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Publicación Serlada del

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# **INFORUM 3 - 83**

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## INTRODUCCION

En 1976 México fue sede del 38 Congreso Mundial de la Federación Internacional de Documentación (FID). Este congreso tuvo como tema central "La Información y el Desarrollo".

Para entonces, el CICH tenía cinco años de creado y tres de compilar los datos para su "Bibliografía Latinoamericana". El material acumulado en 1974-1975 se prestaba para el estudio preliminar de algunos aspectos importantes de la investigación en nuestra región.

El personal del CICH inició ese estudio, lo que dio como resultado una serie de trabajos que fueron propuestos al Comité Organizador del Congreso; al aceptarlos, uno de los miembros del Comité de Selección opinó: "Estoy muy impresionado por la calidad e importancia del trabajo presentado en estos artículos".

Sin embargo, estos artículos, al no haber sido impresos y puestos en circulación por los organizadores del Congreso, no contaron con la difusión adecuada y oportuna. Aún así, las solicitudes de copias de los mismos no han sido infrecuentes, y el Dr. F. W. Lancaster de la Graduate School of Library Science de la Universidad de Illinois, los ha citado más de una vez.\*

En una de estas citas (1979), Lancaster dice: "Apart from the impressive compilation of data for the

## FOREWORD

In 1976 the 38 World Congress of the International Federation of Documentation (FID) was held in Mexico City. The Congress centralized its interest on the slogan "Information and Development".

By then, CICH had turned its 5th year of activities and had, during the last three, compiled the data for its "Bibliografía Latinoamericana". The material accumulated in 1974-1975 was ideal for a preliminary study of some important aspects of research in our region.

CICH's staff initiated this study, resulting in a series of papers that where proposed to the Congress Organizing Committee and, being accepted, one member of the Selection Committee expressed the following opinion: "I am very impressed by the quality and importance of the work represented in these papers."

However, the papers were not printed and circulated by the Congress organizers and, consequently, did not receive the proper and timely dissemination. Nevertheless, request for copies of the same papers have been frequent, and Dr. F. W. Lancaster of the Graduate School of Library Science, University of Illinois, has cited them more than once.\*

In one of these citations (1979) Lancaster writes: "Apart from the impressive compilation of data for

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United States by King et al. (1976), some of the most relevant studies toward the development of statistical indicators of the type outlined have been conducted in México at the Centro de Información Científica y Humanística, Universidad Nacional Autónoma de México. This work is summarized in four papers by Sandoval et al., Buttenklepper et al. and Pérez-Guinjoan et al. The bibliometric studies conducted in México examine the quantity and distribution of articles on Latin America published in non-Latin American journals, including the proportion of the total contributed by Latin American authors, and the extent to which scientific and humanistic research conducted in Latin American is reported in journals of world prestige published outside Latin America. The contribution of individual countries to this literature, the contribution of individual institutions in these countries, and the distribution of the literature over about 4000 journals is also examined. The studies conducted in México can be regarded as useful models of what can be done in the development of indicators of communication, in science, technology, and other fields, that may be of direct concern to policy makers at national levels."

Al contar con un nuevo órgano de circulación, el CICH ha creído

the United States by King et al., some of the most relevant studies toward the development of statistical indicators of the type outlined have been conducted in Mexico at the Centro de Información Científica y Humanística, Universidad Nacional Autónoma de México. This work is summarized on four papers by Sandoval et al., Buttenklepper et al. and Pérez-Guinjoan et al. The bibliometric studies conducted in Mexico examine the quantity and distribution of articles on Latin America published in non Latin American journals, including the proportion of the total contributed by Latin American authors, and the extent to which scientific and humanistic research conducted in Latin America is reported in journals of world prestige published outside Latin America. The contribution of individual countries to this literature, the contribution of individual institutions in these countries, and the distribution of the literature over about 4000 journals is also examined. The studies conducted in Mexico can be regarded as useful models of what can be done in the development of indicators of communication, in science, technology, and other fields, that may be of direct concern to policy makers at national levels."

Now that CICH has this new tool of circulation, it was considered convenient to give these papers the long delayed and needed

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conveniente darles la difusión que merecen. Por eso se presentan ahora como Número 3 de INFORUM. Se conservan en inglés, por haber sido la lengua oficial del Congreso.

dissemination. This is the reason to publish them as Number 3 of INFORUM. They are written in English, the official language of the Congress.

\* Lancaster, F.W. "Toward paperless Information Systems", Academic Press, 1978 (Chapter 5, Some problems of formal communication in Science and Technology").

\* Lancaster, F.W. "Information retrieval systems: characteristics, testing and evaluation". 2nd. ed. John Wiley & Sons, 1979 (Chapter 17, Evaluation of a National Information System).

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## RESEARCH AT LATIN AMERICAN INSTITUTIONS OF HIGHER EDUCATION. A BIBLIOMETRIC APPROACH.

Alfredo Büttenklepper  
Aurelio Pérez-Guinjoán  
Armando M. Sanchoval  
Margarita Almada de Ascencio  
Centro de Información Científica y Humanística  
Universidad Nacional Autónoma de México  
Apartado Postal 70-392, México, D.F. 04510

### ABSTRACT

Based on 4656 Latin American scientific, technical and humanistic articles detected by the scanning of about 4,000 non-Latin American journals of world prestige during a two-year period (August 1973 to July 1975) the institutional origin of Latin American research is analysed.

Institutions of higher education produce almost two-thirds (64%) of the total, and non-educational institutions the remaining 36%. By decreasing order of production, five out of twenty countries: Brazil, Argentina, México, Chile and Venezuela, produce 93% of the total research carried out at institutions of higher education. Brazil alone, 37%.

The same countries produce the largest part of research carried out at non-educational institutions (84%). Argentina alone, 29%.

### BACKGROUND

The institutions of higher education, which from now on will be called "Universities", in their non-commercial role or both producers and consumers of information, face great problems trying to cope with this expensive producing-consuming process which is closely linked to their tasks of administration, teaching, research and dissemination of culture. This is particularly certain for universities in the areas of the world considered in the process of "development" (the

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central concept of this FID World Congress), universities which, in general, depend on modest budget for both "research" and "information".

Moreover, great difficulties should be anticipated for he who intends to link the concept of "information and development" with the concept of "research in universities" since, as it is well known and can be confirmed once more in another paper (1), research carried on at universities is essentially that considered as "basic", which means research which has no specific application in view.

However, evidence has accumulated which is worth mentioning. In the technical innovations studied during project SAPPHO (University of Sussex), the idea which originated the innovation was positively identified as originating externally to the innovator in 46 out of 86 innovations; 22% of the ideas derived from University, 28% from government agencies, 39% from industry and 11% from individuals (2). For basic science produced in Universities to be converted into applied science, 22% is not bad. If this were not enough, the document "The conditions for Success in Industrial Innovation (OECD, Paris, 1971, p. 96)" states that: "The key component in an industry-university interface is the recognition by industry of the potential contribution of fundamental

science to industrial innovation rather than the performance of "applied" research in the universities" (3).

Therefore, for a developing country or region it is necessary to learn: ¿What research is being carried on at its universities?

To answer this question has a particular importance at the National University of México (UNAM) since its research infrastructure (human and material resources, current programs and organizational elements) are about one third of that of the whole country, receiving in 1973 one sixth of the economic resources that the country invested in research, which means 0.26% of the gross national product (4).

To this aim, an analysis was made of the Latin American Bibliography published in foreign journals of world prestige during the period from August 1973 to July 1975, as to the countries of origin, and the disciplines covered, obtaining interesting data on the same analysis. Data have been gathered related to contribution of articles by Latin American institutions, obtaining an image of the active research nuclei in 20 countries.

During the two-year period studied, 4656 articles were compiled (1) which were classified in two large groups, as to their origin: 1) from institutions of higher education, and 2) from non-



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educational institutions.

## RESULTS AND CONCLUSIONS

Figure 1 shows the distribution of the 4656 articles in the two groups. Universities produce the largest percentage (63.73%), performing almost two thirds of the research carried on in Latin America. These results agree with those previously obtained for single disciplines like Biomedicine (5) and Chemistry (6) which are unquestionably the most attractive fields of knowledge for Latin American researchers.

The rate of this contribution by type of institution in each country is illustrated in Figure 2.

The universities of a single country among 20, Brazil, contributed almost one fourth (23.84%) of the total Latin American articles. Universities of three countries: Brazil, Argentina and Mexico, contributed almost half of the total (49.4%).

The universities of the remaining 17 countries contributed only 14.33% of the total.

The non-educational institutions of only one of the 20 countries, Argentina, contributed 10.43% of the total Latin American production of articles. The non-educational institutions of three countries: Argentina, Mexico and Venezuela, contributed 28.48% of the total. The non-educational institutions of the

remaining 17 countries contributed 7.79%.

Among the seven countries with the largest contribution (Argentina, Brazil, Chile, Colombia, Mexico, Peru and Venezuela), Brazil alone, with 24% of the total number of universities in these countries (in 1973, see Table 2), produces 30.49% of the Latin American articles, distributing this contribution as follows: 23.84% from universities and 6.66% from non-educational institutions.

Brazil and Argentina, with 44% of the total number of universities in these seven countries, produce 57.19% of the Latin American articles, distributing their contribution as follows: 40.10% and 17.09%, respectively.

Brazil, Argentina, Mexico and Chile, with 66% of the total number of universities in the seven countries, produce 83.15% of the total Latin American articles, distributing their contribution as follows: 56.52% and 26.62%, respectively.

The remaining 16 countries produce 16.85% of the total Latin American articles, distributing their contribution as follows: 7.20% and 9.65%, respectively.

The ratio of the contribution educational/non-educational research institutions (E/NE) for each country as per total Latin American production, is as follows:

TABLE 1

Country	Contribution to total Latin American production	E/NE
Brazil	30.47%	3.58
Brazil and Argentina	57.19%	2.35
Brazil, Argentina, Mexico and Chile	83.15%	2.12
The remaining 17 countries	16.85%	0.75

In the four countries of major contribution (Brazil, Argentina, Mexico and Chile), the largest number of articles comes from universities, whereas in the 16 countries of minor contribution, the largest number of articles comes from non-educational institutions.

Figure 3 illustrates how the contributions are distributed within each country. The high proportion of university production as related to non-educational institutions, is remarkable in the cases of Brazil and Chile (3.6 and 3.4, respectively).

When the university production of articles is considered alone, exclusive of other institutions, the contribution of Brazil appears even more remarkable, being 37% of the whole Latin American university production of articles (figure 4), followed in decreasing order of importance, as in several other bibliometric data (1), by Argentina,

Mexico and Chile.

Among the countries with a minor contribution, the leaders are Uruguay, Costa Rica and Cuba.

The universities of five countries (Brazil, Argentina, Mexico, Chile and Venezuela) produce 93.37% of the total Latin American articles originating in universities. It can be concluded, therefore, that in the universities of these countries 59.5% of the Latin American research is produced.

In the countries with a minor contribution, their universities produce 6.63% of the total Latin American articles originating in universities and, therefore, they produce 4.2% of the total (universities plus non-educational).

Research in Chilean universities appears as more productive than that in the other countries with higher production, if related to the average number of article/year

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produced in each university, as illustrated in Table 2.

Figure 5 illustrates the contribution of non-educational institutions in each country, as related to the whole Latin American contribution in this type of institutions, exclusive of any other.

The countries with major contribution (Brazil, Argentina, Mexico, Chile and Venezuela) produce 84.35%. Argentina is the

leader with 28.77%. These percentages represent 30.6% and 10.4%, respectively, of the total Latin American contribution. It is concluded that Argentina is the country with the largest research contribution performed at non-educational institutions. At the other end, Ecuador is the leader among the minor contributions of the same.

TABLE 2

Countries	No. of universities (1973)	Articles/year Aug 73-Jul 75)	Average of papers-year per university
ARGENTINA	47 (3)	379	8.1
BRAZIL	57 (3)	555	9.7
CHILE	8 (3)	166	20.8
COLOMBIA	37 (2)	26	0.7
MEXICO	42 (2)	217	5.2
PERU	33 (1)	22	0.7
VENEZUELA	10 (1)	70	7.0

(1) Compendio Mundial 1976. Publicaciones Continentales de México, S.A. México, D.F.

(2) Adams, S. "Scientific and Technical Information Services in Eight Latin American Countries". Report to the Office of Science Information Service. National Science Foundation. NSF project Grant SIS 75-14767. Louisville, Kentucky, 1975.

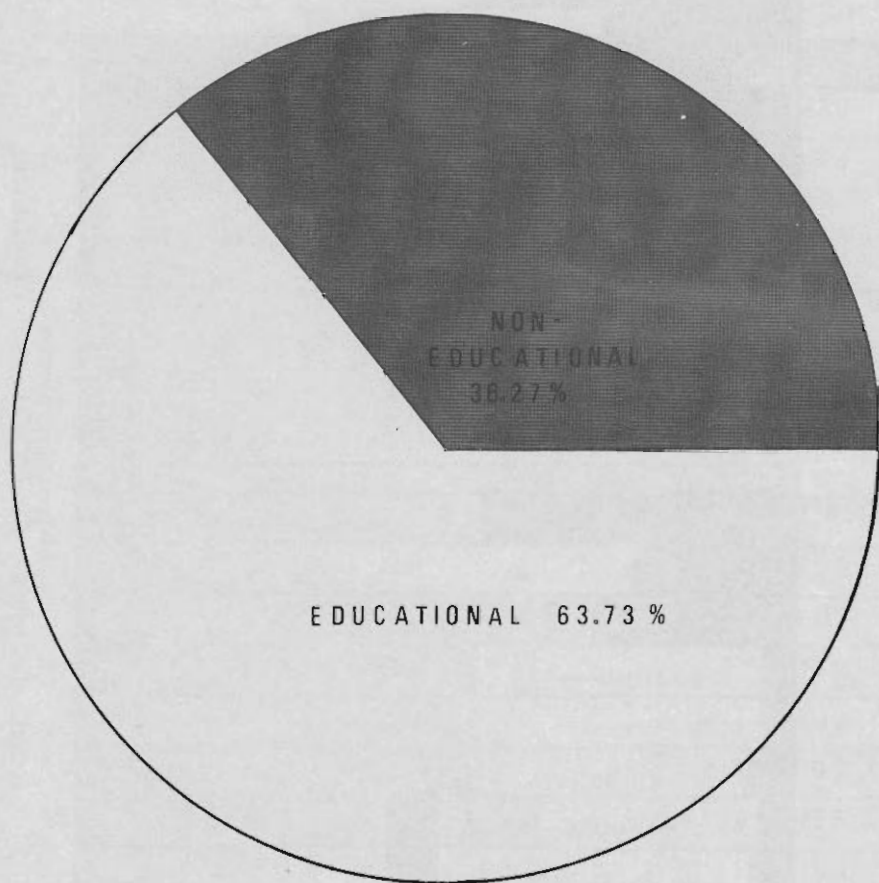
(3) América en Cifras 1974. Situación Cultural: Educación y otros aspectos culturales. Instituto Interamericano de Estadísticas. Organización de Estados Americanos. Secretaría General. Washington, D.C., EUA., 1975.

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1. Pérez-Guinjoán, A., Buttenklepper, A., Sandoval, A.M. and Almada de Ascencio, M. "Research in Latin America. A bibliometric approach", Paper submitted to the 38 World Congress of FID. México City, Sep. 27-Oct. 1, 1976.
  2. Rothwell, R and Robertson, R. "The roles of communications in technological innovation", *Research Policy* 2(3):204-225, 1973.
  3. Gibbons, M. and Johnston, R. "The roles of science in technological innovation", *Research Policy* 3(3):220-242, 1974.
  4. Soberón, G. and Mendoza de Flores, R. "La investigación y la universidad", *Rev Univ Méx* 29(5): 8p., 1975.
  5. Sandoval, A.M. and Núñez, A. "The biomedicine manuscripts drain from Latin America" *Unesco Bull Libr*, 28(1):10-16, 1974.
  6. Büttenklepper, A., Almela, J., Turnbull, F. and Almada de Ascencio, M. "Latin American Chemical papers in non-Latin American journals. Statistical approach". Paper No. 117 of the EICH presented at the 1st. Congress of Chemistry of the North American Continent. México City, Nov. 3-Dec. 5, 1975.

**FIGURE 1**

**SOURCE OF PAPERS BY INSTITUTIONS**



TWO - YEAR TOTAL : 4656

FIGURE 2  
SOURCE OF PAPERS BY COUNTRY & INSTITUTIONS  
AS PER REGIONAL PRODUCTION

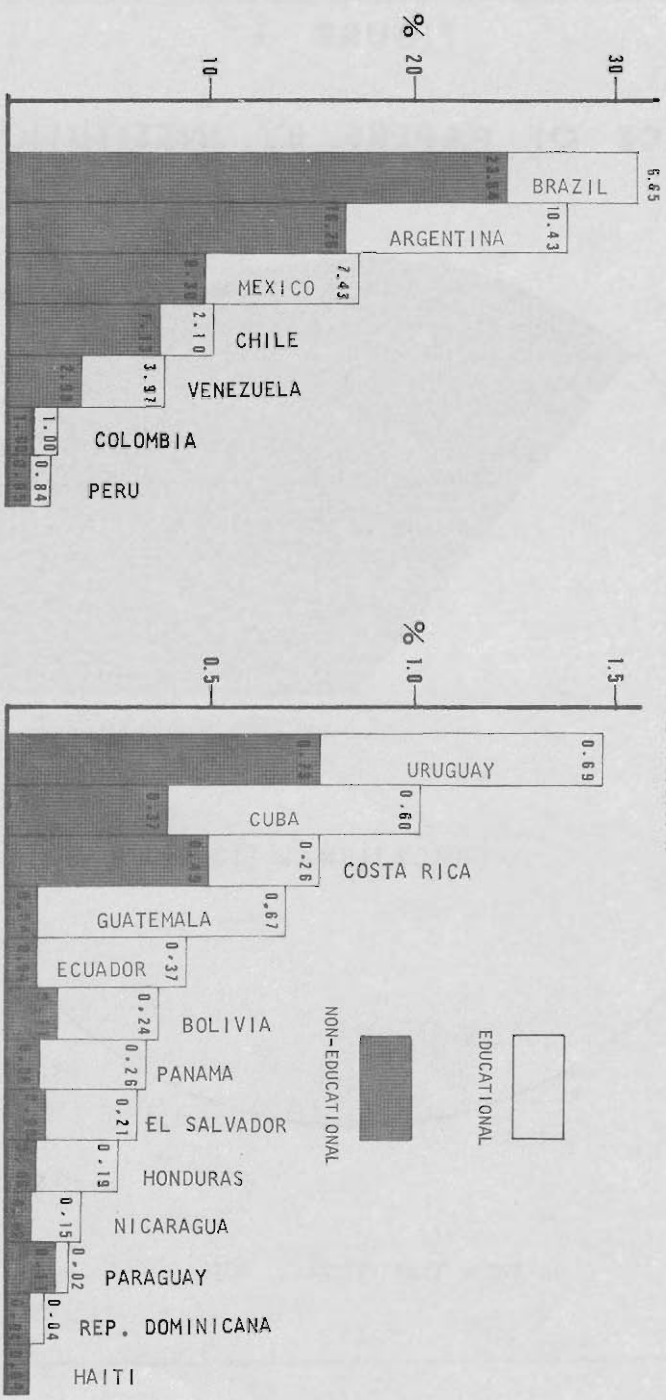


FIGURE 3 SOURCE OF PAPERS BY COUNTRY AND INSTITUTIONS  
as per national production

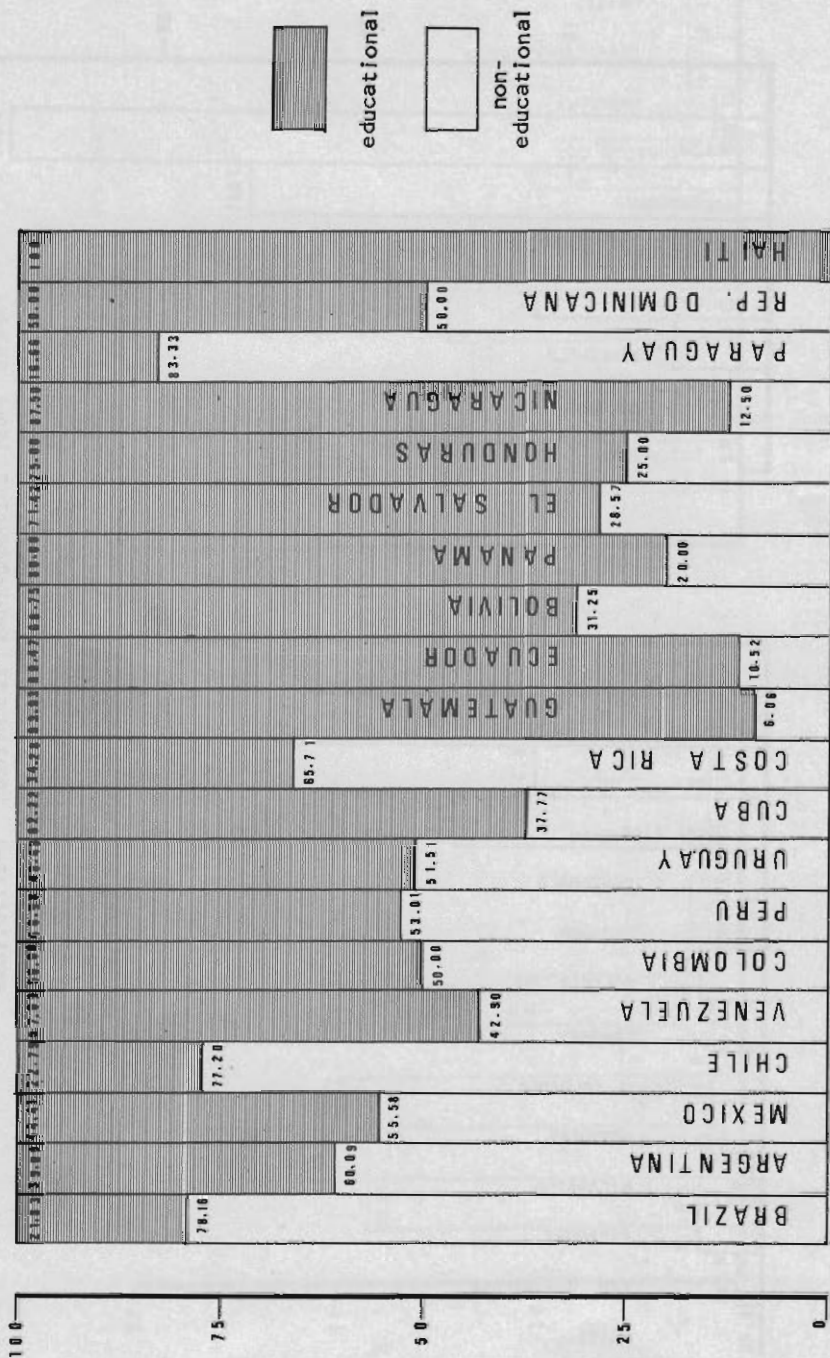


FIGURE 4  
PAPERS FROM LATINAMERICAN EDUCATIONAL INSTITUTIONS

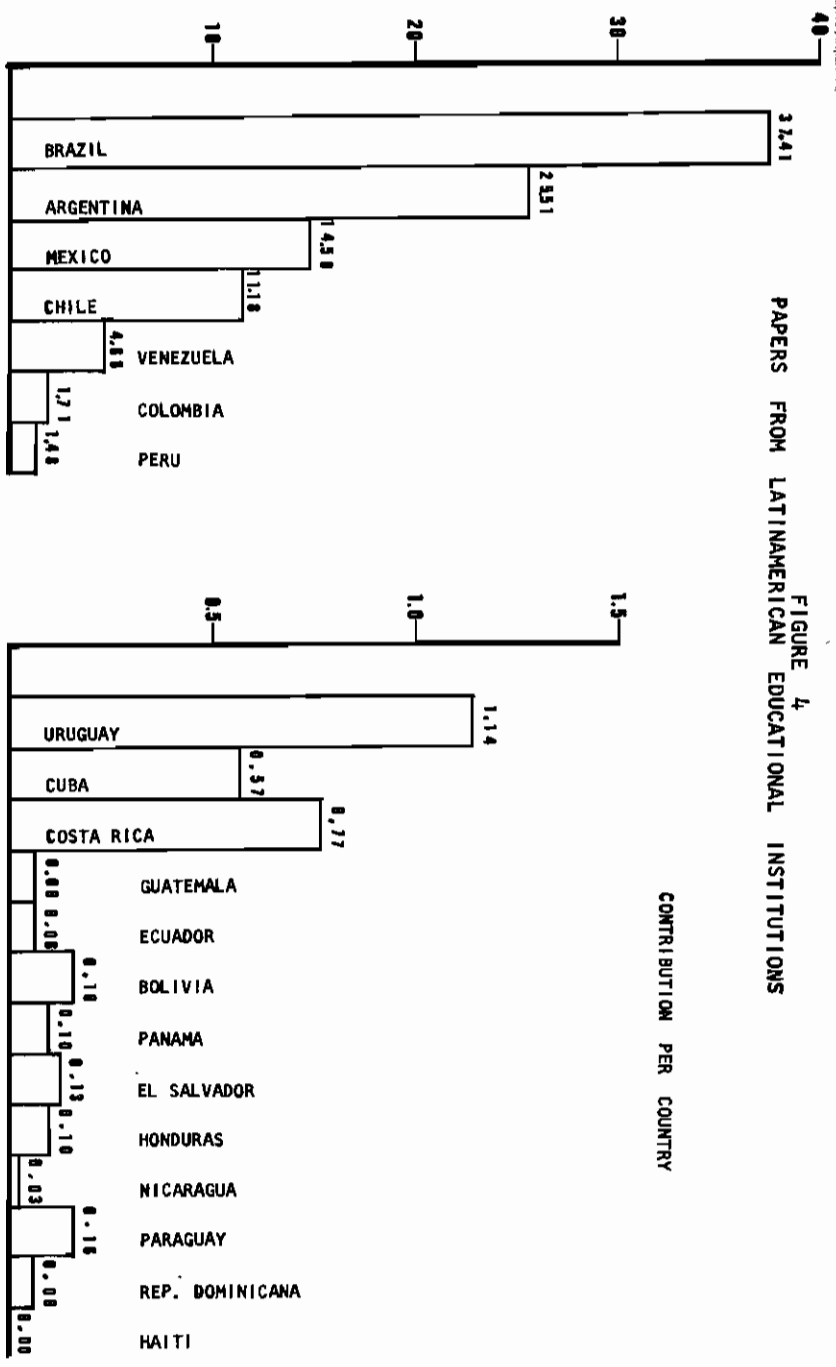
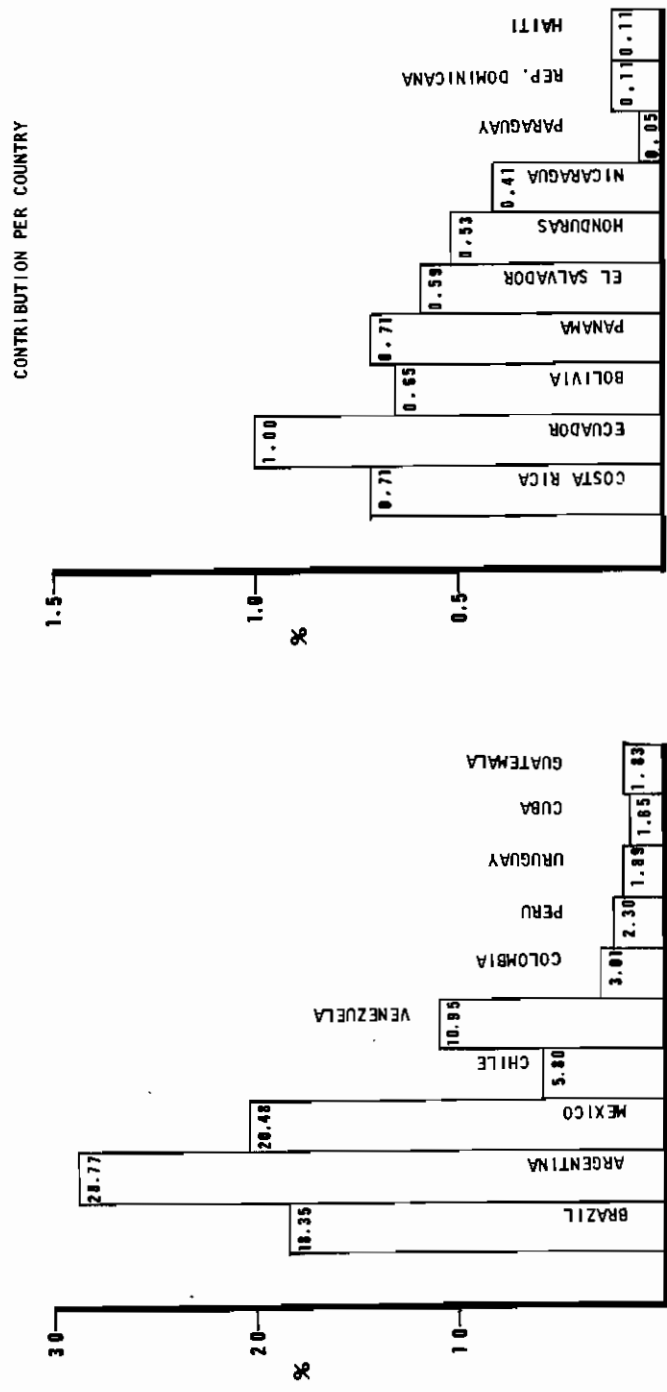




FIGURE 5  
PAPERS FROM LATINAMERICAN NON-EDUCATIONAL INSTITUTIONS



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AUTONOMA DE  
MEXICO**

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**Dr. Jaime Martuscelli Quintana**  
Coordinador de la Investigación Científica

---

**Dr. Armando M. Sandoval**  
Director del CICH

**Quim. Alfredo Büttinklepper**  
Secretario Académico