Master's Thesis of Public Administration

Labor Market and Professional Education in Ecuador:
Entailment and Relevance

에콰도르의 노동시장과 고등교육:
기술수준의 적합성을 중심으로

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Abstract

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Education investment promoted as part of the economic development strategy in Ecuador, was being pursued with the intention that the supply of labor, through the development of high-quality manpower, will be matched with the demands of the industry. This was supposed to lead not only to industrial development but also to personal income growth since the strategy focused on the training of high-tech manpower as an important way to improve social efficiency. This study examined labor supply and employment status of enterprises by region in 2017 and found inconsistencies through the correlation between them. In other words, the skill level and quantity of labor force supplied by region shows different combinations with the skill level and quantity employed by firms. These results, in spite of efforts over the years, have implications in terms of workforce reallocation, the need to promote entrepreneurship and innovation, reform of the education system, and private and public synergies that impact industrial productivity.

Keywords: education, labor market, mismatch
Student ID: 2018-27846

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Glossary

GDP	Gross Domestic Product
IKIAM	Amazon Regional University
ILO	International Labour Organization
IMF	International Monetary Fund
INEC	National Institute for Statistic and Census
ISIC	International Standard Industrial Classification of all Economic Activities
ISTTP	Higher Technical and Technological Public Institutes
MINEDUC	Ministry of Education
OAS	Organization for American States
OECD	Organization for Economic Cooperation and Development
SENESCYT	National Secretary for Higher Education, Science, Technology and Innovation
SICES	Integrated system of knowledge and social statistics of Ecuador
UARTES	University of the Arts
UNAE	National University of Education
UNESCO	United Nations Educational, Scientific and Cultural Organization
YACHAY TECH	Experimental Technology Research University

Chapter 1: Introduction

1.1 Purpose of the Study

The labor market and its changing dynamic has always been part of the concerns in the process of policy agenda setting since factors like globalization, industrial revolution or demographic movements are causing constant changes in social, economic, and political life all over the world (Camarena & Velarde, 2009; Bosch, Pagés, & Ripani, 2018). The debate around this issue has emerged discussions on areas like social security and its sustainability, gender equality and its gaps, the automation of labor and its consequences, or the entailment and relevance of education systems in the new era, among others.

The gradual change of production activities experienced in the last decades in economies around the world has brought changes to the forms and conditions of the labor market structure with several implications on jobs (ILO, 2018). As part of it, it has been recognized as a main challenge the ability of the workforce to transform and adapt to the type of occupations that are required in an increasingly competitive and changing market (Bosch, Pagés, & Ripani, 2018). The types of work, functions, professional profiles and competencies demanded are constantly evolving, leading to concerns over how it is shaping, and what should be the response in terms of public policies to guarantee the well-being of workers and their families (Smith & Fix, 2004).

In this regard, the achievement of a sustained development for a country has shown to require not only to focus efforts on the shift of production sectors in the economy but to improve productivity through technology, institutional capabilities and also human capital development (McMillan, Rodrik, & Sepúlveda, 2016). Governments around the world have had to start implementing reforms as part of the policy agenda in order to keep up to date in the promotion of economic and development strategies.

In this framework, education systems appeared as a key element of analysis. Investments in human capital, usually understood as investment in education and training (Becker, 2007), have shown to promote cognitive and non-cognitive skills formation as a way to allow people to get individual direct benefits, like higher employment likelihood, better employments, higher earnings, or even better health status; but also end up giving indirect benefits to the society as a whole mainly through increased productivity and economic growth (Heckman, 2006). This idea has led to the creation of educational plans as part of the policy agenda in order to address issues like the need to increase the attendance rates, boost improvements in the quality of education, redesign the curricula to guarantee the adequate development of skills, or the availability of relevant educational offer according to the context of each territory.

Well trained human labor has been considered as a crucial input for the development of modern societies, reason why policy making agents have been trying to joint labor market trends with educational systems, through processes of redesign and reform that produce the skilled labor force required (Psacharopoulos & Woodhall, 1986).

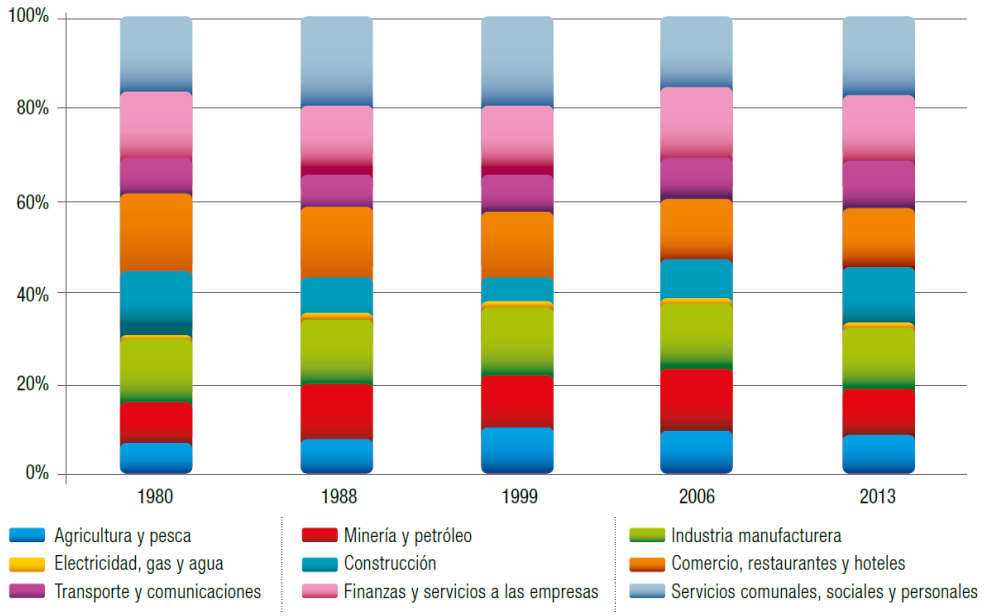
By 1968 for example, a survey conducted by the United Nations Educational, Scientific and Cultural Organization (UNESCO), showed that about 60 out of 73 countries analyzed, were trying to address the labor market trends as a way to propose reforms on its national education system, procedure that within the last decades has been increasing and wide spreading among public agencies. However, since the labor market has to deal with people rather than just with goods, the design of interventions and reforms in it has to be done under special assumptions that consider the interrelated nature of labor with production, income, human capital development, among others (Coudouel & Paci).

The existence of mismatch problems among the supply of workforce and the demand from the labor market, not only affects employment rates but productivity, returns to households, individuals and the economy as a whole (Bhorat, Cassim, & Tseng, 2016). In this regard, the extent to which policy makers can align the production sector with the labor market demand supported by an adequate education system, is highly desired.

Recognizing the importance to work on the creation of capacities among the population as well as on the promotion of the economic sector to foster the development and growth of one country, the Ecuadorian Government designed the National Strategy for the Change of the Production Matrix. As for 2015, the ideas behind the implementation of the strategy were justified on the fact that the country´s economy has always been dependent on a specific productive structure being the main economic activities concentrated on areas like social and personal services

(health, education, administration); commerce, restaurants and hotels; manufacturing; and mining and petroleum as presented in Graph 1.

Graph 1: GDP Structure by economic activity 1980-2013 (percentage)



Source: Vice Presidency of the Republic of Ecuador (2015)

This structure generated problems for the economy by being dependent on positive international prices of commodities for its performance as well as a lack of diversification that limited the potential development of the economy. For these reasons, the strategy sought to promote the transition from a primary resources based economy to a knowledge based one through the promotion of specific productive chains in order to increase productivity and competitiveness. For its implementation three components were proposed: (1) environment and systemic competitiveness; (2)

development and strengthening of productive chains; and, (3) basic industries technology (Vice Presidency of the Republic of Ecuador, 2015).

As part of the first component, the creation, expansion and improvement of relevant academic offer in the sciences, technology and education field articulated to the needs of the productive transformation were proposed. Guidelines for that purpose were included as part of the National Development Plans 2009 – 2013, 2013 – 2017 and still on the 2017 – 2021 version, as shown in Figure 1. To put these policy settings into practice, a project named Strengthening of Knowledge and Human Talent started to be implemented since 2011 (National Secretariat of Higher Education, Science, Technology and Innovation, 2010). A reform in the education system to guarantee its interaction with the productive sector of the economy was expected.

Figure 1: Legal and political framework

Source: Author, based on National Secretariat for Planning and Development (2013)

The reform process identified that by 2009 the skilled labor force required by the country to develop innovation in the areas that were prioritized as part of the transformation of the productive matrix strategy were less than 1% of the total careers offered in the higher education system. And since the capacities and skills built in the different levels of education, usually determine the frontier of production possibilities of a country, the link between the educational system and the labor market was considered to be determinant in terms of the development strategy adopted (National Secretariat of Higher Education, Science, Technology and Innovation, 2010).

Studies in the region of Latin America and the Caribbean have tried to have an approach towards the reality of higher education and the labor market considering elements such as the period of "transition" towards the labor market and the employment condition, identified that not all graduates manage to place themselves in areas for which they were prepared (in terms of branches of economic activity) (Álvarez, 2015). Other researches have tried to identify the productive vocation of each territory reporting the needs of actors at the territorial level as a mechanism to identify the professional figures that could be implemented (Ministry of Education, 2018). All of them show as a challenge the still pending articulation between education and labor market with special connotations in the actual context in which technological and demographical changes are shifting the future of work (OAS, 2017).

This has led Governments to re think the type of academic offer the country has and how it is articulated with the labor market. For Ecuador, this represents a real challenge since the development strategy has put as one if its pillars the promotion of innovation through the creation and accumulation of human capital. In this sense, the present proposal will concentrate on the analysis of the entailment and relevance of the professional education system[1] and the labor market in Ecuador from a territorial perspective and include as part of the analysis some insights of the allocation of the labor force within economic sectors. For that purpose, the thesis will be structured as presented below:

- Chapter 1: giver the framework in which the study is intended to be developed in terms of purpose of the study, research questions, hypothesis and objectives.

- Chapter 2: describes an overview of the theoretical backgrounds that guide the investigation. This includes an examination of the link between education, employment and growth.

- Chapter 3: defines the methodological approach adopted for the research, so to give the reader a clear image on the sources of information, variables analyzed, and methodology to be used.

[1] For the purpose of the study the research will use professional education to refer to higher education system corresponding to universities and technical and technological institutes as well as technical and technological baccalaureate.

- Chapter 4: presents a general overview of the legal and political framework on which the National Development Strategies and its policies are being implemented as well as a big picture of the structure of the labor market and the education system.

- Chapter 5: presents the entailment and relevance analysis considering the labor demand from the side of the enterprises as well as the supply of education programs from the side of educational institutions.

- Chapter 6: the investigation is expected to analyze the implications of the previous findings in terms of conclusions and recommendations.

Based on this proposal, the investigation tries to contribute with a better understanding about the synergies between the labor market and the education system in Ecuador. This element results particularly important considering the fact that the Development Strategy adopted by the country relies in the need of interactions among these two sectors.

1.2 Research Question

- Are the programs offered as part of the professional education system in Ecuador articulated with the demands from the labor market in terms of economic sectors?

1.3 Hypothesis

- The programs offered as part of the professional education system in Ecuador are not correlated to the actual labor market demand of professionals within economic sectors.

1.4 Objective

- Identify the correlation among the labor market demands and the availability of professional education system within economic sectors.

Chapter 2: Theoretical Background

2.1. Growth, Development and Employment

Growth and development have always been a concern for societies and within time, theories around this issue have linked them to several factors, especially in terms of social and economic conditions. Aspects like increases in capital investment or in human capital, promotion of employment or improvements in productivity, fostering of exports or shifting of production, among others; have been analyzed to test theories that can provide insights for Governments to define and implement national strategies.

The literature that has been developed in this area recognizes as a main contribution the statements made by Smith (1776), Ricardo (1815) and Maltus (1820) who referred to ideas related to production factors in the form of land, capital and labor; decreasing returns to investment, comparative advantages [2] as well as labor specialization (Rodríguez, 2005; Ricoy, 2005). Later on, Lewis (1954) presented the idea of dual economy in which growth is related to the extent in which resources are mobilized from traditional to modern sectors (McMillan, Rodrik, & Sepúlveda, 2016). Moreover, Solow (1957) made evident the relevance of technological changes in the promotion of economic growth based on which Romer (1986) and Lucas (1988) debated about technology from an endogenous perspective and the relevance of research and investment (Benito, 2017). Other contributions pointed out institutional

[2] Countries can gain through trade by producing goods for which they have a relatively lower opportunity cost.

characteristics, social and political situations, or degrees of state intervention to explain the driving forces that have shown to promote growth and development within one country (Rodríguez, 2005).

Multiple models have been developed since then but still, the role that human capital plays on this process is undeniable, and together with other strategies is a common policy setting in all national and international policy agendas. In this regard, the implementation of this strategies have sought not only to promote economic growth and development as a final target but also to address issues related to poverty reduction, increased employment rates, higher scholarship, among others; understanding the need of articulation among different sectors and interventions due to the multidimensional condition that growth and development have lately taken. The extent to which these final objectives can be achieved however, is usually related to structural transformations in order to guarantee the sustainability of the strategy in the medium and long term (ILO, 2017).

This aspect is related to the typologies of growth patterns and outcomes proposed by McMillan, Rodrik, & Sepúlveda (2016), according to which the relevance of structural transformation and fundamental challenges are pointed as main forces to drive economic growth in a country as presented in Figure 2. Based on the study of several cases from developed and developing economies, the authors were able to define a framework in which growth is achieved by the availability and reallocation of resources in non-traditional economic sectors characterized by low productivity meanwhile human capital, institutions or infrastructure should be strengthened,

condition that usually represent a challenge for developing countries. This idea combines classical and neoclassical theories as arguments for economic development within sectors at the time that is able to use dual economy models to address strategies between sectors.

Figure 2: Typology of growth patterns and outcomes framework

		Structural transformation (industrialization)	
		Slow	Rapid
Investment in fundamentals (human capital, institutions)	Low	(1) No growth	(2) Episodic growth
	High	(3) Slow growth	(4) Rapid, sustained growth

Source: McMillan, Rodrik, & Sepúlveda (2016)

To the extent in which economies can align structural and fundamentals, the authors defined four possible typologies of growth. High structural transformation might lead to growth but if it does not go hand in hand with fundamentals, then it would be temporal as in case two; or, if structural transformation is not reached despite of the development of fundamentals it might lead to a slow growing process as in case three. On the other hand, in a case of a convergence the ideal sustained growth can be reached while in the case of divergence of both conditions growth is not achieved.

Despite of the fact that structural and fundamentals need to be addressed as part of a strategy to promote economic growth, it is required to note that changes among them

are not mechanic processes and so not all interventions have the same implications or effects so that structural and fundamental changes not always go hand in hand, in the same pace or leading to the same expected effects (ILO, 2018). For instance, the Latin American experience shows that improvements of fundamentals in terms of governance were developed leaving behind a lot of work to do in terms of structural changes while in countries like China structural changes, achieved through industrialization, happened fast leaving behind fundamentals (McMillan & Rodrik, 2011). Successful experiences worldwide happened mainly in the Asian region in which many developing countries during the beginning of the 20th century where able to manage structurals and fundamentals like the case of South Korea (ILO, 2018)

In terms of labor, the need for articulation between structural and fundamentals represent a real challenge. The lack of this condition can determine that, the human capital not absorbed by the labor market in the sector for which they were trained or educated, would be forced to be reallocated in different sectors of the economy, affecting productivity, the labor structure as well as the capacity to strengthen quality jobs within the economy (International Labor Office, 2018; McMillan, Rodrik, & Sepúlveda, 2016). In this regard the following section is intended to discuss labor entailment and relevance in the new global context.

2.1.1. Labor in the new economic context

As part of the process of globalization and technological innovation that is being experienced worldwide, markets from different countries and even from

different regions, are increasingly integrated (Weller, 1998). This process has been determined by global trends such as innovations in technology and communication, the development of the service sector, or the changes in consumer´s preferences for more sophisticated products, which have had an impact on a growing demand for more skilled employers in the labor market (Smith & Fix, 2004).

For the Latin American Region for example, the 90´s were characterized by a reduction in the employment rates on the primary sector of the economy and an expansion on the third one, promoted by changes in the development strategies implemented (Weller, 1998). Nowadays, there is a boom of technological changes and an increase in the aging society due to the end of the so called demographic bonus, leaving a low dependency rate that will challenge the social welfare state (Bosch, Pagés, & Ripani, 2018). In general, the world dynamic has proved to be permanently changing the market employment conditions within regions and countries, for which a constant monitoring process of labor is required in terms of policy decision making processes.

Lately research on labor market issues has put on evidence the fact that countries are facing a process of restructure towards knowledge based economies (Smith & Fix, 2004). This characteristic has been negatively associated to low skilled workers bringing about the relative importance of education and skills development (Weller, 1998). With world economy

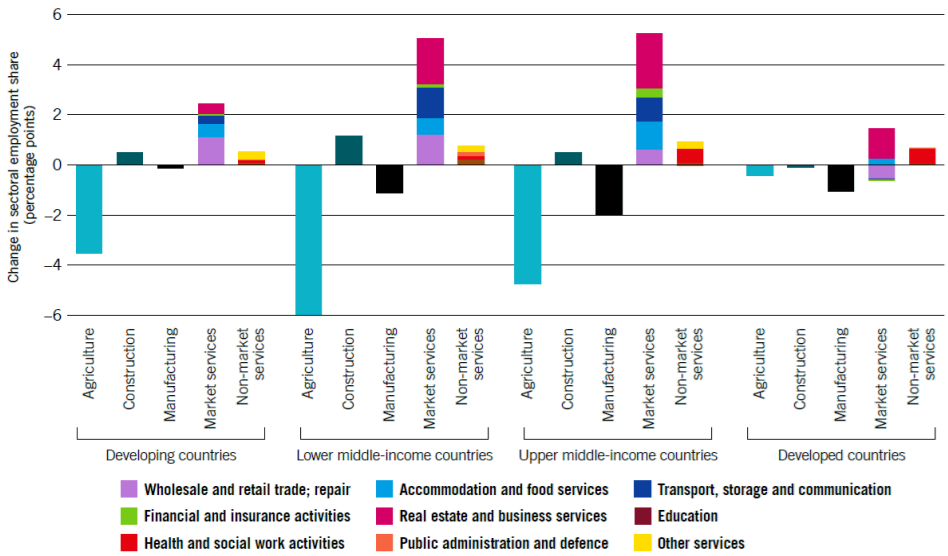
changing fast, access to knowledge and education systems seems to be the key to improve individual´s employment opportunities.

In this context, the analysis and discussion of trends in the labor market has emerged as a way to assess policy makers in the debate and development of better policies for employment promotion. First, the future labor market seems to be characterized by several challenges. Globalization, and technological developments are happening faster day after day shaping the way people work and so the skills required to go hand in hand with it. Second, demographic conditions like the trend to an increasing aging population as well as the increase in the life expectancy may change characteristics of the labor market such as social security, retirement age or emerging professions. Then, factors as the movement towards high cognitive and skilled labor employment, the importance of gap reductions among policy agendas, macroeconomic development, among others are elements shaping the dynamic of the labor market (Frey & Osborne, 2013).

As part of this analysis, it is also required to consider a sectoral approach for the assessment of labor market. This condition is determined by the fact that economic sectors within different economies may differ widely in characteristics and so the labor force they demand. In this regard, any policy assessment towards them requires to have a deep analysis to target policy decisions, feature specially required to identify oncoming challenges in the labor market changing dynamic (International Labor Office, 2017). To

illustrate, an assessment of world labor within economic sectors for 2018 has shown the shifting trends of employment from agriculture to the service sector of the economy as presented in Graph 2; implications to which governments must be ready to address in order to guarantee working conditions or a restructure of development strategies.

Graph 2: Shifting trends in labor by sector, 2017-2025[3] (percentage)



Source: ILO (2018)

In general, the future of the labor market should not be understood as a constructed reality but as a shifting one (Bosch, Pagés, & Ripani, 2018). In this regard, the assessment of this dynamic represents a tool to help policy makers to plan and determine evidence based policies, both for labor and education

[3] Sectors classified according to the International Standard Industrial Classification (ISIC) Rev 4. For the sectors of utilities and mining and quarrying, expected changes were not included as they are not big.

sector, in order to align efforts, reduce mismatches orienting the educational offer to the training institutions and ensuring the adequate use of resources for the compliance with the development strategy of the country.

2.2. Human Capital

Classic economic theory used to define labor force as a mass of people who performed physical tasks without considering much about their knowledge, abilities or motivation (OECD, 2007). However, with the contributions made along the way, the Human Capital Theory gained space in the academic field presenting the conceptual framework of investments that people do in order to get prospect future returns, alike to the capital market sector (Acemoglu & Autor, 2016). The difference however, relies on the fact that the investments on human capital are made on intangible areas like training, medical care and mainly or most recognized, on education.

Several scholars have contributed to the construction of an economic perspective of the investments in education, training or health in the form of the so called Human Capital Theory. Smith (1776) first talked about it as the acquisition of (…) talents during (…) education, study, or training; Fisher (1897) referred to human capital in the form of living capital; but it was formally stated by Mincer (1958) to provide insights on the differences in income distribution among individuals (Goldin, 2014). Later on, scholars like Schultz (1961) studied it as a way to explain productivity and

economic growth, and Becker (1964) made references in terms of rates of return from schooling and training (Machlup, 1982).

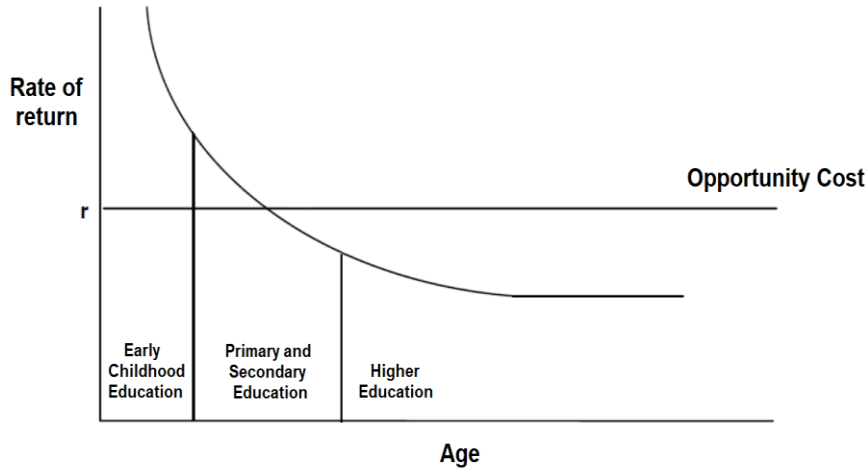
A particular interest has been put over the issue of rates of return for which the link between education and earnings have been increasingly studied as part of the economic theory. The contributions of Schultz, Becker, or Mincer, improved the knowledge in this area with special insights in analyzing differences among ethnicity or racial groups, gender gaps as well as determinants of income differences between and within educational levels. As stated by Psacharopoulos and Patrinos (2018), the rate of return can be understood as "the value of lifetime earnings of the individual –future– to the net value –present– of costs incurred to get education".

Figure 3 presets the idea behind the concept of rate of return for the investment in human capital which is represented by the vertical axis, meanwhile the horizontal one represents the age or different stages of the life of a person. Holding everything constant, the rate of return to investments for the acquisition of human capital is supposed to be higher at early stages of life and tend to decrease as age increases giving relevance to the cost of opportunity (Carneiro & Heckman, 2003).

As individuals are expected to be rational, they will invest as long as the rate of return is positive and higher than the opportunity cost, condition that becomes particularly relevant in the case of high school and higher education when the incursion in the labor market starts to be relevant. In this way, human capital acquisition is supposed to be a dynamic process happening along the life cycle of a person and in which

factors like families, schools, and even firms have a major role to play when it comes to the development of cognitive and noncognitive skills (Carneiro & Heckman, 2003).

Figure 3: Rate of return to human capital investment



Source: Carneiro & Heckman (2003)

Through the process of acquisition and accumulation of human capital, people get direct benefits in the form of positive outcomes like increased productivity, participation in the labor market and generation of incomes to satisfy their needs, among others. But the society can also benefit from this process through the promotion of the economic development of a country, improvements in health, household welfare, poverty reduction, security increase, and even democracy and human rights improvements (McMahon, 2009; Goldin, 2014).

In this sense, investment in human capital is not just justified in terms of a human rights perspective but also in terms of the expected positive benefits of this activity for the society as a whole (Psacharopoulos & Woodhall, 1986). This has led to the

recognition of education as a key element for development that is no longer a concern within families but for National Governments and international agendas like the Sustainable Development Goals.

2.2.1. Demand driven education

Despite of the potential positive benefits of the investments in human capital, it is necessary to understand that, the provision of education per se cannot be seen as the only condition for success. Elements like the macroeconomic environment, population characteristics, institutions, technological state, production reallocation, among others, influence the process through which the investment in human capital might pay off (Machlup, 1982). For instance, changes in factors like technology will lead to a shift on the demand for workers with a higher human capital (Goldin, 2014). The Toyota Advanced Manufacturing Technician Program in the United States can be sited as an example. Recruitment processes for the industry was characterized by the availability of single skilled workers on areas like mechanics or programming but lacked multi-skilled labor force, process that was worsened by a growing trend on retiring workers (National Conference of State Legislature, 2012)

As part of it, the design of good education systems represents a key element for the design of policies in the area of education. Good systems are said to be the ones that, among others, are subject to constant reforms in order to improve and adapt to changes (Patrinos, 2016). Education systems have been

particularly challenged to adapt to the new trends in terms of professional profiles so that would be able to provide labor force up to date with the labor market requirements (Camarena & Velarde, 2009). Policies in this area had been set to foster education systems as a tool for growth and development, willing to improve access and quality of the human capital formation process (Ortiz & Roser, 2016).

But the changes in work activities of has brought discussions to be made mainly in terms of the need for coherence and relevance between the offered education programs, and the demand of professionals in the labor market (Iberoamerican States Organization, 1993). This because the speed in which demographic, social, economic, and technological changes are happening has been posing new challenges for educational systems and governments (Messina, Enrique, & Castañeda, 2008). New demands for professionalization, equity in the access to education, as well as a constant curriculum renewal are part of the concerns.

In this framework, permanent educational innovations are crucial to anticipate adequate responses to the demands of the labor market and individual's preferences. Training for work is claimed as necessary to enhance articulation between education and work. The idea behind it is that formal and non-formal education programs coexist so that young ones can be prepared and successfully inserted in the labor market (Messina, Enrique, & Castañeda, 2008). For that purpose, public policy guidelines are a key element to reach

the desired articulation as a mean to guarantee employment and so development.

The challenge for policy makers is then to ensure that education systems can adapt and respond to changes and still be able to prepare future (and even current) workers to seize opportunities in order to avoid labor market disruptions (The World Bank, 2016). Countries experiencing a process of high technology dynamism for example, as well as geographic mobility might be more likely to foster the implementation of a flexible education system rather than a specific one (Goldin, 2014). In the same way, high and low income countries might not have the same educational system since the professional demands might be totally different (e.g. arts - technicians), especially in terms of higher education (Machlup, 1982).

Within this framework, it is important to note that the successful development of workforce should not concentrate only on the increase on attendance rates but on the purposes of the economic policy in which the national educational policy is inserted (Camarena & Velarde, 2009). Human capital can be used as the driving force of any strategy, which should be approached considering the process of entailment and relevance of the education sector within a particular context. This approach however, has positioned in both positive and negative ways. On one side, detractors of this idea concentrate their arguments on the reliability of estimations as well as on the ability of the market to adjust on its own peace while on the other side advocates of this idea state the importance

of long term planning due to the time required to form skilled labor work force (Psacharopoulos & Woodhall, 1986).

Linking and designing a social relevant education sector requires to consider: 1. Higher education institutions and their strategic role on growth and development; 2. Production sector of the economy; 3. Labor market demands (Camarena & Velarde, 2009). In this sense, the process to build up a policy agenda should consider different work fronts in terms of state, industries and universities; who are main actors in the educational policy agenda (Narodowski, 2002).

To sum up, the idea of designing and linking education and workforce development is not a one institution job. Governments have a clear role on the promotion of the policy agenda setting but the participation of different society actors promotes the construction of a common vision to be accomplished (Association of chamber of commerce executives, 2002). The coordination of an agreed mutual agenda, not only allows to build up partnerships among the public and private sector but also to strengthen their roles and commitment to the final objective.

2.3. Assessment of linkage

The concerns about the labor market and education have been challenging Governments in their need to assess and rethink strategies to guarantee their linkage. As a result, during the 40´s and 50´s in the region of Latin America and the Caribbean

there was a trend for the creation of training institutes and training baccalaureate programs to solve problems in the labor market related mainly with unemployment (OAS, 2017). Nowadays, national realities impose new challenges since the effects of the adoption of new technologies as well as demographical transformations are shaping the world.

In this regard, the implementation of specific analysis to try to identify the actual condition of both sectors have been emerging as tools for the government to propose reforms in labor policies as well as on the structure of the education systems. It has been noted that in the new context, it is more required to think about innovative ways to assess the linkage of them as well as the inter sectorial approach of policies and measures to face the problems of today related each time more with quality forms of employment as well as the access to labor market for young population (OAS, 2017).

Some exercises have been developed to determine the existence of synergies between the education system and the labor market have focused on the analysis of several dimensions. The initiatives include considering conditions such as the productive vocation of local territories, the focus on perception of actors in terms of their preferences as well as based on characteristics that determine the general structure of the workforce as from that of the labor demand.

In terms of the productive vocation the exercises have tryied to address the issue assessing and characterizing the main economic activities of local territories in order to identify the availability of education programs in those specific areas (Ministry of

Education, 2018). With this, the idea is to boost the growth of those activities in which the territory has an specific advantage to promote development from a local perspective and allow population to participate in the local economy. This exercise however requires the acquisition of information from local actors in a consulting process that migh be highly demanding in terms of time and resources.

On the other hand, the assessment of the characteristics of the demand and the supply side has been propossed as an alternative for analysis. In this case, main characteristics are analyzed to configure an image of the structure of the labor market or the education system based on information like the volume of employment or number of students respectively. This situation is usually complemented by including perceptions about what workers expect from the labor market or what employers expect from the employees in terms of skills, wages, training, among others. The implementation of this type of assessment can be done based on the availability of information to configure the big picture as a first step and complemented later on with exercises to capture information about the perception.

Chapter 3: Methodology and Data

3.1 Research design

In order to turn the research proposal into a testing project, the investigation adopted a quantitative approach based on which what information to observe and how to manage it, is structured around a statistical analysis. In this regard, the research is

expected to contextualize the entailment and relevance of the labor market and professional education in Ecuador. A detail of each of the data used for the exercise as well as the methodology adopted is reported as follows:

3.1.1 Data and source of information

Key sources of information to analyze labor market and education among the population usually come from: national census and household surveys (accounts for data of skills, population, income), firms surveys (accounts for sectors, salaries, enterprises), and administrative records (Pietschmann, Kapsos, Bourmpoula, Sajai, & Lokshin, 2016). For the case of the entailment and relevance analysis of labor and professional education, the analysis was developed with two data set: 1. National Business Directory; and 2. Administrative Records of the National Educative Offer.

The research considered as the unit of analysis the lowest territorial unit for which information was available or could be reconstructed in Ecuador being the level that could be used called Canton. For each of them economic sectors were constructed based on the International Standard Industrial Classification of All Economic Activities (ISIC, CIIU for the Spanish acronym). The period of the investigation was 2017 due to the availability of information for all the sources analyzed. The detail of the information used and their treatment is presented as follows:

3.1.1.1 National Business Directory

The National Business Directory corresponds to a dataset that started to be constructed since 2012 by the National Institute of Statistics and Census (named INEC for its Spanish acronym) about public and private legally constructed companies within the Ecuadorian territory. The data is constructed based on firms' surveys and administrative records of the national office in charge of collecting taxes (named SRI for its Spanish acronym) as well as administrative records from the national office for social security (named IESS for its Spanish acronym). Due to the fact that the dataset is constructed with administrative records it has one year of lag in terms of the release of information.

The dataset reports variables related to economic activity, geographic location, sales, employees, wages and social security affiliation of firms in a national basis. As for 2017, the dataset registered 884.236 firms nationwide that employed and affiliated to social security a total amount of 2'939.410 people and reported sales for an amount of US$158.567 million dollars (National Institute of Statistics and Census , 2018). For the purpose of the investigation 884.172[4] firms were used and the variables that were analyzed are the following:

[4] For which information about their politic – administrative territorial organization could be reconstructed. Less than 1% of firms which were part of the dataset could not be used in the analysis.

Table 1: Variables within the National Business Directory

Group	Variables	Description
Location	Province Canton	Corresponds to the classification of firms according to their geographical location. The politic-administrative division of the national territory defines 24 provinces each of which is subdivided in n number of cantons that account for 221 territories nationwide.
Firm	Sales Employment Wages	Corresponds to characteristics of the economic activity of the firms in terms of the total amount of sales reported by the firm in a yearly basis, as well as the amount of employees in each institution and the total amount of money spent in salaries for the period of study.
Sector	Economic Sector (1 digit)	The information of ISIC (CIIU in Spanish) is used to classify firms into economic sectors that account for 19 economic sectors: A. Agriculture, forestry and fishing; B. Exploitation of mines and quarries; C. Manufacturing industries; D. Supply of electricity, gas, steam and air conditioning; E. Water distribution; sewage, waste management and sanitation activities; F. Construction; G. Wholesale and Retail; repair of motor vehicles and motorcycles; H. Transportation and storage; I. Accommodation and meal service activities; J. Information and communication; K. Financial and insurance activities; L. Real estate activities; M. Professional, scientific

		and technical activities; N. Administrative and support services activities; O. Public administration and defense; mandatory social security plans; P. Teaching; Q. Human health and social assistance activities; R. Arts, entertainment and recreation; S. Other service activities; T. Activities of households as employers; activities not differentiated from households as producers of goods and services for their own use; U. Activities of extraterritorial organizations and bodies; V. No economic activity.

Source: INEC, 2018

3.1.1.2 Administrative Education Records

The education system in Ecuador has developed several administrative records with which information about the higher education system can be reported. In this regard, the information available for the exercise proposed in this research was based on the data of the Ministry of Education (named MINEDUC for its Spanish acronym) which reports through their institutional records [5] technical and technological baccalaureate, as well as the data from the National Secretary for Higher Education, Science, Technology and Innovation (named SENESCYT for its Spanish acronym) which reports technical and technological

[5] Named Master Archive of Educational Institutions (named AMIE for its Spanish acronym).

higher education institutes and universities[6]. As in the case of firms, the data has one year of lag.

Limitations of the dataset were identified in terms of the availability of information regards the number of students attending as well as complete information of technical and technological institutes. Due to legal and administrative loops, technical and technological institutes which have a private source of funding were not required to report their information; while on the other hand, the number of students each institution has, is not yet being adequately registered and so the release of information is restricted for its use.

The dataset reports variables related to geographic location, institution identification, number of programs offered, and economic sector alignment in a national basis. As for 2017, the dataset registered 10.397 programs for technical and technological baccalaureate as well as higher education institutions in the form of universities or technical institutes (Ministry of Education, 2017; National Secretary of Education, Science, Technology and Innovation, 2017). For the purpose of the investigation the variables that were analyzed are the following:

Table 2: Variables within the Education Administrative Records

Group	Variables	Description

[6] Universities account for public and private institutions while institutes are only public.

Location	Province Canton	Corresponds to the classification of educational institutions according to their reported geographical location. The politic-administrative division of the national territory defines 24 provinces each of which is subdivided in n number of cantons that account for 221 territories nationwide.
Institution	Identifier Name Programs	Administrative records are quite detailed in the identification of the institutions but the key variables used for the research are related to their id codes and names as well as characteristics of the educational offer that accounts for professional figures, majors or specializations that for purpose of the research, were aggregated to know their overall availability or not.

Sector	Economic Sector (1 digit)	The information of ISIC (CIIU in Spanish) is used to classify firms into economic sectors that account for 19 economic sectors: A. Agriculture, forestry and fishing; B. Exploitation of mines and quarries; C. Manufacturing industries; D. Supply of electricity, gas, steam and air conditioning; E. Water distribution; sewage, waste management and sanitation activities; F. Construction; G. Wholesale and Retail; repair of motor vehicles and motorcycles; H. Transportation and storage; I. Accommodation and meal service activities; J. Information and communication; K. Financial and insurance activities; L. Real estate activities; M. Professional, scientific and technical activities; N. Administrative and support services activities; O. Public administration and defense; mandatory social security plans; P. Teaching; Q. Human health and social assistance activities; R. Arts, entertainment and recreation; S. Other service activities; T. Activities of households as employers; activities not differentiated from households as producers of goods and services for their own use; U. Activities of extraterritorial organizations and bodies; V. No economic activity.

Source: MINEDUC (2017); SENESCYT (2017)

3.2 Entailment and relevance

The articulation analysis among the labor market and the educational system in Ecuador was conducted based on the information available as part of the Business Directory and the Educational Administrative Records, sources of information described in the previous section. In that context, the unit of analysis were the 221 canton units within the 24 provinces in the Ecuadorian territory (cantons are the smallest territorial unit for which information required for the research could be constructed in both dataset) organized in 19 economic sectors as a measure to identify the correspondence among them from a territorial perspective.

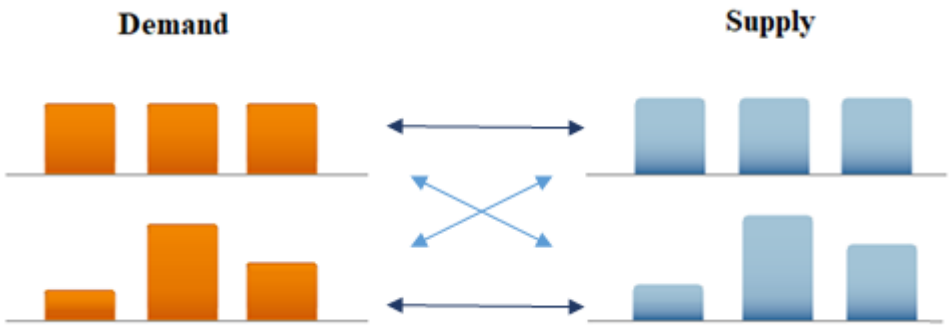
For the case of the Business Directory the information reported in the dataset corresponds to firms and their characteristics of economic sector (1 digit), geographical location, amount of sales, employees and salaries of each company within the year of study. On the other side, the Educational Administrative records reported information in terms of institutions with data about geographical location, programs offered and alignment to an economic sector (1 digit)[7].

In order to develop the entailment and relevance analysis, the research used the described two sets of data. The information at a canton level was used to build a Herfindahl Index used as a measure of concentration since in both cases enterprises as programs within each canton level could be matched with an economic sector. The

[7] Specific cases didn't report alignment for which ISIC Classification up to 4 digits was used in order to report their contribution to a specific economic sector.

idea behind the use of the index was to show the existence of a correlation among them that could account for the report of a mismatch or not between the professional figures being offered and the labor market demands as presented in Figure 4. For that purpose, the following assumptions were used:

Figure 4: Entailment assumptions for labor demand and professionals supply



Elaboration: Author

- **Strong correlation** among them accounts for the **absence of a mismatch** between the labor market demand and the supply of professional figures. In this case it is required to consider that, conditions like the equal distribution of supply and demand can be found as well as concentrated distribution of supply and demand among specific economic sectors.

- **Weak correlation** among them accounts for the **existence of a mismatch** between the labor market demand and the supply of professional figures. In

this case, conditions unequal distribution can be found whether on the side of the supply or in the one of the demand.

3.2.1 Herfindalh –Hirschman Index

The research used the Herfindalh –Hirschman Index as a way to address concentration among economic sectors within each canton level. This index has been widely used to measure concentration in a variety of aspects as income, industry, banking systems, among others (Rhoades, 1993). It was developed by Orris Herfindahl (1945) and Albert Hirschman (1950) to account for the concentration of firms according to their shares and their power within the market, estimation done as in Equation 1 as follows:

Equation for market share (1):

$$HHI = \sum_{i=1}^{n} s_i^2$$

Where:

n *= number of firms in the market;*

s_i *= market share of firm* i

As part of it, the index takes values that go from 0 to 1 (different scales might be adopted) being the higher the index the less competition within the market

and so the higher the market power of the firms; meanwhile a smaller index would represent an opposite situation in which there is more competition in the market and as a result a lower market power for firms. Market power in here should be specially considered since a perfect competition market is hardly find in real life situation so the relevant issue has been revolving around how important it is (Schmalensee, 1982).

In terms of the research the idea behind the use of the index was to have a measure for size dispersion of educational programs, or to say it in other word, to measure the variance among them. For that specific purpose and in order to have a clear idea of the information presented for the analysis, the Herfindahl –Hirschman index represents a tool to address this issue (Kelly, 1981). This condition allowed the development of the entailment and relevance analysis between the labor market demands and the educational supply to find the existence or not of a mismatch among them.

Chapter 4: The Development Strategy

4.1. Education and Labor Environment

Economies all over the world deal with labor market and education issues on a daily basis since they are key areas in any policy agenda. Concerns about employment and unemployment as well as enrollment rates and desertion by education levels (among others), are usually monitored to track progress in the implementation of policies, programs and projects. In this regard it has come to the discussion the existence of mismatches among the labor market and the educational systems since changes in the labor market are shaping the demands for workers and the skills required for which educational systems need to catch up. As part of it, it has been more needed to count with relevant and opportune analysis that gives insights of the ongoing processes in order for policy makers to deal with nowadays challenges as part of agenda setting.

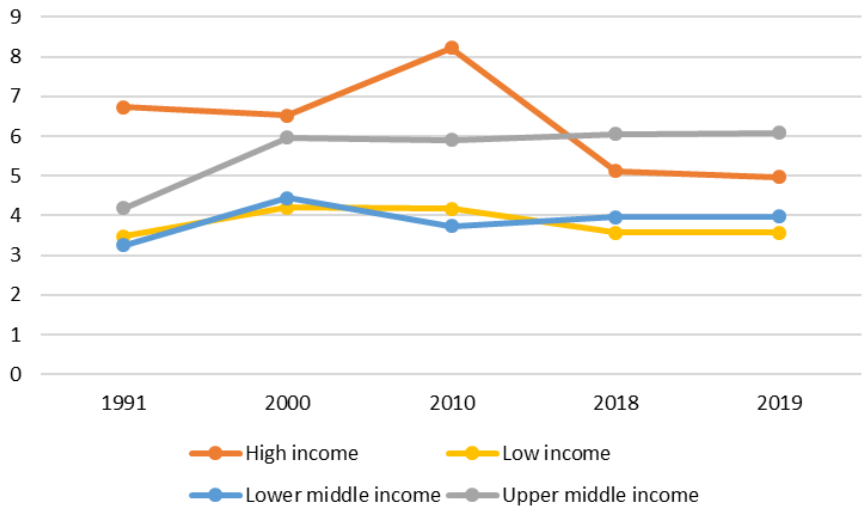
4.1.1. International and Regional Context

It has been recognized the key role that labor force plays on the economic, social, and political aspects of the world economies (Bosch, Pagés, & Ripani, 2018). In terms of growth, worldwide modest expectations are presented for 2020 as growth rate is expected to reach 3,4% (IMF, 2019). On the other hand, unemployment levels have been decreasing in the last decade with significant progress in high income countries who were able to reduce the rate in 30%

between 2010 and 2018, meanwhile low income economies did it in around 15% (ILO, 2018).

For the region of Latin America and The Caribbean, economic growth was expected to reach 2,2% by 2018 and unemployment levels to remain as a challenge for the economies, due to heterogeneous performance trends between countries and increasing concerns about the persistence in vulnerable forms of employment and informality, especially in the young population (Olmedo, 2018).

Graph 3: Unemployment Rate ILO estimates, 1991-2019 (percentage)

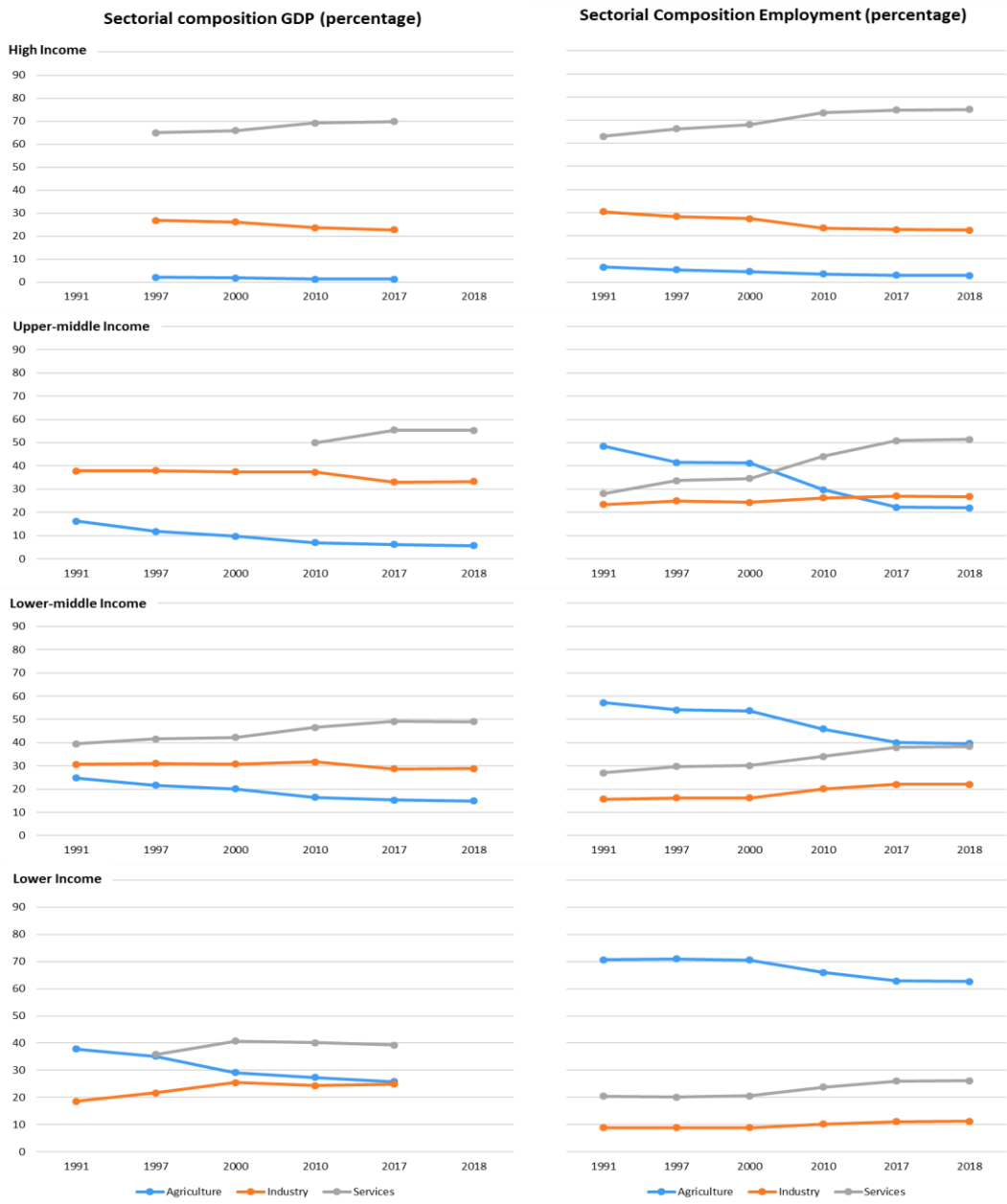


Source: World Bank (2019)

While the trend in the level of unemployment in the global context shows downward trends, the concerns around this issue remain. ILO reports show that by 2018 40 million new jobs will be created worldwide while the population that will become part of the labor market will be 42.6 million, which shows that in the coming years there will be no significant progress (Álvarez, 2015). On the other hand, youth unemployment still represents a challenge for the economies worldwide since its rate has increased since the 90´s being over 10% by 2017 and not expected to change by 2019 with a world rate of 12,8%.

Demographic conditions also represent an element which is shaping economies and labor markets worldwide. World's population will reach almost 10 billion by 2050 with a slowdown in the growth rate that falls behind past decades' experiences, based on which population aged 65 and over is expected to account for at least 16% in 2050 (ILO, 2018).

Graph 4: Sectorial composition of GDP and employment by income group, 1991-2018 (percentage)



Source: World Bank (2019a)

For countries in Latin American and the Caribbean, this condition represents a new challenge which is shaping the local economies. The demographic bonus experienced by the region is said to be coming to an end, affecting social security systems, bringing more pressure on government spending accounts and challenging economic growth for which changes are required to guarantee the inclusion and permanence of this group of the population in the labor market (Bosch, Pagés, & Ripani, 2018).

Moreover, demographic changes go in hand with the incorporation of new technologies as part of the analysis. Both are expected to influence economic growth, productivity, labor market structures and even economic performance, requiring governments to rethink policies in areas like education, employment, welfare or production, to take advantage of the opportunities and mitigate any possible constrains for the economy (Bosch, Pagés, & Ripani, 2018). Furthermore, sectorial changes have been taking place in the last decades with effects on the employment allocation of the labor force worldwide, as presented in Graph 4.

According to the information of the World Bank (2019), the agriculture sector has been decreasing its participations in the national gross domestic product in all regions of the world, tendency that has been accompanied also by a reduction in the percentage of population who participates with its labor on that sector; meanwhile manufacturing and service have been going on the opposite direction. This conditions might be showing insights of a structural

transformation of the economies which is going hand in hand with the allocation of the employment in more productive sectors, with direct implications on the economic performance (McMillan, Rodrik, & Sepúlveda, 2016).

However, this path towards development does not mean that all the desired effects are to come to economies on their own. Sectoral changes happening mainly into the service sector might impose a challenge to guarantee quality employment conditions as part time and informal jobs are becoming more common (ILO, 2018). In fact, for the region of Latin America and the Caribbean, despite of the increased access to education and the labor force available, the region has been lacking behind the capacity to get more people into the labor market, limiting their development potential and so reducing the chances to improve inequality conditions that have always characterized the region (International Labour Organization, 2014). This issue in hand with demographic changes and shifts among employment by economic sectors requires an assessment of labor market to ensure the policy adjustments to go in line with the new trends and guarantee job access its positive outcomes.

4.1.2. National Context

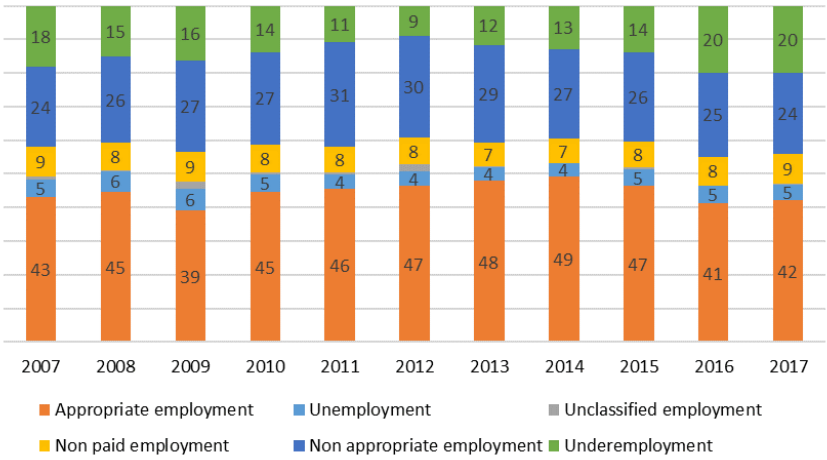
By 2017, from the 16’961.926 amount of national population, 11’937.928 people were part of the group in the working age, out of which 68% were economically active and 32% were economically inactive (INEC, 2017). The

employment structure in the last decade hasn't had big changes but in 2014 when the appropriate employment rate reached 49% while as for 2017 was 42% as presented in Graph 5[8].

In line with the international and regional tendency, the economy in Ecuador faces challenges related to the capacity of the economy to guarantee adequate forms of employment. Rural areas of the country have an employment rate of 25% by 2017 meanwhile a 50% is register in the urban ones; being the main type of employment the non-appropriate one in rural areas with 32% of the employees by 2017. On the other hand, unemployment among young population remains a big challenge since its rate has reached 9,6% in 2017. This unequal condition when analyzed in terms of specific groups of the population shows the prevalence of disparities within the country.

[8] According to the national classification of the labor market structure the labor indicators are defined as follows: 1. Appropriate employment: during the reference week received income equal to or greater than the minimum wage, and worked equal to or more than 40 hours (regardless of the desire) or worked less than 40 hours but didn't want more. 2. Unemployment: during the reference week were unemployed and available to work or looked for a job or start a business. 3. Unclassified employment: can't identify their category due to lack of information. 4. Nonpaid employment: were employed but didn't receive any compensation (household employees) 5. Non-appropriate employment: employed but didn't receive the minimum wage compensation or worked less hours than the legal ones without any desire to have additional ones. 6. Underemployment: employed but didn't receive the minimum wage compensation or worked less hours than the legal ones with the desire to have additional ones.

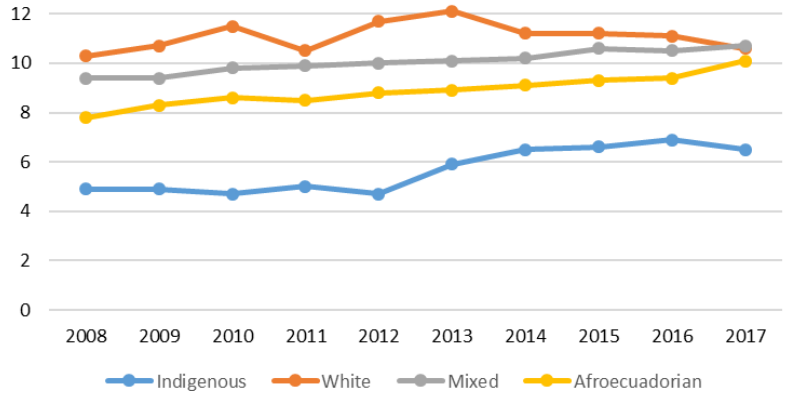
Graph 5: Employment evolution by categories, 2007-2017 (percentage)



Source: INEC (2017)

The population with appropriate employment by ethnicity reveals that only 16% of the indigenous population falls in this category while 47% of white and 45% of mixed people in the country have that characteristic. The low access to quality employment might be a reflect of structural conditions like the lack of opportunities in terms of human capital formation. As for 2017, the indigenous people registered 6,5 average years of schooling meanwhile white, mixed and afro ecuadorians have already reached at least 10 years of schooling on average as presented in Graph 6.

Graph 6: Average years of schooling by ethnicity, 2008-2017

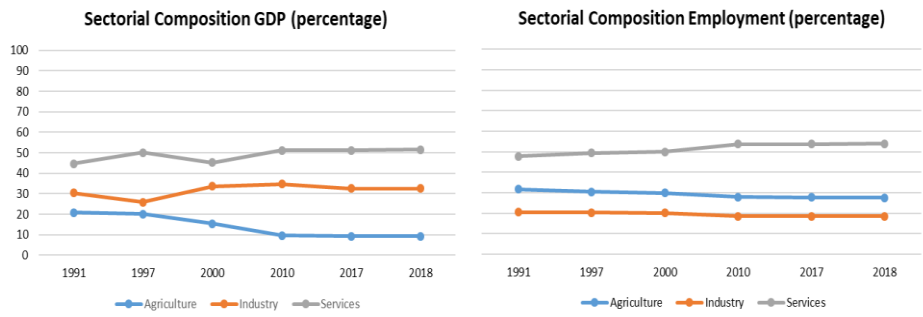


Source: INEC (2017)

These conditions were supposed to be address by the national development strategy which incorporated a reform in the educational system[9] to remove barriers to access education as well as incentives in the form of subsidies and scholarship programs. In fact, 66% of people among 15 and 17 years old who were not attending to school mentioned the lack of economic resources as the main reason for their absence by 2008 condition that was reduced to 35% by 2017. In the same line, the net enrollment rate in secondary education increased in a national basis from 69% in 2008 to 85% in 2017, being the highest growth rate the one for the indigenous group with 50%. For higher education the challenge remains in the country. Despite the efforts in this sector, the gross rate of higher education assistance remains in around 30% (SICES, 2019).

[9] Accompanied by a strategy for the reduction of poverty.

Graph 7: Sectorial composition of GDP and employment Ecuador, 1991-2018 (percentage)



Source: Source: World Bank (2019a)

In terms of economic sectors and taking into account the population which is employed, agriculture still concentrates the national working population. As for 2017, 26% of the employees in Ecuador were employed there, followed by commerce with 19%, and manufacture with 11%. However, if categories like communications, transportation, teaching, among others are added; the Ecuadorian working population is moving towards the service sector (INEC, 2017).

National GDP by sectors reflects this reality. Agriculture during the last decades has been decreasing its importance in the economy reaching about 9% of the national production by 2018 from a 21% registered in 1991, a variation rate of 56%. Services and Industry on the other hand have increased in 16% and 7% respectively their relevance as percentage of the GDP but the trends in the labor market don't show a big change. In fact, employment in Industries has reduced in 9% while services have increased in 13% between 1991 and 2018.

4.2. Development Strategy

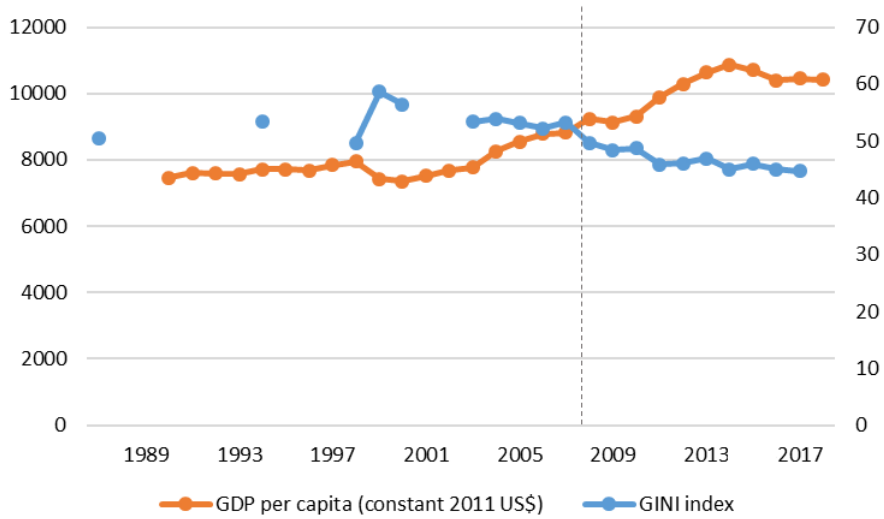
4.2.1. Historical Background

From 2013 the Vice Presidency of Ecuador leaded the way on the design and implementation of a new development strategy for the country named "National Strategy for the Change of the Productive Matrix" (ENCMP for its Spanish acronym). The strategy proposed a structural transformation of the economy by a transition of the country from a primary resources based economy to a post-oil one based on knowledge which required the commitment of all social and economic sectors towards the development and adoption of new technology as well as the promotion of science innovation and human talent investment in the prioritized areas as fundamental pillars for its success (Vice Presidency of the Republic of Ecuador, 2015).

Since the 1950's the Ecuadorian economy was based on primary goods exports, lately transformed into an oil dependent economy during the 1970's and followed by a strategy of import substitution industrialization which helped to promote economic growth within the economy but that was totally dependent on the fluctuation of international economic cycles that led to increasing fiscal deficit and re primarization of the economy. In this regard, the proposed development strategy intended to diversify the economy by the concentration of efforts into high potential sectors and productive chains that could foster the process of productive transformation.

Moreover, the configuration of the economy added to the historical socio-economic context, have been conditions for the prevalence of inequality within the Ecuadorian reality. Unequal access to opportunities in the form of employment or education increased inequality conditions within the population reason why in the 1990's the adoption of focalized programs in the form of cash transfers and later on into conditioned cash transfers tried to fight against high levels of inequality with a Gini coefficient of 0,5 and 15% of extreme poverty in the country by 2009.

Graph 8: GDP per capita and Gini coefficient



Source: The World Bank (2019)

In general, the economy of the country was concentrated on specific areas that depended on a favorable international environment to contribute to the development of the country meanwhile a negative scenario only led to the

contraction of the economy. With the coming into office of a new Government in 2007, a big process of reforms started to take place promoting the role of the government as a driving force and implementing long terms strategies to guide the design of policies, programs and projects in the medium and short term. Key areas were intended to be addressed by this idea mainly in terms of social welfare (health, education, social security) as well as infrastructure investments to increase the competitiveness of the country (Vice Presidency of the Republic of Ecuador, 2015). Is in this framework in which the National Strategy for the Change of the Productive Matrix was born which as being part of a long term strategy has been stated as part of each of the National Development Plans of the country. The last supposed to be implemented until 2021 states:

- **Objective 5: Promote productivity and competitiveness for sustainable economic growth in a redistributive and supportive manner.**

  In the change of the productive matrix, it is key to promote the transformation and productive diversification, which enhances its comparative advantages in the short term but that promotes the creation of competitive advantages in the long term. Only then will it be possible to change the productive pattern that has led the Ecuadorian economy throughout its history. We need to strengthen and enhance the integration of local productive chains, and of well-

> designed and timely refined incentives, guiding production to the intelligent substitution of imports and attention to exports. To do so, on the one hand, the country seeks to prop up basic industries to support the creation of new industries, and the strengthening of existing industries; on the other hand, it is committed to an inclusive industrialization process, which allows the majority of the population to be incorporated into the productive sector so that the benefits are collective. At the same time, the institutional and regulatory development that accompanies and fosters the process should not be neglected.

Likewise, an economy based on knowledge generation must be consolidated, which implies investing in human talent and strengthening technical and technological education linked to development processes, which allows innovation and entrepreneurship. The most significant challenge in this regard is to change the productive matrix of the country, accompanied by a cultural change that encourages self-confidence. In addition, this change must be guided by environmental responsibility and social inclusion, which will allow industrial development to become a powerful driver of economic growth for the satisfaction of rights.

4.2.2. Components of the Strategy

The implementation of the development strategy was expected to face several challenges. Ecuador is a country of entrepreneurs, three out of ten Ecuadorians do this activity (Polytechnic School of the Coast, 2014). However, the highest proportion of ventures is promoted and driven by necessity and not by opportunity or innovative ventures. On the other hand, the lack of articulation between the academy and the national productive apparatus was not allowing the diversification of production meanwhile inequalities in terms of social welfare between and within territories was reducing the opportunities for development of all the population.

In this regard, the adopted development strategy proposed to work on three components: 1. Systemic environment and competitiveness which focused on production promotion, innovation environment and infrastructure; 2. Development and strengthening of productive chains, which concentrated efforts on the promotion of high potential productive chains; and 3. Basic industries intended to the strengthening and development of industry.

As part of the first component which concentrated efforts on innovation and systemic environment, strategic action axes were defined in terms of the expansion and improvement of the relevant and quality academic offer in science, technology and education as well as on the improvement of the territorial relevance of the educational and scientific offer, articulated to the

needs of the productive transformation (Vice Presidency of the Republic of Ecuador, 2015).

It seemed to be necessary to promote systems of education linked to the productive sector to offer job opportunities for the new qualified labor force, process in which the role of universities, technical and technological institutes was determinant. Measures like free access to education at all levels, a broad scholarship program, the restructuring of the Higher Technical and Technological Public Institutes (ISTTP for its Spanish acronym) and the Public Institutes of Research, as well as the construction of specialized universities in a decentralized basis were part of the Government's policies to put the strategy into practice. In general terms, the following strategic guidelines were established:

- Deploy educational and scientific services throughout the national territory with criteria of productive and territorial relevance (technical baccalaureate, reconversion of Higher Institutes of Technical and Technological Training, reform of universities)
- Promote professional and technical training articulated to the requirements of the productive matrix: (national qualifications catalog, recognition of competencies, evaluation and accreditation, information and orientation system, job training).
- Democratize access to Information and Communication Technologies (Digital literacy program).

- Development of human talent and innovation (Organic Law of Higher Education, evaluation of universities, scholarship programs).

Additionally, and in order to promote the productive vocation of each territory with the development of human capital, the Government worked on the creation and start of operation of the following universities:

- **The National University of Education (UNAE)**: was located in the city of Azogues, in the province of Cañar, with the objective of promoting the teaching and management, administrative and support positions in the national education system. The National University of Education's mission is to contribute to the training of educators and pedagogues who, with their ways of doing, thinking and investigating, transform the National Educational System in order to build a fair, equitable, free and democratic society generating educational models, pedagogical and didactic of excellence characterized by its scientific rigor, focus on rights and interculturality. Its main axis is the transfer of teaching from the field of explanation, to the territory of tutoring, so that each student can understand himself and develop his own vital project, his professional project and the skills he needs as a teacher of the 21st century and of the digital age, understanding that future teachers must develop a systemic set of resources that are put in place when they face problem solving, propose alternatives, create, analyze, experiment. Future professionals have to be trained as good teachers where it is most needed: with

disadvantaged students, in disadvantaged social contexts. In this way they learn to help those who need it most in pedagogical terms, and also to develop attitudes of social, ethical and professional commitment where it is more difficult (UNAE, 2019)

- **The Amazon Regional University (IKIAM)**, based in the city of Tena, Napo province, will be dedicated to generating knowledge, research and information that allows developing technological alternatives to reach a rational and responsible use of natural resources in the region. IKIAM manages a system that seeks the training of leaders and innovators within an interdisciplinary framework that strengthens the development of science, technology and engineering, to contribute to the solution of humanity's problems related to: environmental degradation, water resources management, sustainable development, study of tropical diseases, among others. Near the Colonso Chalupas Reserve, a protected area of 93,000 hectares of forests and moors, located one hour from the university campus, and containing six ecosystems, with its specific biodiversity available for investigation and of which we still know very little, what which allows students to carry out their field studies in a privileged place. Its students will contribute to the strengthening of architectural or urban development solutions within the framework of sustainability and accessibility, through the creation of rural development programs and projects, both in the ecological-

environmental field and in the agro-productive field, and participate in the balanced management and administration of biodiversity products, generating creative approaches for their use and subsistence. In addition, it is an entity that materializes academic mobility at local, regional and global levels with the involvement of researchers and students in labor projects closely related to the areas of medicine, pharmacology, industry, agronomy, ecology, microbiology, mining, resource management water, and sustainable urban development (IKIAM, 2019).

- **The Experimental Technology Research University (YACHAY TECH),** based in Urcuquí, Imbabura province, will aim to investigate new technologies, generate and disseminate scientific knowledge. Yachay Tech University began operations in 2014, being a public university that promotes interdisciplinary sciences and discoveries, in the hands of innovation and entrepreneurship, making a constant effort to maintain integrity in all academic activities, among them research, teaching and human interactions; maintaining excellence and professionalism in all the activities we carry out as an Institution (YACHAY TECH, 2019). Due to its emblematic nature and its possibilities of impact, the City of Knowledge of Yachay Tech plays a specific role in the process of changing the productive matrix. On the one hand, Yachay Tech can make a great contribution in selected production chains from the interest of productive transformation, through research projects

that inject new knowledge. On the other hand, it must be used to promote research projects located on the frontier of knowledge, which can be used to create new industries. For this purpose, different connection modalities must be established between the production chains and Yachay Tech: research projects financed by the State, open competitive funds, joint ventures with international companies, projects financed by the Public Research Institutes, among others. This aspect is critical to ensure the relevance and sustainability of the research projects carried out at Yachay Tech, an issue that is always of crucial importance in the area of research and development.

- **The University of the Arts (UARTES),** based in the city of Guayaquil, is oriented to the training of artists and cultural professionals, to generate more critical and creative citizenship. Art research goes to different ways of investigating, investigating and generating knowledge, through its own method of search, work and experimentation, to arrive at unpublished results that point to artistic creation. It focuses its teaching and research activity on creative production in arts and critical reflection on the arts, based on the development of diverse aesthetic concepts and criteria, the stimulation of creative talent that uses a maximum of expressive abilities and the link between art and transformation. Social (UARTES, 2019)

In addition to these, there is the Reconversion Project of the Higher Public Technical and Technological Education of Ecuador, which seeks to strengthen the non-university higher education system, physically and academically transforming the public technical and technological higher institutes (ISTTP) aligning them to the needs of the country and the National Plan for Good Living, providing them with physical infrastructure, equipment and implementation of the dual modality in careers linked to strategic, priority and essential public services sectors, in order to contribute to the change of the matrix Ecuadorian production (Vice Presidency of the Republic of Ecuador, 2015).

Chapter 5: Data and Analysis

5.1. Entailment and Relevance

For the application of the proposed methodology and with the purpose of defining the entailment and relevance of the labor market demands with the professional figures supply in Ecuador by 2017, the research used two constructed datasets as presented in Chapter 3. In order to review the process that was carried out, the following sections will detail the exercise as well as present some descriptive statistics related to the information used in order to understand the dynamics between labor and education.

5.1.1. Descriptive Statistics

A first attempt to analyze the entailment and relevance of the labor market and the professional education system in Ecuador was based on a descriptive analysis of the data corresponding to the two datasets constructed for that purpose. Based on that, it was identified that, in terms of the areas that were reported as part of the national educational supply were concentrated mainly in “manufacturing industries” and “professional, scientific and technical activities”. It called the attention to find as part of the reported information the existence of a high number of programs reported to be “without economic activity” alignment.

On the other hand, the data corresponding to the labor demand was put together in order to account for the main economic activities within each canton level. As part of the exercise, the results showed that activities related to "wholesale, retail, repair of motor vehicles and motorcycles" and "public administration, defense, mandatory social security plans" are the ones that are present on most of the territorial units within the country.

Putting together the information, it can be noted that around 26% of all the canton levels analyzed, have no supply of educational programs or if there is, they are not related to any economic activity within the territory. On the other hand, for the ones who do have availability of any educational offer, only 5% of them have an alignment with the principal economic activity of the territorial unit. If a second economic activity is included, then the percentage of canton levels that have an availability of educational supply goes up to 10% only.

This information might be revealing the existence of a mismatch problem, which will be assessed through the correlation analysis. Before that, a description of the information contained in each dataset will be presented in order to get a better understanding of the economic activities that are being more relevant as for the supply and demand in the labor market.

5.1.1.1. Business Directory

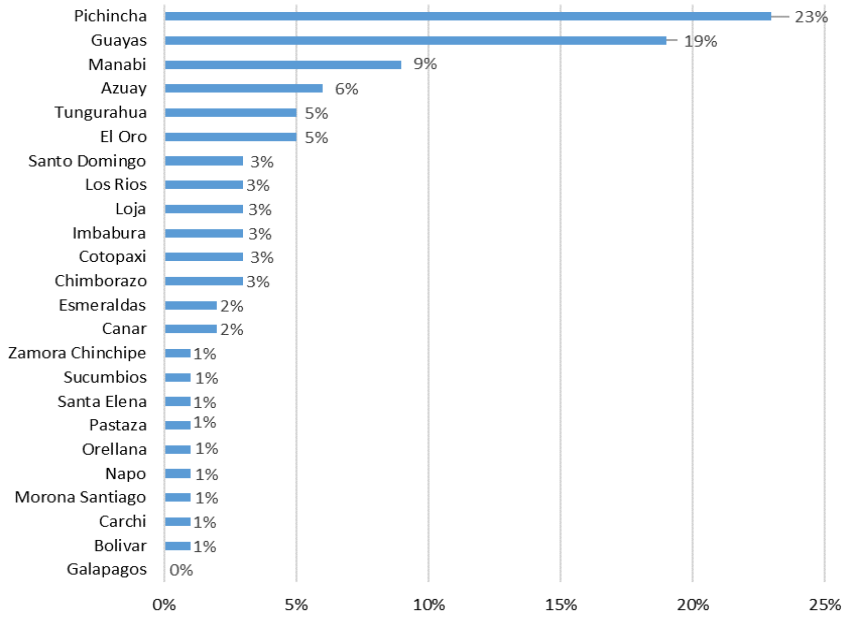
The business directory reports information about firms within one year with data related to their geographical location and their economic activity. Based on that, the variables analyzed were related to their location according to the political-administrative organization of the Ecuadorian territory as well as their economic sector based on the ISIC classification, wages, sales and employees.

The dataset reported information of 884.236 firms in the national territory among which 884.172 reported information about their geographical location. The remaining ones belonged to territories which are still ongoing legal and political disputes about their administrative allocation, reason why were excluded from the analysis as provinces and canton levels can't be constructed to report and compare data.

With this regard, the information reported in the business directory shows that the provinces which allocate the main amount of firms in the national territory are Pichincha, Guayas and Manabí with 23%, 19% and 9% respectively. Together, they account for 51% of the total firms in the country as reported in Graph 9. Among the mentioned provinces, Guayas, Pichincha and Manabí are the ones that concentrate the greatest amount of population in the country

with 4´207.610, 3´059.971, and 1´523.950 of people by 2017 respectively. On the other hand, Pichincha and Guayas are among the top provinces with the highest GDP with US$ 26´406.871,29 and 25´815.766,35 thousand of dollars.

Graph 9: Geographical location, province (percentage)

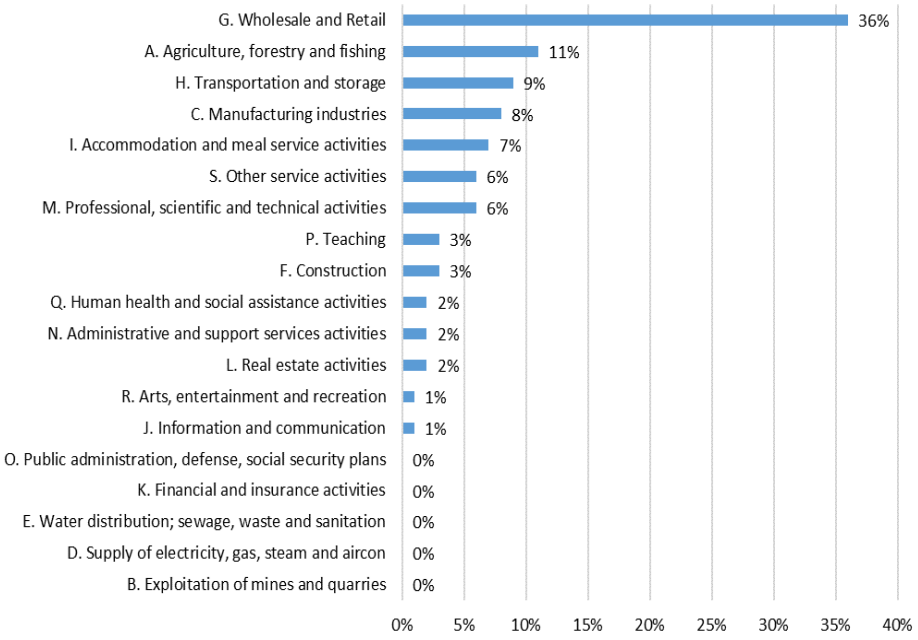


Source: INEC, 2018

In terms of the activities performed by the enterprises in the country, their classification follows the ISIC guidelines for economic activities. As part of it, within the national business directory for 2017, 19 sectors account for the economic activities of the firms in Ecuador. Among them, wholesale and retail (mainly concerned about commerce) accounts for 36% of the firms reported,

followed by agriculture, forestry and fishing with 11% and transportation and storage with 9%. When analyzed together they group 56% of the total amount of firms in the national territory as presented in Graph 10 as follows.

Graph 10: Economic sectors (percentage)



Source: INEC, 2018

In terms of the variables that were used for the construction of the index, the descriptive characteristics of each of them are reported as part of Table 3 presented below. For the case of the number of employees and the amount of wages during the firms' last operation cycle, the information is constructed and reported in an annual basis with a total amount of 463.271 firms for which

information is available in the year 2017; meanwhile for the variable corresponding to the total amount of sales in the year 2017, information was available for only 318.174 firms. This case is presented due to the existence of micro and small firms which are not legally forced to declare taxes and so they are not forced to report the total amount of sales within the year.

Table 3: Variables within the National Business Directory

Variable	N	Mean	SD	Min	Max
Employment	463.271	6	63	1	9.395
Wage	463.271	53.250	832.867	0	121´315.394
Sales	318.174	498.320	15´067.964	0	5.348´471.020

Source: INEC, 2018

Sales by 2017 reached and amount of US$ 158.567 million dollars being the main economic sector that contributes to this amount wholesale and retail (commerce) with sales of US$ 60.431 million dollars followed by services with US$38.828 million dollars. In general terms, 5 economic activities concentrate 76% of the total sales reported in the business directory: commerce, manufacture, mines and quarries, agriculture and livestock, and Financial and insurance activities.

In terms of employees the business directory by 2017 accounted a total of 2’939.410 people which correspond mainly to activities related to Services representing 56% of the total employees with 1’631.724 people working there, followed by Commerce with 18% of the reported employees corresponding to 536.588 people and Manufacture Industries representing 13% of the working population reported with 387.361 people. Five provinces (Pichincha, Guayas, Azuay, Manabí and El Oro) account for 78% of all employees reported in the directory.

As for wages by 2017, they reached a total amount of US$ 24.672 million dollars, 60% of which corresponded to the sector of services while 16% corresponds to the sector of commerce. Disaggregating the data into economic activities, 5 of them corresponding to commerce, public administration and defense, manufacture, teaching, and health and social assistance account for 63% of the total amount paid as part of the wages reports. From a territorial perspective, the provinces of Pichincha and Guayas concentrate 66% of the wages reported.

5.1.1.2. Educational Administrative Records

As for the educational administrative records, the information reported was from 2017 corresponding the academic offer in

universities, technical and technological institutes, as well as technical baccalaureate. This three types of institutions were part of the educational reform expected to foster the acquisition and accumulation of human talent in Ecuador as part of the promotion of the innovative capacity in the national environment.

The dataset constructed reports the existence of 10.397 programs in the national territory. The information however covers mainly characteristics of the public educational offer when it comes to technical and technological institutes due to the fact that private institutions are not required to fully report their existing programs, students attending or any other characteristic.

The dataset has 64% of the programs corresponding to the ones offered by public institutions while the remaining 20% account for programs that belong to private institutions. Finally, the dataset also accounts for institutions that have a public and private source of funding and so 16% of the existing programs correspond to this characteristic as presented in Table 4.

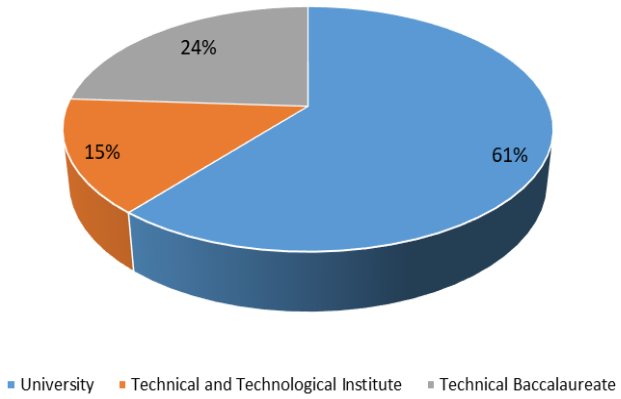
Table 4: Variables within the National Business Directory

Variable	N	Mean	SD	Min	Max
Public	10.397	0.64	0.48	0	1
Private	10.397	0.20	0.4	0	1
Co-funding	10.397	0.16	0.37	0	1

Source: MINEDUC (2017); SENESCYT (2017)

On the other hand, the reports include variables related to the number of available programs, sustenance, type of institution, among others; but do not report the number of students which are attending each of them being this another limitation of the study. Despite of that, the research used the number of programs as a proxy variable to measure the educational offer into each canton level.

Graph 11: Institutions offering programs (percentage)



Source: MINEDUC (2017); SENESCYT (2017)

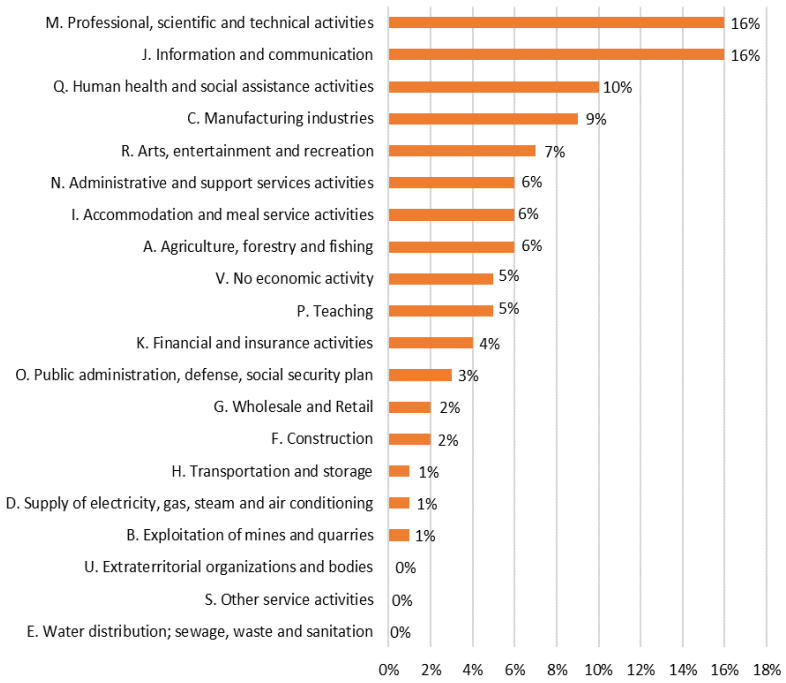
Based on this, the information of the number of programs shows that Universities concentrate the highest number of professional education with 61% of the total programs in Ecuador by 2017. On the other hand, technical baccalaureate programs are the second biggest offerer in Ecuador accounting for 24% of the programs while Technical and Technological Institutes represent 15% of the total amount of programs in the country. In this regard, the professionalization offer is concentrated on third level institutions with 76% of the total progrmas meanwhile baccalaureate accounts for 24% of the available programs by 2017.

This structure might be reflecting the reforms in the area of education which intended to promote not only the availability of university programs (traditionally concentrating the supply in the education sector) but also the impulse towards the technical and technological institutes as a way to guarantee the generation of labor force for the industries in order to increase the likelihood of a positive labor market inmmersion of the group of the population opting for this profesionalization path.

Finally, in terms of economic sector, the programs reported as part of the administrative records account for the concentration of the educational supply in the areas of Professional, scientific and

technical activities; Information and communication; Human health and social assistance activities; and Manufacturing industries. As presented in Graph 12, 16% of the programs correspond to the Professional scientific and technical activities; same as for Information and communication. In the case of Social assistance activities 10% of programs are allocated in that sector while 9% in the manufacturing industries. Putting them together, the amount of programs offered accounts already for 51% of the total national offer.

Graph 12: Programs by economic sectors (percentage)



Source: MINEDUC (2017); SENESCYT (2017)

5.1.2. Correlation Analysis

For the correlation analysis the research proposed the use of the Herfindalh –Hirschman Index in order to have a tool to measure the concentration in the market. All data was analyzed in a micro level framework, meaning that the information referring to the labor demand accounted for individual firms while the one referring to the supply of professionals was reported for each educational program.

In this framework, a concentration index was constructed to address the supply side based on the variable measuring the number of programs being offered within each canton level among economic sectors. On the other hand, to capture the information for the demand side corresponding to the firms' information, four variables were analyzed: salaries, employees, sales and number of firms. For each of them, indexes measuring concentration were constructed and its correlation was analyzed.

Later on a common measure was used to captured in only one variable the information of the labor demand within each canton level. In this way, the Herfindalh –Hirschman Index analysis was conducted in two stages to test the results and improve the internal validity of the research. The description of each exercise is presented below.

5.1.2.1. General Correlation Analysis

A first exercise was developed in terms of a correlation analysis including all variables related to number of programs, enterprises, employment, sales and wages which were treated to become indexes.

With the indexes constructed the correlation analysis was performed reporting the following: 1. Negative correlations were reported among the concentration of the number of programs and all the variables that accounted for the concentration of number of enterprises, number of employees, total sales and total amount of wages. 2. The values reported as part of the exercize among the analyzed variables show the existence of a low level of correlation among the analyzed variables as it is reported in Table 5.

Table 5: General Correlation Matrix

Variables	(1)	(2)	(3)	(4)	(5)
(1) HHI-Programs	1				
(2) HHI-Enterprises	-0.12	1			
(3) HHI-Employment	-0.14	0.85	1		
(4) HHI-Sales	-0.09	0.29	0.34	1	
(5) HHI-Wages	-0.14	0.81	0.98	0.33	1

Elaboration: Author

In this sense, the results might be showing that the labor market demand and the supply of educational figures are not struictly linked and so this would be translated into the existence of mismatch between the labor market and the country's education sector according to the assumptions established for this analysis.

5.1.2.2. Components Correlation Analysis

To test the previous results and try to extract the information about the labor market demand presented in the form of wages, salaries, number of firms and employees into one unique variable, a principal components analysis was developed. As part of it, Table 6 presents the results of the exercise reporting that component 1 captures in a higher degree the information from the variables in an aggregated manner.

Based on those results, the correlation analysis was conducted with the following reports: 1. Negative correlations are presented among the concentration of the number of programs and component 1 which accounts for the variance of the used variables for its construction. 2. The values reported as part of the exercise among the analyzed variables show the existence of a low level of correlation among the programs and the component 1. 3. High and positive correlation is reported for component 1 respect to the

analyzed variables since it is capturing the variance of the information reported by those variables.

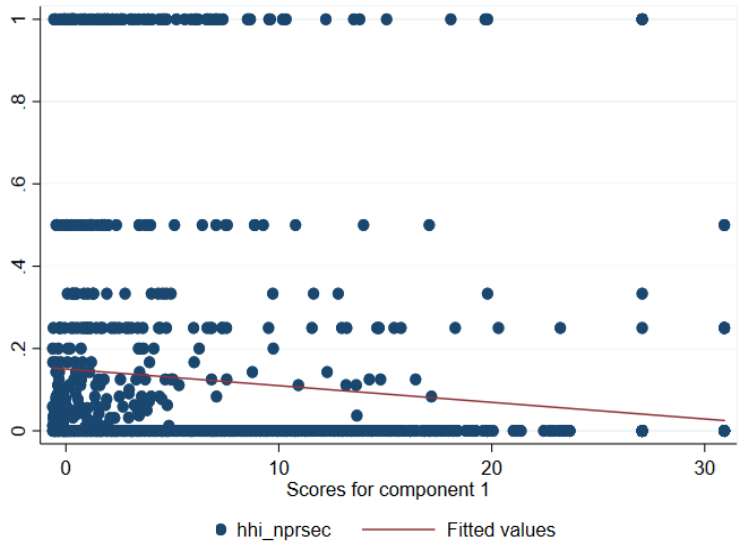
Table 6: Component Correlation Matrix

Variables	(1)	(2)	(3)	(4)	(5)	(6)
(1) HHI-Programs	1					
(2) HHI-Enterprises	-0.12	1				
(3) HHI-Employment	-0.14	0.85	1			
(4) HHI-Sales	-0.09	0.29	0.34	1		
(5) HHI-Wages	-0.14	0.81	0.98	0.33	1	
(6) Component 1	-0.14	0.95	0.96	0.45	0.93	1

Elaboration: Author

In this sense, the results might be showing that the labor market demand and the supply of educational figures are not struictly linked and so this would be translated into the existence of mismatch between the labor market and the country's education sector. The correlation found for the Herfindahl index of the number of programs and the scores for the component 1 which accounts for the variables of the labor market is reported as part of Graph 13 as follows.

Graph 13: Correlation analysis



Elaboration: Author

5.1.3. Results and Public Policy Implications

The definition of the educational offer for professional training in the national education system of Ecuador has been a constant concern as part of the implementation of the national development strategy. The idea has tried to be analyzed with the purpose of ensuring that the formation of human talent in the national context can effectively be a catalyst for economic and social development processes within the country as part of a long term strategy that intended to change the production relations in the Ecuadorian economy. As part of this, approaches related to analyzing special characteristics of the supply and demand side or considering concentrating on preferences as an approach for the analysis have been

proposed as alternatives to try to identify the existence of a link or mismatch between the productive and educational sectors of the economy; however, the availability of information in the Ecuadorian context has been a determiant factor for which the present study uses the analysis of the characteristics of the demand side of the economy as the adopted approach.

By implementing this type of analysis, the results presented in the previous section show traces of the existence of a mismatch among professional education and labor market in the Ecuadorian context, since a high degree of correlation were not found among the variables analyzed. What this results might be showing is that the educational programs are not strictly nurturing the demand of workforce when analyzed in terms of territorial units and economic sectors, and so that each of them are concentrating efforts on different areas, contrary to what was proposed as the development strategy of the country.

In fact, if the economic activities of each canton are categorized in terms of the volume of employees, sales, and wages; the main economic activity for the 221 canton is represented by commerce in the form of wholesail and retail which is the case of 94 cantons in the country. This result might be expected since commerce is a transversal activity, but also the next economic activity that cantons are concentrated on in terms of relevance is agriculture, forestry and fishing. On the other hand, manufacturing

industries is the economic sector in which the bigger amount of professional programs are concentrated on followed by professional, scientific and technical activities.The educational offer seems to be concentrated on the sectors that were part of the development strategy while in the productive field the relevance of sectors such as commerce continues to mark the economic structure.

These results have several implications in terms of public policy. One that is evident in the analysis is related to the need to work on mechanisms for linking the education system and the labor market specially considering the persistent levels un youth unemployment in the country. As government big efforts have been put into the social sector as a way to increase the access to education all the population specially for the ones who have had fewer opportunities because of the socioeconomical background, however breaking the poverty cycle and implementing measures to fight inequality requires to go beyond education since its final objective is to guarantee to successful inclusion as part of the labor market.

In this framework, policies need to consider the importance to foster the relationships between public and private actors since the productive sector of the economy is usually the main generator of employment in the country. Agreements between groups of companies with professional educational institutions, the promotion of first employment plans, among

others can be elements to be discussed as a way to help former students to guide their future professional careers at the same time that the recruitment of professionals from the side of the firms can be improved.

It is also considered relevant that as a mechanisms to strengthen the implementation of strategies towards human talent development and their relationship with the labor market, institutional arrangements should be generated among all levels of government so that territorial contexts can be taken into account for the definition of a policy. This because despite of the fact that the Government can implement a policy, is the productive sector which finally determines the existence or not of jobs.

A second implication has to do with the need for professional education systems to be more flexible to the chamging needs in the labor market. Education in specific fields of study has been understood as something unchangeable and without with a imited scope to that area whereas employees are increasingly demanding people who can perform different tasks and have not just one type of skill. This means that education systems require to be constantly changing and adapting to what is required in the labor market with a broader perspective of new careers and new challenges for the existing ones.

Third, the need for linkage between these sectors represents a condition for the fulfillment of the objectives set as part of the national development

strategy. But the link and pottential chain should not be understood only as a necessary process when students are in the transitioning stage from university life to work life but much earlier so to have an integral process in which the student can trace the development of their skills and potential as soon as possible. Here the role that technical and technological baccaulereate is determinant as well as technical and technological insitutes which were not seen in a posotive way as adequate options for professional formation before.

Finally, it is important to recall that the development strategy relied on the investment in human capital as a mechanism to boost innovation for the adoption of technologies and new production relations within the economy. As part of it, students should not consider as their only option the possibility relying on someone else to find a job or start working even when they area of study is not related with the employment and the characteristics of the position do not count for a good condition. Ecuador seems to have potentional for entrepreneurship so a look at that side of the strategy can bring about changes to foster innovation, investment, entrepreneurship and also dependent relationships that wont be allowing the country to grow.

5.1.3.1. Limitations

This research adopted a methodology concentrated on the analysis of main characteristics of the demand side of the labor market in order to link them with the availability of educational programs from the supply side of workforce. The adopted idea sought to create a way to approach towards what is considered as the preferences of the labor demand side which might be a first attempt since limitations can be found.

An adequate exercise around this topic could incorporate, in addition to the information presented regarding employment, sales, salaries and number of companies; reports referring to employers' expectations about skills, abilities, experience, among others. However, the lack of information in this regard represents a limitation of the present investigation but at the same time a working potential for future exercises that due to its impact on the national level would require a macro analysis of policies and strategies.

A second limitation might be related to the fact that the dataset used for the side of the labor market in terms of the business directory is limited to the reports of formal institutions in the country. Despite of the fact that it does account for the main economic

activities, informality is an element that still characterizes the relations in the country and so there is no a formal way to assess its degree of presence within a territorial perspective. It implies then that results might be analyzed in this particular framework and that efforts should be put to promote the formalization of economic activitites.

Third and as presented in previous sections, the professional offer of progrmas in the Ecuadorian context does not count with information about technical and technological institutes for which their source of funding is the private sector. The government has started to work on the topic by making it mandatory the report of information from this year so then further studies around this issue will have the chance to contrast data.

5.1.3.2. Perspectives

The absence of correlation in all the exercises carried out represents a first approach towards the identification of bottlenecks in the implementation of the national development strategy framed in the change of the productive matrix that sought to strengthen investment in human capital for development of prioritized areas to which the production of the country should be oriented in the medium and long term.

In this sense, it is necessary to complement the analysis of the link between the education system and the productive sector, taking into other approaches to allow the comparison of results in order to provide more evidence for the design of public policy. As part of it, it is particular interesting the possibility of researches that report the preferences both from the employers' field and from the students. The preferences of each of them must also be understood as determining the supply of educational programs. The type of skills that are required, experience levels or motivations of employment represent important points of discussion for which a deeper analysis between labor supply and demand needs to be carried out.

Chapter 6: Conclusions and Recommendations

Labor and education are key elements as part of any agenda setting around the world. Both play a determinant role in the promotion of development and economic growth, reason why the link between them is highly desired. On the contrary, the existence of a mismatch among the labor demand and the professional figures supply might imply that the expected benefits of the investment in human capital won't be fully achieved as professionals are displaced to sectors for which they are not trained and so the labor productivity will be affected also shaping the potential economic growth of the country.

One point for discussion as part of the analysis carried out should be related to the idea that labor market as well as the educational sector within an economy are being shaped day by day. Demographic changes, technological developments, as well as national realities configure their structure, condition that should be taken into account in the process of designing and implementing national policies. For the region of Latin America and the Caribbean as well as for Ecuador, the current situation has made evident the need to work in terms of a long term vision that could assess the challenges that are expected to come in the next years from a multidimensional approach. That is to say, that interventions in the educational system for example, should not be isolated from the possible articulations with the productive sector of the economy.

In this sense and directing the analysis in terms of the entailment and relevance it has been showed that, despite the fact that the professional education system was completely reformed to allocate resources and concentrate efforts on the development of human capital according to the prioritized areas of the country, the economic and productive sector of the economy hasn't gone through a structural change that could absorb the labor supply that is being generated. As part of it, the need to promote the participation of different actors and economic sectors in the implementation of the policies if\s required. Governments, academia, citizens, firms, non-governmental organizations, among others should be part of a common agreement to promote synergies.

But synergies should also be promoted within the same Government. In that sense, the relevance of planning and development instruments that allow the mutual allocation of resources to address common problems and reduce the duplication of efforts is denoted. Each time is more relevant the idea of interconnection and interrelations among different sectors of the economy and this research showed the need to work on that, based on a specific case of research. But Government intervention are everywhere affecting and shaping every aspect of the economic and social structure, for which permanent channels of coordination should be maintained.

It is also required to note that the design and put in practice of a policy by its own cannot guarantee success. In the analyzed case, a national strategy was promoted since the last decade in the country but still the desired effects haven't been achieved in terms of the transformation of the production relations of the economy and the reallocation of the workforce in the prioritized sectors. This condition might be leading to considerations about the implementation process and the degree of success in each of the areas of intervention. For the case of the national higher education system for example, the process of restructure might be easier to be put into practice compared to the transformation of a whole productive structure, reason why the time scope in which effects are expected to be seen is also a consideration in the analysis.

In this regard, another discussion idea is the need of implementing an effective monitoring and evaluation strategy. The promotion of an evaluation culture would be an opportune mechanism to allow decision makers to assess the existence of shortcomings that might be affecting or limiting the implementation and so the desired outcomes of a policy. Ecuador made a big investment in terms of reforming the education system with projects that involved not only the whole education system but also infrastructure as well as financing the concession of grants and scholarships in order to accumulate human capital. Despite of that, the available information is still limited in order to know its effective implementation. As an example, reports of the location of beneficiaries of grants and scholarships is barely generated and so its contribution to the change of the production matrix is hard to be assessed. In the same line, the information

available about the whole professional education system is still barely available or in process to be generated, condition that limits the potential process of monitoring and evaluation.

As part of it, it is evident that the country relies mainly on the availability of data from national surveys which tend to be highly expensive and limited in terms of the information they could provide while the administrative records still present deficiencies in terms of data validity, complete information as well as management and report. In this sense, the capacity of governmental institutions to commit to the management of own data for the management monitoring represents an opportunity not only for the generation better information systems but for the promotion of accountability and results.

The desire to research about the existing of a mismatch problem among the labor market and the educational system supply comes from the fact that studies in this area haven't been implemented in the country but can represent a highly promising tool for the generation of evidence to organize and structure the education and productive sectors of the economy. Ecuador has been trying to successfully design and implement programs aligned to the productive vocation of each territory but the need to accompany this strategy with changes in the production relations has become a real challenge.

Human talent is a critical element for the development of a country and investment on it can represent a chance to overcome structural problems like inequality, which have characterized economies in the Latin American Region. However, the only option to achieve the desired effects and take a chance for success is to constantly adapt to the new changing and dynamic economy which seems to be displacing workers to specific sectors of the economy (services for example). This movements of the workforce shouldn't be ignored and instead used to ensure that policies secure not only employment but the quality of it and the contribution to the economy.

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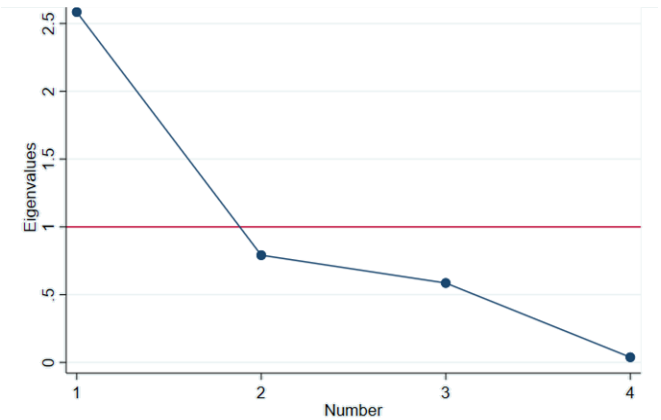
Appendix

1. Components Analysis Report

For the assessment of the correlation among the educational programs and the labor demand a component analysis was developed for which component 1 was used to account for the variability of all the analyzed variables. The exercise was based on the calculated data reported as follows:

Component	Eigenvalue	Difference	Proportion	Cumulative
Component 1	2.58	1.79	0.65	0.65
Component 2	0.79	0.21	0.20	0.84
Component 3	0.59	0.55	0.15	0.99
Component 4	0.04	.	0.01	1.00



Elaboration: Author

Abstract in Korean

에콰도르의 노동시장과 고등교육:
기술수준의 적합성을 중심으로

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글로벌행정전공

에콰도르에서의 경제개발 전략의 일환으로 추진된 교육투자는 양질의 인력양성을 통한 노동공급이 산업계에서의 수요와 매칭됨으로써 산업발전은 물론 개인의 소득성장을 유발할 수 있을 것이라는 의도에서 추진되고 있다. 특히 고급기술의 인력 양성은 사회적 효율성을 제고할 수 있는 중요한 방안이라는 점에 초점을 맞추고 있다. 그러나 본 연구는 2017 년 교육기관별 노동공급과 기업의 고용현황을 지역별로 구분하여 살펴보고, 이들 간의 상관성에 대한 검토를 통해 여전한 불일치를 발견하였다. 즉, 지역별로 공급되는 노동력의 기술수준과 양이 기업이 고용하는 기술수준과 양과 서로 상이한 조합을 보이고 있다는 것이다. 이러한 결과는 지난 수년 간의 노력에도 불구하고 산업 생산성에 영향을 미치는 인력 재할당, 기업가정신과 혁신을 촉진해야 할 필요성, 교육 시스템의 개혁, 민간 및 공공의 시너지를 촉진한다는 측면에서 시사하는 바가 있다.

주제어: 교육, 노동시장, 불일치

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