Chapter 2

The Web of Science: a new window to watch mobility

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Introduction

An important challenge of the Cidesal Project was the exploration of new modes of access to the diaspora, in order to understand it better and to mobilize it more carefully. A special survey was designed to this effect, seeking to distance itself from the traditional channels of information such as: the web sites of associations of migrant professionals; the consular and diplomatic records; and the interpersonal contacts of expatriates, accessible through the “snowball effect”.

The originality of this survey rests on the Web of Science, a complete innovative source for online database. This new avenue opens the way to a systematic and independent analysis, away from pre-existing networks. This chapter explains the very special methodology developed for this purpose. Then the sample populations used for the survey will be described and characterized. Their movements form the subject of a sequential, spatial analysis. The trajectories of circular (returned) and diaspora (settled abroad) migrants will then be differentiated. Finally,

1 Apart from the work in data analysis and processing by the authors, this study required a number of other diverse skills:

- the extraction of the co-publication data from the Web of Science, carried out by Doriane Lemeltier, Engineer for the Atomic Energy Commission in France;
- the presentation and on line placement of the questionnaire, carried out by Alejandro Blanco, Consultant on diasporas, in Bogota, Colombia;
- the design, planning and execution of the procedures for the mass e-mailing to 37,000 authors concerned, undertaken by Fabrice Thomas Ferre of the IRD and Baptiste Billiot from the information technology company Osiatis;
- the removal of duplicate references of co-authors, conducted by Hanka Hensens, documentalist at the IRD;
- the mapping carried out by Stéphane Coursière, from the Laboratoire ArtDev at the University of Montpellier 3.

Without their skills and collaboration, such a study could not have been completed. We would like to express our profound gratitude for their contributions.
in the last part, lessons learned from the new methods and experimental instruments in this exercise will be discussed.

Part 1. Methodology

Objective of the survey

The survey “Mobility by the WoS” aims to draw information from the Web of Science (Thomson Reuters) on the migrations of the researchers and engineers whose publications are listed. This database assembles the addresses of the authors who published the scientific works. Consequently, their place of work was located through the institutional affiliation indicated. We were thus able to obtain the co-publications authored by the nationals of the three countries under study (Argentina, Colombia and Uruguay) with their co-authors from other countries that were published during the past decade (2000-2010). The logic behind this extraction was that the cooperation among these three countries and the rest of the world, as reflected in the co-publication of research results, is associated with the migration of academics, previous or current. If this were the case, diaspora links could then be located and traced from these publications that were systematically listed.

This hypothesis is not gratuitous. A certain number of works during the last decade observed significant correlations between the proportions of co-publications of authors from certain countries and the current or deferred presence of these researchers in the foreign countries with whom they have published articles (Regests, 2001; Agarwal, Kapur & Mc Hale, 2003; Lowell Gerova, 2004; Jin et al., 2007). Thus, the co-publications of Uruguay and Germany, for example, incorporate more frequently than normally authors who have returned to Uruguay after a stay in Germany as well as Uruguayan authors who are expatriates in this country. Starting with a corpus of co-publications of a country with the rest of the world also makes it possible to circumscribe a diaspora and potentially mobile population, without addressing an unlimited and anonymous universe (the cyberworld) or networks that are predetermined by existing social actors (official consular records or members’ lists of associations).

This prospection approach has never been explored before. The correlation between the rate of co-production and migration intensity has till now been deduced statistically but not exploited to identify, locate and contact individuals on the move. It is this exercise that we undertook in the present survey.

This approach has several advantages:

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• it consists of taking a random sample from a limited world – that of producers of scientific and technical results – guaranteeing the viability of the survey and the neutrality of the sample;

• it impacts a general population (in the field of R&D authors) who are not pre-selected for their proven links with their country of origin nor for their membership in some thematic, geographical, professional or social sub-group; and

• it allows direct access to individuals and contact with them, opening up the possibility of a sustainable link and not a simple transitory exchange.

A fundamental choice was made from the beginning: that of emphasizing relationships rather than the most complete flow of information possible, in accordance with the objectives of the Cidesal Project. In fact, the goal of this approach was not to accumulate a plethora of information but to obtain useful information on development, in particular on the links with the diaspora. For this reason, a simple, modest questionnaire of around 20 questions was drawn up (see appendix 1). It ends with a request for the address of the person in order to establish a sustainable link, to pursue the investigation or to participate in actions to support their countries of origin.

Population surveyed and process of access

To find mobile Argentine, Colombian and Uruguayan researchers and engineers, we extracted all the joint publications of the three countries of which they are nationals, together with their foreign co-authors. Over a period of 10 years, this constitutes a large number of publications: 66,256, 12,554 and 5,576, respectively for each of the countries. Each of these indicates a corresponding author and address (from whom a reprint may be requested) whom anyone may contact, in order to interact with the producers of these scientific results. For the publications produced over the period studied (2000-2010), only some of these corresponding authors had an e-mail address recorded in the database of the WoS. For logistical reasons, we limited ourselves to this group of authors who could be contacted by e-mail. This constituted lists of 28,313 authors for Argentina, 6,047 for Colombia and 2,669 for Uruguay. A personal message was addressed to each of them, mentioning the title, year and support (journal) of the publication of which they were co-authors, the names of their colleagues associated with it and our request that they forward our invitation to them (see appendix 2). This invitation followed in the body of the message and referred each national of the three countries under study to a website where the survey questionnaire could be completed (active link).

On the site corresponding to this link, which is that of the Mical observatory, three short pages of open and closed questions could be filled in. The results were

3 See <www.observatoriodiasporas.org>.
immediately accessible on the website of a service company that gathers and files data. On this website, not only could data be displayed and downloaded, but the number of visits to each of the three questionnaires (one for each country) could also be observed and thus the number of those who activated the link in the invitation be compared with those who actually responded. This enabled us to assess the valid response rate of the population sample that felt they were concerned.

Table 1. Scientific publications of migrant researchers

<table>
<thead>
<tr>
<th></th>
<th>Argentina</th>
<th>Colombia</th>
<th>Uruguay</th>
</tr>
</thead>
<tbody>
<tr>
<td>Joint publications, period 2000-2009</td>
<td>66,256</td>
<td>12,554</td>
<td>5,576</td>
</tr>
<tr>
<td>E-mail address of the corresponding authors</td>
<td>28,313</td>
<td>6,047</td>
<td>2,669</td>
</tr>
<tr>
<td>Invalid returns</td>
<td>4,800</td>
<td>998</td>
<td>368</td>
</tr>
<tr>
<td>(17 %)</td>
<td>(16.5 %)</td>
<td>(13.8 %)</td>
<td></td>
</tr>
<tr>
<td>Effectively contacted</td>
<td>23,513</td>
<td>5,049</td>
<td>2,301</td>
</tr>
<tr>
<td>Number of co-authors</td>
<td>58,084</td>
<td>17,265</td>
<td>7,122</td>
</tr>
<tr>
<td>Co-authors finally contacted (estimation)</td>
<td>48,210</td>
<td>14,416</td>
<td>6,125</td>
</tr>
<tr>
<td>Visits to the questionnaire</td>
<td>4,507</td>
<td>2,046</td>
<td>696</td>
</tr>
<tr>
<td>(9.5 %)</td>
<td>(14 %)</td>
<td>(11.5 %)</td>
<td></td>
</tr>
<tr>
<td>Valid responses effectively received</td>
<td>795</td>
<td>392</td>
<td>128</td>
</tr>
<tr>
<td>(17.7 %)</td>
<td>(19.1 %)</td>
<td>(18.4 %)</td>
<td></td>
</tr>
</tbody>
</table>

Source: own production based on Cidesal Survey “Migración internacional de profesionales de América Latina”

Several observations on this process of collecting data should be made:

• for the period under study, the availability of e-mail addresses was limited to the latter part of the decade;
• a certain number of our e-mail messages were returned due to inaccurate or old addresses (rejection rate of about 15 %);
• all the names of the co-authors from the WoS were listed, then duplicates if any were eliminated in order to accurately estimate the extent of the total population sample, to which we applied a rejection rate to subtract the probable number of those who could not be contacted;
• as it was not possible to monitor the effective contact between the corresponding authors and their co-authors, we do not know how many of these latter were reached;
• the proportion of those who reacted (between just under 10 % and nearly 15 %) cannot, as a result, be interpreted as significant for the numbers of qualified migrants sponsored by international cooperation agencies;
• the response rate (just under 20 %) is quite respectable for a survey of this type, in the absence of any reminder messages or previous contacts.

4 See <www.encuestafacil.com>.
In the last part of this chapter, some avenues suggested by this new experimental practice for the purpose of studying and managing migrations and diasporas are explored.

Part 2. The populations

Age and gender

Argentina and Uruguay have a similar profile, with large number of population in categories of over 40 years of age. The population of Colombian researchers is younger, owing to a different history (no military dictatorships during the 70s and an academic system that is more recent than that of the Southern Cone).

The average age of respondents are: Argentines, 45 years; Colombians, 40 years; and Uruguayans, 45 years.

On the whole, the sample population is active and experienced, with a majority of Colombians younger than 40 years while the opposite is the case for those from the Southern Cone.

Figure 1. Age groups

Source: own production based on Cidesal Survey “Migración internacional de profesionales de América Latina”

According to figure 1, the predominance of the male gender is clear in all the three countries: Argentina: 62 %; Colombia: 68 %; and Uruguay: 70 %. However,
the age pyramids show a substantial change with the increased participation of women over time. In the youngest age groups, women are sometimes in the majority.

Figure 2a. Age groups. Argentina

![Age groups. Argentina](image)

Source: own production based on Cidesal Survey
“Migración internacional de profesionales de América Latina”

Figure 2b. Age groups. Colombia

![Age groups. Colombia](image)

Source: own production based on Cidesal Survey
“Migración internacional de profesionales de América Latina”
The feminization of skilled migrants, identified elsewhere (OECD, 2012), is thus confirmed and re-stated here. This concerns the population samples that are less than 36 years, and it increases erratically and discontinuously, as witnessed from the younger age groups where the majority is male (as of now).

Figure 2c. Age groups. Uruguay

A detailed analysis of the evolution of migration was carried out by cross-tabulating the age of migrants on their departure and the gender of migrants surveyed. This made it possible to show the recent feminization of qualified migrants. During the period 2000-2005, the numbers of women migrants caught up with those of the men. Statistics from later years (2005-2010) and those from Uruguay include a very small number which made it difficult to take them into consideration statistically in a similar way.

Figure 3a. Gender and year of departure from the country. Argentina
Figure 3b. Gender and year of departure from the country. Colombia

Source: own production based on Cidesal Survey
“Migración internacional de profesionales de América Latina”

Figure 3c. Gender and year of departure from the country. Uruguay

Source: own production based on Cidesal Survey
“Migración internacional de profesionales de América Latina”

Educational levels

The degrees of respondents surveyed are unsurprisingly very advanced, as this is a population group that is involved in activities of research and development, as it is shown in figures 4 a, b and c.
Figure 4a. Level of education attained. Argentines

Source: own production based on Cidesal Survey
“Migración internacional de profesionales de América Latina”

Figure 4b. Level of education attained. Colombians

Source: own production based on Cidesal Survey
“Migración internacional de profesionales de América Latina”

Figure 4c. Level of education attained. Uruguayans

Source: own production based on Cidesal Survey
“Migración internacional de profesionales de América Latina”
For the respondents from Argentina and Uruguay, over half of those surveyed have a post-doctoral level of education. Those who do not have a doctorate are a small minority. For those from Colombia, they represent a quarter of the studied population.

These differences are partly related to their age: the age group of 20 to 30 years represents over 10% of those from Colombia while it is minimal for those from Uruguay and tiny for those from Argentina. However, there is also an educational factor that is specific to these countries, with the presence of doctoral programs, local or otherwise, which also have an effect on these migratory movements. In Argentina, where doctoral training has been present for a long time and enjoys international recognition, graduates today leave the country to do post-doctoral training and research in the same way they used to for doctoral training. In contrast, doctoral training abroad is crucial for Colombia; indeed, it is essential for many disciplines which hardly exist or have been set up only very recently.

In addition, the distinction between expatriates and returnees has different implications for Argentina and Colombia. For Argentina, expatriation, without any ambiguity, is correlated with a higher level of education: those who do not have their doctorates represent 8% of residents but only 5% of expatriates, while the rate of post-doctoral training is less than 2/3 for residents but over 3/4 for expatriates.

For the Colombians, the situation is less obvious: the rate of post-doctoral students in the diaspora is high in comparison with that of residents (1/3 vs 1/4) but the rate of those who do not have a doctorate is also high (nearly 1/3 vs 1/5).

Lastly, the distinction by gender reveals a slight difference: among the highest degrees (post-doctoral in all three countries and doctoral also in Colombia and Uruguay) the male population is slightly over-represented among the junior degree holders (Master’s and Bachelor’s). The age factor plays a role in this current difference which could decline in the near future since the proportion of females is higher in the age groups whose training is not yet complete (20-35 years).

Professions and fields of work

The professional sectors that are the most mobile are those of research, teaching (often confused with the first), engineering and medical practice. Over and above academic research, the work of these actors consequently involves activities in development and the application of knowledge to areas that are important for society (figures 5 a, b and c).
Figure 5a. Professions. Argentines

n = 405. Source: own production based on Cidesal Survey
“Migración internacional de profesionales de América Latina”

Figure 5b. Professions. Colombians

n = 273. Source: own production based on Cidesal Survey
“Migración internacional de profesionales de América Latina”

Figure 5c. Professions. Uruguayans

n = 75. Source: own production based on Cidesal Survey
“Migración internacional de profesionales de América Latina”
The proportions are relatively comparable for the population samples of the three countries under study with Argentina and Colombia being very similar. Research and teaching always comprise substantially more of the professional activities mentioned. However, one-third of the producers of scientific results comprise practitioners (doctors and engineers).

When the professions of those who are currently residing in their home countries are compared with those who are expatriates an important difference can be observed between the populations of Argentina and Colombia: the proportion of teachers is very high among those residing in the latter country, whereas it is low in the diaspora. This reflects the institutional situation in Colombia: research and therefore scientific production there are the functions of universities in which the personnel naturally perform the duties of both teaching and research. However, this may also reveal the fact that the diaspora is more likely to devote its skills exclusively to research because the teaching requirements are less intensive abroad… It is also notable that engineers are sought after significantly more for scientific production in Argentina than abroad. This may indicate the higher status of expatriates in the academic sector (teachers and researchers) as well as a differentiation of functions and status, higher in Argentina as compared to abroad.

Areas of work

Regarding the scientific disciplines of respondents according to their country of origin, the fields cited most frequently are biology and health, which represent about a quarter and one-fifth, respectively. Physics and chemistry are always significant, around 5% and 10% but agro-food varies, from 13% for respondents from Uruguay, to 7% for respondents from Argentina and 4% for respondents from Colombia. Similarly, the social and human sciences as well as economics and ecology vary in importance between 9% for respondents from Argentina and Uruguay and 21% for respondents from Colombia. Mathematics is very significant for respondents from Uruguay, while materials and energy are important for respondents from Argentina; however, electronics, as well as computer science, are of minor importance for the three countries.

When we studied the differences between respondents of the diaspora and those who have returned, it was observed that for respondents from Argentina the health sector is significantly represented for respondents of the diaspora, as also in materials and energy, whereas inversely, agro-food is significant for respondents residing in the home country. For respondents from Colombia, the importance of health is even more marked for respondents of the diaspora than for those residing in the home country, as compared with respondents from Argentina. The social sciences and ecology also stand out, whereas chemistry and economics are more frequently the areas of work for respondents who have returned to their home countries.
Country of birth and nationalities

The origin of respondents was mostly the country of which they are nationals: above 90% (93% of respondents from Argentina, 90.5% of respondents from Colombia, 92% of respondents from Uruguay). Thus a community of origin is undeniable, which is a characteristic of diasporas, both contemporary and traditional (Berthomière & Chivallon, 2006). Other countries of birth which have any significance are generally in immediate geographical proximity (Brazil, Chile and Uruguay for Argentina; Brazil and Argentina for Uruguay, Venezuela for Colombia), hemispherically (United States for Argentina and Colombia) or historically (Spain with Argentina). There was thus a local territorial and spatial domination, still far from globalization, during the era when these scholars were born, who much later were called on to undertake worldwide journeys. This homogeneity of origins is far from being cosmopolitan or elitist and thus supposedly innately international (Meyer, Caplan & Charum, 2001).

The vast majority of people surveyed have retained the nationality of the country from which they originate. This means that they have not abandoned this nationality or only a very few have done so. However, this nationality is not necessarily unique.

Argentina

90.7% of researchers originating from this country are of Argentine nationality, a percentage that is somewhat lower than that of their country of origin (country of birth). 34.2%, or slightly more than one-third, have one or two other nationalities. A tiny minority of 11 people, or 15/1000, even have a third nationality. All of the additional nationalities break down as shown in figure 6a.

Over half of the 32 additional nationalities are dominated especially by that of Italy and Spain to a lesser extent. This resemblance to the native pattern of the Argentine population as a whole (ancestors in both of these countries) indicates a dual nationality by descent rather than by acquisition during the course of migration in most cases.
Figure 6a. Other nationalities. Argentina

Source: own production based on Cidesal Survey
“Migración internacional de profesionales de América Latina”

Figure 6b. Other nationalities. Colombia

Source: own production based on Cidesal Survey
“Migración internacional de profesionales de América Latina”
Colombia

In contrast with the case of Argentina, a proportion of respondents somewhat higher than that of the country of origin, 93.5%, are of Colombian nationality. However, only 17.8% have one or two other nationalities. All of the additional nationalities break down as shown in figure 6b.

There is a great diversity among the 30 additional nationalities, ranging from North America and Latin America to Europe, without any of them showing a marked predominance. Uruguay

Figure 6c. Other nationalities. Uruguay

![Diagram](Image)

Source: own production based on Cidesal Survey “Migración internacional de profesionales de América Latina”

A 95.7% of researchers who originate from this country are also of Uruguayan nationality, a proportion that is clearly higher than that of their country of origin, compared with the two other countries.

Uruguay is also the country where the proportion of respondents with dual or triple nationalities is the highest: 38.3%. All of the additional nationalities break down as shown in figure 6c.

The first four nationalities are identical to those of the Argentine population under study but their distribution is different. Spain is more important than Italy, while the United States and Brazil are more heavily represented. Nevertheless, the low numbers make it difficult to generalize from this observation.

Comparing the three countries, it can be observed that Spain and the United States are still among the first three nationalities for migrants from each of these countries and that the Italian nationality is still strongly represented. The Colombian profile is more North American (especially if Mexico is included) than that of the two others which are more ‘Latin’, both American and European. Finally, the difference in the multi-nationality between Colombia and the countries of the Southern Cone is far from being insignificant. Here again the weight
of history is revealed. Recent European immigration has left traces in these latter two countries. Even though they were born in the New World, their solid links with Europe are reflected in their possession of another nationality. For these mobile populations and beyond the confines of their host countries, the persistence of their ancestral links is clear. It remains to be seen whether it has an effect on their geographic mobility or it is independent.

Part 3. Mobility

The destination countries of migrants

The USA and Spain are the main destination countries for circular migration for each of the three countries of origin. They are still the destination countries for nearly half of migrants from these countries: one-third or more for the USA and about 15% for Spain. France and Brazil are the two other countries which are still among the five countries that receive the highest numbers of migrants: France between 9 and 12% and Brazil between 7 and 14%. Germany, Mexico, Switzerland, Sweden and the United Kingdom also attract a significant number but fewer overall. They especially attract the nationals of one or another of the countries among the three.

Map 1. Destination countries for Argentine migrants

Source: own production based on Cidesal Survey
“Migración internacional de profesionales de América Latina”
When we compare the migration routes of circular migrants (returnees) with those of migrants of the diaspora (settled abroad) differences appear. For the respondents from Argentina, most of those currently resident (who have returned home) have gone through the United States – or the United Kingdom to a lesser
extent – and some through Spain; whereas most nationals of the diaspora circulate or live in Europe and proportionally more intensively, in Brazil.

However, this situation is different and more varied among respondents from Colombia. Migrants of the diaspora are relatively more numerous in the Anglo-Saxon and Germanic countries (except for the United Kingdom) while most of those who have returned went to Latin countries (Spain, France, Brazil, Mexico, Chile and Argentina).

For most of the respondents from Uruguay, the main destination countries for migrants (the USA, Spain and Brazil) attract the diaspora, whereas relatively more returnees went to less popular destinations (France, Mexico, Sweden and the United Kingdom) and are relatively more numerous among returnees.

These differences show the diversity of background and orientation of qualified migrants. In accordance with the country, the settlement and circulation of their nationals constitute the choices or strategies which are proper for them.

Figure 7a. Main host countries for Argentines

Source: own production based on Cidesal Survey “Migración internacional de profesionales de América Latina”
Figure 7b. Main host countries for Colombians

Source: own production based on Cidesal Survey
“Migración internacional de profesionales de América Latina”

Figure 7c. Main host countries for Uruguayans

Source: own production based on Cidesal Survey
“Migración internacional de profesionales de América Latina”
Duration of migration

Argentina

Figure 8a. Number of years abroad (total sample), Argentina

n = 595. Source: own production based on Cidesal Survey “Migración internacional de profesionales de América Latina”

Figure 8b. Number of years abroad (currently resident), Argentina

n = 306. Source: own production based on Cidesal Survey “Migración internacional de profesionales de América Latina”

Figure 8c. Number of years abroad (expatriate Argentines)

n = 289. Source: own production based on Cidesal Survey “Migración internacional de profesionales de América Latina”

Nearly two-thirds of the respondents had spent between 1 and 10 years abroad, but only a quarter stayed longer than that.
However, the contrast in mobility is surprising between those who returned to Argentina and those who stayed in the diaspora. Although over 90 per cent of the former stayed abroad for less than 10 years, half of the latter have been abroad for longer than this and three-fourths for over five years. Of course, the group of refugees/political exiles from the period 1970-80 is clearly the most stable (1/3 have been abroad for over 15 years); but these traces of history do not explain everything. The large numbers of respondents who have been abroad from 5 to 10 years and from 10 to 15 years, and the relatively low numbers of respondents who have been abroad from 0 to 5 years, in a more or less inverse proportion to those who have returned, reflects two different types of migrations: settlement abroad versus circular migration.

**Colombia**

The length of time spent abroad is less on an average than that of the Argentine respondents, but with a higher proportion for those who stayed abroad from 5 to 10 years (middle category).

In a way similar to the Argentine respondents, returnees have stayed abroad for less time than migrants of the diaspora; nevertheless the largest number of migrants stayed abroad from 5 to 10 years whereas the number of expatriates abroad is lower. Thus, there seem to be cyclic variations according to the country.

**Uruguay**

Uruguay is the country where migration is by far the most enduring, as over 70 per cent of respondents had spent over five years abroad (as opposed to less than 60 per cent for respondents from Colombia and Argentina).

For returnees, the periods of their migration were relatively short (mostly from 1 to 5 years). However, the proportion of migrants who returned after over 15 years abroad is considerably higher than those of the two other countries (19 %, as against 4 % for Colombia and even 3.3 % for Argentina). The return migration for the two countries of the Southern Cone is thus very different, in spite of comparable historical and political sequences. The impact of return programs is certainly an important explanatory factor in this (see Lema, this volume).

The proportion of those who have been abroad for over 15 years is no greater than that of the Argentine sample; in contrast, the proportion of respondents who have been abroad from 10 to 15 years, with no relation to the period of dictatorship, is over-represented. To summarize, the contrast in migration periods appears less stark than for Argentina.
Figure 8d. Number of years abroad (total sample) - Colombia

n = 311. Source: own production based on Cidesal Survey “Migración internacional de profesionales de América Latina”

Figure 8e. Number of years abroad (currently resident) - Colombia

n = 126. Source: own production based on Cidesal Survey “Migración internacional de profesionales de América Latina”

Figure 8f. Number of years abroad (expatriate Colombians)

n = 185. Source: own production based on Cidesal Survey “Migración internacional de profesionales de América Latina”
Figure 8g. Number of years abroad (total sample) - Uruguay

n = 106. *Source:* own production based on Cidesal Survey “Migración internacional de profesionales de América Latina”

Figure 8h. Number of years abroad (currently resident) - Uruguay

n = 48. *Source:* own production based on Cidesal Survey “Migración internacional de profesionales de América Latina”

Figure 8i. Number of years abroad (expatriate Uruguayans)

n = 58. *Source:* own production based on Cidesal Survey “Migración internacional de profesionales de América Latina”
Average stay abroad according to country

The average stay abroad in foreign countries differs significantly also between Argentina and Colombia. Argentines spend more time in America (especially Brazil but also Mexico, Canada and the USA). Except for Italy, their stays in Europe are shorter. Colombians stay proportionately longer in Europe (Switzerland, Germany, and France) even if Brazil and also Mexico, the USA and Chile are countries of unusual permanence. Regarding length of stay, respondents from Uruguay favour important destination countries: Brazil, Spain and the USA. A notable fact is the length of stay in Brazil in general but especially for expatriates from Argentina and Uruguay. For Colombians, this is the country where the length of stay is on an average the longest, for returnees. There also, different orientations prevail in migration trajectories. Some interesting observations follow: the USA is never the country, for any of the nationals, where they stay the longest, be it the returnees or those who settle abroad; but neither is Spain. It is especially Brazil (for respondents of all three countries) but also the United Kingdom (for Colombians and Uruguayans), Switzerland (for Colombians, in particular) and Canada (for Argentines) where permanent settlement (permanent residence) is the most frequent for respondents.

Migration sequences

The geographical mobility of researchers and engineers of these three countries can be characterized according to the number of locations.

Argentina

Nearly two-thirds of respondents from Argentina went to one country and stayed there; only a quarter went on to a second country of expatriation and less than 10% to a third or even a fourth country. This proportion varies between returnees (overall less mobile, with two-thirds having stayed in only one country) and those who are still abroad in the diaspora (for whom the temporal multilocality is more pronounced, with over a quarter of them going on to a second country and 10% to a third or even a fourth country).

Figure 9a. Number of host countries (from 1 to 5) and proportion in the Argentine population (%) – currently resident in Argentina

\[ n = 227. \text{ Source: own production based on Cidesal Survey “Migración internacional de profesionales de América Latina”} \]
Colombia

The proportion of Colombians who have stayed in only one country is equivalent (2/3) to that of the Argentine respondents, and those who went to a second country is slightly higher (28%). However, when we separate out those who returned from those who were still abroad, the proportions are the inverse for those of the Argentine respondents. Those who are currently resident in Colombia were more likely to have been to at least two countries (nearly 40%) whereas those who have settled abroad were more likely to have limited themselves to only one country (over 2/3).

Chapter 2
The overall majority of respondents from Uruguay was similar to that of the two other countries (about 2/3 had visited only one country). There was no marked difference between those who had returned and those who were still abroad. The low number of the sample population analysed does not permit a categorical generalization of this distribution between the two groups.

The comparison among the three countries underlines the stability in the characteristics of migration for these three population samples. In fact, the tendency to settle in one country and to operate there professionally/intellectually is practiced by the majority of respondents (2/3). However, there are also small variations among respondents from one country to another, showing that the phenomena of migration trajectories cannot be entirely generalized as they are marked by conditions that are specific to each country.

Migration trajectories and itineraries

We often speculated on the re-emigrations of highly qualified people. Are there territories of residence as opposed to migration transit countries—necessary steps on a journey aiming to go further? Is one region (North America) in fine the pole where migration candidates aspire to be on their departure? The questionnaire, recording the successive destinations of migrants, allowed for the detailed and precise analysis of their journey. For reasons of statistical relevance, we restricted ourselves to the study of the three major poles (USA, EU and Brazil).

Argentina, Uruguay

Nearly half of Argentine researchers/engineers who re-emigrate from Europe head to another country in the same region, while only a quarter re-orient to the USA and one-tenth to Brazil. In the case of a third migration (to a third country), Europe is the choice of the great majority, as much for those who come from the USA as those from the EU.

For those who first migrated to the USA, Europe is the following destination in over two-thirds of the cases. Canada and Brazil are the only other countries that are of any importance. The destination for a third migration is hardly to the USA but to another European country or to Brazil. The idea of a migratory process undertaken in several stages and ending in North America has not been verified from this data. Similarly, Europe, probably owing to its diversity of conditions and institutions, visibly offers options for multiple re-emigrations.

In the case of Uruguay, intra-European re-emigration has been verified frequently. Other movements (from the USA and Brazil to a third country) involve too few people to make an analysis possible.

The figures for Colombian respondents are less eloquent than those for Argentine but reflect a similar trend. More migrants to Europe re-migrate to
Europe than to the USA and more migrants to the USA re-migrate to Europe than migrants to Europe who re-migrate to the USA. Migrants to Brazil, far from rivalling the two other poles, preferentially re-migrate to Latin America and Europe.

In the course of multiple migrations, Europe thus appears to be more involved in the heavy circular migration movements than the United States.

Part 4. Circular migrations and diasporas

Countries of residence

Among the researchers surveyed who are or were migrating, slightly more or slightly less than half, according to the country, returned home and are situated as follows: 60% of Argentine respondents reside in Argentina; 47% of Colombian respondents reside in Colombia; and 51% of Uruguayan respondents reside in Uruguay.

Table 3. Distribution of residence of respondents by major areas

<table>
<thead>
<tr>
<th></th>
<th>Argentines (total: 769)</th>
<th>Colombians (total: 368)</th>
<th>Uruguayans (total: 118)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Argentina</td>
<td>USA</td>
<td>EU</td>
</tr>
<tr>
<td>Argentina</td>
<td>459</td>
<td>84</td>
<td>141</td>
</tr>
<tr>
<td></td>
<td>59.69%</td>
<td>10.92%</td>
<td>18.34%</td>
</tr>
<tr>
<td>USA</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Colombian</td>
<td>174</td>
<td>65</td>
<td>73</td>
</tr>
<tr>
<td></td>
<td>47.28%</td>
<td>17.67%</td>
<td>19.84%</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Uruguaian</td>
<td>60</td>
<td>20</td>
<td>18</td>
</tr>
<tr>
<td></td>
<td>50.85%</td>
<td>16.95%</td>
<td>15.25%</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Source: own production based on Cidesal Survey “Migración internacional de profesionales de América Latina”

Among those who are expatriates, the dispersion varies among respondents according to the country as follows: Argentina: 30 countries of expatriation (total number of respondents: 310); Colombia: 28 countries of expatriation (total
number of respondents: 194); and Uruguay: 13 countries of expatriation (total number of respondents: 58).

Europe and the United States still constitute the poles of concentration for expatriates. However, Brazil appears to be increasingly attractive: it rivals the European countries, taken individually, which it often even overtakes, in so far as respondents from Argentina and Uruguay are concerned (maps 4, 5, 6).

Asia is still significantly absent from this landscape. Oceania has a very minimal presence and Africa has even less.

United States and Spain are still the two preferred host countries. In Europe, France has exercised a significant attraction for the three populations, while Germany and Switzerland attracted the Colombian respondents and the Argentines to a lesser extent. The United Kingdom and Italy have a low representation for the nationals of the three countries.

Map 4. Argentine diaspora

Map 5. Uruguayan diaspora


Map 6. Colombian diaspora

When we examine the urban poles that attract these Argentine, Uruguayan and Colombian diasporas in the main European countries more closely, we observe a major contrast between Spain and the others. Barcelona and Madrid attract most of the flows, while only Valence and Alicante compete with this dual pole from a distance. In contrast, Germany and France, as well as Italy and the United Kingdom to a lesser extent, show a more balanced landscape. No university pole monopolizes the Latin American scientific and technological diasporas. Their dispersion is thus very real (map 7).

Map 7. Distribution of diasporas in Europe

This dispersion is also high in the United States, although there are significant concentrations in New York and Boston. It is interesting to note that states known to be hispanophone (California and Florida) are not over-represented. There is thus a real decoupling of highly qualified migrants from those who are less specialized in areas where the Latin American presence is more pervasive. The first operate according to an academic territorial logic while the second base their movements on traditional migrant networks (map 8).

Map 8. Distribution of diasporas in the United States


Places of return for migrants

What impact does migration have on concentrations of skills within countries of origin? We can visualize this by locating the places of residence in their country for those who returned after staying abroad. In contrast to the widespread idea that the capital city drains for its benefit these flows of relations from abroad, we observed a relative dispersion in the locations of the homes of people who had returned. This appears clearly in the case of respondents from Argentina and Colombia (maps 9 and 10).
Map 9: Locations of international migrants who have returned to Argentina

In Argentina, the small towns accommodated people who have followed distant international trajectories for a significant period of time. In Colombia, these are essentially the regional cities but many are involved. The case of Uruguay is less convincing from this point of view but very special: the town of Montevideo largely dominates the knowledge-intensive activities in the country.

In general, it has been observed that this geographical dispersion of qualified international returnees tends to invalidate the idea of a concentration in a few global centres (Sassen, 2002). The hierarchy of urban poles of international appeal...
appears here to be largely tempered by an effective participation of multiple medium-size towns in the globalization of flows of qualified migrants.

Very few of the people surveyed are employed by the same organization. This institutional dispersion is very high, especially among respondents in the diaspora. On the average, we found only one respondent per institution but rarely several nationals of one or another of these three countries. Even in such a case, they do not necessarily know each other. However, sometimes a group provides the opportunity for organizing an association. For example, the four members of the Colombian diaspora employed at the EPFL (École Polytechnique Fédérale de Lausanne) are all members of the ACIS (Association Colombienne des Chercheurs en Suisse). However, this is an exception. Moreover, for researchers who have travelled internationally and returned to their countries, the level of dispersion remains high. On an average for respondents from Colombia it is three people per organization and four for those from Argentina, but the majority of these organizations have only one migrant who has returned from abroad. There are thus very few institutional poles which would be natural anchors for actions from or to the diaspora. Most of these organizations are public and very often form part of academic circles, with universities and institutes of scientific and technical research being particularly well represented.

Links with diaspora countries and associations (associativity)

Table 4. Link with countries of origin and membership in an association

<table>
<thead>
<tr>
<th>Links</th>
<th>No</th>
<th>Yes</th>
<th>Association</th>
</tr>
</thead>
<tbody>
<tr>
<td>Argentina (575)</td>
<td>14</td>
<td>461</td>
<td>44</td>
</tr>
<tr>
<td>Colombia (299)</td>
<td>96</td>
<td>203</td>
<td>24</td>
</tr>
<tr>
<td>Uruguay (104)</td>
<td>17</td>
<td>87</td>
<td>3</td>
</tr>
</tbody>
</table>

*Source: own production based on Cidesal Survey “Migración internacional de profesionales de América Latina”*

The proportion of respondents who maintain professional links with their home countries is in the majority: 84 % from Uruguay, 80 % from Argentina and 68 % of those from Colombia, respectively. It is slightly less among women respondents as opposed to men, according to the statistics on the relevant samples from Argentina and Colombia.

In contrast, the proportion of associativity is very low: 7.6 % for those from Argentina, 8 % from Colombia and less than 3 % from Uruguay. This means that among people connected to their home countries, only a minority do so through formal collective action (about 1/10). The rest maintain individual links, mediated by items exchanged and not through formal membership in a diaspora collective.

5 The case of Uruguay, with a marked pre-eminence of the Universidad de la República, is unusual.
This observation has several important limitations:

- A digital problem of quantification: when we attempted to draw out the diaspora from the memberships of formal networks that are constituted and visible, we missed – without knowing – the majority of the expatriate population.
- A theoretical or conceptual problem: can we term a diaspora this nebula the components of which are linked to its centre but are not inter-connected?
- A political problem: how should we act and interact with a dispersed population that has no spokesperson?

Moreover, the number of members per association is very low, often just one. The concentration is thus minimal and the dispersion maximal.

Only the Raíces program and the CEGA association in Argentina group together a significant number of the people surveyed (12 and 4, respectively). For Colombia, this is the case only for the ACIS association in Switzerland (4).

### Circular migration and diaspora settlement

For the large contingents from Argentina, Europe and the United States are more the areas to circulate than places in which to settle down for good. The numbers of those who remain there represent one-third of the total sample population of migrants. In contrast, American countries such as Canada, Mexico, Chile and above all Brazil are places where they settle in large numbers.

The proportion of permanent expatriation among Colombian migrants is much higher than for Argentine migrants. Above all, the relationship between circular migration and diaspora settlement is more balanced with a ratio of 2:1 in general, without any one region or country standing out (see map 12, Colombia).

Uruguay tends to follow Argentina, the leader in migration, with moderate settlements abroad compared with circular migration, and with Brazil being the preferred destination country for expatriation (see map 13, Uruguay).

Finally, this general outline varies when we observe relationships within the European Union. Some countries held migrants more and others hosted them more temporarily. Whereas respondents from Argentina settled more often in Spain and Italy (traditional destination countries for nationalities and migration), respondents from Colombia looked beyond these two countries and were more likely to settle in Switzerland, Belgium and Germany (see maps 14 and 15).
Map 11. Circular migration and diaspora settlement – Argentina


Map 12. Circular migration and diaspora settlement - Colombia

Map 13. Circular migration and diaspora settlement – Uruguay


Map 14. Argentines in Europe

Part 5. New prospects for migrants and diasporas

Bibliometrics as a tool to study migrations?

The survey Mobility by the WoS opens up new prospects for the study of the migration of highly qualified people for the following reasons:

1. **Random selection of the survey population**, in contrast with the usual surveys, which access expatriates through networks that are institutional (consulates, embassies and ministries), organizational or associative (businesses and NGOs) or through internet links (social networks, websites, blogs). However, these modes of access involve pre-existing relationships and communities from which a diaspora structure is naturally inferred. By surveying a sample population of researchers and engineers (and others), who produce knowledge, in relation to their
country of origin as well as abroad, no pre-existing structure or relationship is presumed. The population under study is thus larger and a priori has no special characteristics.

2. *Opening up contacts with a traditionally invisible segment* of the diaspora and the migrant community. Taking into consideration the largely individual choices that preside over mobility, in the decision to return as well as the decision to settle abroad permanently, the relationships between migrants and countries are difficult to trace and to mobilize, outside of partial programs that affect a restricted number of individuals. The systematic census conducted and contacts established through the WoS open up a new communication channel, which migrants and their counterparts are free to use.

3. *Comprehensive circular approach.* The survey a priori distinguished hardly at all between expatriates and returnees, considering that the first could one day return home and the second could one day go abroad. It also clearly forms part of a circular view, the relevance of which much of the recent empirical research has confirmed. It makes it possible to perceive contemporary migration outside of permanent emigration. On the basis of the same database that records expatriates and returnees, it allows us to draw comparisons that would not be possible at all with disparate samples.

The survey undertaken is of special interest for the original results that it provides; however, is it worthwhile? Is the information reported worth the efforts made to obtain it? Some lessons can be drawn from this first experience:

1. *Massive prospection for a fine collection.* Tens of thousands of references and co-authors are mobilized for a survey of this type, for one-tenth of the visits to the questionnaire and between one and a few tenths of the responses from among them. The information yield (of a total of a few hundreds to a few tens in the best cases) seems low, at least quantitatively. In reality, the logistics set up to contact people is identical for either a low or a high number. The only variation is in the capacity required of the servers and computers, according to the number of messages sent.

2. *Limiting factors to control for.* There are two in the present survey. First, all publications systematically have an email address. This was not the case up to 2005 but it is the case today. As a result, the capacity to contact by internet should now be multiplied by 2 in relation to our survey. On the other hand, we let the corresponding authors contact their co-authors, thus closing off the possibility of verifying the effective contact at the end of the chain as well as of an eventual reminder message in case of no reply. However, we found that the response rate for the corresponding authors was twice as high as for the co-authors, who
were contacted indirectly. There is thus definitely a high on-line loss in the transfer from the first to the second. Moreover, many visits to the questionnaire were observed, without any responses. This could reflect a capacity that could be mobilized as respondents (a reserve) for a second phase with a reminder message (frequently the case with web surveys). This reserve is about 5 times higher than all of the responses received. However, it appears that the reminder messages to respondents of survey questionnaires conducted by internet are particularly productive; much more so than for classic surveys. Traditional decreasing returns of mail surveys issues are to be contrasted with the increasing returns of internauts to questionnaires requested at different times.

3. Potentially significant capture of the diaspora. Regarding the case of Argentina, it is possible to estimate the proportion of the diaspora that could be contacted by the method used, improved by addressing the limiting factors above. The Argentine R&D diaspora is estimated to number about 7000 people (Albornoz, Fernandez Polcuch & Alfaraz, 2002). The survey enumerated and documented precisely 320 of them, or just under 5%. If all the e-mail addresses had been available, 2.3 times more authors could have been contacted. Moreover, the number of visits to the Argentina questionnaire was 5.65 times higher than the responses. If these factors had been controlled, the potential for contacts and responses consequently would have been 60% of the estimated population. Taking into consideration the fact that this latter necessarily includes non-publishing scientists or those whose production has a low profile, this rate is very high. It must be compared with the number of those who are registered formally in institutional or organizational initiatives, today visible, contactable or reconnected: 44 (in the survey) or less than 1%.

Data mining and new technologies of investigation: the case of 'Unoporuno'

A survey such as Mobility by the WoS makes it possible to considerably increase the capacity to contact, to know and to mobilize the diaspora. Other techniques of data mining were also experimented with in the framework of the Cidesal Project. This survey served to adjust the parameters of the tools while offering promising prospects for immediate application.

In effect, the Cidesal Project set up a system of information that made it possible to seek out individuals of the diasporas. A set of integrated programs, together with different databases, identify on the web people who likely share a common national origin. In detecting diachronic geographical locations for pre-selected corpus of

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6 See William Turner, Jorge Garcia, Mathilde de Saint-Léger, Chapter 8 in this volume.
texts, the migration trajectories of the people concerned can be reconstructed. This complex program is called ‘Unoporuno’, as it seeks information, documenting one by one each of the individuals likely to belong to a particular diaspora. For those that it selects, a choice of five preferred links are offered for the researcher to examine, and then to confirm or reject the classification of the person in a diaspora. In case a decision could not be made, it is possible to widen the spectrum of study and to consult other references proposed by the program.

The database of the WoS lends itself well to such an exercise in prospection. It provides lists of names (those of the authors), geographical and institutional locations, as well as disciplines and scientific activities. ‘Unoporuno’ can be applied to these lists to observe the results of its selection of profiles including a high probability of migration or of belonging to a diaspora.

This exercise was conducted on a sample of 1138 out of 7122 co-authors of Uruguayan publications listed on the WoS.

Five categories were drawn up to classify the results:
- The foreigners are the co-authors for which ‘Unoporuno’ detected no trace of any obvious period of time spent in Uruguay;
- The local residents are in contrast those for whom hardly any sign appears of a significant period of time spent abroad;
- The mobiles are, conversely, the co-authors who obviously originate from Uruguay and have spent a part of their trajectory abroad;
- These latter are then divided into two groups: those who are still abroad (linear) and those who are no longer abroad (circular);
- Finally, a small group is made up of people whom the program was unable to classify as belonging to a specific group.

Chart 5. Results delivered by the program on these 1138 co-authors are the following:

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Foreigners</td>
<td>504</td>
<td>43 %</td>
</tr>
<tr>
<td>Locale</td>
<td>343</td>
<td>30 %</td>
</tr>
<tr>
<td>Mobiles</td>
<td>231</td>
<td>20 %</td>
</tr>
<tr>
<td>Linear</td>
<td>46</td>
<td>20 %</td>
</tr>
<tr>
<td>Circular</td>
<td>182</td>
<td>79 %</td>
</tr>
<tr>
<td><strong>N/A</strong></td>
<td>60</td>
<td>5  %</td>
</tr>
</tbody>
</table>

Source: own production based on Cidesal Survey “Migración internacional de profesionales de América Latina”

These results show that for respondents from Uruguay, the researchers who are or were migrants represent one out of five scientific and technical producers listed on the WoS and concerning this country. They are thus involved in more than one out of two publications, on an average. The link between mobility and production is thus important.

A comparison between these results and those of the survey is possible: the first notable aspect is the observation that the majority are circular migrants, that
is, researchers/engineers who have returned home after a period abroad. Although the survey questionnaire was filled in only by half of them, ‘Unoporuno’ – with its random sample – revealed to us that they represent over three-quarters of those who are mobile on an international scale.

Moreover, a more detailed analysis, case by case, name by name, revealed that 33 of those from the ‘Unoporuno’ extraction were also respondents in the Mobility by the WoS survey and they thus represented 40% of the 82 respondents. The remaining 60% formed a part of the 5,984 (7,122-1,138) authors outside this sample.

Ultimately, ‘Unoporuno’ supplied 7 times more results than the survey (231 versus 33). If we extrapolate the results of this sample, there should be approximately 800 Uruguayan migrant researchers – 140 linear and 660 circular migrants – involved in the 5,776 scientific and technical publications of this country during the first decade of the 2000s.

Conclusion

The use of new sources of information – such as the Web of Science – as well as new instruments of investigation – such as ‘Unoporuno’ – opens up new perspectives. They allow us to think that it is possible to increase the coverage of the diaspora population considerably and to bring to light a vast, invisible part of it. It also appears that the limited view we had up till now, through access to institutional records or formal associations, must change with these new techniques. A fundamental lesson of the exercise accomplished here with the Cidesal Project is that of the crucial importance of research in setting up a diaspora policy. Without the former, the foundations of the latter would be profoundly biased, taking into account only a small proportion of the population to reach out for. Finally, it appears clearly that one of the first steps, in order to set up a system of enlightened governance, consists of investing in the instruments which enable the most complete and precise access possible to this transnational and/or mobile population as a whole.
References


Appendix 1.
Survey’s questionnaire

Appendix 1.
Survey’s questionnaire
Appendix 2.
Letter sent to the reference authors and from them to theirs coauthors

Dear colleague,
You are the reprint author of the article <Title of the article>, written by <authors names>.
For scientific reasons, we need to contact all the authors of this article (see below). Could you read and forward to these colleagues our contact message?
We thank you very much in advance for your cooperation and wish you the best for your work,

Sincerely,
Jean-Baptiste Meyer, for the Cidesal project
Institut de Recherche pour le Développement
<http://www.msh-m.fr/cidesal>

Letter to co-authors

Dear colleague,
The Cidesal research and development project is contacting all researchers of Argentina origin, in an effort to reconnect with the intellectual diaspora. If you are or have been expatriate of <Argentina>, please click on this link? <http://www.observatoriodiasporas.com/page/encuesta-cidesal-argentina>.
We thank you very much for your attention and remain at your disposal should you have any query,

Sincerely,
The Cidesal team
<cidesal@msh-m.org>