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Modernization for Emigration: Determinants and Consequences of the Brain Drain*

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The migration of professionals and technicians from poorer countries to the advanced world has received considerable attention for a long time, less because of the numbers involved than because of the economic and cultural significance of such flows. Dubbed “brain drain”, the movement has been traditionally defined as a net loss for sending nations who spend scarce resources in providing advanced training for their youths, only to see them move abroad once they earn the necessary credentials.

This view has become considerably more nuanced in recent years under the influence of new theories of migration and new facts on the ground. The traditional characterization of the brain drain relied on a simplified view of migration as a one-way process in which migrants left to carve a new life in the rich countries and never looked back. On the contrary, recent evidence points to an intense two-way and, sometimes, multiple-way traffic between migrants and their places of origin giving rise to novel conceptualizations of the process. Similarly, countries long regarded as labor exporters and, hence victims of the brain drain have come to benefit from such flows in previously unexpected ways.

Traditional destinations of this type of migration have also started to diversify in recent years reflecting shifts in the global economic system. The relative decline of the United States and the rapid rise of other large nations, such as China, have led to the partial re-channeling of high-end labor flows and the emergence of new temporary and cyclical movements. We review first the evolution of theories of the brain drain as a framework to examine empirical evidence about the recent evolution of these flows and their significance for the countries involved and for the migrants themselves.

Migration Theories

The classical theory of international migration focused on the joint “push” from places of origin and the “pull” from places of destination. Closely associated with this theory is the cost-benefit approach of neo-classical economics. Both theories are individualistic and rational, predicting migration on the basis of differentials of advantage in the receiving countries. Early analyses of trans-Atlantic migrations, such as the classic study of Brinley

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Thomas, made ample use of the push-pull framework. More recent, Borjas advanced an elaborate cost-benefit approach to labor migration based on the wage gap between sending and receiving destinations times the probability of securing a job upon arrival, minus the costs of the journey.¹

As applied to highly-skilled migrants, these theories do not work very well. It is true that, broadly speaking, this type of migration originates in countries of the Global South and is destined to those of the advanced North, but empirical support for push-pull theory pretty much ends there. If “differentials of advantage” calculated on an individualistic basis were the principal determinant of this type of flow, professionals from the poorest countries should be those best represented, at least on a relative basis. This is not what happens.

Highly-skilled migrants frequently originate in mid-income countries such as Argentina, Colombia, Mexico, and Turkey and even in relatively high-income ones, such as Israel and Canada.² Moreover, only a minority of similarly-trained professionals in countries of out-migration decide to undertake the journey. Since all persons with comparable training and skills are supposed to be affected by the same push-pull forces and cost-benefit calculations, it would stand to reason that many more would decide to leave if the balance was decisively in favor of that option. Empirical evidence contradicts that prediction.

The poor predictive record of push-pull theory and the associated economic calculus has progressively relegated this approach to the status of metaphor, used to describe *ex-post-facto* the reasons for particular flows but incapable of anticipating them. At the opposite end of the analytic continuum are structural theories of neo-Marxist inspiration that explain the brain drain on the basis of the increasing penetration of institutions of “core” powers in the global system into its periphery. This penetration takes the form not only of diffusion of modern consumption standards, but also of modern educational and scientific practices and modes of institutional organization. As a consequence, not only multinational corporations from the advanced countries conquer the “heights” of peripheral economies, but the educational and training systems developed in advanced countries become increasingly imitated in weaker ones.³

Countries at mid-levels of development are particularly susceptible to this effect since they are the most motivated to “catch up” with the advanced world and possess the resources to copy its educational practices.⁴ The outcome is that young professionals in peripheral countries commonly find themselves with advanced scientific and technical training, but without opportunities to put them into practice, given limited demand in their respective labor markets. When shortages of trained workers in their particular fields materialize in the advanced countries, these professionals provide a ready supply. This syndrome, dubbed “modernization for emigration” is graphically portrayed in Figure 1.

Macro-structural theories explain why professional emigration originates in mid-income countries, but are also vulnerable to the same criticism regarding the failure to differentiate migrants from non-migrants. For if all young professionals in a country are exposed to the same modernization syndrome, it is unclear why only a minority actually undertake the journey. It is certainly true that the structural unbalancing of peripheral nations by the

corporations and institutions of the advanced world creates the conditions for the outset of such flows. However, explaining who actually migrates requires better grounded theory. One such theory, dubbed the “new economics of migration”, makes heavy use of the concept of “relative deprivation” to explain the causes of out-migration from rural communities in countries such as Mexico.⁵ In the case of professional migrants, relative deprivation has also been found to be a powerful motivating force. Generally, the relevant comparison is not with foreign professionals, but with those of the same nationality in the same country.⁶

Professionals who secure relatively well-remunerated positions that allow them to put into practice the skills acquired during their training rarely migrate. On the contrary, those who cannot access incomes providing a middle-class life style, according to the standards of their own country, or who are threatened with early obsolescence in their careers have every motivation to leave. Put differently, the relevant point of reference is not the invidious comparison with the incomes and work standards of First World professionals but with conditions *internal* to the sending countries themselves.

A second theory used for predicting who migrates is grounded on the concepts of social capital, social networks and path dependence.⁷ Once a few pioneers have gone abroad seeking to overcome constraints at home, the risks and costs for other would-be migrants are significantly reduced. This is so because social networks convey the necessary information: how to apply for a job, what tests must be passed, how to negotiate work conditions, where to live and what to guard against. Pioneers migrants have to confront all these hurdles on their own; the “social capital” of their associates back home consists precisely on gaining access to this migration-relevant information.⁸

Over time, the operation of social-networks can lead to a self-sustaining flow of migrants. As more and more professionals move abroad, the costs of migration for those left behind are concomitantly reduced. In addition, relative deprivation – previously confined to conditions internal to the country of origin – now becomes externalized as stay-at-home professionals start assessing their incomes and work conditions in relation to their fellow nationals abroad. Through the operation of these forces, out-migration may become normative, i.e. the “thing to do” by young professional in order not to fall behind their peers. At that point, migration turns path dependent as it is transformed into expected behavior in the professional community.⁹

Path dependent migration represents the final stage of the process through which the “modernization for emigration” syndrome is actualized. For various reasons, this stage is not always reached. One is the improvement of salaries and work conditions at home as governments and home country institutions struggle to retain their high-skilled work force. A second is the saturation of demand for foreign professionals in receiving countries that significantly raises the barrier for successful migration. A third important one, is the return of migrant professionals and the changed conditions that they may create at home.¹⁰

Theories of professional migration have concentrated so far on the *departure* of skilled workers, but not on the likelihood of their return. That is why the process, as outlined in Figure 1, culminates in a net drain of talent for countries of origin. More recent theories have

called attention to the fact that international migrants seldom leave for good. Developments in communication and transportation technologies have made cross-border contacts easier than ever.¹¹ This new *transnational* perspective extends and corrects the structural unbalancing theory presented in Figure 1 by adding a number of significant causal arrows. As applied to labor migrants, the emerging transnational perspective is represented in Figure 2. In the case of professionals, it must be supplemented by the significant knowledge transfers that, in addition to money remittances, this type of migrant can generate.

The research literature supporting the transnational perspective has uncovered another important fact, namely that participation in these activities *increases* with length of time in the host society, security of legal residence, and economic status.¹² This finding runs contrary to the classic assimilation theories that would regard such transnational contacts as a short-lived “passing phase” of immigrant adaptation.¹³ To the contrary, the more secure and occupationally successful migrants are the readier they are to take part in transnational organizations and invest in enterprises in their country of origin.

The character of immigrant engagement with their home countries depends on a set of variables that the empirical literature has only recently begun to clarify. For the moment, the important point is that the advent of the transnational perspective provides a novel lens to analyze what had been seen previously as one-way flows. By the same token, it calls attention to an entirely different social dynamics, with consequences for both places of origin and destination. We review next the empirical literature as it bears on these alternative theoretical positions.

U.S. – Bound Flows

Most theorizing on the origins and consequences of the brain drain has had U.S.-bound professional flows as their main empirical referent. There are good reasons for this, as the United States has been the principal magnet of this type of migration for many decades and certainly in the post-World War II era. A preference category of the U.S. visa allocation system is reserved for “priority workers with advanced degrees or aliens of exceptional ability”. This category provided, until recently, the main entry channel for this type of immigrant. In 2002, for example, 34,452 “persons of extraordinary ability”, “outstanding researchers” and their kin plus an additional 44,468 professional holding advanced degrees and their families were admitted for permanent residence. In 2010, and despite the employment drop due to the Great Recession, the figures were not too different: 41,050 “priority workers” plus 53,946 professionals with advanced degree or “aliens of exceptional ability” were admitted or adjusted their status to permanent residence.¹⁴

Although, in relative terms, employment-related immigration has only represented about 13 percent of the total legal flow, it has been the main channel for the permanent addition of highly-trained foreign worker to the American labor force. Tens of thousands of immigrant physicians, nurses, engineers, and scientists have arrived through this channel fueling the growth of diverse sectors of the U.S. economy. Their presence helps explain why about a quarter of the U.S. foreign-born populations are college graduates and post-graduates and

why about 25 percent of foreign workers are in managerial or professional-specialty occupations.¹⁵

In addition to foreign professionals making use of the preference categories of the American immigration system, large numbers have also come as political refugees. The strong bent of U.S. refugee policy during the Cold War years to admit as refugee people escaping from Communist regimes, translated into the arrival of thousands of educated and formerly prosperous persons fleeing Marxist takeovers of their countries. Practically the entire Cuban upper and middle classes left for the United States in the aftermath of Castro's Revolution.¹⁶ The same pattern repeated itself in Vietnam twenty years later.¹⁷ Following the end of the Cold War, the annual refugee flow has included significant numbers of university-educated Iranians, Iraqis, and Bosnians. In 2010, over 73,000 refugees were admitted to the U.S., including over 16,500 Bosnians, 18,000 Iraqis, and close to 5,000 Iranians.¹⁸ Unlike regular immigrants, refugees are generally barred from returning home and, hence, they tend to settle permanently in the receiving country.

At the other extreme, in terms of temporality of migration, we find professional and technical specialty workers arriving under the H1-B program. This new category, created by the 1990 Immigration Act and expanded subsequently, has become the principal conduit for the arrival of tens of thousands of foreign engineers, computer programmers, and medical personnel on temporary labor contracts. The H1-B visa is granted for a three-year period, renewable for another three. The annual ceiling for petitions of this type of visa was originally set at 65,000; it was increased to 115,000 in 1999 and then to 195,000 in 2001–03 under the American Competitiveness for the Twenty-first Century Act (AC21). The actual number of beneficiaries in 2002 was 197,357. In the same year, the total number of “temporary workers and trainees” reached 582,250.¹⁹

While the cap on H1-B visas reverted to 65,000 in 2004, the actual number of beneficiaries exceeded several times that figure because professionals coming to work for non-profit colleges and universities and governmental agencies are exempted from the cap and renewals are not counted in the quota. Thus in 2009, over 214,000 H1-B petitions were granted. Reflecting the effect of the economic recession, this figure represented a 22 percent decline from the prior year, but it was still far ahead of the original quota. Fiscal year 2009 is the first in the decade where H1-B visas did not exceed a quarter of a million.²⁰

As shown in Table 1, professional immigrants originate primarily in Asia and, overwhelmingly in India. Just as Mexico has become the main supplier of unskilled and semi-skilled labor for the American economy, India has pride of place as a source of highly-skilled professionals and technicians. As seen in Table 1, almost 99 percent of H1-B migrants possess a bachelor's degree or higher. Their occupational skills concentrate primarily in computer-related fields and, secondarily, in architecture and engineering. Average annual incomes exceed \$70,000, ranging from close to \$90,000 for medical and health professionals to \$55,000 for college instructors and other educational personnel.

Though reasonable, these salary figures are not particularly high for university-trained professionals. Herein lies one of the principal advantages of this type of migrant for the

firms and institutions that hire them, namely to hold down compensation for highly-skilled personnel in high demand. Predictably, the principal industries benefiting from this flow are computer systems design companies, architecture and engineering firms, and colleges and universities. While H1-B visas are granted for a maximum of six years, there is evidence that a number of these professionals manage to switch to permanent residence.²¹

So far, the situation portrayed by these figures conforms, in all its essentials, to that predicted by brain drain theory. Developed countries, in particular the United States, benefit year-by-year from a steady flow of highly-skilled personnel trained, often at public expense, in educational institutions of the less developed world. In principle, the movement represents a major net transfer of resources from the poor to the rich. The reality, however, is more complex, as we have anticipated previously and document next.

The Brain Gain

... immigrant technologists, often the best and brightest from their home countries – integrated themselves into local economies ... by extending their social networks to their home countries, they have transplanted the relationships of technology entrepreneurship and are reshaping global technological competition.²²

As noted previously, the main problem with traditional theories of the brain drain was to overlook the tendency of immigrants to remain in close touch with their home countries. Like their theoretical cousin, the classical theory of assimilation, the orthodox portrayal of professional migration assumed that once these fortunate individuals left their countries, they would never look back. This does not happen. Indeed, as also seen above, the longer adult immigrants have been abroad and the better established they have become and the more likely they are to involve themselves in activities in their home nations. As a result, countries like India and China, once seen as the principal “victims” of the brain drain because of the number of professionals they exported have become the principal beneficiaries of a return flow. This return has fueled technological and economic development back home to an extent unanticipated only a few years ago.

These two-way flows have been characterized by two features. First, as Annalee Saxenian, one of the first scholars to study the phenomenon noted, the transnational activities of return professionals have consequences that go well beyond those of the remittances and philanthropic contributions of manual labor migrants:

By promoting the development of local capabilities in Tel Aviv, Hsinchu, Shanghai, Bangalore, and other technology clusters, while also collaborating with entrepreneurs in Silicon Valley, the new “Argonauts” have initiated a process of transformation that is shifting the global balance of economic and technological resources.²³

Put differently, return professional migration possesses both *structural importance* for the home economies and significant *change potential* for both sending and receiving regions. This potential is greater in home countries as it can alter both their value systems and their skill repertoires, but it also can affect the institutional framework supporting technological entrepreneurship in the host countries.²⁴ Second, the investments and knowledge transfers of

transnational entrepreneurs (whom Saxenian labels, “new Astronauts”) can be achieved *without leaving the host country or giving up legal residence in it*. The usual recommendation ensuing from traditional analyses of the brain drain was for sending nations to try to repatriate their professionals living abroad. This solution rarely worked, as sending countries could seldom compete in terms of salaries or work conditions with those chosen by their expatriates.

To the contrary, the transnational perspective highlights the key point that immigrant professionals can, if they so choose, revert permanent migration to a cyclical pattern through use of the new communication and transportation technologies. Indian engineers in Silicon Valley, Chinese software programmers in Boston and Filipino doctors everywhere can continue living and working in the United States while conducting a steady stream of exchanges and investment activities in their own countries. This is a direct reflection, at the personal level, of the compression of space brought about by the new technologies and of a global system becoming increasingly interconnected.²⁵

Although, as seen above, the main intent of the U.S. H1-B program has been to increase labor flexibility for American high technology firms and educational institutions, an unanticipated consequence has been to reinforce the flow of transnational communication. The expectation of return after a few years, whether it materializes or not, keeps migrant professionals attuned to events back home and firmly connected to their social networks there. In their case, it is not necessary to re-start transnational connections after a lengthy period of residence abroad since they never severed such links.

A partial exception to the transnational trend among expatriate professionals is the case of refugees. Communications and investments in their home country are commonly blocked by reason of their opposition to the dominant regime. Their case may be labeled “blocked transnationalism” because, despite their skills and resources, they are prevented or prevent themselves, to engage in these kinds of activities for political reasons.²⁶ While exceptions to this pattern have been detected here and there, the main result is that nations forcing their educated citizens to flee effectively lose the significant developmental effects associated with transnational activities elsewhere.

Global Brain Exchange: Winners and Losers

The pioneering work of Saxenian has been followed by a burgeoning of literature that describes the current situation in different exporting and receiving countries. Countries of sub-Saharan Africa are in the worst situation as their emigrant professionals seldom return. Medical professionals from their region leave for Canada, the United States, and Western Europe. One study estimates the loss for poor African countries in training these emigrant professionals at 2.17 billion dollars during a decade.²⁷ Oberoi and Lin focused on motivations for migration by medical personnel in South Africa. Push factors such as poor working conditions, lack of job satisfaction, and the prevalence of HIV/AIDS are cited as the main ones fueling the flow of doctors and other medical personnel to Australia.²⁸

Albania is in a similar situation losing an estimated 50 percent of its trained labor force to Germany, Italy and other European countries with no prospects of return. Conversely, Slovenia has benefited from significant return migration and transnational exchanges from its professionals in the United Kingdom.²⁹ Asian countries have been able not only to stimulate visits and investments from their expatriates but, in some instances, to attract flows of professionals from other countries. This is the case of Singapore who has successfully entered the competition for foreign talent, luring scientists and engineers that otherwise would settle in the U.S. or Western Europe.³⁰

Zucker and Derby provide quantitative evidence of the “brain exchange” benefiting China from their longitudinal study of 5,401 “start scientists: this sample was followed for 23 years (1981–2004). It found ample evidence of return migration, both temporal and permanent from the United States, as well as investments and managerial participation in high-tech industries in China.³¹ The diverse experiences of brain drain, brain gain, and brain exchange all converge on the same point: for expatriate professionals to be able to contribute significantly to their home countries’ development *there must be something to return to*. In other words, there must exist a minimum of scientific and technological infrastructure able to receive the immigrants’ contributions in know-how and investment capital and put them to use. Little Slovenia, like large India and China, possesses such infrastructure; Albania and the countries of sub-Saharan Africa do not. This common lesson also points to a path-dependent process leading to both vicious and virtuous circles. Poorer countries devoid of basic scientific facilities and equipment are victims of a brain drain that feeds on itself. At the opposite end, nations with a proactive state capable of providing the necessary infrastructure and enticing the activities and investments of their expatriates can benefit mightily from the transnational flow.

This is another way of saying that unaided, free markets work no magic in this field. Left to themselves, expatriate communities are able, at best, to sponsor philanthropic projects in their places of origin.³² Targeted investments and systematic transfers of scientific and technological know-how require a level of synergy between professionals abroad and home country institutions that only the state can create and sustain. In these areas, as well as many others, an efficient and proactive state is a necessary condition for countries to place themselves in the path of sustained development.³³

Conclusion: The New Worldwide Talent Competition

The United States continues to be the principal beneficiary of international talent flows but, in an increasingly multi-polar world, other countries are currently challenging its hegemony. Some authors have voiced alarm at the rapid loss of American competitiveness given the flexibilizations of entry requirements in other receiving nations and the cumbersomeness of the process to gain a permanent resident’s visa in the United States. A Brookings Institution report concludes that:

To stay competitive, the United States must institute more of an open-door policy to attract unique talents from other nations. Yet Americans resist such a policy despite

their own immigrant histories and the substantial benefits of welcoming newcomers³⁴

Given the flexibility of the H1-B program, these comments refer primarily to the difficulties of shifting from temporary to permanent visas and from student visas to at least temporary residence and work permits. The requirement that foreign students must return to their countries of origin after completing their degrees has the laudable purpose of stopping the brain drain from these nations, helping them regain access to their pool of young professionals. At the same time, the requirement leads to a significant loss of talent to the United States at a time when its competitors have no such qualms about attracting it. Canada's point system, the European Union's blue card, and the United Kingdom's new point scheme have all increased their competitiveness in the quest for high-powered scientists and professionals. Technological growth poles in China, such as Shanghai, are attracting not only returned Chinese scientists and engineers but, increasingly, those from other countries as well.³⁵

A transnational lens would add flexibility to the present American immigration system by highlighting the mobility of highly-skilled immigrants. It would make clear that those granted permanent resident visas do not necessarily stay permanently and those who return home do not necessarily settle there for good. On the contrary, a great deal of back-and-forth movement can be expected, as talented individuals explore opportunities distributed unequally in space. To stay competitive, U.S. policy should reflect the synergies of transnational exchanges in science and technology when immigrant professionals, secure in their legal status, communicate freely with their counterparts at home and elsewhere. These synergies not only underlie the "brain gain" for sending nations, but redound to the benefit of the United States by creating an attractive environment for others to migrate here.

To achieve this purpose, the currently cumbersome, even humiliating process of adjusting to permanent legal status or obtaining a resident's visa under the occupational preferences categories of the law must be streamlined and the two-way flows of information and investments with source countries facilitated. To be able to retain its position at the lead of the global economy, the U.S. must adopt a policy toward highly-skilled immigration as flexible as the realities on the ground have become.

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Figure 1.
Determinants of the Brain Drain

Figure 2.
The Process of Immigrant Transnationalism

Table 1

The U.S. H1-B Program 2008–09

	<i>Fiscal Year 2008</i>	<i>Fiscal Year 2009</i>
Petitions Approved, Total	276,252	214,271
<i>National Origin:</i>		
India	149,629	103,059
China	24,174	20,859
Canada	10,681	9,605
Philippines	9,606	8,662
Korea	6,988	6,968
United Kingdom	4,494	4,180
Japan	4,312	3,825
Mexico	3,721	3,346
<i>Education:</i>	%	%
Less than Bachelor's Degree	1	1
Bachelor's Degree	45	41
Master's Degree	37	40
Doctorate	11	13
Professional Degree	4	5
<i>Occupation:</i>	%	%
Computer-Related	49.6	41.6
Architecture,	10.9	11.8
Engineering, Surveying	10.5	11.6
Education	8.5	9.9
Administration	6.4	8.2
Medicine and Health	14.1	16.9
Others		

	<i>Fiscal Year 2009</i>			
	<i>Initial Employment</i>		<i>Continuing Employment</i>	
<i>Compensation:</i>	Median \$	Mean \$	Median \$	Mean \$
Total	59,000	66,000	74,000	78,000
Computer Related	60,000	67,000	75,000	77,000
Architecture, Engineering, Surveying	67,000	71,000	65,000	72,000
Education	45,000	53,000	48,000	56,000
Administration	50,000	58,000	65,000	72,000
Medicine and Health	54,000	76,000	69,000	100,000

	<i>Fiscal Year 2008 %</i>	<i>Fiscal Year 2009 %</i>
<i>Petitions by Industry:</i>		
Computer System Designs	42.4	33.6
Colleges, Universities, Professional Schools	10.2	11.7
Architectural, Engineering Firms	4.1	4.2

	<i>Fiscal Year 2008 %</i>	<i>Fiscal Year 2009 %</i>
Management, Scientific Consulting Firms	3.4	3.6
Elementary & Secondary Schools	2.9	3.1
General Medical & Surgical Hospitals	2.4	2.9
Others	34.6	41.9

Source: U.S. Citizenship and Immigration Services, "Characteristics of H1-B Specialty Occupation workers – Fiscal Year 2009 Report". Washington D.C.: Department of Homeland Security, April 2010.