

SHOULD WE WORRY ABOUT THE BRAIN DRAIN?

1. Introduction

Last year's EEAG report discussed how the United States managed to increase its technological lead over Europe in the 1990s, in particular because of its greater production and use of new information technologies.

If Europe wants to catch up, a number of things must be achieved. One of them is retaining highly talented workers. Yet, there are casual reports and anecdotes suggesting that these workers are increasingly attracted by the United States. Anecdotes of European entrepreneurs having contributed to the growth of the US economy with their talent and human capital abound. One may mention Andreas Bechtolsheim, co-founder of Sun microsystems, who was born in Bavaria, as well as French-born Philippe Kahn, founder of Borland. A recent report by the French Senate shows that between 1995 and 1999 the number of French nationals registered at the consulates of Atlanta, Chicago, San Francisco, and London increased by 53 percent, 93 percent, 44 percent, and 33 percent, respectively. Similarly, between 1990 and 1996, the number of French entrants with a visa, granted because of their professional skills increased by 60 percent. In an alarming tone, the report states that as many as 12 percent of students who graduated in 1998 from the French elite "grandes ecoles" – the top schools for business and engineering – took jobs abroad in the following year.

Emigration of highly skilled Europeans to the United States is all the more paradoxical as the

U.S. is already better endowed with skills. If anything, one would expect the returns to skills to be higher in Europe, and skilled labour to move in the other direction.

A reduction of intellectual capital in Europe may be worrying for several reasons. In particular, intellectual workers are complementary to other workers. A greater scarcity of intellectual workers is likely to push the wages of other workers down and to create pressures toward greater inequality. Furthermore, the expatriates' secondary education, and often a large share of their tertiary education, was paid by the European taxpayer, who gets a lower return on his investment in higher education.

This chapter discusses the economic significance of this issue and analyses potential policy responses. Our analysis suggests that the brain drain is a symptom of a more general problem, namely institutional rigidities, that have a number of consequences. In last year's report we discussed how these rigidities affected important determinants of long-run productivity such as investment in high technology or business start-ups. In this chapter we essentially analyse one of the mechanisms by which such rigidities – in particular wage setting institutions, and the structure of taxation – act, namely the expatriation of the most talented.

2. How big is the brain drain?

How worrisome is European emigration of highly skilled workers? To answer that question one first needs to evaluate the quantitative importance of the phenomenon. This is not easy, but one can get an idea by looking at some statistics. Table 5.1 summarises the

Table 5.1

H-1B visas issued by country of origin: 1990 – 1999

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
China (mainland)	610	1,145	894	1,031	1,256	1,887	2,330	3,214	3,883	5,779
India	2,697	4,102	5,552	7,606	11,301	15,528	19,203	31,686	40,247	55,047
Japan	3,791	5,167	2,767	2,152	2,217	2,070	2,411	2,929	2,878	3,339
Philippines	7,302	7,221	7,550	7,596	8,753	10,026	4,601	2,685	2,758	3,065
France	2,293	2,413	1,686	870	1,003	1,216	1,463	1,894	2,110	2,633
Germany	1,637	1,888	1,501	1,012	1,092	1,484	1,518	2,088	2,242	2,451
United Kingdom	7,174	8,794	6,726	3,993	4,230	4,771	5,601	6,928	6,343	6,665
Russia	3,709	3,942	1,651	1,892	1,245	1,196	1,255	1,357	1,395	1,619
Mexico	3,727	3,227	2,488	1,307	1,147	1,451	1,909	2,785	2,320	2,419
Australia	827	1,102	990	863	1,050	1,042	1,123	1,438	1,666	1,651
Subtotal	33,767	39,001	31,805	28,322	33,294	40,671	41,414	57,004	65,842	84,668
Ceiling	65,000	65,000	65,000	65,000	65,000	65,000	65,000	65,000	65,000	115,000

Source: US Department of State, Visa Office.

Table 5.2
Number of European-born

Country	Number	% of home population
Belgium	27,800	0.27
France	189,000	0.32
Germany	1,011,000	1.2
Greece	121,000	1.1
Italy	442,000	0.76
Portugal	160,000	1.6
Spain	106,000	0.26
Switzerland	34,000	0.47
United Kingdom	548,000	0.92

Source: 1990 US Census.

evolution of H1-B visas granted by the United States every year since 1990. These visas are explicitly targeted at highly skilled workers. Many of them come to work in the field of information technology.

The Table suggests that while emigration of highly skilled workers has sharply increased in the second part of the 1990s, moving from 1,216 to 2,633 visas for the French, from 1,484 to 2,451 for the Germans, and from 4,771 to 6,665 for the British, this phenomenon is largely cyclical, the mid 1990s numbers marking a clear trough. However, there are some reasons to believe that there is an upward trend, although it is not very steep.

It is possible to get data on the *stock* of European expatriates in the United States by using U.S. Census data, which contain detailed information about an individual's place of birth – which is what we use as a proxy for immigrant status¹ – and characteristics. We use this data set to get information on both the number and characteristics of European migrants.

Unfortunately, it has not been possible for us to use the results of the 2000 Census, as they are not yet available. If the phenomenon has been accelerating in recent years, as may be inferred from Table 5.1, our results may be biased.

These raw data seem to suggest that the phenomenon is of lim-

¹ Using place of birth as a proxy for immigrant status does not go without caveats. In particular, in the case of Germany, which was occupied by US troops for a long time after 1945, a substantial number of individuals who claim to be born in Germany are likely to be in fact of American descent. For that reason we shall also look at the characteristics of those who have been in the United States for less than 10 years.

Table 5.3
Employment rate of French-born, German-born, and Italian-born US residents

US labour force	FR	GER	IT
67.26	69	68.14	68.04
	(60.6)	(64.8)	(55.7)

Note: Employment rate in the home country in parenthesis.

Source: 1990 US Census.

ited importance. However, as we shall see below, they understate its true economic consequences.

2.1 The characteristics of expatriates

Employment rates

A first aspect is that the *employment rate* is substantially higher for expatriates, as evidenced in Table 5.3. It is slightly higher than the employment rate of similar people among US residents and substantially higher (by 5 to 13 percentage points) than that of residents in the home country. This is not surprising: one most often migrates in order to work in the host country. But it means that one would under-estimate the impact of the brain drain by just looking at the number of migrants.

This higher employment rate could simply result from the fact that migrants are more likely to be in more active age and gender categories. If, say, prime-age males are more likely to migrate, then one should expect systematically higher employment rates for migrants; while Europeans who emigrate would then be more likely to be employed, the same would be true for non-Europeans immigrating to Europe, and little could be deduced. In order to check whether there is more to it, Table 5.4 disaggregates by age categories. For males, it implies that the

Table 5.4
Employment rate by sex and age (population 25 – 64)

Age	Sex	US	French-born	German-born	Italian-born
25 – 64	M	82.59	87.92	86.50	82.53
	F	64.52	59.89	61.84	52.36
25 – 34	M	86.67	88.13	88.96	87.37
	F	68.9	68.24	69.81	60.28
35 – 44	M	88.75	93.10	90.11	90.06
	F	72.90	64.58	74.02	61.48
45 – 54	M	86.43	90.80	91.48	89.77
	F	68.19	63.12	65.38	56.31
55 – 64	M	63.9	79.21	75.72	70.34
	F	43.33	45.26	43.78	40.36

Source: 1990 US Census.

difference is not due to a mere composition effect, but prevails across all categories. In particular, the employment rate for older workers is 7 to 15 percentage points higher for European-born than for the average US labour force, while in home countries it is much lower than in the US, due to early retirement and similar schemes. For females, the story is more mixed, probably because cultural differences in participation rates, as well as family motives for migration, tend to offset the effects of selecting more active workers.

These data thus suggest that European expatriates are disproportionately more active.

2.2. Education

The next question concerns the composition of such migrants in terms of skill levels. If it were the same as that of the home population, one could not speak of a “brain drain”. Instead, one would see a uniform outflow, which, while reducing the population in the home country, has no effect on its relative skill composition. Then there would not be too much reason for worrying, unless one considers the mere size of the population as too low.

Table 5.5, which focuses on workers aged between 25 and 64 years, presents the proportion of people who have achieved tertiary education and compares it to that same number in their native country.²

Table 5.5 shows that European natives who live in the United States are much more skilled than those who live in Europe. This is true even in countries that are traditional exporters of *low-*

² The numbers for the home country come from the OECD for the year 2000. Given that we use the US Census for the year 1990, if educational achievement trends upwards, which is surely the case, then this Table understates the difference between migrants’ and stayers’ achievements.

Table 5.5
Tertiary education rate among expatriates
and in home countries

Country	US expatriates in %	Home country in %
Belgium	68	32
France	66	24
Germany	57	26
Italy	29	19
Spain	49	27
United Kingdom	62	27

Source: 1990 US Census.

Table 5.6
Tertiary education rates by country of birth
and age category

Country	United States, %	Prop. home country, %
Belgium: 25 – 34	68	34
35 – 44	86	28
45 – 54	67	23
55 – 64	49	15
France: 25 – 34	68	31
35 – 44	64	21
45 – 54	72	18
55 – 64	53	12
Germany: 25 – 34	59	22
35 – 44	56	26
45 – 54	48	24
55 – 64	41	20
Italy: 25 – 34	38	20
35 – 44	41	22
45 – 54	18	20
55 – 64	14	10
Spain: 25 – 34	64	33
35 – 44	44	29
45 – 54	32	19
55 – 64	35	9
United Kingdom: 25 – 34	66	25
35 – 44	68	26
45 – 54	56	24
55 – 64	43	19

Source: 1990 US Census.

skilled workers such as Italy and Spain. These migrants are also more skilled than the US labour force in which they participate. The tertiary education rate in that population is 35 percent, above that of European countries but much below that of the expatriates.

One can learn more about the recent evolution of the higher-education rate among expatriates by breaking down these numbers by age categories, which is done in Table 5.6. It suggests that the gap between expatriates and natives is not a new phenomenon, and does not seem to go away. In France and Belgium, the “brain drain” seems to have stabilised, in the sense that the last three cohorts of expatriates have similar rates of tertiary education, while achievements in the home country are improving. In Germany, the brain drain seems to be accelerating: recent cohorts of expatriates are substantially more skilled than previous ones, while there is no significant improvement in the home country. A somewhat similar pattern is found in the United Kingdom. In Spain, the quality of the workforce is sharply increasing, but so it is for expatriates. Finally, Italy has moved from being an exporter of low-skilled labour to an exporter of high-skilled labour, much like its European neigh-

hours.³ Note, however, that the quality of expatriates in recent cohorts remains lower than for other European countries. This perhaps reflects the persistence of low-skill immigration networks from the south of Italy to the United States.

2.3 Is exceptional talent more likely to move away?

As Table 5.1 makes clear, expatriates typically represent 1 percent or less of their home population. Even if their tertiary education rate is twice higher, this means that at most 2 percent of the college-educated population is lost. This is likely to have rather small economic consequences. On the other hand, the issue can be much more serious if people of exceptional talent or rare skills are very likely to migrate. Such people may represent small numbers but have a critical economic significance. In this section, we tackle that issue from a variety of angles.

The following Table looks at expatriates who have a *doctoral* degree and distinguishes between recently arrived migrants (less than 10 years) and others. Among recent expatriates, the doctoral rate is quite high: from 3.6 percent among Italians to 9.1 percent among the French. This is two to four times higher than among earlier immigrants, which is partly a cohort effect but also suggests a possible sharp increase in the quality of expatriates in the second half of the 1980s.

Similarly, the next Table reports on the percentage of expatriates with any post-graduate degree, that is it includes workers who hold at least a master's degree. A similar phenomenon is found, although it is less pronounced, for the United Kingdom.

³ This is confirmed by the findings of Becker et al. (2002), who, using an Italian data base of expatriates, find that the Italian brain drain accelerated in the 1990s and that about 5 percent of college graduates go abroad. However, their study is not directly comparable to this chapter, as they look at Italian emigration to any country.

Table 5.7
Doctoral rates among expatriates,
recent and earlier arrivals

	Ph.D., recent arrivals, %	Ph.D., overall, %
Belgium	8.5	5
France	9.1	3
Germany	4.2	1.4
Italy	3.6	0.9
Spain	4.9	2.4
United Kingdom	5.0	2.5

Source: 1990 US Census.

Table 5.8
Post-graduate rate among expatriates,
recent and earlier arrivals

	> Master's, recent arrivals, %	> Master's overall, %
Belgium	36.8	21.1
France	36.9	16.6
Germany	20.3	8.5
Italy	15.2	5.5
Spain	22.3	12.2
United Kingdom	14.3	10.2

Source: 1990 US Census.

So far, we have only studied the distribution of measured educational levels among expatriates. This misses a potentially important dimension of skill, that is unmeasured ability. The loss of talent would be underestimated if, at a given skill level, those who emigrate from Europe have a higher ability level than others. The problem can be most acute for entrepreneurs, whose creative and managerial skills are not necessarily well captured by the educational system, where they sometimes fail or drop out before completion of the course of study (Bill Gates being one famous example).

One way to look at that issue is to estimate the wages of expatriates compared to the average wages of American residents with similar observable characteristics. This technique says little about how many outliers there are among expatriates as compared to the home country, but it tells us how frequent they are relative to the entire US labour market.

This is what we have done, using the 1990 US Census. According to these data, controlling for individual characteristics, European-born workers earn on average 9.4 percent more than their counterparts. Thus, a “European premium” exists. This suggests that the emigration process tends to select people who fare better, given their personal characteristics, than others, that is “exceptional people”.

It is also possible to estimate different “European premia” according to the individuals’ educational level and country of origin.

Regarding education, the average premium to being European-born tends to fall with the educational level, from 23 percent for those with no education to just 3 percent for those with 17 years of education. This probably means that the unob-

Table 5.9
Wage premium by country of birth

Country	Premium (%)
France	7.1
Germany	2.9
Italy	15.8

Source: 1990 US Census.

served ability of low-education workers who migrate to the United States is greater than that of high-education ones. One possible interpretation is that the United States disproportionately attracts talented people whose talent was not identified by the educational system in their home country.

With respect to the country of origin, one finds wide disparities in the premia, as shown in Table 5.9.

These data tell us that, on average, European-born people are more “talented” than similar US residents. One could further ask about the proportion of “exceptionally talented” European-born people compared to other participants in the US labour market. Let us define “exceptional people” as those whose earnings are unusually high compared to others with the same observed characteristics. This means those in a top percentile for “residual” earnings, i.e. that part of earnings that is not explained by observable characteristics. In the US labour market, 1 percent of the people earn more than 5 times more than people with similar characteristics; 5 percent earn more than 2.43 times the income of similar people, and 10 percent earn more than 1.95 times the income of similar people. The following Table shows the proportion of French-, Italian-, and German-born participants who are beyond these thresholds.

The results suggest, again, that there are wide variations across countries of origin. If one looks at the “very top” people, that is the top 1 percent, one finds that they are three times as numerous, in pro-

Table 5.10
Percentage of European-born in top percentiles, adjusted for individual characteristics

Residual threshold	French, %	Italian, %	German, %
Top 10%	15.5	18.7	12.4
Top 5%	8	8.3	6.2
Very top 1%	3	1.2	1.2

Source: 1990 US Census.

portion, among the French than on average. But they do not seem to be significantly more present among Italian and German expatriates. On the other hand, “top people” (top 5 percent and top 10 percent), are substantially more frequent among the French and Italian expatriates than on average, and more so for Italian expatriates. They are only marginally more frequent among German expatriates. Interestingly, this pattern is in accordance with business surveys. The Global Competitiveness Report (World Economic Forum, 2002), a collection of competitiveness’ measures based on questions addressed to corporate executives, asks entrepreneurs to answer on a scale between 1 and 7 whether they would agree that “The most talented workers remain in the country”. On that account, the United States ranks first with a score of 6.4, Germany is 4th with a score of 5.1, the United Kingdom is 9th at 4.9, France is 18th at 4.6, and Italy is 36th at 3.6.

Another way to measure the density of “exceptional talent” among expatriates is to look at the distribution of income among them. Since such a large proportion of them has tertiary education, one would expect them to be more homogeneous than US workers or non-expatriate European employees. One would thus expect the distribution of income among expatriates to be more equal. This is, in fact, not the case. In 1990, the income share of the top 10 percent in the French labour market was 26 percent. The corresponding share in the US labour market was 30 percent, while among French expatriates in the United States it was even higher, at 35 percent. Thus, even though the average French expatriate is much more educated, he does much more poorly relative to the best 10 percent of his peer group than the average non-expatriate or the average US worker.

Further evidence on workers with tertiary education yields interesting additional insights. Thus, if one limits oneself to workers with at least tertiary education, the expatriate premium disappears: controlling for individual characteristics, a European-born who holds at least a master’s degree does not earn more than the average US resident. This somewhat confirms the above finding that the premium falls with measured education. Does that mean that outliers are more represented among expatriates with less than top education, but not among expatriates with top education? This is true on average, but it hides hetero-

generosity with respect to the *nature* of the higher education degree.

In the entire US labour market, relative to the benchmark of a master's degree, those who have a doctorate earn on average 5 percent *less*, while those who hold professional degrees (MD, LL.D) earn 13 percent more. If one only looks at French expatriates, however, PhDs earn 18 percent *more*, while professionals earn 3 percent more. Among Germans, PhDs earn the same, and professionals earn 8 percent more, so that the structure of rewards to higher education is similar to that in the United States. Among Italian expatriates, PhDs. earn 10 percent more, and professionals earn 3 percent *less*. These differences suggest that the process of selecting the most talented workers still operates for people with a Ph.D. coming from France and Italy, while Italian and French professionals earn less than similar US workers, perhaps because they lack US-specific skills regarding legal and medical practices.

In addition to wages and degrees, one can measure top performers by occupation and achievement. For example, it is useful to look at the proportion of *entrepreneurs* among expatriates. According to the US Census, that proportion is 9.1 percent in the US labour market. Among expatriates, it is slightly higher: 13.5 percent for Italian-born, 10.5 percent for French-born, and 9.9 percent for German-born. These figures are substantially higher than in the labour markets of the home countries, where, according to the Global Entrepreneurship Monitor, cited in last year's EEAG Report, the proportion of entrepreneurs does not exceed 5 percent. As for achievements, there are studies about scientists, which tend to conclude that foreign-born scientists perform better than average in the United States. For example, Stephan and Levin (1999), cited by the OECD (2002), find that the foreign-born account for 18 percent of the most cited patents, and for 25 percent of the founders of start-up enterprises in the biotechnology sector. If they were, on average, as productive as US born scientists, they would account for just 11 percent of patents and 14 percent of start-up founders.

To summarise, European expatriates have much more human capital than the average employee in both their home country and the United States. They earn more than US workers with similar human capital, and, in the case of Italy and France at least, they are more likely to be exceptional performers.

3. Economic consequences of the brain drain

The preceding analysis lends support to the view that there is an outflow of high-skilled workers from Europe to the United States, and that there are reasons to believe that this phenomenon is accelerating. This raises the questions of whether it poses a problem and what policy should do about it.

3.1 The optimistic views

While many observers express concern with regard to the potential damaging consequences of the brain drain for Europe, there are some arguments according to which it is positive, or at least not harmful.

One view is that Europe will benefit from it, because most expatriates are only transitorily present in the United States, and the home country will benefit from their valuable experience upon their return. The question is how important is such return migration, quantitatively, relative to the numbers of those who do not return or return only for retirement. At present we lack evidence on this, but casual evidence from the academic world suggests one should be sceptical. This is confirmed by some surveys. For example, a 1999 French study concluded that out of 1,000 young graduates established abroad, some 31 percent had no intent of returning. 80 percent of them say that their career prospects are better abroad. Furthermore, it is known by specialists of immigration that many people who intend to return actually stay abroad.

This finding is confirmed by other studies. The US National Science Foundation has studied the trajectories of foreign-born PhDs in Science and Engineering (Johnson and Regets, 1998). It found that 63 percent of graduating students intend to remain in the United States. The proportion is highest for Asians (65.5 percent), and greater than one half for Europeans (55.9 percent). The same study finds that out of those who graduated in 1990–91, 59 percent of the British and 35 percent of the Germans were working in the United States in 1995. Interestingly, there is no sign of larger return migration in the longer term; the proportion of foreign-born scientists working in the United States 25 years after their Ph.D. is the same as those working in there five years after their Ph.D. This suggests that part of the return migration is temporary – people in

fact go back to the United States after a while – and therefore should not be overstated.

Overall, these studies suggest that, on average, some 50 percent of Europeans who do doctoral studies in the United States can be expected to be lost to Europe. On the other hand, there is evidence that those who do return earn a higher income beyond what would be predicted by their observed characteristics, which suggests that international mobility is associated with the acquisition of specific additional skills.⁴ In the case of Ireland, for example, the premium to return migration for males is estimated at 10 percent.⁵

Another view holds that greater migration of skilled workers is the by-product of globalisation, and that while it is true that Europe loses more of these workers than in the past, it also imports more of them than it used to. According to that view, the brain drain is just the outcome of greater labour mobility worldwide, and not of a systematic pattern of greater incentives for highly skilled workers to migrate to the United States.⁶ There is certainly some truth in that view, since internationalisation implies greater mobility of executives. But in the field of science and engineering, it is clear that the flow from Europe to the United States is orders of magnitude higher than the reverse flow.⁷

This being said, there are a number of mechanisms that should convince Europe's policy-makers to be worried about a possible delocalisation of its elite.

3.2 Lower returns to investment in public education

First, there is a fiscal externality in education. Many European countries have a generous education system, and taxpayers invest a substantial amount of money in training the elites. Presumably, the social return to such investment is in the form of greater innovation, better managing practices and so on, when these people take on important jobs. However, when they go abroad and stay there, this return is reduced, and taxpayers are

actually subsidising the human capital and productivity growth of the United States. The greater the brain drain, the lower the return to European public investment in higher education; this may in turn lead to a reduction in that investment, for example via a lower political support from the bulk of taxpayers, which will also penalise those highly skilled workers who would have stayed in Europe.⁸

3.3 Inadequate specialisation

Second, the brain drain could affect *specialisation of economic activity* in Europe in an undesirable way. Basically, this means that very highly skilled workers will be in rather short supply relative to some other developed countries and that Europe would specialise away from sectors that are intensive in that factor. In last year's EEAG Report, we presented data showing that Europe is less involved in advanced technologies, tends to specialise in medium-tech goods, and is lagging the United States in terms of high-tech patents or in the intellectual balance of payments. The brain drain is one contributor to that pattern. In principle, this specialisation should not have harmful effects per se. One can perfectly achieve similar living standards and grow at the same rate, as the United States, while being specialised in cars, tourism, shoes, food, and so on. There are reasons to believe, however, that specialisation is not entirely neutral. One such reason is that different sectors have a different growth potential, essentially because they have different learning curves – the learning curve refers to the fact that costs fall, that is productivity goes up, as the cumulated output of a good increases, because people gradually learn how to improve practices. There is probably more scope for productivity improvements via learning in high technologies than in medium technologies. For example, costs in the semiconductor industry have been constantly falling at a very rapid pace. This technology, in which the United States and East Asia are leaders, was an important factor of growth.

3.4 Reduced rents from innovation

Another potentially important effect of the brain drain derives from the fact that if the most talented scientists and entrepreneurs go to the United

⁴ This may be due to selection bias, though, if return migration is triggered by having found an attractive job in the home country.

⁵ See OECD (2002).

⁶ This would be the case, for example, if a reduction in the home bias in consumers' preferences induces an increase in the demand for imports, which would then increase the market shares of multinationals, and eventually the expatriation rate among their top scientists and executives.

⁷ See Mahroum (1999).

⁸ Of course, it may well be that from the point of view of global social welfare, it is efficient to subsidise education in Europe even though those who benefit from it are best employed in the United States; at a minimum, however, one should then consider compensatory transfers in favour of European taxpayers so as to give them a fair share in the global social benefits of the higher education they have funded.

States, then the United States will own more patents. This might be of little consequence, and a nice landscape, folkloric traditions, or know-how in cooking and handicrafts may be as much an asset to an economy as patents in computers, biotechnology, and aerospace. Yet, patents give monopoly rents to the firms that own them, and – provided one has to pay the high monopoly price for a given good as a consumer regardless of location – it is preferable for workers to be located where these monopoly rents are. This means higher wages and more job security, because a part of excess profits is transferred to workers via bargaining mechanisms, and monopolies are less vulnerable to volatility than firms exposed to competition. In other words, we know that the labour market consists of “good jobs” and “bad jobs”⁹, that the former entirely dominate the latter from the point of view of wages, working conditions, fringe benefits, and the like, and that good jobs are located in some industries and not in others. In particular, industries that earn high monopoly rents (due to patents or other factors) typically offer more good jobs. Furthermore, economic analysis has also shown that from the point of view of social welfare it is likely that there are too few “good jobs”. Lagging behind in intellectual property rights will therefore probably reduce the proportion of good jobs in the economy, all else being equal. European governments have tried to increase the number of “good jobs” by labour market regulations, and this has been successful if one defines a “good job” as a long lasting job. But this strategy has generated unemployment and reduced productivity, and may thus prove unsustainable in the long run.

3.5 Negative effects on entrepreneurship and business creation

The argument is magnified if one believes that entrepreneurs are particularly affected by the brain drain phenomenon. Entrepreneurs are a central ingredient of capitalism. Their activity is ultimately responsible for job creation, innovation, and growth. Absent entrepreneurs, economic activity is a mere potentiality. They are the ones who take the practical steps in order for gains from trade to be exploited, by bringing together complementary factors of production, making supply meet demand, and so on.

One may think of the economy being in one of two regimes. In one regime, entrepreneurs are not a limiting factor, and competition selects among them on the basis of luck and efficiency. The economy is “fully employed” in that factors are not idle. In the other regime, entrepreneurs are a limiting factor. Savings have a low return and people are underemployed. An excess outflow of entrepreneurs may harm the economy if it moves it from one regime to the other, although the effects could be small if it does not.

There are reasons to believe that the recent acceleration of the brain drain has been associated with a slowing down in business starts. In the French case, for example, the monthly number of new business establishments peaked at 27,000 in the late 1980s, during a strong expansion. Quite remarkably, a steady increase in business starts was experienced between 1993 and 1995, when it peaked at 26,000 despite a depressed economy. However, since then, it has never exceeded 23,000, although the French economy experienced an expansion even stronger than that of the late 1980s.¹⁰ Of course, this may be due to other factors, for example the evolution of the regulatory environment, itself a potential cause of entrepreneurial emigration. But at least these numbers are compatible with the view that the drain of entrepreneurs dampens the rate of business formation.

Furthermore, business formation in high-tech areas may be further harmed by the expatriation of *top scientists*. The evidence discussed above suggests that exceptionally able workers are over-represented among European expatriates. The impact of such individuals on economic activity could be much larger than suggested by their wages if they exert positive spillovers on business formation in high-tech industries. Can that hypothesis be substantiated with empirical evidence? Zucker et al. (1998) study the determinants of birth rates for biotechnology enterprises. In particular, they look at the impact of intellectual capital in a given area on the birth rate in that same area. A key finding is that controlling for measures of overall intellectual capital, the number of “star scientists” (as measured by publications and citations) has a strong positive impact on business formation. In other words, losing the “stars” may look quantitatively unimportant if one measures the loss by the actual

⁹ See Bulow and Summers (1986) and Saint-Paul (1996) for a theoretical analysis.

¹⁰ See: www.insee.fr.

number of people going abroad multiplied by their wage (as an estimate of their productivity); it seems, however, that these people have a critical impact on high-tech business formation and thus on the long-term growth potential of an economy.

3.6 Pressures towards greater inequality

The lower the number of high-skilled workers, the more unequal will be the distribution of income. High-skilled workers are typically thought of as complementary in production to low-skilled workers. Consequently, a reduction in the supply of high-skilled workers reduces the wages of low-skilled workers, while it increases the wages of high-skilled workers. Thus, if one could reduce the outflow of high-skilled workers while not touching existing systems of wage setting and redistribution, there would be a gain in terms of a more equal distribution of income. However, as we discuss below, we believe that one important factor fuelling the brain drain is rigid wages and income redistribution, and that this will have to be reconsidered if one is serious about reversing the brain drain. In other words, if income redistribution is the only concern, a certain level of brain drain is the price to be paid. But redistribution is less effective, the greater the mobility of skilled labour. Consequently, a more intensive brain drain may lead society to reconsider its redistributive policies, as it means that such policies are more costly.

4. Causes of the Brain Drain

In order to devise appropriate policies to deal with excess emigration of talented workers, it is necessary to have some idea of its causes. This is the subject of this section.

4.1 Greater income for high-skilled workers in the United States

As we have shown above, the brain drain is an outflow of human capital from countries, which have a lower human capital endowment than the destination country. If production technologies were the same across Europe and the United

States, and if wages were set competitively, then, since skills are scarcer in Europe, the return to skills would be higher in Europe than in the United States. Highly educated workers would therefore have no incentive to move from Europe to the United States. Rather, the reverse would occur.

A first reason that comes to mind to explain the brain drain is that technologies may be more productive in the United States, implying that, at any skill level, wages are higher overall. This effect does not seem to be very strong, however. Most of the difference between Europe and the United States in terms of GDP per capita is due to a lower employment rate in Europe. The productivity difference does not exceed 15–20 percent, and it is unlikely that people would move just to earn 15 percent more, at least on an hourly basis. Furthermore, mobility would then not be biased in favour of highly skilled workers, although the latter may be at an advantage in obtaining visas.

Another reason is that, despite the fact that skills are scarcer, the wage structure is more compressed in Europe than in the United States, implying that the return to skills is actually lower on this side of the Atlantic. Figure 5.1 reports the average returns to an extra year of education (in percent) in selected countries, from Psacharopoulos and Patrinos (2002). It shows the proportional impact on pre-tax wages of an extra year of education on average¹¹

¹¹ This is the appropriate number one wants to look at if one is interested in the incentives to migrate rather than the incentives to acquire education, for which the cost of acquiring education must be taken into account.

Figure 5.1

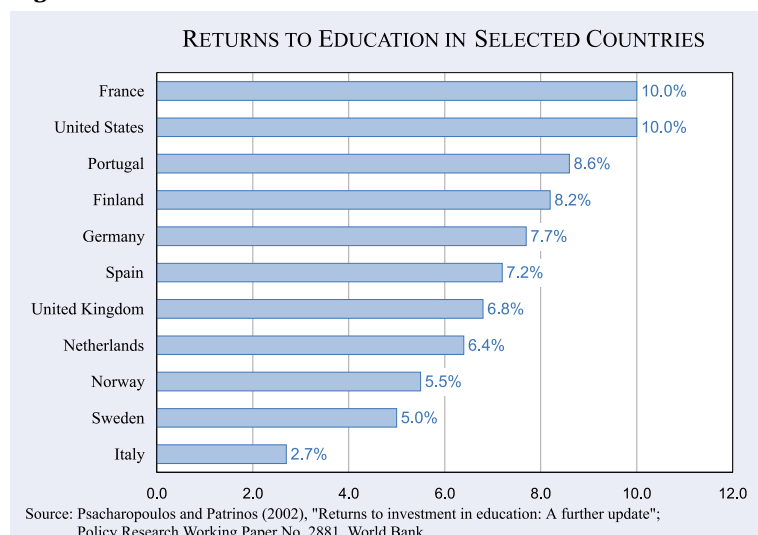
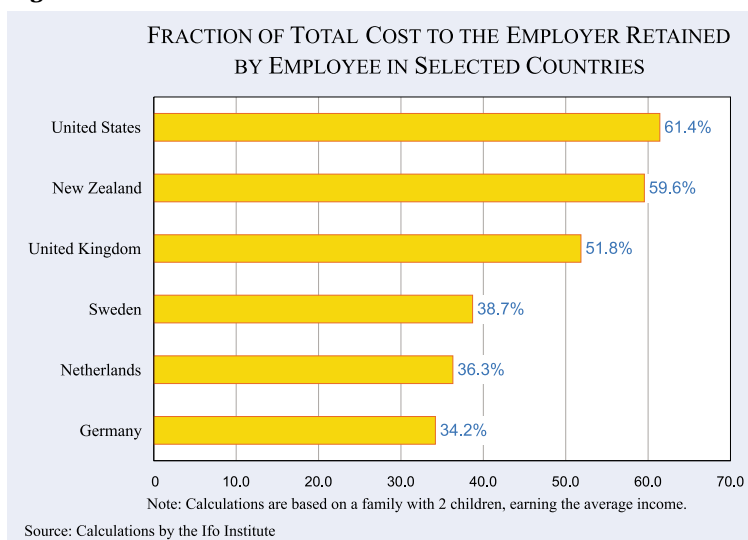


Figure 5.2



and confirms that the returns to education are on average lower in Europe. Note, however, that France has the same returns as the United States. Again, a few percentage points of extra returns to schooling does not justify emigration, but this phenomenon has to be *added* to that of higher US productivity.

A third phenomenon, which cumulates with the other two, is the fact that top marginal income tax rates are also typically higher in Europe than in the United States, with the notable exception of the United Kingdom.

Top marginal income tax rates are 55 percent in France and 51 percent in Germany, respectively, vs. some 40 percent in the United States and the United Kingdom. If one adds social security contributions, the difference between the total cost to the employer and the workers' income implies nearly confiscatory average tax rates for top earners in Europe. Figure 5.2 shows the fraction of the total cost to the employer accruing to the worker, after all taxes and contributions for a yearly nominal employee income of 200,000 euros.¹²

The figures speak for themselves: If an employer wants to give \$1 more to say a top executive, it will cost him \$3 in France vs. \$1.70 in the United States.

If anything, these differences in the distribution of income have been aggravated by recent trends.

¹² Wedge includes the employee's income taxes and social security contributions, and the employer's social security contributions.

While in the United States income inequality has risen over the last three decades as a result of technical change, in Europe it has remained much more stable. This is in great part due to labour market institutions, which compress the distribution of wages. Greater mobility of high-skilled workers makes it difficult to sustain such institutions if wage inequality continues to increase in the United States.

Admittedly, Europe offers better amenities in terms of public goods, social services, and the

like. But the amenities are more adequate for lower and middle class workers than for top workers. These can presumably buy high quality health and education in the United States, and have little demand for their publicly provided equivalents in Europe.

4.2 An environment more friendly to entrepreneurship

The motivation for moving may not only be monetary. People may also enjoy the greater economic freedom, less restrictive social norms, and even in some cases the greater freedom of expression in the United States compared to Europe. Regarding the ease of starting a new business, for example, Harvard's *Global Competitiveness Report* constructs a start-up index capturing the ease with which one can start a business. The United States ranks first at 2.02, followed by Hong Kong at 1.63. The United Kingdom ranks 6th at 1.36, Germany 21st at 0.41, and France 35th at - 0.18, ahead of Portugal but behind Mauritius.

One may speculate that part of the wage premium associated with being an expatriate, especially at low and moderate education levels, reflects the greater density of people with entrepreneurial and creative skills among migrants. At this stage, however, we lack direct evidence.

4.3 Agglomeration externalities and economic geography

Most of the preceding explanations are associated with the view that the institutional environment is friendlier to talented people in the United States.

If this view is correct, then institutional change is part of the solution if one wants to reverse the phenomenon. However, another potential explanation does not involve institutions, but is based on the view that, for historical reasons, high-tech sectors are located in the United States. To the extent that there are favourable scale and spill over effects associated with the location of a large number of high-tech industries in the same place, the reward to talent will be higher in these locations, and they will therefore attract more talented people. This view may be relevant to the extent that markets for highly talented people are thin, implying that it may be quite difficult or impossible to find an appropriate job in some areas. A Cameroonian specialised in artificial intelligence, for example, will virtually be unable to find adequate employment in Cameroon; and even if Cameroon's institutions were quite favourable to high technologies, it would be unlikely that a sizeable labour market for AI specialists would arise there. The problem is less severe when one is dealing with migration from Europe to the United States, but may still exist. For example, there is hardly a place in Europe where one could find a market for computer specialists comparable to Silicon Valley.

If this explanation is correct, institutional change will not go a long way toward reversing the brain drain. More active "industrial policy" may be needed, as is discussed below.

5. Possible solutions?

Above we posed the fundamental question: should governments worry about the brain drain problem and if so, what are the appropriate policies? The answer to that question depends obviously on which causes and which consequences of the brain drain are most relevant. Here we discuss a certain number of measures that would alleviate the brain drain problem; most of these measures, however, tackle the more fundamental problems of lack of incentives for risk-taking and innovation, of which the brain drain is just one symptom.

Concerning the fiscal externality, for example, it seems reasonable to consider public funding of higher education as a loan to the individual rather than a gift. This loan could be repaid in money or in kind, by working in the country, which has financed the education, or in the European Union.

Such a measure is unlikely to have a large impact on the brain drain, but at least it would offset its negative consequences on the social returns of public investment in higher education.

In our view, reversal or at least reduction of the outflow of talent necessitates two key measures. First, a reconsideration of taxation of top incomes, which in some countries is nearly confiscatory, if one adds all the taxes. One has to do away with the view that a reduction in marginal income taxes at the top is "unfair". Reducing the income of the rich is not a goal in itself. The goal of redistribution should be to increase the income of the poor. Standard models of optimal income taxation for a society, which cares about inequality, predict that marginal income taxes should be falling as income rises. The reason is that one wants to give the most talented workers greater incentives to work, since their working time is most valuable to society. The tax losses induced by such changes are likely to be rather small, as top earners account for a minute share of total tax receipts. Furthermore, a reversal of the brain drain tends to compress the distribution of wages as highly skilled workers are less scarce, thus partly offsetting the adverse impact on inequality of reduced taxation at the top. Finally, talented workers exert a number of favourable effects on the rest of society that are not reflected in tax receipts.

Second, a reduction of barriers to entrepreneurship seems to play a key role in discouraging talented people from staying in the home country. These barriers mostly penalise potential entrepreneurs from a socially disadvantaged background, and those who, despite great performance, have underachieved at school (perhaps because of illness or family problems in addition to poverty). As we have seen, European expatriates tend to be above-average performers, not only overall, but at all education levels, and especially at low educational levels. This could be related to the fact that the fraction of entrepreneurs among expatriates is slightly higher than in the US labour market, that is much higher than in the source countries. There is no reason why regulation could not be adjusted so as to induce more of these people to start a business in Europe. This would not only retain a greater share of precious talent, but also enhance social mobility and the returns to effort in our societies.

In our view, these measures are necessary. But they need not be sufficient. Within countries, regulations and taxes are fairly uniform, and yet we

observe that talent is concentrated in some areas, usually around political decision centres, universities, and advanced technology firms. The location of these centres reflects political and economic events of the past. Similarly, in a global world, most intellectual talent may end up being located in the United States, just as it deserted rural and provincial areas to go to political centres and big cities one hundred years ago. This situation may be a self-sustaining equilibrium, and it can take much more than mere convergence to US regulatory and taxation standards to reverse it. This raises the question whether voluntary government investment in “centres of excellence” would work. That is, governments could act as a co-ordination device to implement some new “Silicon Valleys” in Europe. This is the old industrial policy which is now somewhat discredited, as decades of support for “technological champions” from both the EU and national governments have not prevented Europe from gradually sliding behind the United States. These policies could work in principle, however, provided the talented people on whom they rest have incentives to stay, that is provided the other changes have been made.

The real difficulty, though, lies in subsidising “talent” *without* targeting the *wrong* sectors at the same time. There are many examples of state intervention in Europe directed at a specific technology which ended up being a failure, for example because it was not adopted as a standard. Thus, restoring industrial policy with a high-tech orientation is not so easy as it looks. Rather than taking the risks of directing the nature and contents of economic activity, governments can do it in a less committed way¹³, invest more in higher education and public research, with an emphasis on better rewarding performance in these sectors. They can then hope that these institutions will have positive effects, at the local level, on high technology firms.

Similarly, favouring the mobility of highly skilled workers *within* Europe may favour the emergence of clusters of talent and put a brake on the brain drain. Increased mobility of scientists could help a lot in light of the fact that the market for these workers is *thin*. That is, a given individual does not have a large number of alternative job opportuni-

ties, which increases the value of establishing oneself in a more efficient labour market, such as the United States. Better integration of the labour markets for scientists and top engineers across Europe will go a long way in reducing its thinness.

In principle, the single market grants mobility as a right. In practice, however, many obstacles remain. In particular, lack of portability of pension schemes remains a major obstacle, especially because pension rights are not proportional to total cumulated contributions. Removing these obstacles would probably help, but the “talent clusters” that would emerge need not be uniformly distributed across countries; there would be winners and losers, and some countries might even lose more of their talent to other member states than they have been losing to the United States. (An example of such a phenomenon is French emigration to London.)

Respectively, one may believe that *enlargement* of the European Union will have some effect on migration flows of highly skilled workers. Presently there is a large flow of professionals and scientists from Eastern Europe to North America. The integration of these countries will probably divert part of that flow to Western Europe. Admittedly, the total outflow may be even larger, which is unlikely to help Eastern European countries. On the other hand, this diversion phenomenon may increase the intellectual capital of Western Europe, which may favour the emergence of high technology clusters. After a while, Eastern European countries could eventually benefit, for example if there exists some intra-EU scheme helping the repatriation of Eastern European scientists. This will not happen, obviously, until the Eastern European countries have reached a certain level of prosperity and stability.

References

- Becker, S., A. Ichino and G. Peri (2002) “How large is the brain drain from Italy?,” *Munich University working paper*.
- Bulow, J. and L. Summers (1986) “A theory of dual labor markets”, *Journal of Labor Economics*.
- EEAG (2002) *Report on the European Economy 2002*, European Economic Advisory Group at CESifo, Munich.
- Global Entrepreneurship Monitor Consortium (2002) *Global Entrepreneurship Monitor 2002*.
- INSEE <http://www.insee.fr>.
- Johnson, J.M. and M. Regets (1998) *International Mobility of Scientists and Engineers To the US – Brain Drain or Brain Circulation?*, NSF Issue Brief 98-316, June 22.

¹³ The only area where government intervention should promote specific technologies, is where there are network externalities, as in the case of setting common standards in areas such as telecommunications.

Mahroum, S. (1999) "Europe and the Challenge of the Brain Drain," *IPTS Report 29*.

OECD (2001) *International Mobility of the Highly Skilled*, Paris.

OECD (2002) *Revenue Statistics 1965-2001* (October).

Psacharopoulos, G. and H.A. Patrinos (2002) "Returns to investment in education: A further update." *Policy Research Working Paper* no. 2881, World Bank.

Saint-Paul, G. (1996) *Dual Labor Markets: A Macroeconomic Perspective*, MIT Press.

Stephan, P. and S.G. Levin (1999) "Exceptional contributions to US Science by the foreign-born and Foreign-educated," *Science*, 285.

World Economic Forum (2002) *Global Competitiveness Report*, Harvard: Center for International Development.

Zucker, L., M. Darby and M. Brewer (1996) *Intellectual Human Capital and the Birth of US Biotechnology Enterprises*, NBER Working Paper Series.