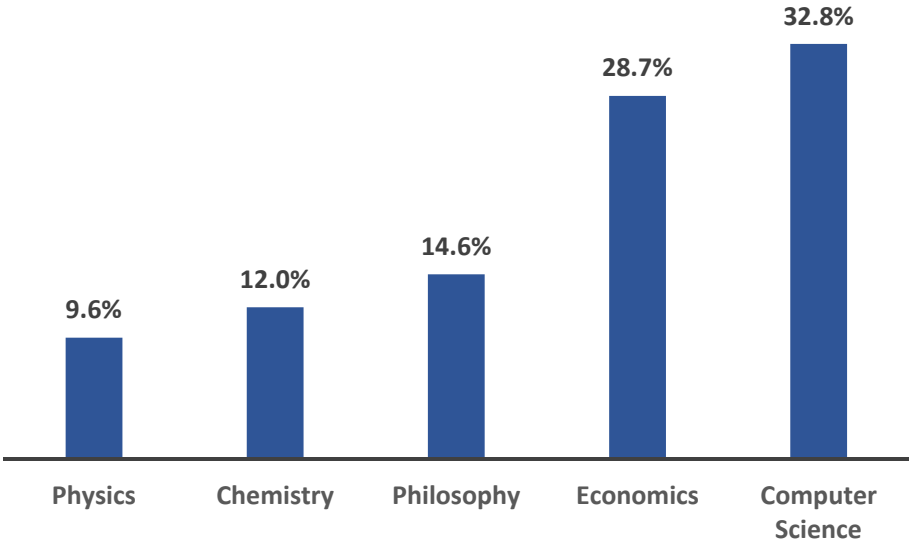
Figure 1 describes the percentage of home country academic scholars who have academic position in US universities. Figure 2 similarly describes Israel scholars in percentage of Israel Universities' senior faculty) in in the top US universities.

Figure 1: Foreign Scholars in U.S. Universities, as percent of academic scholars in home country, 2003-2004



Source: Ben-David Dan (2008)

Figure 2: Israelis in Top American Departments, 2007, as percent senior faculty in Israel, by field



Source: Ban David (2007).

The figures demonstrate that Israel stands out internationally in terms of the size and quality of the brain drain.

Top-talent drain, is therefore an issue of concern in Israel, despite Israel's current technological and scientific prowess, has been trending upward.

Appendix A: Robustness Tests

Razin and Wahba (2015) utilize the free labor movement within the European Union plus Norway and Switzerland (EUROPE) and the restricted movement from outside the EUROPE in order to compare the free-migration regime to the controlled-migration regime. Using bilateral migration movements, and splitting the sample among flows within EUROPE, and flows from outside EUROPE, they identify in Table 1 the migration regime effect. Robustness tests are shown in Tables A2-A4. The dependent variable is the share of skilled migrants in the migrant population, and the main explanatory variable is "benefits per capita" –a measure of the generosity of the welfare state. The hypothesis is that under free migration the coefficient of this variable is negative whereas under controlled migration coefficient of "benefits per capita multiplied by R" is positive. The indicator X is a dummy variable: R=1, if migration is controlled, whereas R=0, if migration is free. Recall the bi lateral migration flows within EUROPE are referred to as free migration, whereas bilateral migration flows where the SOURCE is outside and the DESTINATION is inside EUROPE are referred to as controlled migration.

Table A2: OLS Estimates Using Migration Rates Adjusted by Relative Educational Quality

Dependent Variable: Skill Difference in Migration (REQ) Rates in 2000

	EUR & DC to EUR			EUR & LDC to EUR		
Welfare generosity						
benefits per capita (logs) 1974-90 (host)	-0.105 (0.052)**	-0.115 (0.049)**	-0.109 (0.042)**	-0.111 (0.051)**	-0.116 (0.054)**	-0.138 (0.054)**
benefits per capita (logs) 1974-90 (host) X R	0.115 (0.053)**	0.139 (0.062)**	0.135 (0.054)**	0.104 (0.059)*	0.111 (0.070)	0.132 (0.062)**
Lagged migration rates						
low-skilled migration rate (REQ) 1990	-0.697 (0.151)***	-0.695 (0.149)***	-0.686 (0.160)***	-0.681 (0.156)***	-0.595 (0.143)***	-0.578 (0.150)***
low-skilled migration rate (REQ) 1990 x R	1.711 (0.175)***	1.738 (0.172)***	1.713 (0.174)***	0.715 (0.295)**	0.576 (0.217)***	0.314 (0.208)
high-skilled migration rate (REQ) 1990	1.037 (0.169)***	1.033 (0.168)***	1.022 (0.176)***	1.011 (0.175)***	0.937 (0.162)***	0.920 (0.167)***
high-skilled migration	-0.702	-0.702	-0.688	-0.584	-0.637	-0.468

rate (REQ) 1990 x R	(0.167)***	(0.164)***	(0.171)***	(0.194)***	(0.175)***	(0.178)***
Returns to skills						
high-low labor ratio in 1990 - (host)		-0.482 (0.234)**			0.205 (0.302)	
high-low labor ratio in 1990 (host) X R		0.325 (0.482)			0.043 (0.571)	
high-low wage diff. in 1995 - (host)			0.002 (0.002)			0.003 (0.003)
high-low wage diff. in 1995 (host) X R			-0.007 (0.003)**			-0.006 (0.003)*
Gini in 1990 (source)		0.013 (0.004)***	0.014 (0.004)***		0.011 (0.004)***	0.013 (0.005)***
Gini in 1990 (source) X R		-0.013 (0.005)***	-0.014 (0.005)***		-0.011 (0.005)**	-0.011 (0.005)**
High-low unemp. rate diff. in 1990 - (host)			0.001 (0.002)		0.001 (0.002)	0.006 (0.004)

High-low unemp. rate diff. in 1990 (host) X R			-0.004 (0.004)		-0.005 (0.004)	-0.009 (0.005)*
Immigration policies						
Total migrant stock in 1990	-0.001 (0.001)	-0.001 (0.001)	-0.001 (0.001)	-0.001 (0.001)	-0.002 (0.001)*** **	-0.002 (0.001)*** *
Share of refugees in 1990	-1.907 (2.547)	-1.168 (3.230)	-3.680 (3.298)	-0.672 (1.983)	-2.954 (2.509)	-1.497 (3.081)
Observations	384	384	360	569	569	533
R-squared	0.861	0.867	0.871	0.842	0.816	0.835

Notes: All the migration rates are adjusted for the quality of education by the relative education quality in source to host country, i.e. $REQ = (EQ_s/EQ_h)$; F=Free migration; R=Restricted migration. Regressions include log distance, dummy for same language in host and source, strong dummy between host and source, and real GDP per capita in host and in source countries. Robust standard errors in parentheses; * significant at 10%; ** significant at 5%; *** significant at 1%.

Table 8A3: IV Estimates with Lagged Dependent Variable

Dependent Variable: Skill Difference in Migration Rates in 2000

	EUR & DC to EUR			EUR & LDC to EUR		
Welfare generosity						
Fitted benefits per capita (logs) 1974-90 (host)	-0.157 (0.081)*	-0.217 (0.097)**	-0.118 (0.063)*	-0.181 (0.080)**	-0.180 (0.089)**	-0.154 (0.070)**
Fitted benefits per capita (logs) 1974-90 (host) X R	0.270 (0.089)***	0.261 (0.099)***	0.207 (0.078)***	0.198 (0.088)**	0.209 (0.103)**	0.161 (0.083)*
Lagged migration rates						
low-skilled migration rate 1990	-0.711 (0.130)***	-0.711 (0.125)***	-0.706 (0.135)***	-0.592 (0.131)***	-0.581 (0.131)***	-0.581 (0.137)***
low-skilled migration rate 1990 x R	1.774 (0.171)***	1.775 (0.166)***	1.752 (0.169)***	0.563 (0.229)**	0.556 (0.229)**	0.562 (0.221)**
high-skilled migration	1.055	1.052	1.046	0.944	0.931	0.933

rate 1990	(0.147)***	(0.142)***	(0.150)***	(0.148)***	(0.148)***	(0.152)***
high-skilled migration rate 1990 x R	-0.726 (0.147)***	-0.722 (0.141)***	-0.713 (0.148)***	-0.627 (0.166)***	-0.611 (0.168)***	-0.618 (0.168)***
Returns to skills						
high-low labor ratio in 1990 - (host)		-1.455 (0.541)***			0.060 (0.458)	
high-low labor ratio in 1990 (host) X F		0.794 (0.548)			0.522 (0.690)	
high-low wage diff. in 1995 (host)			0.003 (0.002)			0.003 (0.003)
high-low wage diff. in 1995 - (host) X F			-0.008 (0.003)***			-0.006 (0.003)*
Gini in 1990 (source)		0.012 (0.004)***	0.012 (0.004)***		0.011 (0.004)***	0.011 (0.004)**
Gini in 1990 (source) X R		-0.013 (0.005)***	-0.015 (0.005)***		-0.010 (0.005)**	-0.010 (0.005)**
High-low unemp. rate		0.011	-0.000		0.005	0.005

diff. 1990 (host)		(0.005)	(0.002)		(0.003)	(0.004)
High-low unemp. rate diff. 1990 - (host) X F		-0.005 (0.005)	-0.005 (0.004)		-0.008 (0.006)	-0.008 (0.005)*
Immigration policies						
Total migrant stock in 1990	-0.001 (0.001)	-0.001 (0.001)	-0.001 (0.001)	-0.002 (0.001)***	-0.003 (0.001)***	-0.003 (0.001)**
Share of refugees in 1990	-2.470 (3.174)	0.827 (3.803)	-4.835 (3.670)	-1.590 (2.603)	-2.990 (2.827)	-2.261 (3.266)
Cragg-Donald F-statistics	49.46	54.34	103.01	86.23	98.44	159.12
Observations	384	384	360	538	538	504
R-squared	0.865	0.871	0.875	0.811	0.815	0.821

Notes: F=Free migration; R=Restricted migration. Instrumented using legal origin dummies, and the interaction of legal origin dummies and R. Regressions include real GDP per capita growth rate in host, log distance, dummy for same language in host and source, strong dummy between host and source, and real GDP per capita in host and in source countries.

Robust standard errors in parentheses; * significant at 10%; ** significant at 5%; *** significant at 1%.

Table A4: IV Estimates with Lagged Dependent Variable and Adjusted by Relative Educational Quality (REQ)

Dependent Variable: Skill Difference in Migration Rates (REQ) in 2000

	EUR & DC to EUR			EUR & LDC to EUR		
Welfare generosity						
Fitted benefits per capita (logs) 1974-90 (host)	-0.159 (0.075)**	-0.207 (0.087)**	-0.170 (0.070)**	-0.175 (0.076)**	-0.179 (0.079)**	-0.178 (0.064)***
Fitted benefits per capita (logs) 1974-90 (host) X R	0.269 (0.089)***	0.268 (0.098)***	0.207 (0.077)***	0.207 (0.083)**	0.218 (0.102)**	0.194 (0.080)**
Lagged migration rates						
low-skilled migration rate (REQ) 1990	-0.686 (0.148)***	-0.685 (0.145)***	-0.678 (0.155)***	-0.602 (0.144)***	-0.665 (0.154)***	-0.666 (0.164)***
low-skilled migration rate (REQ) 1990 x R	1.753 (0.172)***	1.765 (0.170)***	1.732 (0.174)***	0.553 (0.212)***	0.694 (0.290)**	0.686 (0.292)**
high-skilled migration rate (REQ) 1990	1.026 (0.166)***	1.022 (0.163)***	1.014 (0.171)***	0.941 (0.163)***	0.991 (0.173)***	0.989 (0.180)***
high-skilled migration rate (REQ) 1990 x R	-0.698 (0.164)***	-0.693 (0.162)***	-0.684 (0.168)***	-0.632 (0.173)***	-0.566 (0.193)***	-0.564 (0.198)***
Returns to skills						

high-low labor ratio in 1990 - (host)		-1.192 (0.358)***			0.075 (0.386)	
high-low labor ratio in 1990 (host) X R		0.833 (0.534)			0.027 (0.574)	
high-low wage diff. in 1995 (host)			0.004 (0.002)*			0.003 (0.002)
high-low wage diff. in 1995 - (host) X R			-0.007 (0.003)**			-0.007 (0.005)**
Gini in 1990 (source)		0.012 (0.004)***	0.013 (0.004)***		0.012 (0.004)***	0.013 (0.005)***
Gini in 1990 (source) X R		-0.013 (0.005)***	-0.015 (0.005)***		-0.012 (0.004)***	-0.012 (0.004)***
High-low unemp. rate diff. in 1990 (host)		0.008 (0.003)**	0.002 (0.003)		0.003 (0.003)	0.006 (0.004)
High-low unemp. rate diff. in 1990 - (host) X R		-0.005 (0.005)	-0.005 (0.004)		-0.008 (0.005)	-0.012 (0.004)***
Immigration policies						
Total migrant stock in 1990	-0.001	-0.001	-0.001	-0.002	-0.001	-0.001

	(0.001)	(0.001)	(0.001)	(0.001)**	(0.001)	(0.001)
Share of refugees in 1990	-2.592 (3.245)	0.106 (3.535)	-2.809 (3.548)	-1.768 (2.476)	-1.694 (2.571)	-1.315 (2.919)
Cragg-Donald F-statistics	51.69	58.98	62.65	86.45	92.77	169.49
Observations	384	384	360	538	569	533
R-squared	0.863	0.867	0.871	0.805	0.830	0.835

Notes: All the migration rates are adjusted for the quality of education by relative quality in source to host, i.e. $REQ = (EQ_s/EQ_h)$, F=Free migration; R=Restricted migration. Instrumented using legal origin dummies, and the interaction of legal origin dummies and R. Regressions include real GDP per capita growth rate in host, log distance, dummy for same language in host and source, strong dummy between host and source, and real GDP per capita in host and in source countries. Robust standard errors in parentheses; * significant at 10%; ** significant at 5%; *** significant at 1%.

Table A2-A4 describe the skill mix-benefit correlations under various econometric specifications. Overall, the fiscal burden and the magnet hypotheses, tested with the coefficient of social benefit in the regressions, are statistically significant. Therefore, regression findings yield support for the magnet hypothesis under the free-migration regime, and to the fiscal burden hypothesis, under the restricted-migration regime. In the regression analysis Razin and Wahba (2015) control for differences in educational quality and returns to skills in source and host countries, and for endogeneity bias (by using instrumental variables).

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