CHAPTER TWELVE

BRAIN DRAIN AND TECHNOLOGIES IN THE SOCIAL JUSTICE NEW POLICIES OF ECUADOR

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Abstract

In this article, we want to denounce how the politics of the global economy of knowledge have built an inter-state-dependent geography, which reinforces unfair access to the valorization of knowledge on a global scale. National governments participate in the systemic organization of collective intelligence when dealing in intellectual property rights (whether controlling markets or favouring monopolization) and regulating education institutions, universities and research centres. The brain migration flows indicate the close complex articulations and interactions between higher education sectors, economic policies and national interests in science and technology, RandD and ICT on the one hand, and the competitive strategies and global influences of the wealthier countries on the other. In this scenario, knowledge, science and technology public policies in Ecuador rely on growth patterns, which assumes a structural cognitive deficit, complicated by globally and regionally spread cognitive unfairness. Such policies attempt to strategically relocalize the country, in hegemony terms, in the international division of knowledge.

Keywords: Brain drain, Social Justice, Science, Technology, Public Policies.

Knowledge economy, university investment and new forms of inequalities

Current society, usually referred to as a global society, has become more cognitive as knowledge is a key element with which to leverage the financial valorization mechanisms of capital. This is not a change from the typical industrial capitalistic polarization of knowledge ownership;

however, it now entails the development of new mechanisms and devices whereby knowledge is becoming a command and dominion variable that differentiates humans from other beings, a new factor establishing hierarchies and ruling labour division. Ever since the nineties, OECD-member countries plan their political-economical agendas by sticking to the new growth and endogenous growth economic theories guidelines. Endogenous theory model patterns are emphasized: the scientific system, public and private research centres, and higher education institutions have become the hallmarks of a knowledge-based economy.

Table 1. Analytics of the knowledge economy

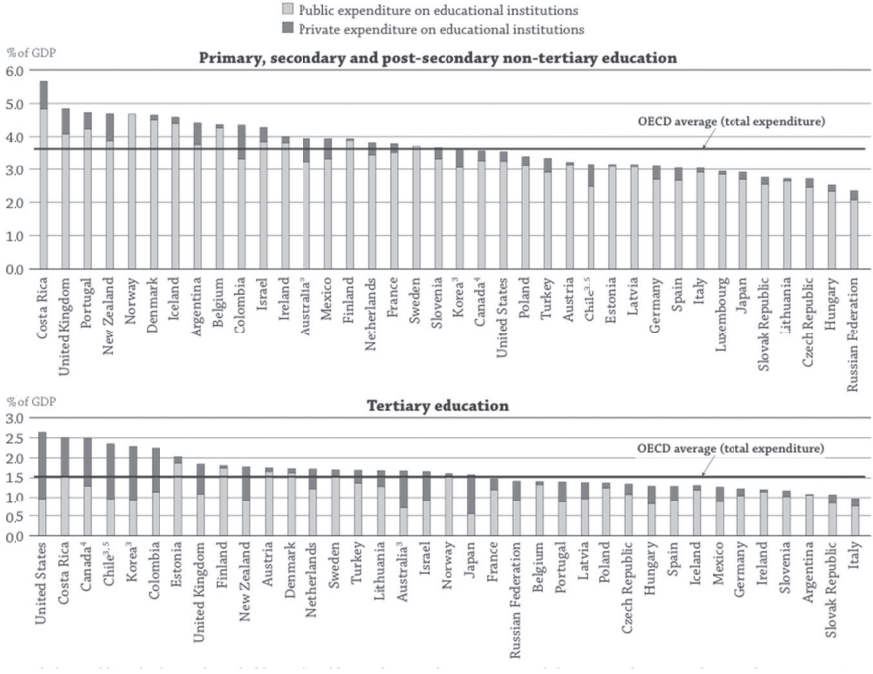
The rise of the sign or symbolic economy (knowledge capitalism) based on the combined logics of abundance and dispersal	• unlike most resources that are depleted when used, information and knowledge can actually grow through sharing, exchange and application; • capital in a symbolic form of information can be speedily transferred in deregulated 24-hour virtual finance markets, allowing international currency speculation and increased geographical spread and mobility of FDI; • displacement of manufacturing industry from its old locations in the North to selected locations in the South (in Asia and Latin America) and a dematerialisation of the industrial products (the weightless economy).
ICT diminishes the effect of distance, making possible "action at a distance in real time"	• the radical concordance of image, text and sound, and development of new information/knowledge infrastructure; • the emergence of a global media network linked with a global communications network; • the emergence of a global Euro-American consumer culture and the rise of global edutainment giants in music/film/TV.
Investment in human capital and key competencies as a source of value in knowledge-based institutions, with an emphasis on knowledge being locked into systems or processes	• the technological transformation of "leading" science, where the major developments in informatics and modern theories of algebra, computer languages, communication theories and cybernetics, phonology and theories of linguistics, problems of information storage, retrieval and data banks, telematics, problems of translation, are significantly all language-based; • new legal, ethical and economic problems concerning knowledge creation, transmission and distribution highlighted in the emergence of international intellectual property rights regimes and the recent GATS agreements within the international knowledge system;

	• the promotion of new knowledge cultures and knowledge/technology transfer policies through the corporatization of the university, the encouragement of new public/private partnerships and the concept of lifelong education.

Source: Stiglitz, 1999.

By subjecting education institutions to the production realm, these policies encourage scholars and scientists to become entrepreneurial, thus stressing the structural transformation of knowledge society as a whole. However, as shown in the graph below, for all the neoliberal myth of the importance of a weak state apparatus, national governments keep strategic power around public education investment.

Figure 1. Public and private expenditure on education institutions as a percentage of GDP, by level of education (2013)



Source: OECD, 2016.

In the first place, we want to stress the fact that the investment gap in higher education is accounted for by an inter-state-dependent geography, which reinforces unfair access to and valorization of knowledge on a global scale. National governments participate in the systemic organization of collective intelligence by dealing in intellectual property rights (whether controlling markets or favouring monopolization) and regulating education institutions, universities, and research centres. The deregulation myth paves the way for new regulation forms.

> Governments will need more stress on upgrading human capital through promoting access to a range of skills, and especially the capacity to learn; enhancing the knowledge distribution power of the economy through collaborative networks and the diffusion of technology; and providing the enabling conditions for organizational change at the firm level to maximize the benefits of technology for productivity (OECD 1996: 6)

OECD technicians are convinced that financing higher education yields greater profits than real interest rates (Schleicher 2006). It is precisely these profits that move Stiglitz, a consultant with both the World Bank and the White House, to suggest that information economics entails something like a balance and welfare formula in *Globalization and Its Discontents* (2002).

> The standard models that economists had used for generations argued either that the market worked perfectly – some even denied the existence of genuine unemployment –or that the only reason that unemployment existed was that wages were too high, suggesting the obvious remedy of lower wages. Information economics, with its better analysis of labor, capital and product markets, enabled the construction of macroeconomic models that provided deeper insights into unemployment, models that explained the fluctuations, the recessions and depressions, that had marked capitalism since its beginnings (Stiglitz 2002: 12)

Financial profits are the actual payoff of a clockwork organization of knowledge, as described by Stiglitz as early as 1999, when he wrote the UNDP report headed *Knowledge as a Global Public Good*. Firstly, he emphasizes the "financial wants" that force those countries embracing neoliberal reforms to promptly engage in restructuring and expanding their university systems. This is the actual meaning of Stiglitz's words when he states that "we now see economic development as less like the construction business and more like education in the broad and comprehensive sense that covers knowledge, institutions, and culture" (Stiglitz 1999: 2). The World Bank has shifted from financing infrastructure projects to financing

what he calls a "knowledge bank". State-run university financing focuses on using public expenditure to promote competitive companies, or start-ups, that seek to increase their value in the financial markets and definitively keep human capital costs down.

This is why Stiglitz underlines the governments' unique power to regulate capital/knowledge flows. Despite the recent wave of education reforms, the proclaimed end of the comprehensive era and the advent of new public-private partnership forms,[1] state-run formal education continues to be a major form of knowledge organization. Far from weakening, the state takes on an even more strategic role – as the stakeholder of the citizens' knowledge. Mazzucato and Dosi (2006) study how the state is still the main player in the knowledge accumulation process and, therefore, in the development of high-added-value industry. With the development of the knowledge economy, stock market participation by institutional investors has grown to strongly influence corporate leaders, and now the same interests and goals are shared by institutional stakeholders and management alike. The knowledge economy has thus undergone a change that is in line with that of the financial economy: the risks are increasingly run by the public sector while the economic gains are reaped by the private sector.

In the second place, national science and technology policies reinforce state hierarchies, where the ownership of knowledge-rent establishes a peculiar international division of knowledge, labour, and wealth, which sets the basis for newer forms of dependence not only in political terms but also in economic and social ones.

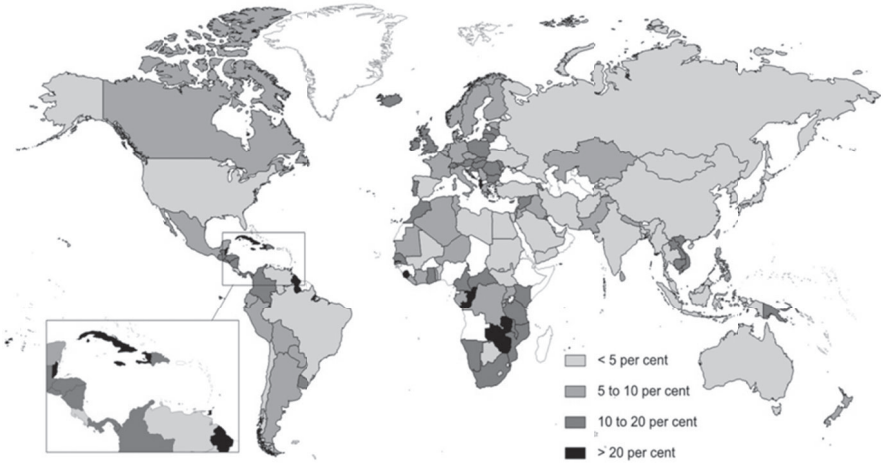
Third, national science and technology policies result in new cultural and material colonization and dominion forms. In fact, by quantifying and controlling knowledge flows and productions and imposing benchmark checks at admission and during the whole training process, such policies contribute to the exploitation of social relationships and the private appropriation of knowledge. In this organizational and organic revolution, the concerned institutions produce and socialize knowledge, clearly dealing in abilities, skills and creativity, producing at the same time abundance (of degrees, diplomas, certificates) and scarcity (since no degree seems to be enough) and establishing particular regional and domestic development patterns.

[1] For instance, the UK Private Finance Initiative (PFI) and the *Ley Orgánica de Universidades* (Act 6/2001), a Spanish university-regulation act passed on December 21, 2001 during José María Aznar's second term; or the Gelmini reform in Italy (Act IT-133/2008), which reasserts the destructuring of public education and the full convergence with the private sector.

Brain migration in the international division of knowledge

Endogenous theory model patterns are emphasized: the scientific system, public and private research centres, higher education institutions and human capital growth have become the hallmarks of the knowledge-based economy. Through the analysis of international highly skilled people migration flows, we can describe the consolidation of this new geography of inclusion and draw the map of what we call the *spatial division of knowledge* (Maniglio 2016), as shown below.

Map 1. Emigration rates of the highly-skilled to OECD countries, 2010/11



Source: OECD-DIOC, 2010/11

The increase in the demand for qualified professionals has expanded the external recruitment field, creating an internationally competitive tableau. Not only war but also new alliances and dependence forms arise in which highly skilled professional migration flows are driven by countries, companies and universities through favourable migration policies, alluring strategies and retention capacity (Boeri et al. 2012).

Qualification-based migratory discrimination policies have a serious impact on the labour market and in the public accounts of those countries, which adopt selective immigration policies, establishing controlled migration flows and reducing non-qualified immigration. As shown in the map below, since the 90s, in order to meet the demand for talent, the highly skilled labour market has expanded further in cross-border terms,

progressively increasing the quota of highly skilled foreigners in industrialized countries and implementing international mobility programmes in the majority of universities (Stein et al. 1996). The *priority worker* classification has been adopted by Western countries in order to discriminate between the wanted immigration (highly skilled personnel) and the unwanted (unqualified personnel), thereby reinforcing the international knowledge and labour division. We can observe the USA, Canada, Australia, Japan and the EU, whose immigration policies, especially in the 1990s, have become selective in terms of educational profiles, according to the demands of the internal labour market. In Europe, in 2007, Commissioner Frattini launched the *European Blue Card* initiative (Directive 2009/50/CE), by and large an equivalent to the US's *Green Card*, to favour the entrance of highly skilled immigrants, harmonizing thus the measures taken by Germany, the UK and France, which had themselves followed the paths of the US, Canada and Australia.[2]

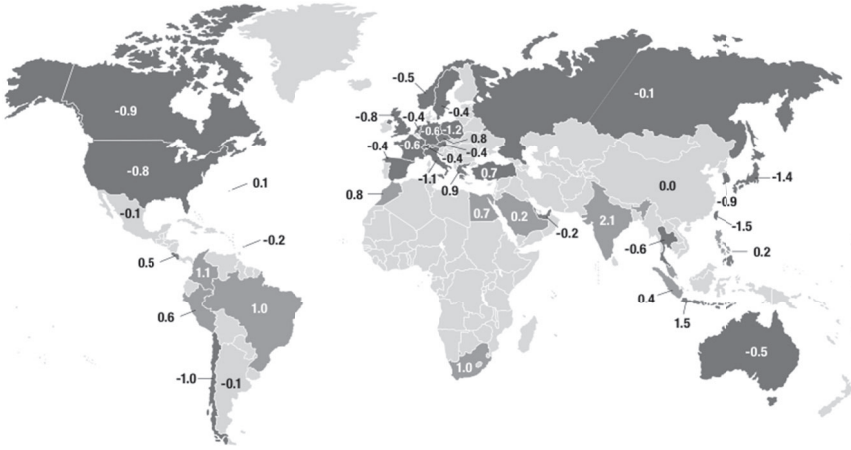
Second injustice: the talent gap approach and the differential immigration public policies

The differential immigration public policies that favour the entrance of highly skilled people are inseparable from the national technological development policies. In the selective immigration process, governments and industrial lobbies intervene by increasing the alluring policies in the receiver countries, promoting tax incentives and superior quality investigation infrastructures. The capacity of some countries, regions and cities to attract talented people from all over the world seems enormous, and governments are always under pressure to react to such scenarios. Thus, knowledge spatial division mechanisms are amplified and inequality becomes fiercer between nations in order to retain, attract and supply

[2] Australia and Canada were pioneers in adopting these types of measures, implementing, since the 60s and 70s, a visa system with points based on skills. The point system was established in Australia in 1958 with *The Migration Act*, based on criteria of age, titles, experience and health. In 1978, Canada adopted the same Australian model with the *Immigration Act*: as a consequence, , in 1997, more than half of the immigration in Canada was composed of highly skilled professionals. The USA's system follows the previous lines, functioning by visa quota. This quota was set at 65 thousand units in the *Immigration Act*, and was increased during the Clinton presidency in the 1990s to 115 thousand, with the *American Competitiveness Work Force Improvement Act*, in line with the development of policies concerning the Information Society.

highly skilled people flows. Specifically, mapping the global talent supply-and-demand growth gap, two considerations can be made. The first one is consistent with the criticism of the neo-classic economic convergence theories and the technology gap approach (Fagerberg 1887, Romer 1993): deficits and surpluses are here seen as signs of a developmentally non-converging knowledge economy. Flows of highly qualified immigrants could easily be interpreted as unidirectional, i.e., as coming up to the North from an ever-more dependent South.

Map 2. The gap between the growth in demand and in supply of talent, 2011



Red indicates a deficit trend, green a surplus trend, yellow a broad balance. Numbers show trend growth as annual percentages.

Source: Oxford Economics, 2012

Table 2. Percentage of temporary residents receiving S/E doctorates in 2006 who were in the United States, 2007-2011, by degree field

Degree Field	Recipients	2007	2008	2009	2010	2011
Physical Science	1,975	78	75	72	69	66
Mathematics	666	75	73	72	67	65
Computer Science	798	81	79	78	79	77
Agricultural Science	400	55	51	48	46	46
Life Science	2,260	78	76	74	71	70
Computer/EE Engineering	1,453	82	81	79	78	76
Other Engineering	2,845	79	76	73	71	70
Economics	676	50	47	45	43	42
Other Social Science	876	51	49	46	45	46
Total, all fields	**11,949**	**75**	**72**	**70**	**68**	**66**

Source: Oak Ridge Associated Universities, 2014

In fact, the technological policies of advanced capitalist countries always put the relationship between technology transfer and social learning at the top of their list, along with the resulting human capital growth. The national innovation systems (NIS) of advanced countries play a major role when it comes to determining the inflow and outflow of foreign qualified workers. In political and economic terms, inflows are greater in those industries where human capital is scarcest, i.e., computer science and the computer/EE engineering sectors.

In the US, the NIS revolves around certain excellence centres that have gone beyond the national borders and operate globally. Public migratory policies regulate the entrance quotas according to their financial and industrial development. For more than a decade, these policies have linked knowledge exploitation to the development of incubators by *high tech* companies, *the technology of the materials* and the development of ICTs. According to a study by the Institute for Prospective Technological Studies, as early as 1999, 30% of foreign students in the universities of Northern California (UC Berkeley, Stanford, San Francisco SU and San Jose) ended up working in Silicon Valley (Mahroum 2005). This shows how the convergence between the industrial sector, the academic world and the services sector creates an extremely attractive environment for highly skilled immigration. For these reasons, the employability characteristics claimed by universities is related to academic mobility.

Corporate national interests and global university policies

Let us go back to Map 2, and the talent demand/supply growth gap, 2011 to 2021. The US, Australia and the EU share a similar talent deficit trend (US: 0.8; Australia: 0.5). However, these values cannot indicate a convergence in the development of a knowledge-based economy. On the contrary, they express multi-scale competitive strategies in higher education, science and technology arising from complex articulations between higher education governance, global economic (and especially financial) policies and state interests. Indeed, one of the strategic goals of Australia's educational policies ever since the 1990s has been to increase the number and diversity of foreign enrolments in order to economically develop education into a specific knowledge-based industry, to which purpose it entered international agreements with student-supplying countries and generated specific immigration policies. Australia might be seen as a successful knowledge-valorization-and-exploitation case. Indeed, "from 1990 to 2003, Australia's share of the global market in cross-border degrees grew from 1% to 9%" (Margison 2007), and by 2014, 18% of all higher education students in Australia were international students (OECD 2016).

Meanwhile, US higher education and domestic research policies are aggressively undermining the global market of doctoral education. In 2014, 35% of US doctorate or equivalent level students were foreign. In sum, the United States has more foreign doctoral students than the rest of the world put together. This US leadership in the market of doctoral education can be accounted for by the capital flows that finance US universities and research centres domestically and abroad. This leadership explains how the US attracts talents from the EU: about 64%, 53% and 62% of SandE students arrive from the UK, France and Germany, respectively (PhD graduates in the USA), as estimated from the labour market force of the USA.

Table 3. International Students Mobility and Foreign Students in Tertiary Education (2014)

	Share of international or foreign students by level of tertiary education					Rate of growth of the number of international or foreign students between 2013 and 2014
	Total tertiary education	Short-cycle tertiary programmes	Bachelor's or equivalent level	Master's or equivalent level	Doctorate or equivalent level	
	(1)	(2)	(3)	(4)	(5)	(6)
Australia	18	13,3	13,1	40	34	6
United States	4	2,0	3,5	9	35	7
OECD total	6	3,0	4,9	4,9	27	5
EU22 total	8	4,5	6,1	6,1	22	4

Note: Countries using the "foreign students" definition are not taken into account in the OECD and EU22 totals. 1. Data on short-cycle tertiary education refer to foreign students; 2. Year of reference 2013; 3. Total tertiary education excludes doctoral students; 4. While international students include only students who moved to a country with the purpose of studying, foreign students comprise all students who have a different country of citizenship than the country in which they study; these data are not comparable with data on international students and are therefore presented separately in the table.
Source: OECD, 2016.

Table 4. Percentage of European temporary residents receiving S/E doctorates in 2006 who were in the United States, 2007 to 2011, by country of origin

Country/Region	**2001**	**2003**	**2005**	**2007**	**2009**	**2011**
Greece	110	60	55	53	53	47
United Kingdom	84	74	67	69	66	64
Germany	130	67	66	61	56	53
Italy	126	64	61	59	59	57
France	107	64	62	62	56	62
Romania	163	90	88	87	84	83
Spain	54	55	52	44	47	47
Other EU countries	269	55	50	50	50	48

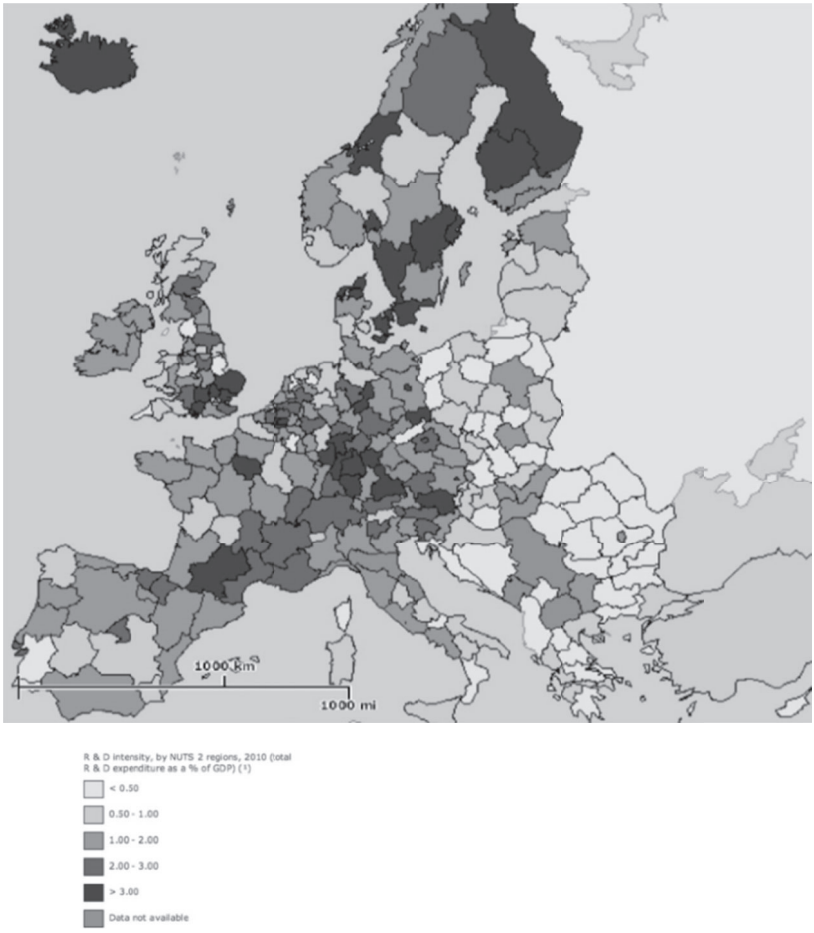
Source: Oak Ridge Associated Universities, 2014

Thus, we have seen how the EU – along with massive immigrant-selectivity policies – has elaborated a series of measures for the faster recognition of academic qualifications in order to facilitate privatization and competitiveness between the higher education centres.

The goal is to "enable universities and their partners in industry to offer a more open and challenging working environment to the most talented students and researchers, thereby making them more attractive to Europeans and non-Europeans alike". To amplify, the student mobility mechanism is one of the first causes of qualified emigration, and for this reason, higher education centres compete to attract the best students, to have the "best academics and researchers, to recruit them by flexible, open and transparent procedures, to guarantee principal investigators/team-leaders full research independence, and to provide staff with attractive career prospects" (European Commission 2006: 10).

University corporatization has derived from a series of higher education system reforms which have included the enforcement, since 1995, of a number of cognitive-capital-based measures necessary for the valorization processes of capital/knowledge. The EHEA (European Higher Education Area) is a political tool of the European Commission which, promoting mobility as a motto, further stratifies the labourer's market, leading to an increasingly uneven spatial division of knowledge and labour (Maniglio 2016). Such global strategy both fosters and intensifies interregional competition mechanisms. Member states aggressively set their research funding goals, striving to capture the best researchers, intensifying excellence and differential inclusion mechanisms, and favouring intra-European brain migration (which has been massive since the first term of the programmes Comenius, Erasmus, Leonardo da Vinci and Grundtvig). Knowledge division and the resulting economic, social, and territorial dependence in Europe is a clear consequence. The map below shows specialized RandD production sites, which are centres for the exploitation of inflowing knowledge and highly qualified professionals.

Map 3. Intensity of R+D in UE



Note: Belgium, Denmark, Germany, France [except Martinique (FR92), Guyana (FR93) y Réunion (FR94)], Netherlands, Austria, Sweden, the United Kingdom, and Iceland, 2009; Switzerland, 2008; Greece, 2005; Martinique (FR92), Guyana (FR93) and Réunion (FR94), 2002; Switzerland and Turkey, domestic level.

Source: Eurostat, 2014.

Intra-Europe PhD flows include a brain drain from the Southern regions towards the Central European countries and even out of the EU (US and UK). A recent study on the concentration of "minds" in Europe shows the case of Greece, where "73% of the emigrating people have a postgraduate degree, 51% a PhD, and most have studied abroad in some of the world's best universities. The main destinations of current Greek emigrants include the UK (31%), the US (28%), and Germany. Italy loses many highly skilled professionals too, mainly to the US (34%), UK (26%), and France (11%), the main reasons being the lack of research funding and better economic conditions and career opportunities abroad" (Wende 2016: 79).

Science and technology policies in Ecuador: a social justice perspective

In this unfair global distribution, Latin America clearly takes the subaltern part. The region growth can be diagnosed as non-converging regarding North America and the OECD European countries, whose science and technology production is 20 times as large as that of Latin America.

> Latin America concentrates 8.48% of the world population, 46% of the water supply, and 20% of the world's biodiversity. However, it registers less than 2.95% of the world scientific knowledge production, barely 1% of its universities are ranked among the 500 world top ones, and has recorded as little as 0.19% of the global patents. Whereas 3651 researchers per million inhabitants exist in the OECD countries, only 495 exist in Latin America. (Belletini and Ordóñez 2013)

Nevertheless, as can be observed in the map below, even in a subaltern region like Latin America, cognitive divisions and unfair distributions also exist.

Map 4. Geo-referenced distribution of works included in the Science Citation Index (SCI) per 100,000 inhabitants (2008)

Source: Lemarchand, 2010

Non-converging knowledge development (the path to new forms of dependence) is all the more marked in Ecuador. This is the diagnosis: No Ecuadorian university is ranked among the top 500 world universities (Shin, Toutkoushian and Teichler 2011), and domestic research and development investments used to be, until not long ago, the second lowest

in the region.[3] Therefore, from 2009, Ecuador has been developing new legislation in order to democratize knowledge so that it has a social function and serves the development of national industry. In Ecuador, this unfair global cognitive distribution has been politically counteracted by expanding the state agents' legitimating power. Thus, Ecuador's public policies regarding the social economy of knowledge involve analysing and intervening on a global level on the following:

- Domestic and international knowledge (RandD) commercial flows, granting of licences, direct foreign investment, use of technological spillovers as intermediate inputs, etc.
- Capital flows and international limitations thereto.
- International movement of people.

And, economically, at a domestic level:

- The promotion of knowledge, capital and human flows, considering their effects on the economic structure.
- The consequences of commercial restrictions and their positive or negative impacts on knowledge flows.

In short, Ecuador has overcome the neoclassical growth model, which hardly considers state intervention as an investment-driving factor. The Ecuador government's model rejects that limit by acknowledging the fact that growth, increasing innovation and new capital accumulation forms are complementary to one another. Although a primary-goods exporting (or rather resource-extraction exporting) economy, Ecuador has embarked on a series of efforts, which are expressed in the restructuration of the Secretariat of Higher Education, Science, Technology and Innovation. Such efforts include new public policies regarding the following:

- Access: Scholarships, education credit, enhanced support to universities and technical and technological institutes.

[3] Roberto Beltrán Zambrano, using data from 2011, explains, "About 70 universities offer different undergraduate and post-graduate degrees in Ecuador. Only a few offer research post-graduate courses, and much fewer offer Ph.D. programs. Apart from these, there are some 360 technical and technological institutes with a highly varied, in some cases *sui generis*, academic offer which in a certain way are much like universities. Thus, there are about 430 higher education institutions, which should cater for a population roughly above 300,000 students". (Bellettini and Ordóñez 2013: 65)

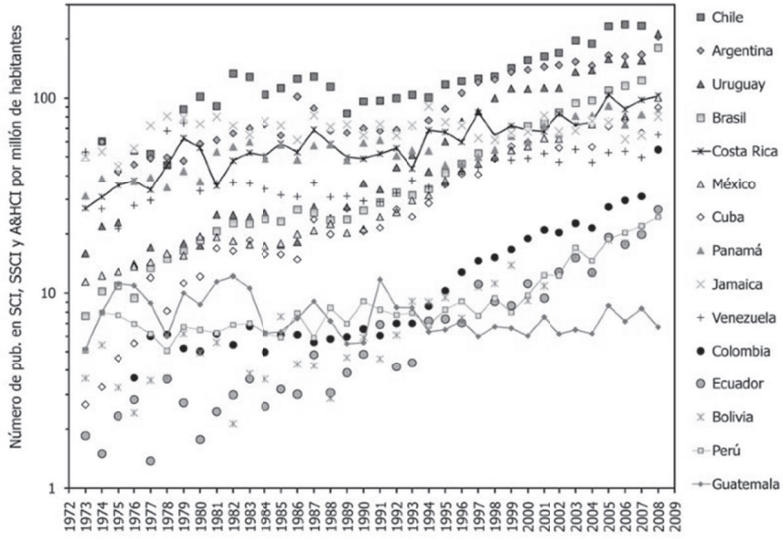
- Measurement and Control: Ongoing evaluation of students, university accreditation (quality), increased salaries for professors/researchers (status).
- Public Funding: Allotment of nearly 2% of the GDP to higher education.
- Strategic Positioning Regarding Knowledge Economy: Building of massive projects and setting of progressive agendas, aiming at the transfer and maximum valorization of knowledge and technology (Yachay, Ikiam, Unae, Uniarte).

Ecuador's science and technology system reforms over the last 8 years have strategically focused on the valorization of the so-called intangible components in society (knowledge, know-how, education, learned practices, innovation, etc.), to step out of what is mostly a resource-extraction-oriented system. For these reasons, higher education in Ecuador is going through a radical change compared to the previous decade.

> In passing the Higher Education Law (LOES) in 2010, we faced the challenge of transforming society, its social, productive, and environmental structure, and enhancing our human potential so that it lives up to the needs of national development and citizenship construction. (Ramírez 2014)

The main transformation involved higher education public investment. Now, Ecuador is one of the countries that invests the most in higher education in the region, with 2% of the GDP (Argentina: 1.2%; Colombia: 1.1%; Brazil: 1.0%; Chile: 0.9%; Paraguay: 0.8%; Peru: 0.4%), compared to the OECD mean of 1.7% (SENESCYT 2013). Not only has this resulted in a rise in the main international scientific ratings, it also resulted, for instance, in an increased number of scientific publications.

Figure 2. Growth of cognitive justice



Long-term track of the yearly number of mainstream scientific publications as per the Science Citation Index, Social Science Citation Index and Arts and Humanities Citation Index (1973-2008). Data per million inhabitants.
Source: Lemarchand, 2010.

Let us go back to brain migration studies: A considerable rise in qualified emigration was observed in Latin America. While in 1990 it had increased to 1.9 million people, in 2007 it was 4.9 million, i.e., 19% of the world's qualified migrants (OECD countries) (Docquier, Lowell, Marfouk et al. 2008). It is precisely because of the importance of human capital as a strategic growth factor that the National Well Living Development Plan (2009-2013) attempts to put a stop to the brain drain and foster the return of highly qualified Ecuadorian men and women by both controlling and intervening in migration flows. Although we lack data from systematic studies on the repatriation rate of highly qualified Ecuadorians, we do know that Ecuador has been a human-capital-friendly country since 2010.

Table 5. Growth of cognitive justice: international university degrees registered in Ecuador

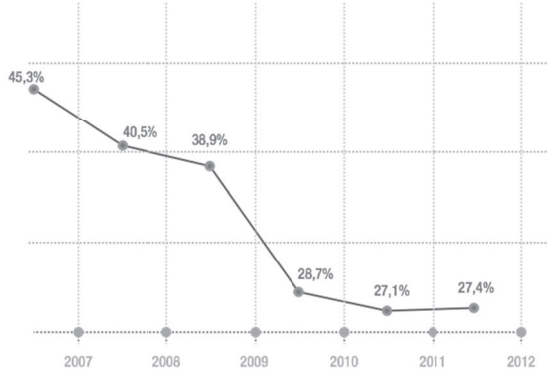
	Total	Higher education level		
		Technical/technological	Third level	Fourth level
Ecuadorian	38,642	1,326	12,889	24,427
Foreign	38,877	1,738	26,142	10,997
Total	77,519	3,064	39,031	35,424

Source: SENESCYT - SNIES, 2016

In 2015, SENESCYT recorded 23,415 foreign degrees, which is a 48.5% increase from 2014, with 16,163. The SENESCYT report *35 logros de la revolución ciudadana en Educación Superior, Ciencia, Tecnología e Innovación* (SENESCYT 2013)[4] reveals the radical higher education policy changes in the region. Notably, democratizing higher education access has been a fundamental and strategic step towards enhancing social policies and material justice.

[4] Cf. Ecuador National Secretariat of Higher Education, Science and Technology.

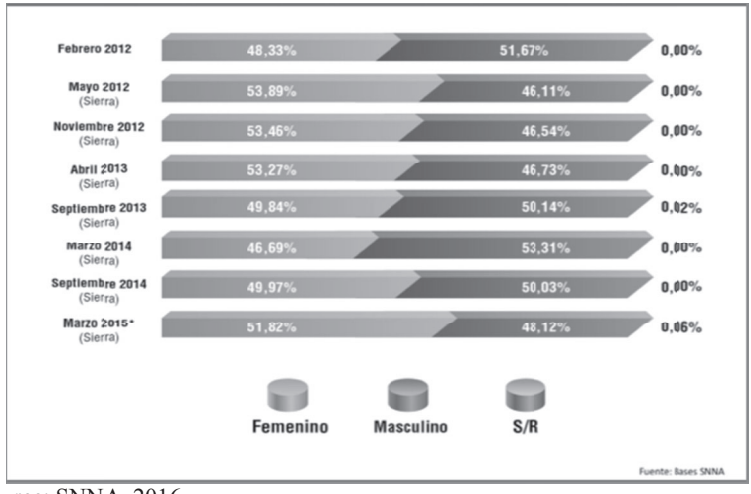
Figure 3. Growth of social and material justice in higher education: rate of non-enrolment in higher education for economic reasons



Source: ENEMDU, 2012

Furthermore, a substantial gender parity has finally been achieved in higher education enrolment rates: 46.69% of the new enrolments in March 2014 were women compared to 53.31% of men. In March 2015, 51.82% women were enrolled compared to 48.12% men.

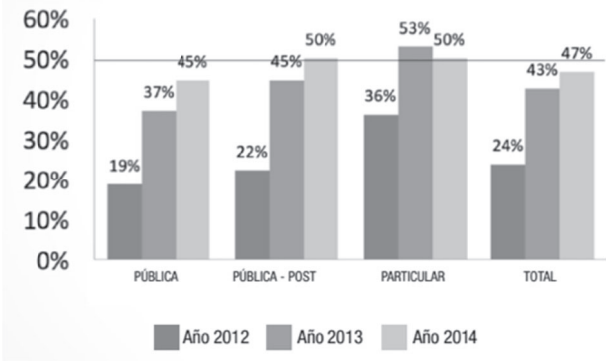
Figure 4. Growth of gender justice in higher education: access to higher education by gender



Source: SNNA, 2016

The gross female enrolment rate in higher education was 30.7% in 2006 compared to 37.4% in 2014. Other achievements in this area are self-evident: In 2012, only 2 out of 10 academic positions were occupied by women; in 2014, gender parity was attained, with 5 out of 10 positions being occupied by women.

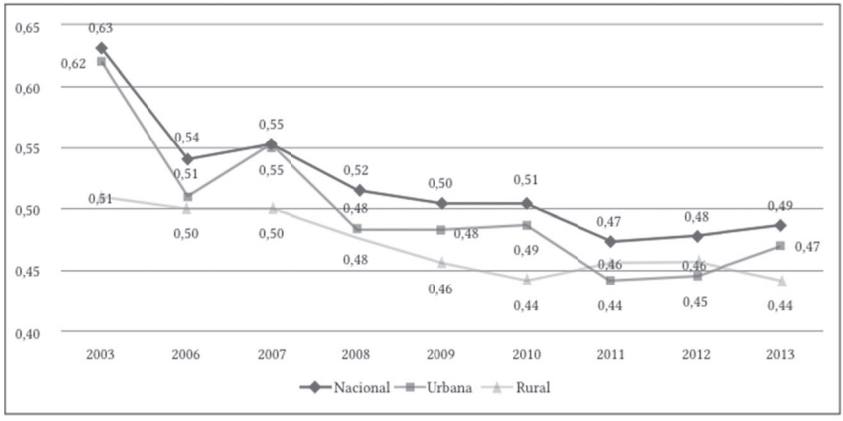
Figure 5. Growth of gender justice: academic managers in the world of work



Source: SENESCYT, 2015

Advances have also been made in class-origin-based differences. The gross enrolment rate among the poorest quintiles was observed to rise from 4.9% in 2006 to 10.6% in 2014. Political attitudes confronting global cognitive unfairness have played a major role in democratizing access to higher education, which is in line the social equity policies in force since 2008.

Figure 6. Growth of social and material justice: Income Gini Coefficient 2003-13



Source: Central Bank of Ecuador, 2013

The combination of easier access to education, and especially to university, and lower poverty rates particularly points to a political attempt to support the knowledge economy from a social stance (which is reflected in the Ecuadorian Code of Social Economy of Knowledge, Creativity, and Innovation).

As a conclusion, knowledge, science and technology public policies in Ecuador rely on growth patterns that assume a structural cognitive deficit, complicated by widespread global and regional cognitive unfairness. Such policies attempt to strategically reposition the country, in hegemony terms, in the international division of knowledge. Put another way, public policies, like the ones expressed in the General Basic Education reform and the Higher Education Law (2010), which reformed the science and technology system, constitute the decade's great socio-economic revolution of Ecuador; indeed, they have driven a social and technologic revolution, which is strategic from the country's social justice perspective. Interestingly enough, a law was passed in 2006 to dispute the political meaning of knowledge-rent and use it as a state-supported social struggle weapon against the transnational knowledge rentier class.

Public intervention through the Code of Social Economy of Knowledge, Creativity and Innovation (INGENIOS Code) is, in this historical context, a strategy conceived by the Ecuador government towards the capitalization of knowledge, the deterritorialization of information and the technologization of education (Peters 2003).

Setting different (social) principles on which to assess income does not preclude the valorization of the knowledge-commodity except from a social function perspective, i.e., as a guarantee of future income. By "income" we do not mean currency capital but cultural, social and relational capital. Primarily, this is a political struggle for income not to be so paltry at the social base: this is a struggle against inequality.

These knowledge-social-economy development processes are essential not only in terms of knowledge property (accumulation/regulation/ patenting) and access (dissemination/production) but also, and especially, in terms of the hegemonic process entailed by the changes in the productive structure in Ecuador and its class reproduction implications. Currently, pursuing the political struggle for revolution in Ecuador means fighting for the collectivization of knowledge. Otherwise, misery will be trivialized and we will get used to unfairness, considering it as our natural and deserved fate.

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