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Country Competitiveness Relationship with Higher Education Indicators

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Abstract: This paper reports the performance of global competitiveness and higher education competitiveness between two groups of countries. The first group is formed by four Asian countries; the second one by four Latin American countries. Indicators from the World Economic Forum 2007-2015 are compared. The indicators with the nearest proximity were found in the management quality of the universities, where there was only a five-point difference in favor of the Asian group. The indicator with the widest gap came from the quality of math and sciences education where we found a difference of 104 points. This is congruent with the results of PISA 2012, which showed a difference of 152 points in math.

Keywords: higher education; competitiveness; Asian countries; Latin-American countries; quality in higher education; indicators of higher education; World Economic Forum; rankings of countries; competitive advantages; higher education systems.

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Introduction

This paper reports the competitiveness of the higher education system in two groups of countries. The first group includes four countries that Gregory and Stuart (2014) classify within the Asian development model because of their development styles. This model states that to achieve fast economic growth, "The government promoted universal education and investment in human capital, such as public health. The high levels of human capital at the start of growth contributed substantially to the rapid economic growth." (Gregory & Stuart, p. 348)

According to the World Economic Forum (WEF), these countries are in the third stage of competitiveness, which include the most competitive or developed countries. The second group is comprised of four Latin American countries that are in transition from stage two to stage three, i.e. they are moving from the stage of intermediate competitiveness to high competitiveness.

The theoretical framework was built by reviewing the categories of competition and competitiveness, which have been introduced in the economics of education studies, since they are processes with high influence in higher education institutions and for being theoretical dimensions that have been widely discussed from the last quarter of the twentieth century.

By analyzing the Global Competitiveness Index data (developed by the WEF), in particular the pillar number 5, also called *higher education and training,* we found out that from its eight components, Asian countries have achieved the best indicators in two components: *quality of the education system* and *quality of math and science education*. On the other hand, the Latin American countries of Group II observed a better performance in *quality of management schools* and *availability of specialized training services or local capacity for research.* We compared the performance of both groups regarding their competitiveness in the eight components and then we were able to determine the strengths and weaknesses of each educational system.

The main hypothesis of this research is that the performance of the fifth pillar and its components equally influence global competitiveness in both groups of countries. A secondary hypothesis is that the performance of the eight components shows a similar trend in their contribution to competitiveness for both groups.

To prove these hypotheses we used data from international organizations, such as the WEF, the United Nations Development Program (UNDP), and the Program for International Student Assessment (PISA).

Theoretical Frameworks

There are different models to analyze competitiveness within the countries. The first model is the one proposed by the German Institute for Development, which is known as "Systemic Competitiveness" and is founded in four levels: meta-economic, macroeconomic, meso-economic, and Microeconomic. In this model, higher education and all the government levels are part of the meso-economic level.

The Institute for Management Development (IMD) proposes a second model. This institute sponsors the World Competitiveness Center that presents an annual ranking of competitiveness, and in 2015 ranked sixty-one countries. Competitiveness is analyzed considering four primary factors: Economic performance, Government efficiency, Business efficiency, and Infrastructure

Each of those factors is divided into five sub-factors. The twenty subfactors are assessed considering 300 criteria. Education is the fifth sub-factor within the factor of infrastructure, which is evaluated using 18 criteria.

Considering Porter's theories and his Single Diamond (SD) model, in 2013 Cho and Moon developed other models with a higher number of variables, such as the Generalized Double Diamond (SD), the Nine Factors Model (NFM) and the Dual Double Diamond (DDD).

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Introducing an international variable in the existing domestic model SD creates the GDD model. The NFM is formed by introducing a diamond of human factors to the existing diamond of physical factors. The integration of these two extensions and the incorporation of international human factors into the single framework produce the DDD model (Cho and Moon, 2013, p.172).

Cho and Moon designed four rankings considering sixty six countries; the first one belongs to the simple model of Porter SD, the second one to the NFM, the third one to the GDD and the last to the DDD. Comparing the last three rankings to the SD, we found out that by introducing the variable of human capital, countries moved 3.27 positions on average. Likewise when the variable 'international' is considered (3.4 positions). Although, the greater variation in the positions happened when we introduced the variable 'international human capital' (5 positions on average). This means that the introduction of this variable in the DDD ranking, completely modified the original SD model by Porter, which agrees with Lane's opinion (2012) who states that Porter did not consider the institutions that form human capital in his analysis of competitiveness.

The WEF defines competitiveness "as the set of institutions, policies and factors that determine the level of productivity of an economy, which in turn sets the level of prosperity that the country can earn." (Sala-i-Martin, et. al, 2015, p. 4)

WEF assess competitiveness within the countries through the Global Competitiveness Index (GCI), which includes 144 indicators grouped in twelve pillars. The interest of this work is focused on pillar five of higher education and training.

The GCI includes statistical data from internationally recognized agencies; notably the International Monetary Fund (IMF), the United Nations Educational, Scientific and Cultural Organization (UNESCO), and the World Health Organization (WHO). It also includes data from the World Economic Forum's Annual Executive Opinion Survey to capture concepts that require a more qualitative assessment (Sala-i-Martin, et al, 2015, p. 5). 160 partner institutes from all over the world participate in the administration of the surveys and interviewed business executives.

In 2015, WEF ranked the competitiveness of 140 countries. They are ranked from 1 to 140 with 1 being the highest rank.

Moreover, there has been a considerable increase in studies regarding economics of education, economics of innovation and in general economics of knowledge and information. That is because these variables are strategic elements for promoting competitiveness in the countries.

Mongkhonvanit (2014) states that two forces have fostered the participation of the universities in the economy and consequently in the competitiveness of the regions. These forces are the rise of knowledge-intensive economic activities and globalization. Consequently, higher education system has experienced three main changes: *1)* a stronger linkage between government funding and economic policy with academic research; *2)* the development of more long term relationships between firms and academic researchers; and *3)* the increasing direct participation of the universities in commercializing research.

Slaughter and Rhoades (1996) pointed out that it was until the eighties of the twentieth century when public policies that promote education as a factor of competitiveness started to be implemented and competitiveness started to be understood through the concept of knowledge economy. Competitiveness begun to be part of the political agenda during the administrations of Reagan and Bush Sr. By that time, new narratives emerged related to the involvement of universities in the economies of emerging nations; governments and companies also started considering knowledge as an important factor of production; hence the promotion of policies that led the integration of universities to the productive world, which has been intensified by the globalization processes.

Carnoy (1995, p. 212) points out five changes that have been observed in the economies where education plays an important role: *1)* higher productivity is increasingly created from knowledge and information applied to production, and such knowledge is increasingly science-based; *2)* in the advanced capitalist societies production shifts from material goods to information processing activities; *3)* the organization of production and the economic activities in general change from mass standardized production to flexible customized production; *4)* the new economy is global; and *5)* these changes have been taking place in the midst of one of the most significant technological revolutions in the human history.

The commitment of science and education with the economy has increased, in particular with the productivity and competitiveness of countries. But competitiveness not only depends on scientific technological advances, "competitiveness depends increasingly on the coordination of, and synergy generated among, a broad range of specialized industrial, financial, technological, commercial, administrative, and culture skills which capacities can be located anywhere around the world." Mongkhonvanit (2014, p. 8).

Globalization processes combined with the global development model that is sustained by knowledge economy has resulted in the phenomenon of the pursuing global competitiveness, influencing policies and higher education decision and actions, which has also entered in a process of competitiveness in the global context. This is confirmed by Portnoi, Bagley and Rust (2010), who point out that competition among universities takes different forms, it can occur in the institutional, local, regional, national and global level.

The increase in the amount of works that address competition among universities has been remarkable. Marginson (2006) says that most universities aspire to achieve the best qualifications in the various quality indicators; their concern to be ranked in the higher positions of world-class universities lists have increased; institutions compete for funding research, and to enroll the best and brightest students and integrate its academic staff with academically distinguished

professors. As Cabrera and Le Renard (2015, p. 12) say "The best research universities attract the best talents, perpetuating their presence and contributing to the country's competitiveness." Moreover, van Vught (2008) notes that universities are engaged in a race to achieve the best reputation. Levin & Aliyeva (2015, p. 540) states that: "Institutions compete for funds, faculty, students, and national and international rankings." Higher education institutions are in a constant struggle to stay in the market, they strive to improve their status and prestige. The growing competition for higher status, prestige and financial resources has created a deepening stratification among the institutions (Levin & Aliyeva, 2015). The most common expression of competition can be seen in the emergence of a large number of university rankings.

Altbach (2016) states that the rankings are the inevitable result of the widespread growth of higher education, and the increase of competition and commercialization worldwide. Rankings have an increasing influence in the decision-making processes and in the implementation of higher education policies.

Production, dissemination and application of knowledge and information taken together constitute what is called knowledge economy. This economy, in several areas, overlaps with financial economy and the economics of production, which through various mechanisms such as innovation, participate in global competition, a process that defines and accelerates the knowledge economy, hence the integration of universities and research centers to global competition (Marginson, 2010). The old idea of universities integrated to national systems of innovation, coming mainly from the thinkers of economic evolution, has been undermined by the growing interdependence between nations and universities, as a result of the global flow of technologies, people, finance, languages and the transmission of ideas and data in real time (Marginson and Sawir, 2006).

In the search for a positive relationship between the quality of universities and the competitiveness of countries, Cabrera and Le Renard (2015) perform an econometric test, which found a strong correlation between the number of world-class universities in a given country with the level of competitiveness of such country. To reduce the possible impact that may be brought by the size of each country, the effect is normalized considering the number of inhabitants.

Higher education not only helps to improve innovation processes, it is also a critical factor to increase the competitiveness of developed countries economies (Ilon, 2010). By analyzing various countries, the same author reaches the conclusion that it is certain that higher education it is shifting from being just a service to the society to become a competitiveness factor for the industry.

The concept of competitiveness of the countries was introduced by Porter in 1990, with his book *The competitive advantage of nations* where he states that economic competitiveness of the nations in the 21st century would be created and not inherited, and he was right about it, because as Lane (2012) properly stated the pillars of competitiveness have been significantly transformed. Lane says that, twenty years ago the debate regarding the role that universities had in the increasing of competitiveness was minimum.

Porter focused his analysis almost exclusively on the firms and their role in the creation of factors that lead the economy and directed the activities within the universities, which were looking to satisfy the necessities of the industry. Comparative studies in higher education emerged in this context.

Since 1998, Altbach noted that these kinds of studies consider the contemporary university within an international analysis framework and developed four topics that were considered important by that time:

1. The development of Western Universities and their influence on the rest of the world.
2. Students and professors roles in the contemporary university.
3. The relationship between the academic systems worldwide, particularly the increasing international exchange of students and professors and its influence in the academic and scientific international community.
4. The recent emergence of the academic power of the industrialized countries.

In 2006, Forest and Altbach made a comparative analysis between regions and countries in the international context, and determined that the topics studied in this type of analysis are related to: demand and access mechanisms to College; diversification and privatization of higher education institutions; universities interconnection and interconnectivity, and the increasing use of technology.

Methods and Data

Data was collected from the annual reports of competitiveness published by the WEF from 2007 to 2015. Particularly, we observed the performance of the fifth pillar that corresponds to higher education and training. This organization evaluates higher education in the international context through eight components, which are: *1)* Secondary education enrollment, *2)* Tertiary education enrollment, *3)* Quality of education system *4)* Quality of math and science education., *5)* Quality of management schools, *6)* Internet access in schools, *7)* Availability of specialized training services, and *8)* Extent of staff training.

For this research, two groups of countries were selected; the first group consists of four countries from the Asian model of development: Japan, Hong Kong, Singapore, and Republic of Korea, which are classified in stage 3 by the WEF. Those are the countries with the higher competitiveness. The second group are four Latin American countries: Argentina, Brazil, Chile, and Mexico, which are in transition from stage 2 to stage 3 according to WEF classification. Table 1 shows the first group of countries with their corresponding indicators of competitiveness in higher education, while the second group of countries is listed in Table 2.

Table 1. Performance of the components of the fifth pillar from the Global Competitiveness Index (GCI) for the countries of Group I (2007-2015)

		YEARS									
Country	INDICATOR	2007	2008	2009	2010	2011	2012	2013	2014	2015	Av.
JAPAN	Competitiveness	8	9	8	6	9	10	9	6	6	8
	Pillar 5	22	23	23	20	19	21	21	21	21	21
	Secondary education enrollment	22	22	24	21	22	22	27	25	24	23
	Tertiary education enrollment	32	29	32	34	35	36	37	39	40	35
	Quality of education system	28	31	31	35	36	43	50	33	27	35
	Quality of math and science education	29	33	25	28	24	27	34	21	9	26
	Quality of management schools	68	82	77	65	57	80	86	72	51	71
	Internet access in schools	26	25	33	40	39	43	37	37	37	35
	Availability of specialized training services	6	12	13	13	12	12	12	9	19	12
	Extent of staff training	4	5	5	6	6	5	4	2	6	4
HONG KONG	Competitiveness	12	11	11	11	11	9	7	7	7	10
	Pillar 5	26	28	31	28	24	22	22	22	13	24
	Secondary education enrollment	63	72	73	81	84	85	93	73	37	73
	Tertiary education enrollment	61	63	66	67	37	37	34	43	30	49
	Quality of education system	9	22	28	25	21	23	22	20	20	21
	Quality of math and science education	4	6	11	12	11	11	10	9	8	9
	Quality of management schools	17	28	28	24	21	17	14	14	10	19
	Internet access in schools	7	10	14	9	14	16	14	16	10	12
	Availability of specialized training services	19	25	20	15	17	10	7	16	15	16
	Extent of staff training	28	29	25	27	26	24	21	26	23	25
SINGAPORE	Competitiveness	7	5	3	3	2	2	2	2	2	3
	Pillar 5	16	8	5	5	4	2	2	2	1	5
	Secondary education enrollment	32	21	17	15	17	15	18	16	17	19
	Tertiary education enrollment	36	31	29	30	27	19	20	10	9	23
	Quality of education system	1	2	1	1	2	3	3	4	3	2
	Quality of math and science education	1	2	1	1	1	1	1	1	1	1
	Quality of management schools	7	7	5	6	8	6	6	6	4	6
	Internet access in schools	9	9	5	5	6	5	4	6	2	6
	Availability of specialized training services	17	13	14	19	19	16	14	12	8	15
	Extent of staff training	7	3	2	4	4	3	6	7	4	4
KOREA	Competitiveness	11	13	19	22	24	19	25	26	26	21
	Pillar 5	6	12	16	15	17	17	19	23	23	16
	Secondary education enrollment	48	35	31	34	38	43	47	48	48	41
	Tertiary education enrollment	1	3	1	1	1	1	1	2	2	1
	Quality of education system	19	29	47	57	55	44	64	73	66	50
	Quality of math and science education	10	11	18	18	12	8	20	34	30	18
	Quality of management schools	26	30	44	47	50	42	56	73	59	47
	Internet access in schools	4	5	4	12	10	7	13	10	19	9
	Availability of specialized training services	14	20	35	39	39	31	31	36	48	33
	Extent of staff training	5	10	29	42	41	42	51	53	36	34

Source: World Economic Forum. The Global Competitiveness Report (annual reports 2007-2015)

Table 1 shows the performance of the four countries in Group I regarding their total competitiveness and the components of the fifth pillar. The information given is for nine years and the final column shows the average for each indicator.

Japan ranks 8th in competitiveness, whereas in Pillar 5 is in 21st place. Its best performance is shown in the component *extent of staff training*, since in average it is in 4th place. But on the other hand, it ranks 71st in the indicator *quality of management schools*, being surpassed by the four countries of Group II. In this country, the competitiveness of higher education shows a lower performance than the indicator of global competitiveness. The correlation between these two variables is lower than 0.2.

Hong Kong's global competitiveness ranks 10th, while the competitiveness of the higher education sector ranks 24th and despite their positions these variables are highly correlated. This country has its best qualification in the component *quality of math and science education* ranking in position number 9, while the component *secondary education enrollment* ranks 73rd, which is the lowest position among the countries of both groups.

The most relevant case is that of Singapore, which in average ranks 3rd in competitiveness and 5th in higher education, although just in the year of 2015 it ranked 1st. It is also number 1 in *quality of math and science education,* and number 2 in *quality of the education system.* On the other hand, the component *tertiary education enrollment is* its worst place in position 23rd. It is noteworthy to mention that Singapore shows the higher correlation between higher education and global competitiveness.

The Republic of Korea is better ranked in higher education than in global competitiveness, in places 16th and 21st respectively. Contrary to the other countries, Korea's *tertiary education enrollment* is ranked in first place, although the component of *education quality system* is in 50th position. Korea also observed a high correlation between higher education and global competitiveness.

In average, Group I is in a better position in global competitiveness that in higher education, since competitiveness is ranked in 10th position, whereas fifth pillar appears in 17th place; In average, they perform better in *math and science education* which is ranked in 14th position. On the other hand, their worst performance is in *secondary education enrollment* in place 39th and in *quality of management schools* in place 36th. They generally have a high correlation between global competitiveness and higher education, except for Japan.

Table 2. Performance of the components of the fifth pillar from the Global Competitiveness Index (GCI) for the countries of Group II (2007-2015)

		YEARS									
Country	INDICATOR	2007	2008	2009	2010	2011	2012	2013	2014	2015	Av.
ARGETINA	Competitiveness	85	88	85	87	85	94	104	104	106	93
	Pillar 5	51	56	55	55	54	53	49	45	39	51
	Secondary education enrollment	67	75	80	76	74	73	69	65	18	66
	Tertiary education enrollment	19	22	20	19	21	20	15	15	11	18
	Quality of education system	105	105	94	90	86	89	104	113	108	99
	Quality of math and science education	95	98	98	106	113	115	116	112	113	107
	Quality of manage schools	30	26	23	16	22	34	33	34	35	28
	Internet access in schools	85	90	89	111	106	87	79	76	75	89
	Specialized training system	45	60	57	42	44	60	60	65	53	54
	Extent of staff training	75	86	81	79	76	78	100	95	88	84
BRAZIL	Competitiveness	72	64	56	58	53	48	56	57	75	60
	Pillar 5	64	58	58	58	57	66	72	41	93	62
	Secondary education enrollment	21	14	25	22	23	17	20	37	35	30
	Tertiary education enrollment	75	76	73	65	68	80	85	85	84	78
	Quality of education system	120	117	103	103	115	116	121	126	132	113
	Quality of math and science education	117	124	123	126	127	132	136	131	134	123
	Quality of manage schools	66	58	66	73	61	52	49	53	84	63
	Internet access in schools	70	67	64	72	86	88	98	98	97	82
	Specialized training system	32	26	29	36	36	34	38	47	101	41
	Extent of staff training	45	46	52	53	33	33	44	44	61	49

CHILE	Competitiveness	26	28	30	30	31	33	34	33	35	31
	Pillar 5	42	50	45	45	43	46	38	32	33	42
	Secondary education enrollment	53	54	57	56	61	75	70	71	72	63
	Tertiary education enrollment	41	41	38	43	38	38	21	20	19	33
	Quality of education system	78	86	107	100	87	91	74	71	86	87
	Quality of math and science education	107	107	116	123	124	117	107	99	107	112
	Quality of manage schools	19	19	17	15	14	14	16	13	21	16
	Internet access in schools	39	41	38	42	45	48	48	42	49	44
	Specialized training system	34	46	41	31	33	36	42	46	36	38
	Extent of staff training	40	48	39	33	37	38	46	52	52	43
MEXICO	Competitiveness	52	60	60	66	58	53	55	61	57	58
	Pillar 5	72	72	74	79	72	77	85	87	86	78
	Secondary education enrollment	80	67	64	61	64	71	67	85	84	71
	Tertiary education enrollment	73	74	75	80	79	78	79	81	78	77
	Quality of education system	92	109	115	120	107	100	119	123	117	111
	Quality of math and science education	113	127	127	128	126	124	131	128	126	126
	Quality of manage schools	49	53	49	52	49	51	65	70	68	56
	Internet access in schools	62	76	77	89	82	82	90	93	90	82
	Specialized training system	52	55	53	55	41	44	50	60	59	52
	Extent of staff training	65	87	78	84	80	67	72	74	79	76

Source: World Economic Forum. The Global Competitiveness Report (Annual Reports 2007-2015)

Table 2 shows the performance of the four countries in Group II regarding their global competitiveness and the components of the fifth pillar.

Argentina's global competitiveness ranks 93rd, while higher education is in 51st position. Outperforming Japan, Hong Kong and Singapore, the component of tertiary education enrollment in Argentina is in 18th place. But, on the other hand, the main weakness of this country is in *quality of math and science education* which in average ranks 107th. It is observed a negative correlation between competitiveness and higher education, meaning that while higher education improves considerably the country loses competitiveness.

Brazil's best indicator is *secondary education enrollment*, which is positioned in 30th place, while its worst indicators are *quality of math and science education* in 123th position and *quality of education system* in 113th position. In average, fifth pillar ranks 62nd, while global competitiveness ranks 60th, with a correlation of 0.6 between these variables.

Chile's best indicator is *quality of management schools* in 16th position, outperforming Japan, Hong Kong and Korea of Group I. Although, its main weakness is in the component of *quality of math and science* which is ranked 112th place. The global competitiveness of this country is in 31st place, while fifth pillar is in 42nd place. There is a negative correlation between higher education and competitiveness, as an improvement in the first one; there is still a small decline in the second one.

Mexico's best indicator is the *availability of specialized training services* in 52nd position. However, its biggest weakness is quality, since the component of *quality of math and science education*, in average, ranks 126th while *quality of education system* ranks 111th. Mexico's competitiveness is ranked in 58th position while higher education in 78th, with a low correlation between these variables.

In summary, Group II performs better in the component of *quality of management schools* which is in 41st position, but they are very bad positioned in the concept of quality of the education system which ranks 103, and even worse, in quality of math and science which is in 116th position. Low correlations are observed for the four countries and there are negative correlations in the cases of Argentina and Chile.

Analysis and discussion

Comparing global competitiveness, Group I ranks 10th, while Group II ranks 60th. Regarding the competitiveness of fifth pillar, Group I is in 17th position while Group II is in 58th position; there is a gap of 41 positions. If the classification were made by deciles, the first group would belong to the second decile and group II to the fifth decile.

The smallest gap between both groups is in the component of quality of management schools, where Group I is in 36th place and Group II in 41st, in this case both groups are in the same decile. On the other hand, the biggest gap is found in quality of math and science education, since Group I ranks 13th, while Group II ranks 117; there is a gap of 104 positions among them. Comparing by deciles, countries of Group I are in the top decile and Group II falls to the ninth decile. They are positioned in the extremes of the whole series of countries.

A similar situation can be observed in the results of the PISA test, although the results shows greater differences: in 2012, Group I achieved 556 points, while Group II achieved 404 points; there is a gap of 152 points. But comparing Singapore with Argentina, the gap is bigger, 185 points, while the first one achieved the highest score with 573 points; the second one achieved the lowest score with 388 points.

Another aspect of comparison is the correlation between global competitiveness and the fifth pillar; among Group I the countries of Singapore and Korea have a correlation above 0.9, Hong Kong is up from 0.7 and Japan has a weaker correlation. The correlation above is calculated based on the positions achieved by the group and each country.

Investment in education has improved the competitiveness of these countries, which is consistent with the work of McMahon (2008, p.49), who concludes: "Heavy initial investment in human capital by households and governments...is largely responsible for the high per capita growth in East Asia ".

East Asian countries have managed to define a development model which Gregory and Stuart (2014) have called Asian model of development, which has a great influence on education as one of its five policies focuses on promoting universal education and investment in human capital. Regarding the same model, Mathews & Hu (2007, p. 93) state that these countries are considered late comers with a development model focused on "catch-up efforts, industry by industry and technology by technology, drawing on the knowledge accumulated in the leading countries". This model was first developed by Japan, quickly adopted by Korea and then by Singapore. Initially, at least during the first fifty years of the catching- up process, the latecomers did not see the universities as agents of innovation, rather they considered these institutions as agents of human capital formation; they were seen as institutions to provide advanced training. For this reason Japan's best performance is in the component *extent of staff training*, but Singapore and Korea indicators are focusing on the quality of education. During the post-war, Japanese universities mainly focused on training students for corporations and to be employed by the government (Mongkhonvanit, 2014). Later, the universities of Singapore focused on raising talents that were recognized by the ability of researching, commercialization of technology, creation of high-tech spin offs, attraction of scientific talent from abroad and the boost of entrepreneurial ideas among graduates (Wong, 2007).

By analyzing the correlations within Group II, it can be observed that Argentina and Chile have negative coefficients, as they tend to lose competitiveness at the same time they improve higher education. In the cases of Brazil and Mexico, although they have positive correlations, they are very low and they lose competitiveness in both variables.

Higher education systems in Latin America have expanded quantitatively and observed improvements in the administration of the universities, but have been criticized for their inefficiency and their growth has resulted in distrust in their quality (Balán, 2013). The indicators that reflect developments in higher education in Latin America are the management of universities and research, the first one because the evaluation model for quality improvement has been focused on the management of institutions at different levels and functions, and research and scientific production have been enhanced by the attention given to this function. Latin American public universities have integrated strong research groups by the pressure of internationalization. Research centers that are the window to the world science in different fields of knowledge (Schwartzman, 2008) can be found in the four countries of Group II.

A very important element revealed by the indicators is that, as Wong (2007) says, in the newly industrialized countries higher education becomes more important for the economy competitiveness. This suggests that the decisions of the government to invest in education in order to improve human capital are appropriate, since education has become the motor of endogenous development (McMahon, 2008). This can be seen in the cases of Singapore and Korea.

When analyzing the indicators, it was found that neither group had a good performance in the secondary education enrollment component; Group I was placed in 39th position and Group II in 57th position. Hong Kong has the worst performance in 73rd position and is surpassed by the four Latin American countries. Singapore has the best position in 19th place.

As for the tertiary education enrollment component, Group I ranks 27th, while Group II is positioned in 51st place. Korea holds the first place worldwide and Mexico ranks 77th holding the worst position among the eight countries.

Korea has increased education coverage as the result of policies that started to be implemented since the 60s, when private universities were saturated and the government began the construction of public schools, then in 1981 when the Fifth Republic was formed, laws were changed and an increase of 30% in the admission of students was established, but in 2000 the amount of young population began to decline and the country had an ample higher education structure.

The biggest problem for Latin American countries is in the field of quality of education system, as Group II ranks 102nd, while Group I ranks 27th, that is a gap of 75 positions. Regarding this component, Singapore is in second place, while Korea is ranked in the 50th position, although any country of Group II does not surpass it. The biggest gap is in quality of math and science education, since Group I is the best ranked in the 13th position, while Group II is the worst ranked in 117th position. Besides, the four countries of Group II tend to obtain worse results in this component, while only one country of Group I follow this tendency.

But in the field of quality not everything is bad for Group II, since the quality of management schools component shows that there is only a gap of 5 positions between Group I and II. This is the best indicator for Group II, ranked in 41st position, although the good performance of Chile in place 16th surpasses Japan, Hong Kong and Korea.

Countries of Group II are ranked in 74th position regarding the component of Internet access in schools; from the group, Argentina is in the worst position 89th position. On the other hand, countries of Group I are ranked in 16th position, which represents its second best indicator after the component of quality of math and science education. Singapore is the best ranked in 6th place with a rapid improvement, while Korea is in 9th place and is tending to lose positions.

As for availability of specialized training services, Japan is the best ranked in 12th position. The countries of Group II also show a good performance, since Brazil is ranked in place 41st, although it still does not surpass Group I, its indicators are not very dispersed and after the component administration of universities, this indicator has shown the best performance of the group.

Last, countries of Group I show good results in the component extent of staff training, being ranked in 17th position, while Japan and Singapore stand out in 4th position. Group II ranks 63th where Argentina has the worst performance in 84th place.

The differences in the competitiveness of education can be confirmed through the observance of other indicators, such the ones developed by the United Nations Development Program (UNDP). One of the indicators to consider is the mean years of schooling. In 2012, Group I reported 10.875 years of schooling and Group II reported 8.825 years, which represents a 2 years gap in schooling. In Group I, Korea stood out with 11.8 mean years of schooling, while Hong Kong only achieved 10 years, although none of the countries of Group II achieved this last number. From Group II, Argentina and Chile reported 9.8 years of schooling, while Brazil 7.2 years. See Table 3.

Another indicator of the UNDP is the expected schooling years, where the difference between both groups is less than a school year, which implies that a child from any of the eight countries, who gets to be enrolled in a school, has the same probability to accomplish, in average, 15 years of schooling.

Table 3. Human Development Index, Education Indicators (2012)

	Japan	H.K	Singapore	Korea	Argentina	Brazil	Chile	Mexico
I	11.5	10	10.2	11.8	9.8	7.2	9.8	8.5
II	15.3	15.6	15.4	17	16.4	15.2	15.1	12.8

I= Mean years of schooling II=Expected years of schooling
Source: Own elaboration with data from the Human Development Reports. United Nations Development Program, 2014.

Conclusion

The analysis of the data demonstrates that the two groups of countries are different in terms of competitiveness of their higher education systems. On the one hand, the countries of the Asian group show a better performance in the indicators, but also their competitiveness is based on the quality of their higher education system and their high rankings on teaching math and science; Group II is in great disadvantage regarding this last indicator, since there is a gap of 104 positions compared to Group I. PISA scores also show a big difference of 152 points in favor of Group I. This indicator certainly represents a major weakness in higher education in the countries of Group II.

Group II shows good performance in the component quality management of the universities, and this indicator remains nearly equal for Group I. This behavior is explained by the kind of assessment that is practiced in these countries, which it is an assessment of the processes of the academic programs and institutions in general.

Countries of Group I observed a high correlation between the components of the fifth pillar and global competitiveness, which implies they have performed similar policies in these areas during the nine years that were analyzed. Group II observed a very low correlation; Argentina and Chile show negative correlations since they have improved their higher education competitiveness but they have descended in the ranking of global competitiveness.

In the case of Asian countries, Japanese universities show a greater strength in training, because in the second half of last century, they were mainly devoted to such type of activities; in the case of Singapore and Korea, which are more newly industrialized countries, their strength lies in the teaching of mathematics and science, the improvements in their education systems and the use of internet in schools. But also, the latter two countries observed a strong correlation between higher education and global competitiveness.

Studies of competitiveness together with competition among the education systems and the levels of competitiveness that these achieve through various components, is a field of work where the research of economics of education can be successfully applied. These works can be done from the perspective of comparative research and facilitate the understanding of the dynamics driven by each of the nations.

References

Altbach, P. G. (2016). *Global perspectives on higher education*. Baltimore, MD: Johns Hopkins University Press.

Altbach, P. G. (1998). *Comparative higher education: knowledge, the university and development*. Westport, CT: Ablex publishing

Balán, J. (2013). Latin American higher education systems in a historical and comparative perspective. In Balán, J. (Ed.). *Latin America´s new knowledge economy: Higher education, government, and international collaboration* (pp. vii-xx). New York: AIFS Foundation- Institute of International Education.

Cabrera, A. & Le Renard, C. (2015). Internationalization, higher education, and competitiveness. In Ullberg, E. (Ed.) *New perspectives on internationalization and competitiveness. Integrating economics, innovation and higher education* (pp. 11-16). New York: Springer.

Carnoy, M. (1995). Education and the new international division of labor. In Carnoy, M. (Ed.). *International encyclopedia of economic education* (pp.211-217). Oxford, UK: Pergamon.

Cho, D. S. & Moon, H. Ch. (2013). *From Adam Smith to Michael Porter: Evolution of competitiveness theory*. New Jersey: World Scientific.

Forest, J. J. F. & Altbach, P. G.(2006). Introduction. In Foster, James J. F. & Altbach, Philip G. (Eds). *International handbook of higher education*, part 1. New York: Springer, pp. 1-4

Gregory, P. R. & Stuart, R. C. (2014). *The Global Economy and Its Systems*, Mason, OH: South-Western.

Ilon, L. (2010). Higher education responds to global economics dynamics. In Portnoi L. M. Rust, Val D. & Bagley, S. *Higher education policy and the global competition phenomenon* (pp. 15-28) New York, NY: Palgrave Macmillan.

Lane, J. E. (2012). Higher education and economic competitiveness, en Lane J. E. y Johnstone D. B., *Universities and colleges as economic drivers* (pp. 205-237). New York: Suny Press.

Levin, J. S. & Aliyeva, A. (2015). Embedded neoliberalism within faculty behaviors. *Review of Higher Education*, 38(4), 537-563.

Marginson, S. (2006). Dynamics of national and global competition in higher education. *Higher Education,* 52(3/4), 1-39.

Marginson, S. & Sawir, E. (2006). University leaders' strategies in the global environment: A comparative study of Universities Indonesia and the Australian National University, *Higher Education* 52(2), 343-373.

Marginson, S. (2010). Global Comparisons and the University knowledge Economy. In Portnoi, Laura M; Rust, Val D. y Bagley, S. S. (2010), *Higher education policy, and the global competition phenomenon* (29-41): New York, NY: Palgrave Macmillan.

Mathews, J. A. & Hu, Mei-Chin (2007). Universities and public research institutions as drivers of economic development in Asia. Yusuf, S. & Nabeshima, K. *How universities promote economic growth* (pp. 91-109). Washington, DC: The World Bank.

McMahon, W. W. (2008). *Education and development. Measuring the social benefits*. Oxford, UK: Oxford University Press.

Mongkhonvanit, J. (2014). *Competition for regional competitiveness. The role of academe in knowledge-based industrial clustering.* New York, NY: Springer.

Porter, M. (1990). *The competitive advantage of nations*. New York, NY: The Free Press.

Portnoi, L. M., Bagley S. S. y Rust, Val D. (2010). Mapping the terrain: The global competition phenomenon in higher education. In Portnoi, L. M; Rust, Val D. y Bagley, S. S. (2010). *Higher education policy, and the global competition phenomenon* (pp.1-13). New York, NY: Palgrave Macmillan.

Sala-i-Martin, Xavier; Crotti, Roberto; Battista Attilio; Drzeniek Hanouz, Margareta; Galvan, Caroline; Geiger Thierry, and Marti Gaëlle (2015). Reaching beyond the new normal: Findings from the Global Competitiveness Index 2015-2016. In Klaus Schwab ed. *The Global Competitiveness Report 2015-2016*. Geneva: World Economic Forum, pp. 3-42.

Schwartzman, S. (2008). The leading Latin American universities and their contribution to sustainable development in the region. In Schwartzman, S. *University and development in Latin America. Successful experiences of research centers* (pp.5-19). Rotterdam, NL: Sense Publishers.

Slaughter, S. & Rhoades, G: (1996). The emergence of a competitiveness research and development policy coalition and the commercialization of academic science and technology, *Science, technology and human values*, 21 (3), 303-339.

Van Vught, F. (2008). Mission diversity and reputation in higher education, *Higher Education Policy* 21(2), 151-174.

Wong, P. K. (2007). Approaches to university-industry links. The case of the national university of Singapore. In Yusuf, S. & Nabeshima, K. *How universities promote economic growth* (pp. 199-208). Washington, DC: The World Bank.