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Data integration and good practices in communication between national statistical offices and producers of administrative data

Proposed methodology for estimating international migration

Note by National Administrative Department Of Statistic (DANE), Colombia [1]

Abstract

In general, the production of statistical information on international migration is a challenge for national statistical offices because of the lack of information sources. Until now, Colombia does not have continuous information for the analysis of migration; this information is generated from population censuses, which only it allows transverse information.

In this context, the National Administrative Department of Statistics - DANE - is exploring the use of administrative records for the production of information on migration issues[2], in this context is presented in this article, the methodological development of the estimation of international migration flows Colombia, from the administrative border control register, that records the data for 91.4 million international trips recorded in 2004-2015. These figures reflect the information of those entering or leaving Colombia through 39 points of air traffic control, land, sea and fluvial.

In this respect, travel itineraries of 16.7 million people and its main features are reconstructed, to whom the migratory status is determined by counting different algorithms following the of the United Nations international standards for the definition of migrants; among other aspects, the estimation algorithm and evaluation of results is also included by comparing immigration flows, from Colombia and registered in other countries.

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I. Introduction

1. The statistics of international migration are the weakest point of the migration information. Today a large group of countries does not have such records and in others, the data used are from decennial censuses conducted in intervals. Two serious limitations characterize census information describing migration between countries, the first is the inability to accept the cyclical changes of international migration as population censuses are raised approximately every 10 years and annual flows; the second limitation is that census only allow to obtain data on immigration and the emigration component is completely ignore. The immigration optical provides by censuses is not responding to the information needs of most Latin American countries for which external migration is from a few decades ago one of the determinants of demographic trends.

2. In another hand, there are other collection systems of international migration statistics more suited for its periodicity: the first from the population register systems and administrative records related to population and administrative records related to the population of foreign nationality; and second, the registers of border control of travellers who cross a border. This information provides the possibility of developing statistics of international migration.

3. The purpose of this article is to present a methodology that allows the use of the administrative record of borders. The research has been done based on records of individual travellers, collected by the government entity "Special Administrative Unit Colombian Migration" hereinafter referred Colombian Migration, in the air, sea, land and fluvial border control of Colombia. DANE uses this information to obtain an estimate of migration inflows and outflows of the country, adapted to the United Nations recommendations on international migration. The administrative record contains anonymised records of travellers with demographic information such as sex and birth date, Geographic data on the origin and destination of the trip as well as the country of nationality, birth and residence also socioeconomic information such as occupation and the reason for the trip and the type of visa.

4. It will describe the methodology used to transform the travel registration information in a statistical international migration based on the definition of migrant / migration proposed United Nations (1999); then the demographic consistency of the flows obtained is analyzed, as well as relations between international travel and migration; finally, will proceed to the validation of flow estimates comparing the results obtained, with those provided by independent sources of destination countries of Colombian emigration. This article only discusses the migration component, because the process of validation of the immigration component is in development.

II. Counting of similar exercises and the contribution of the proposed methodology

5. Although there are some studies on Colombian emigration, these have basically developed from census information and / or surveys with data that has dominated the transverse _ (DANE, 2007; 2008; Maguid, 2009, Ojeda, 2006; Ordóñez 2009).

6. An important part of the literature on international migration in recent years has focused on finding solutions to two basic problems: a consistent measure of international migration and comparability between countries.

7. The main problem remains the difficulty that the sources of information are used to provide a simultaneous image of migrant origin and destination data, this means disjointed definitions of emigration and immigration that sends and receives a country. It is well known that international migration patterns vary considerably depending on the country providing data (Zlotnik, 1987; Kupiszewska and Nowok, 2008). Thus, the concepts used, sources and techniques used in each country to measure external migration, end up affecting significantly in the values obtained and make it hard any international comparison of migration.

8. They are practically nonexistent jobs in the line of research presented here and totally unpublished in the Latin American context. Some studies tangentially address the proposal is presented here. For example, McCann, Poot, and Sanderson (2010) used a longitudinal sample of all international trips made until July 2005 by 13,674 citizens of New Zealand and 6,882 British citizens who migrated to Australia between August 1, 1999, and July 31, 2000. The data contains demographic information on the reasons for the trip short, the expected length of stay in Australia and occupation of the migrant. While the information available to each individual is modest, the data have the great advantage of being longitudinal and capture both short-term travels as the possible re-emigration.

9. In the same direction, the work of Schwabisch (2011) used a random sample of 1 percent of different longitudinal administrative records of the Social Security to deduce migration rates of immigrants from the United States, from a numerical identification system with information on about 325,000 immigrants between 1978 and 2003. The basic strategy first, is to identify immigrants by using the information on the birthplace and other variables that establish their foreign origin. From here, calculates the proportion of immigrants who "emigrate" from the Social Security System.

10. What does this research concerning the most recent literature? The first contribution is the innovation, as shown above, jobs are very scarce and the sources used are different. The proposed research focuses on the methodological aspects of measuring international migration flows, for this purpose has developed an estimate of migration based on the actual duration of stay of people in and out of Colombia. The second contribution is the sample size of the register of Migration Colombia, through the more than 91.4 million trips and 16.7 million people that ensure robust results and not statistically biased. The third contribution is based on the applied longitudinal optic had allowed rebuilding the travel itineraries people. Finally, simultaneous control of information in Colombia inputs and outputs based on the same source offers the possibility to apply similar definition emigration and immigration information. In this way, possible deviations introduced by the measurements from different countries are avoided.

III. The administrative record border control Migration Colombia

11. The administrative record of inputs and outputs Colombian Migration is a record of border control that feeds the information provided by travellers arriving or leaving the country through the 39 air, land, sea and fluvial crossings distributed throughout Colombia (Figure 1).

Figure 1 Map of border controls Colombian Migration

Source: Compiled from Colombian Migration data base

12. The information collected is comprised of 29 information fields of demographic, geographic, territorial and administrative, whose main variables can be seen in Table 1. For 2004-2015, the record structure meets the standards necessary information for the estimation of migration information: demographic characteristics, the timing of events and geographical identification of the movements of origin, destination, and residence.

Table 1 Information provided by Colombian Migration

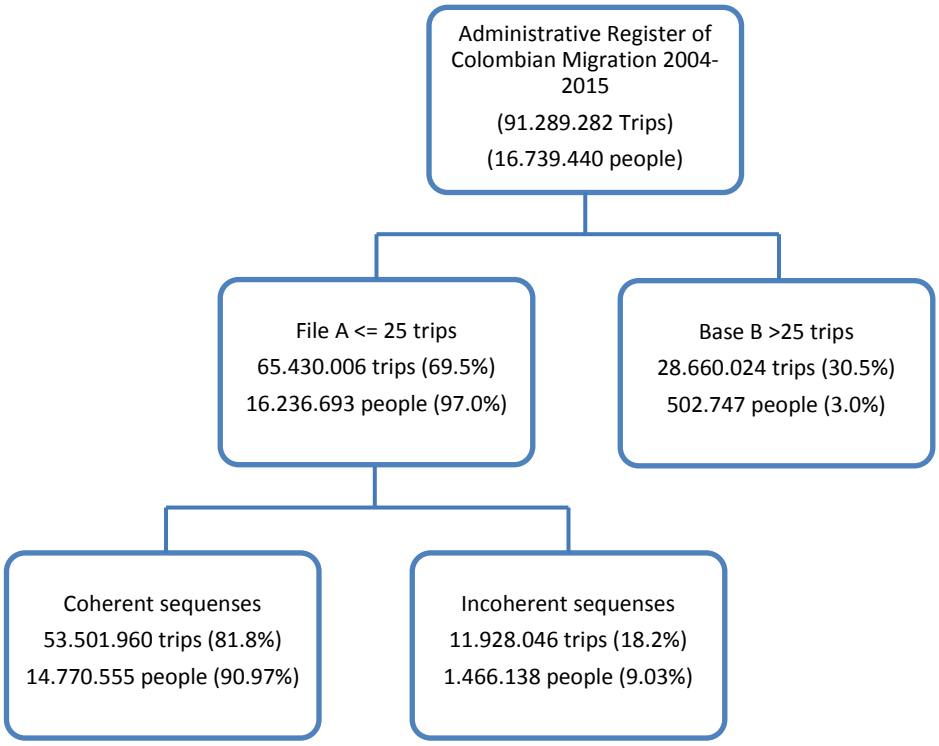
Variable Type	Description of Information
Individual identifier	Previously anonymised individual identifier
Administrative	Document type Number of trip Country issuing passport Check Point Means of transport
VISA	Type of Visa Country of Visa Issuance Date of issue Visa
Flow type travel	I: income, E: outcome
Temporality	Date of trip
Demographics	Sex Birthday Country of birth Traveler's nationality
Geographic	Residence country Country Destination / Origin
Socio-economics	Occupation Trip reason

Source: Compiled from Colombian Migration data base

A. Changes made in the administrative record Colombian Migration

13. It is performed by Migration Colombia, an anonymization process that assigns a unique identifier code for each individual present in the administrative record. To deal in an efficient analysis of this information proceeded to the division of the database of people in two files (Figure 2). The base A pick up travellers with 25 travels or less and is composed of 16,236,693 people (97 percent of all persons identified in Colombian Migration 2004-2015). The file B, which involved the 3 percent of the population group, the travellers who made more than 25 trips. This small group of people represents 30.5 percent of all trips.

Figure 2 Distribution of travel sequences at the base of people who made the DANE



Source: Compiled from Colombian Migration data base

14. Subsequently, the base rating (A) is subjected to an analysis of the consistency of the travel sequences based on the following basic principle: to an output of the country, an input follows and vice versa. This type of analysis is an unprecedented perspective that overcomes classic analyzes on the file as independent travel episodes, regardless of the logical sequencing of the routes that correspond to a traveller.

15. Analysis and correction of incoherent sequences are extremely complex and goes beyond the scope of this article. In addition, we can say that its impact is limited and does not substantially alter the estimates of the flows obtained.

V. Description of the method of estimation of migration flows

16. The difficulties in establishing definitions of migration concepts are related to the dual nature spatial and temporal migration (Courgeau, 1973; United Nations, 1999; Poulain, 1985). Building statistics on migration means setting up the residential status of people at all times, to make status changes in migration flows according to different time dimensions. A migrant, on the other hand, can perform multiple migrations during a period of time. In the following pages, the definition of international migration employing a longitudinal vision is presented, which allows estimating successive migrations.

17. The focus is on emigration of Colombia. There are two reasons for this choice: firstly, migration has an important role in the dynamics of international trade in Colombia because it is considered a sending country. Second, the validation systems estimate the administrative record Migration Colombia are mainly in the countries of destination. To evaluate the consistency of the results obtained from the method flows series compiled by the United Nations on a number of countries will be used. The definitions of these flows (by nationality, country of birth, country of the previous residence) vary from one country to another 7.

18. The register measures travel flows, only part of these trips end up being defined as migrations. For example, a person can perform during the period 2004-2015 countless trips, but is unlikely to exceed 2 or 3 international migration.

19. In the definition of migration, it has dispensed with the self-declaration of a country of residence that provides the traveller to Migration Colombia and has opted for an objective assessment of the residence based on the length of stay in Colombia.

20. So, on the basis longitudinal rating derived Migration Colombia international migrant is defined as: to any person engaged in international travel from or to Colombia and remains more than a year outside or inside of Colombia, estimating the duration of stay based on comparisons between two successive travel dates declared in the register. This means admitting the hypothesis that the administrative record has universal coverage and that all international movements in and out are reflected in it.

21. Additional problems associated with this definition. Since the observation of the administrative record is temporarily truncated to the left (only individuals observed from January 1, 2004) and does not really know the status of residence of the individual within or outside Colombia before January 1, 2004, because registration is available from that date. This implies that migratory movements made during 2004 cannot be detected and it is possible to begin to consider the integrity of the registration of emigrations made in 2004 to end of 2005. Problems of a similar nature occurs in right truncation, only can effectively measure the movements until December 31, 2014, with the difference that data migration made during 2015 are out of the question until no information about 2016.

22. With the algorithm is possible to establish the migratory and residential status for each person as well as the exact date of migration, then the emigrations destinations associated with the date on which the migration was performed are estimated.

V. Results

23. The results presented in this section are derived from the method described in section 4. Have been estimated two types of data: the relationship between international travel and emigration, where first, estimating the migratory flows from Colombia by sex and age are presented; and finally, to evaluate the consistency of the results from the method has proceeded to the comparison between migratory flows calculated from the register and registered by various countries at the point of destination.

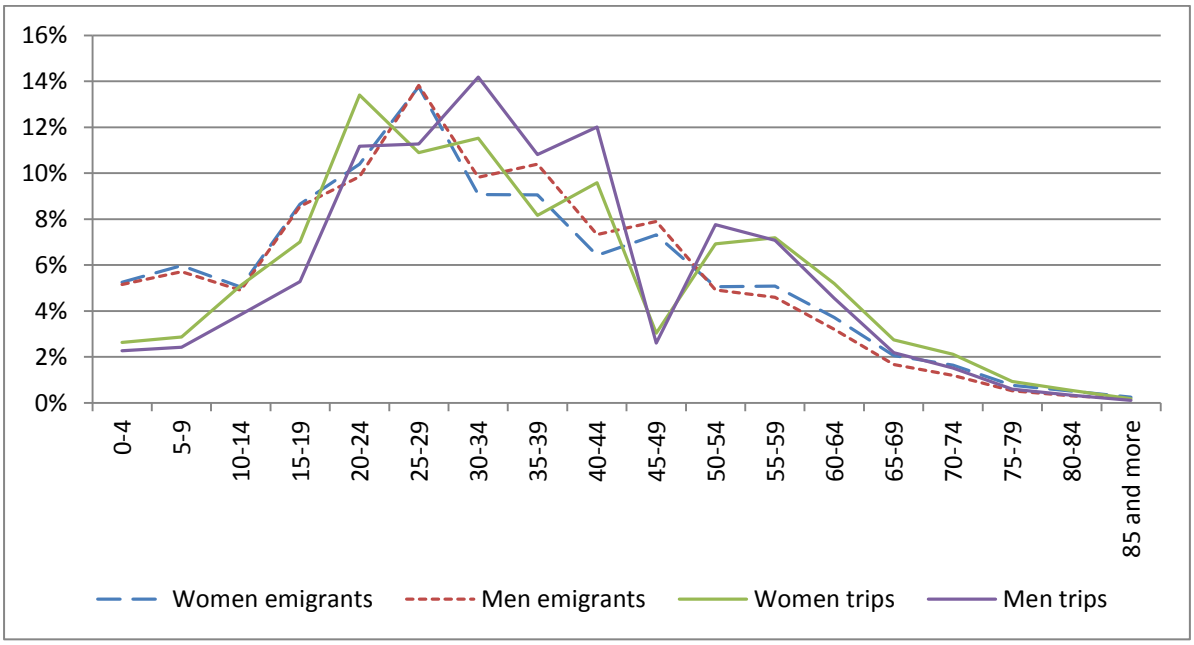
A. Demographic characteristics of international migration from Colombia.

24. The structure of the age distribution of the flows of international travel and migration estimated Colombia, are presented in Figure 2.

25. The profile by age and sex of migrants departing from Colombia during the period of study has the following clearly differentiated structure by sex[3]: between 0 and 54 men migrate more than women with a greater difference between 35 and 44 years. From age 55, a larger number of women migrants are estimated, particularly between 70 and 74 years.

26. The demographic structure of migration is coherent and responds to the expected demographic parameters for international migrants. This study suit for Colombia profiles by sex and age of migration patterns (Rogers and Castro, 1982; Rogers and Willekens, 1986) retaining some specificities of international migration: a low proportion of migration among children drag, a maximum is reached at the age slightly below 30 years and a slight predominance of female migration from the 50 years. Comparison results are shown in Figure 2.

Figure 2 Demographic distribution of flows in the proportion of international travel and migration of Colombia (2005-2014)



Source: Compiled from Colombian Migration data base

[3] Levels of masculinity Colombians travels are closer to a profile with greater presence of migratory component (97 men per 100 women). On the contrary, the outputs of foreigners in Colombia are mostly male and respond to a more linked to business (142 males per 100 females).

B. Comparison of estimates of Colombian international migration data registered in the destination countries

27. In the preceding pages, it has tested the transformation of a base of information on travel and travelers on an estimate of the external migration of Colombia for the period 2005-2014 according to different demographic characteristics. It would be useful to know which of the estimated flows are considered very reliable and which could be subject to discussion. To perform the validation operation estimates the results obtained are compared with immigration registered in the destination countries according to different categories (country of origin, Colombian nationality, and country of birth Colombia). If immigration records had no problems of coverage and definition, emigration figures produced from the administrative record and immigration figures collected in recipient countries would be similar, but this is not so, since the definitions differ between countries and even the reliability of a record does not guarantee full comparability (Bilsborrow, et. al 1997; Nowok, et. al 2006; de Beer, Raymer, van der Erf and van Wissen, 2010).

28. Before approaching the comparative study, it must remember some difficulties for comparison of migration flows between countries to understand the differences of magnitude that found during this exercise. First, migratory events recorded in the issuing country and immigration obtained in the host country can be counted on different dates 9. Second, when a very short duration of stay as a temporary criterion is used, inflation immigration registration occurs (Raymer, de Beer and van der Erf, 2010). On the other hand, there are factors that affect coverage as underreporting derivative collection systems based on self-declaration of international movements and the exclusion of different population groups. Although the desire to report changes of residence varies from one country to another, immigrants generally have more incentive to report their arrival, rather than departure (Thierry et al., 2005; UNECE, 2009). Immigration statistics are considered more reliable than emigration statistics, however, the cash flows of the estimation method used to calculate the outputs of Colombia would not be affected by a significant underreporting.

29. These brief considerations lead to the general conclusion that the currently available data on international migration flows are still far from being comparable internationally and that the results obtained in this comparative exercise are in any case an approximation of the degree of reliability method.

1. Validation of the method of estimating migration flows of Colombia

30. In Table 7 are shown flows for 12 destinations Emigration from Colombia in the 2004-2013 estimated from the administrative record of Colombian Migration, the second part of the table contains the average flows reported by destination countries collecting by International Migration Flows to and from Selected Countries: The 2015 Revision (web-based database) by United Nations according to different measurement criteria. The differences found between emigration figures (Colombian Migration) and immigration (United Nations) are useful for improving and harmonizing migration estimates obtained. If the number of

emigration to a country becomes systematically lower than the corresponding to the number of immigrants reported by destination countries, one can see the existence of underreporting or a bad statement of final destination at the base of Colombian Migration.

31. Definitions of international migration, that the United Nations collected for each country are different and affect the comparative period. The information we used is as follows: type IBR flows correspond to immigration by country of previous residence (Colombia) and has been supplied by Denmark, Spain, Finland, Italy, Ireland, Norway, New Zealand and Sweden; the acronym IFR, immigrations of foreigners country (Colombian nationality) by country of the previous residence, correspond to Belgium and Switzerland and acronyms IFC, is the name of immigration by nationality (Colombian), Canada and the United States have provided such information, in this case, the country of origin is not specified.

Table 2 Estimation of international migration flows according to collection Colombian Migration and flows originating in Colombia in countries of destination according to the United Nations

Colombian Migration	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**
Denmark – MC	65	79	84	105	107	74	78	58	59
Spain – MC	15,553	22,971	29,694	30,414	25,981	21,022	21,619	20,964	19,179
Finland – MC	44	35	47	47	38	30	28	60	14
Italy – MC	1,376	1,483	1,884	2,044	2,088	1,764	1,560	1,195	992
Ireland – MC	23	23	26	21	38	22	15	56	27
Norway – MC	122	128	145	140	123	140	125	113	79
New Zealand – MC	34	24	30	39	51	32	41	47	48
Sweden – MC	242	282	300	379	292	297	275	174	181
Belgium – MC	111	104	90	88	110	109	106	78	73
Switzerland – MC	271	230	229	184	206	142	162	152	156
Canada – MC	2,389	2,618	2,912	3,218	2,222	2,142	2,261	2,121	1,934
United States – MC	15,930	15,648	15,029	16,148	16,710	16,018	14,676	16,278	20,455
Flows recorded in the destination countries	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**
Denmark – IBR	93	114	94	112	92	97	76	81	153
Spain – IBR	21,351	28,650	36,434	36,417	20,946	14,119	13,676	10,433	9,268
Finland – IBR	35	39	32	37	31	33	37	44	31
Italy – IBR	2,136	1,907	1,948	2,446	2,366	2,391	2,036	1,756	1,298
Ireland – IBR		31	21	23	23	32	36	36	60
Norway – IBR	145	163	173	147	104	138	180	138	115
New Zealand – IBR	40	23	33	49	52	56	67	57	78
Sweden – IBR	248	345	273	299	273	319	294	270	258
Belgium – IFR	190	198	208			225	335	297	221
Switzerland – IFR	435	449	477	573	522	540	431	440	469
Canada – IFC	6,424	6,535	5,357	5,452	4,652	5,218	4,366	3,741	3,631
United States – IFC	25,566	43,144	33,187	30,213	27,849	22,406	22,635	20,931	21,131

IBR: immigration by country of previous residence
IFR: immigrations of foreigners country (Colombian nationality)
IFC: immigration by nationality (Colombian)
Source: Compiled from Colombian Migration data base and United Nations, *International Migration Flows to and from Selected Countries: The 2015 Revision (web-based database)*

32. For each country, it has a coefficient estimated placed in the numerator averaged data registered on arrival for the period 2004-2013 and the denominator

the average of the same period measured in origin from the administrative record. This coefficient is called adjustment factor and is the value that would be multiplied to obtain estimates immigrations accounted for on arrival. These factors are set forth in Table 8. When the adjustment factor exceeds 1 indicates that the destination country recorded a higher number of flows estimated from the base Colombian Migration. The data used are by country of the previous residence, in this case, Colombia, and includes both Colombian nationals and foreigners. This result implies that all types (IBR, IFR, and IFC) estimates should be hypothetically above reported data and the adjustment factor should be less than 1.

33. As a whole, the adjustment factor for the data obtained is 1.30 which means that the base Migration Colombia cover 76.8 percent of the flows recorded in the destination countries for the period 2004-2013 with an underreporting of 23.2 percent. These data are good if you consider that the work done by de Beer, Raymer, van der Erf and van Wissen (2010) the global adjustment factor is 1.34 for the migration is estimated between 19 countries of the European Union and EFTA countries for the period 2002-2007. On the other hand, the use of a homogeneous base provides in this case a smaller dispersion factors that those mentioned in the work: data range from 0.89 of United States, and the maximum of 2.05 of Australia, the latter country with very modest flows and only contemplate a period of 4 years (2005 to 2008), while in the study of Beer et al (2010), presents the minimum and maximum 0.69 Germany Poland 10.64.

Table 3 Coverage levels of international emigration flows measured by Colombian Migration and the statistical offices of the respective countries of destination. Annual average 2005-2014

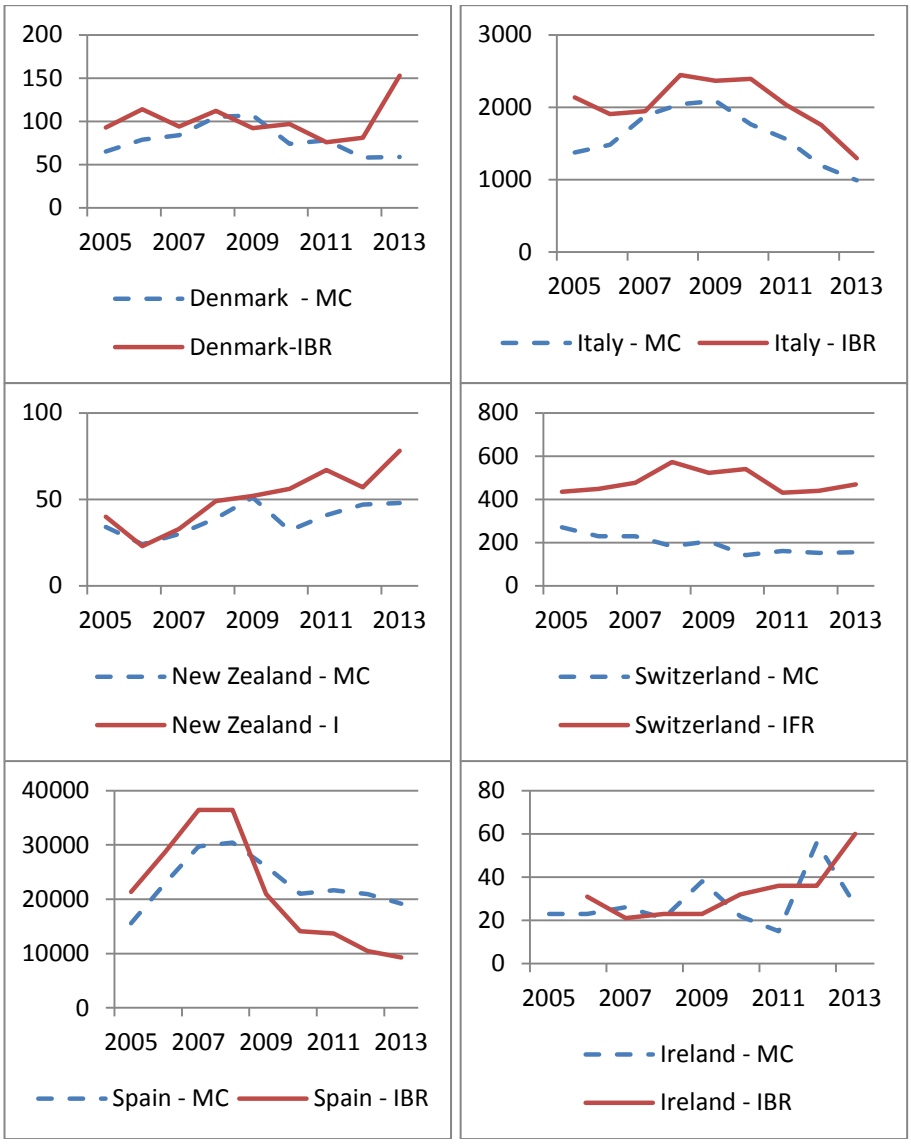
Destination country	Migration flows measured from Colombian Migration	Immigration flows measured in destination countries	Proportion	Adjustment factor
Denmark	79	101	77.7%	1.29
Spain	23,044	21,255	108.4%	0.92
Finland	38	35	107.5%	0.93
Italy	1,598	2,032	78.7%	1.27
Ireland	29	33	87.0%	1.15
Norway	124	145	85.6%	1.17
New Zealand	38	51	76.0%	1.32
Sweden	269	287	93.9%	1.06
Belgium	96	239	40.1%	2.49
Switzerland	192	482	39.9%	2.50
Canada	2,424	5,042	48.1%	2.08
United States	16,321	27,451	59.5%	1.68

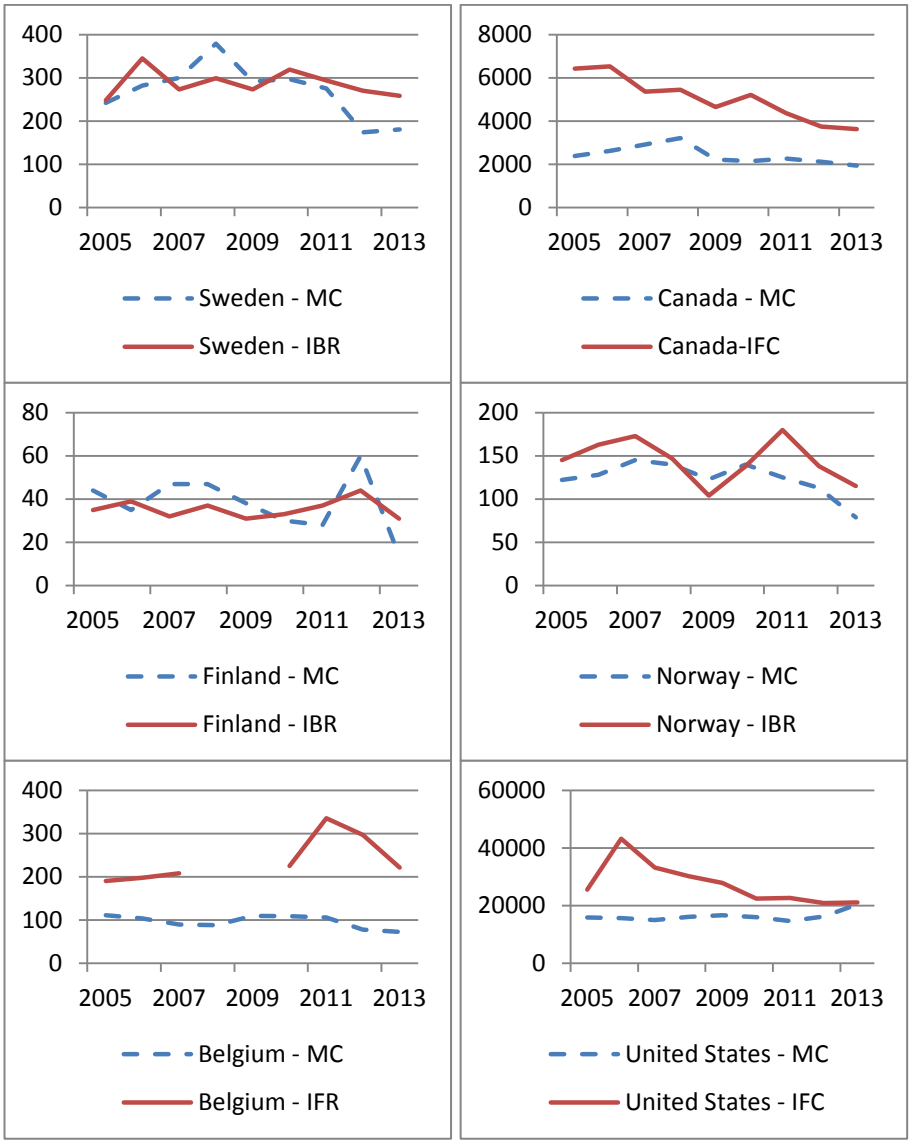
Source: Compiled from Colombian Migration data base and United Nations, *International Migration Flows to and from Selected Countries: The 2015 Revision (web-based database)*

34. The overall average masks disparate situations and in countries such as Italy, Ireland, Denmark, Norway, New Zealand coverage level is relatively low because the adjustment factors are relatively high. The chronology is here important because a person who declares in Colombia destined for a Schengen country may end up residing under the undocumented status in another country or to make a

double migration, once obtained the residency papers and appear in two places different as there are no intra-European systems check on multiple residences. In addition to levels in Spain, Finland and Sweden are about 100 percent, indicating a good level of coverage.

Figure 3 Comparison of emigratory flows by Migration Colombia with data collected in destination countries (2005-2014)





IBR: immigration by country of previous residence
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Source: Compiled from Colombian Migration data base and United Nations, *International Migration Flows to and from Selected Countries: The 2015 Revision (web-based database)*

35. Canada and Australia, with adjustment factors of 1.60 and 2.05 respectively show instead a high underreporting. The possible explanation of these values is related to the duration of two successive trips to Colombia. Often a part of the resident Colombian community in Canada does not accumulate periods greater than twelve months out of Colombia given the low cost of air transport, so for the purposes of the administrative record of Colombian Migration, escape the definition of the immigrant who he has implemented. Moreover, a person who was the subject of family reunification from Canada would join with resident status in that country and could, from that moment, make periodic trips back to Colombia: he had changed his country of residence and duration of stay in Colombia would

not exceed the year. This is a problem that has arisen and that tends to lower the emigrations that provide the method. Moreover, the United States shows an adjustment factor of 0.89 indicates that Colombian Migration registered an 11.8 percent bound emigrants US immigrants are measured in the latter country[4]. In any case, the results are very encouraging to the extent that the current estimate of the migratory flows below the levels that can be achieved in the future based Colombian Migration when it recovers the emigrations from the incoherent sequences and incorporates a more flexible definition of temporary external migration.

36. Anyway, the adjustment factors calculated indicate that estimates would have a higher quality than that provided by the systems for measuring the intra-European international migration and are known through the work of De Beer et al (2010).

V. Conclusion

1. This article had presented a methodology for estimating, from the administrative control register of borders, the Colombian emigration flows by sex, age and country of destination in the period 2005-2014.

2. The results are robust for different reasons: in general, the estimated data coincide with what is expected from knowledge of Colombian migration reported by the census. The highest estimated flows occur between countries that have historically concentrated the main destinations of Colombian emigration. An estimate of consistent flows is also seen in its structure by sex, age, and coefficient of masculinity.

3. The comparison of the flows obtained with the proposal and emigration recorded in destination countries has yielded different but consistent results, some of these differences can be explained by the different timing criteria and definitions of migration.

4. Although estimates are not perfect, the data obtained allow improving understanding of recent external migration patterns. It can be incorporated the estimated migration on population projections.

5. Thorough cleansing in the near future, of the inconsistent sequences through imputation processes, improve coverage of registration and as a result is expected a greater confluence of the values registered emigration. Among the future developments raised it is: to assess the impact of the application of new timeslots in defining migration, adding duration's residence of 3 and 6 months.

6. In conclusion, the methodology presented in this article is the first of its kind in the Latin American region and one of the few developed at the global level from a record of borders. The main obstacles related to some data inconsistencies are overcome and reasonable estimates of flows Emigration from Colombia by year,

[4] The United Nations provides data for the United States, are not flows are Colombian immigrants, by fiscal year, who get permanent residence, while Colombia Migration registers Colombians and foreigners arriving there.

sex, age and country of destination were generated. These estimates provide a coherent picture of the Emigration from Colombia.

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