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Incidence of Human Capital in the Innovative Performance of Service Companies: A Study in Ecuador

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Abstract: The relationship between human capital and innovative performance in service companies has been studied in countries with fast-growing economies and knowledge-intensive companies, but little evidence exists in other contexts. The research examined the relationship between human capital variables and the innovative performance of Ecuadorian service companies. The methodology is quantitative. It is a non-experimental, cross-sectional investigation, and data from Ecuador from the national survey of innovation activities 2015 were used. A bivariate probit regression was performed. The results indicate that the variable training in innovation activities is positively related to service innovation, but not to process innovation, because service innovation requires a greater development of skills and abilities than process innovation in these activities. Company workers and the variable workers with higher education are positively related to process innovation, but not to service innovation. The research contributes to the gap in the literature on the relationship between human capital variables and innovative performance and provides empirical evidence of the relationship in developing countries where evidence is scarce. The research has practical implications for managers and administrators of service companies: Increasing training in innovation activities can increase the potential for service innovation and increasing workers with higher education increases the innovative potential in the processes in these companies. The originality of this study is that it presents evidence of this relationship in a developing country that has companies in a different context such as scarcity of qualified human resources, low level of R&D investment, and companies with a medium level of knowledge complexity, since the evidence focuses on companies in developed countries and knowledge-intensive companies.

Keywords: human capital; innovative performance; training; specialized personnel



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1. Introduction

Innovation is a driver of a country's economic development (Aleknavičiūtė et al. 2016; Pejić Bach et al. 2015). In developed countries, human capital is the most important source of innovative performance in companies (Aleknavičiūtė et al. 2016). In developing countries, many companies have low innovation capacity and as a result have a low level of competitiveness (Pejić Bach et al. 2015), due to low investment in research and development and several internal barriers in companies such as the lack of qualified personnel (Zanello et al. 2016).

Innovation in service companies has had less interest in specialized literature than manufacturing or product innovation (Gopalakrishnan et al. 1999). Innovation in service

companies represents a strategic advantage (Prajogo and Oke 2016; Storey and Kahn 2010) and sustained growth for these companies (Tadic et al. 2015). Service companies require human capital for innovation, that is, to develop skills and abilities in staff (Storey and Kahn 2010). The evidence of the relationship between human capital and innovative performance in service companies is concentrated in knowledge-intensive companies (Doloreux and Frigon 2020; Figueiredo et al. 2019)

There is a strong expansion in knowledge-intensive service companies that are considered essential for the development of economies because they contribute to the generation of employment and wealth (Miles et al. 2018), so it is important to know how service companies innovate and examine these companies regarding the relationship between human capital and innovative performance.

Human capital is considered a part of the intellectual capital of a company, including knowledge, skills, know-how, education, and learning capacity (Aleknavičiūtė et al. 2016). Human capital is formed by education (Carter 1989; González et al. 2016), training (Chatterjee 2017; Hewitt-Dundas 2006), and experience at work, especially in previous R&D processes (Allameh 2018; González et al. 2016). Its main purpose is to create innovation in companies through generating new ideas, and creating and improving products and services (Agostini et al. 2017).

The relationship between human capital variables and innovative performance has been studied in fast-growing economies (Ma et al. 2019) and in companies with complex knowledge (Buenechea-Elberdin et al. 2018) and knowledge-intensive service companies (Doloreux and Frigon 2020), but there are few studies in other contexts, such as companies in developing countries that have less qualified workers and service companies handle less complexity of knowledge, so it is not known in these other contexts if the variables of human capital are related to the innovative performance of companies. Little is known yet about how human capital or the skills and abilities acquired by workers affect innovative performance in service companies (Chowhan 2016; Nieves and Quintana 2018), and there is a gap in the literature on the relationship between human capital and innovative performance (Van Uden et al. 2017).

This research aims to examine the relationship between human capital variables and innovative performance in service companies in Ecuador, a developing country, to contribute to the gap in the literature on how human skills can affect innovation in service companies. In Ecuador, these companies have a medium level of technology and complexity of knowledge. In 2014, Ecuador spent 0.44 of its GDP on R&D (World Bank 2021), which indicates that it is a country with a low level of investment in innovation. It is a country in which service companies have a shortage of qualified workers.

This study is original because it presents evidence on the relationship between human capital and innovative performance in Ecuador, a developing country that has companies in a different context, such as a shortage of qualified human resources, a low level of investment in R&D, and service companies with a medium level of knowledge complexity, since the evidence focuses on companies from developed countries and knowledge-intensive companies.

The study provides results regarding which variables of human capital are positively related to innovative performance in these service companies that operate in a different context from those companies where there is empirical evidence, which allows us to understand how human skills contribute to innovation in these types of companies.

The structure of the paper is as follows. In Section 2, the literature review is described, and the research hypotheses are outlined. Section 3 presents the data and the methodology. Section 4 reports the results. In Section 5 the results are discussed. Finally, Section 6 presents the conclusions and implications.

2. Literature Review

The resource-based view of firms considers innovation as a result of the resources and capabilities available to the company (Barney 1991; Penrose 1959; Wernerfelt 1984). In this theory, knowledge is considered the main resource for innovation (Grant 1996).

In the open innovation paradigm, knowledge in the company for innovation may be limited, so they seek to increase knowledge by acquiring external knowledge through links with other market players (Bogers et al. 2018), but the company requires an absorption capacity that allows internalizing the external knowledge that reaches the company as a result of interactions with other companies and organizations (Cohen and Levinthal 1990; Laursen and Salter 2006). In service companies, there is a relationship between human capital and the absorptive capacity of the company in such a way that the more human capital the company has, the greater its capacity to absorb external knowledge or assimilate new knowledge in the company (Doloreux and Frigon 2020). Absorptive capacity is a determining factor for innovation in developing countries (Pekovic et al. 2015).

Human capital has been widely recognized as a driver of business innovation (Jones and Grimshaw 2012). The main elements of human capital are knowledge, skills, know-how, education, and learning capacity (Aleknavičiūtė et al. 2016). Human capital is formed by education, training, willingness to change at work, and job satisfaction, and is composed of tangible and intangible resources, all of which lead to the competitive advantage of companies (McGuirk et al. 2015). Human capital is considered a part of the intellectual capital of a company, and although the benefits of human capital are not visible, knowledge is the main factor of human capital (Aleknavičiūtė et al. 2016).

Knowledge-based human resource management methods with a mediatory role of human capital impact the innovative performance, including those practices purposefully designed to enhance knowledge processes within an organization. (Shahtaheri and Teymournejad 2020). Ethical leadership with the mediating role of human capital impacts the innovative performance of companies, because it encourages ideas for staff innovation (Ullah et al. 2021). Human resource management can increase the human capital of organizations by managing to share the tacit knowledge that employees have (Oliveira et al. 2021), and knowledge-based human resource management increases the intellectual capital of the company, and this is the innovative performance of companies (Kianto et al. 2017).

The main purpose of human capital is to create innovation in companies through generating new ideas, and creating and improving products and services (Agostini et al. 2017). Human capital specifically in service companies has the ability to create new knowledge and lead to innovation and competitive advantage (Prajogo and Oke 2016). Innovation is achieved by using the skills and abilities of staff to generate new knowledge or new uses of knowledge or combine knowledge to achieve innovation (Rupietta and Backes-Gellner 2019). Innovation can also be increased by the company's human capital through the role of social capital, which leads to more prudent and sustainable innovative organizations (Samad 2020).

Empirical evidence in the literature indicates that human capital has a greater impact on innovative performance in companies in fast-growing economies (Ma et al. 2019) and in companies that manage complex knowledge (Buenechea-Elberdin et al. 2018) and knowledge-intensive service companies or those that provide sophisticated knowledge-based services (Doloreux and Frigon 2020) because the workers represent the company's R&D capabilities, practical knowledge, experience, and know-how (Ma and Yu 2021). However, a critical portion of the knowledge required for service innovation comes from the knowledge of workers and is created outside of formal R&D activities (Capozza and Divella 2019), such as the customer relationship network or at the points of contact between customers and employees (O'Cass and Wetzels 2018).

There are differences between service innovation and manufacturing innovation: Service innovation companies sometimes have a lower level of R&D intensity (Durst et al. 2015), so in these companies, the knowledge of the workers and the links with other companies and organizations have an important role to acquire external knowledge, since knowledge and innovative ideas can come from different sources and arise from their daily activities or from employees, internal R&D, and from other external sources such as customers, suppliers, service providers, and universities (Zieba et al. 2017). Service

innovation can also come from co-creation processes with other actors, mainly customers and suppliers (Hidalgo and Herrera 2020).

The literature on service innovation, although it has been increasing in recent years, is still scarce, but it recognizes that services are intangible and sometimes personalized to the needs of the client, which is why service innovation is different, so service companies do not always carry out R&D to innovate, but they do need to increase knowledge to innovate (Durst et al. 2015), so these companies have different ways in which they achieve knowledge for co-creation and transfer of knowledge for innovation between service companies (Figueiredo et al. 2019). Therefore, further studies on service innovation are required (Durst et al. 2015).

Despite the little empirical evidence on the relationship of the human capital variables examined in this research with innovative performance in service companies, little is known about how human capital, or the skills and abilities acquired by workers affect the innovative performance in service companies (Chowhan 2016; Nieves and Quintana 2018) so there is a gap in the literature on the relationship between human capital and innovative performance (Van Uden et al. 2017).

The variables of human capital are related to the stock of knowledge, quality of knowledge, and development of human capital, so the variable of the knowledge stock can be measured by the total number of workers available to the company since it represents the stock of knowledge for innovation and includes the key workers in the knowledge regarding human capital in the company and can lead to innovation (Mariz-Pérez et al. 2012; Sánchez Muñoz et al. 2014).

Human capital contributes with knowledge, skills, and know-how (Aleknavičiūtė et al. 2016), and increases the absorptive capacity of the company (González et al. 2016), which is a capacity to absorb external knowledge acquired by the company through links with other companies and organizations. Innovation comes from finding new knowledge or new uses for knowledge for which human skills are used (Rupietta and Backes-Gellner 2019) and represents the previous experiences (González et al. 2016). Depending on this stock of knowledge and experiences, the company increases its human capital and can also increase its innovative potential. Considering these factors, we argue the following hypothesis:

Hypothesis 1 (H1). *Company workers are positively related to the innovation of services and processes of the service companies.*

Human capital is acquired through formal education where skills are developed (Al-lameh 2018; González et al. 2016). It is considered that such workers, through formal education, acquire knowledge and develop skills and that such workers can internally expand knowledge to other workers in the company. Further, workers with higher education are in a better technical position to recognize the external knowledge that comes to the company through external sources of information and internalize it in the company so that it is available for innovation (Carter 1989). The management literature has identified highly qualified human capital as a crucial dimension of the innovation process in the company (Fonseca et al. 2019).

Higher education provides workers with skills and abilities (Carter 1989; González et al. 2016), and these skills are used in innovation in companies (Capozza and Divella 2019; Aleknavičiūtė et al. 2016; Smith et al. 2005; Van Uden et al. 2017). These human skills provided by higher education increase the human capital of the company, and workers with formal education have a better capacity to help identify and internalize the external knowledge that the company requires for innovation (Carter 1989). Further, workers with a higher education are a measure of human capital. Considering these factors, we argue the following hypothesis.

Hypothesis 2 (H2). *Workers with higher education are positively related to the innovation of services and processes of service companies.*

Human capital is acquired through training and experience at work, especially in previous R&D processes (Allameh 2018; González et al. 2016). Human capital is also measured with the variable training for innovation activities. It is identified with the training of workers in companies in the various innovative activities and is important because it increases skills, knowledge, and skills for innovation (Lin and Chen 2006). Training also increases the level of specialization of workers which promotes innovation in the company (Chatterjee 2017; Hewitt-Dundas 2006). The evidence of companies that invest in professional training is that they have high returns on investment and economic benefits (Samoliuk et al. 2021).

Human resource management such as training aimed at improving staff skills is more effective for innovation in emerging economies than formal education of workers (Capozza and Divella 2019). The mediating effect of learning orientation in the company and business strategy contributes to the results of innovation. Therefore, through training in innovation activities, the company improves its innovative potential (Meekaewkunchorn et al. 2021).

Considering that training increases knowledge, provides skills, and develops skills to staff, complementing the skills provided by higher education and providing specific skills for innovation in companies (Chang et al. 2011; Martínez-Ros and Orfila-Sintes 2012; Ottenbacher et al. 2006; Van Uden et al. 2017). It increases knowledge for innovation (Lin and Chen 2006), and also increases the level of specialization of workers which promotes innovation in the company (Chatterjee 2017; Hewitt-Dundas 2006). Training in innovation activities increases the human capital of the company and its potential to develop innovations. Considering these factors, we argue the following hypothesis.

Hypothesis 3 (H3). *Training in innovation activities is positively related to the innovation of Services and processes of service companies.*

The research examines the relationship between the variables of human capital and innovative performance using data from Ecuador. Two types of service and process innovation are considered because human capital can influence differently depending on the type of innovation (Buenechea-Elberdin et al. 2017). In the literature, variables have been identified that can affect the innovation in a company, such as the variable company seniority because older companies may have more accumulated knowledge (Lefebvre et al. 2015), and the variable R&D intensity measured in R&D/sales expenses considered a measure of the absorption capacity of the company due to the fact that companies with more expenses in R&D they can develop greater skills and knowledge (Cohen and Levinthal 1990; Laursen and Salter 2006). The innovation capacity of a company can also vary according to its characteristics such as its size, industry, and area of activity (Civelek et al. 2021) or by the type of investment in innovation (Lewandowska 2021). Figure 1 shows the relationship of the variables identified in the literature review.

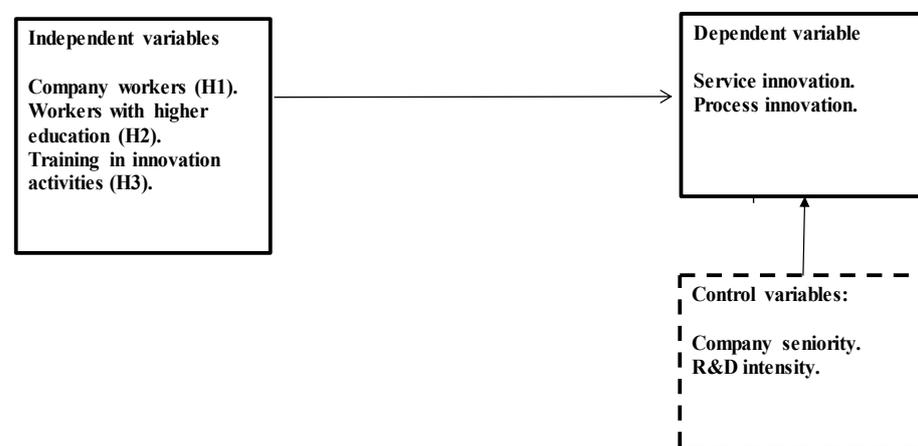


Figure 1. Table of relationship of variables.

3. Methodology

The method used was quantitative. The design was non-experimental and transversal. The quantitative method was an appropriate method for examining relationships on the variables of human capital and innovative performance. The research uses a deductive approach as it starts from previous theories. Several scholars have used the quantitative method to examine human capital variables and their relationship to innovative performance (e.g., [Capozza and Divella 2019](#); [Fonseca et al. 2019](#); [Van Uden et al. 2017](#)).

The study population of the research corresponds to the companies of the Ecuadorian national survey of innovation activities 2015 (period 2012 to 2014). The Ecuadorian survey follows the guidelines of the Oslo manual ([OECD/Eurostat 2018](#)) which is widely used in many Latin American countries ([Guillard and Salazar 2017](#)) and countries of the Organization for Economic Cooperation and Development (OECD). The data were collected in 2015 and 2016 by the National Institute of Statistics and Censuses of Ecuador (INEC), through visits with interviewers to each of the 6275 companies in the sample (industrial, commercial, service, retail, mining and quarry companies). The INEC validated the registration of the survey data through software that had a data validation mesh. The INEC also carried out all the reliability analysis tests of the survey data, such as a Cronbach's alpha, prior to the survey data being posted on the INEC website and made available to the public. For the present study, 2509 service companies were filtered from the survey sample.

The form used by the INEC follows the guidelines of the Oslo Manual ([OECD/Eurostat 2018](#)) and registers in a binary variable if the company has carried out service innovation in the period examined, and likewise in another binary variable if it has carried out process innovation. The form records the number of workers by level of education of the workers and the expenses for training in R&D activities that the company has carried out in the period examined. Ecuador uses the dollar as its current currency.

To measure the innovative performance of service companies, the criterion of having two measures for innovative performance was used: service innovation and process innovation with a dichotomous variable measure that takes the value of one for service companies that have innovated in the analyzed period and takes the value of zero for companies that have not innovated in the analyzed period.

To measure human capital in this research, the following measures were considered: (a) workers of the company measured by the number of workers of the company that represents the stock of knowledge of the company ([Sánchez Muñoz et al. 2014](#)) (b) workers with higher education that measures the quality of knowledge measured by the ratio number of workers with higher education/total workers ([Carter 1989](#); [González et al. 2016](#)) and (c) the training of workers in innovation activities measured by the ratio of training expenditures for innovation activities to total sales, which measure knowledge development ([González et al. 2016](#); [Lin and Chen 2006](#)).

To measure the control variables: company seniority, the number of years of the company in business was considered ([Lefebvre et al. 2015](#)) and to measure the variable R&D intensity, the ratio of R&D/sales expenses was considered ([Laursen and Salter 2006](#)). Table 1 shows the composition of the variables.

Econometric model:

The following econometric model based on the literature is presented.

$$Y1 = \beta_0 + \beta_1 X1 + \beta_2 X2 + \beta_3 X3 + \beta_4 X4 + \beta_5 X5 + \epsilon_i \quad (1)$$

$$Y2 = \beta_0 + \beta_1 X1 + \beta_2 X2 + \beta_3 X3 + \beta_4 X4 + \beta_5 X5 + \epsilon_i \quad (2)$$

Dependent variable:

Y1 = Service innovation.

Y2 = Process innovation.

Explanatory variables:

X1 = Number of workers in the company.

X2 = Workers with completed higher education (including those in higher technical education)/total workers.

X3 = Expenditure on staff training for innovation activities/total sales.

Control variables:

X4 = Years of the company in business.

X5 = R&D expenses/total sales.

The verification of the Pearson correlations between the variables was carried out in order to verify if there are strong correlations between the variables (Kozak 2009). It was verified that there is no strong multicollinearity between the variables using the VIF (variance inflation factor) test, verifying that the VIF value is less than 3.0, which is a commonly accepted value (Brauer and Wiersema 2012). To avoid heteroscedasticity problems, the model incorporates robust standard errors, which allows the construction of a heteroscedasticity-robust t statistic, for which Software Stata was used.

Table 1. Variable composition.

Nomenclature		Composition	Variable Type	Authors
Service Innovation	Y1	1 = There is service innovation 0 = There is no service innovation	Binomial	
Process Innovation	Y2	1 = There is process innovation 0 = There is no process innovation	Binomial	
Company workers	X1	Number of employees in the company	Continuous	Ma and Yu (2021); Sánchez Muñoz et al. (2014)
Higher education workers	X2	Number of higher education workers/total workers	Continuous	Capozza and Divella (2019); McGuirk et al. (2015); Na (2021); Van Uden et al. (2017)
Training innovation activities	X3	Expenditure on training of innovation activities/total sales	Continuous	Capozza and Divella (2019); Chang et al. (2011); Ma et al. (2019); Martínez-Ros and Orfila-Sintes (2012); Na (2021); Van Uden et al. (2017)
Company seniority	X4	Number of years of the company in business	Continuous	Lefebvre et al. (2015); Onkelinx et al. (2016)
R&D intensity	X5	R&D expenses/total sales	Continuous	Gallié and Legros (2012); Laursen and Salter (2006)

Regression:

The regression method was the bivariate probit, this probit method was selected because the dependent variables are binary so it is necessary to use a discrete method and for these cases other methods such as least squares are not appropriate, so it has been model of discrete choice and the distribution function of the typified normal. We selected bivariate probit because we have two binary dependent variables (service innovation and process innovation) that could be correlated and the same group of explanatory or independent variables. The literature shows evidence of this bivariate probit method in the treatment of two binary variables for innovative performance (e.g., Criscuolo et al. 2018; Gómez et al. 2016; Ruiz-Pava and Forero-Pineda 2018).

The bivariate probit regression is performed using two models, the baseline model that includes only the control variables and the full model that includes all the independent variables and the control variables, in order to verify that in the full model there is no significant variation when including the independent variables.

4. Results

For the econometric model, the existence of problems of endogeneity, heteroscedasticity, and multicollinearity was analyzed. It was verified that there are no strong correlations between the variables as shown in Table 2 where the correlations are less than 0.8. Therefore, with the values of the correlations obtained, it is verified that there are no strong correlations between the variables (Kozak 2009).

Table 2. Pearson correlations of variables.

Variable	Company Workers	Higher Education Workers	Training Innovation Activities	Company Seniority	R&D Intensity
Company workers	1	0.402 **	−0.0044	0.060 **	−0.00393
Higher education workers	0.402 **	1	0.021	0.135 **	0.047 **
Training innovation activities	−0.0044	0.021	1	0.015	0.020
Company seniority	0.060 **	0.135 **	0.015	1	−0.025 *
R&D intensity	−0.00393	0.047 **	0.020	−0.025 *	1

** The correlation is significant at the 0.01 level (2 tails). * The correlation is significant at the 0.05 level (2 tails).

To verify multicollinearity problems, the VIF test (inflation of variance factor) was used. Table 3 shows the VIF values were obtained <3, concluding that they were within the commonly accepted values (Brauer and Wiersema 2012). Thus, it was validated that there were no multicollinearity problems.

Table 3. VIF Factor (variance inflation factor).

Variable	VIF
Company workers	1.194
Higher education workers	1.216
Training innovation activities	1.001
Company seniority	1.020
R&D intensity	1.004

4.1. Descriptive Results

Descriptive results were obtained by classifying the companies according to the International Standard Industrial Classification, which is shown in Table 4, where it is observed that the groups with the most companies in the sample are: construction, with 19.49%, transportation and storage, with 15.94%, accommodation and food service activities, with 15.58%, and professional, scientific, and technical activities, with 14.15%. This shows that in Ecuador, service companies are mostly medium-level industries of knowledge complexity.

Table 4. Service companies in the sample according to the International Standard Industrial Classification.

Group	Description	Number of Companies	Percentage (%)
D	Electricity, gas, steam, and air conditioning supply	39	1.55
E	Water supply, sewerage, waste management, and remediation activities	62	2.47
F	Construction	489	19.49
H	Transportation and storage	400	15.94
I	Accommodation and food service activities	391	15.58
J	Information and communication	175	6.97
K	Financial and insurance activities	240	9.57
L	Real estate activities	101	4.03
M	Professional, scientific and technical activities	355	14.15
N	Administrative and support service activities	92	3.67
Q	Human health and social work activities	165	6.58
Total		2509	100.00

Table 5 shows the number of workers in service companies by level of education, where it is observed that there is a low number of workers qualified in specific tasks that require specialized knowledge (doctorate 0.29%, master's degree 1.79%, specialist 1.92%, technologist/technical 5.80%) and the largest number of workers is concentrated in the levels of higher education 23.36% and bachelor with 48.11% who contribute with general knowledge.

Table 5. Educational level of company staff.

Educational Level	Number of Workers Year (2014)	Percentage (%)
Doctorate	946	0.29
Master's degree	5934	1.79
Specialist	6357	1.92
Higher education	77,282	23.36
Technologist/technical	19,183	5.80
Bachelor	165,516	49.11
Basic education	58,673	17.73
Total	330,891	100.00

Table 6 details the descriptive results of the mean and standard deviation of each variable analyzed, the companies examined have a mean number of workers = 131.88, ratio higher education/total workers = 0.29, ratio expenses training activities innovation/total sales = 0.001, years in business = 16.98, and ratio expenses in R&D/total sales = 0.005. In these results, low values are observed in the expenses of companies in the training of innovation activities and R&D intensity. This constitutes a limitation in the development of the human capital of Ecuador's service companies.

Table 6. Descriptive results.

Variable	Measure	Mean	Standard Deviation
Company workers	Number of workers	131.88	458.06
Higher education workers	Worker with higher education	36.08	151.31
	Ratio of workers with higher education/total workers	0.29	0.28
Expenditure training activities innovation	Ratio expenses training activities innovation/total sales	0.001	0.025
Company seniority	Years in business	16.98	13.80
R&D intensity	Ratio expenses R&D/total sales	0.005	0.124

4.2. Probit Regression Results

In Table 7, the estimates of the bivariate probit regression for the two models are shown. The first two columns for the baseline model that only considers the control variables, the coefficients of this model are consistent with the previous literature on innovation and, as an important aspect, do not vary much in magnitude or significance when we include the independent variables. The full model includes both the independent variables and the control variables, it is observed that the variable company workers and workers with higher education are significant for process innovation and training innovation activities is significant for service innovation. Regarding the control variables, it is observed that R&D intensity is significant for process innovation.

Table 7. Bivariate probit regression results.

Variables	Baseline Model		Full Model	
	Service Innovation (Coef/Robust Standard Error)	Process Innovation (Coef/Standard Robust Error)	Service Innovation (Coef/Robust Standard Error)	Process Innovation (Coef/Standard Robust Error)
Company workers			−0.1857054 (0.1692586)	0.3991925 *** (0.0436765)
Workers with higher education			0.1406484 (0.2842448)	0.6904759 *** (0.0895475)
Training innovation activities			1.210912 * (0.7604263)	1.770106 (1.326696)
Company seniority	−0.0264673 *** (0.0102462)	0.0071054 *** (0.0018843)	−0.3830874 (0.2463664)	0.0308844 (0.0787704)
R&D intensity	0.1322727 (0.1148146)	15.9831 ** (7.373352)	0.1412018 (0.1065592)	14.12894 ** (6.879723)
Constant	−2.491635 *** (0.1749337)	−0.70501 *** (0.0436946)	−2.228359 *** (0.2603093)	−1.487104 *** (0.108257)
Number of comments	2509		2509	
Wald chi2(10)	26.70		161.03	
Prob > chi2	0.0000		0.0000	

Note: *** p value < 0.01, ** p value < 0.05, * p value < 0.10.

The results of Table 7 show that the hypothesis H1 = workers of the company, is positively related to process innovation and no relationship was found with service innovation. In relation to the hypothesis H2 = workers with higher education, it is positively related to process innovation and no relationship was found with service innovation.

In relation to hypothesis H3 = training in innovation activities is positively related to service innovation and no relationship was found with process innovation. No relationship was found of the company seniority with the innovation of services and the innovation of processes, in addition it was found that the intensity R & D is positively related to the innovation of processes and not to the innovation of services.

5. Discussion

This research aimed to examine the relationship between human capital variables and innovative performance in service companies in Ecuador, a developing country, to contribute to the gap in the literature on how human skills can affect innovation in service companies. The human capital variables that were examined were: company workers, workers with higher education, and training in innovation activities.

Regarding the hypothesis H1 company workers, which represents the stock of knowledge of the company, no relationship was found with the innovation of services. However, with the innovation of processes, the results were different from those found by [Sánchez Muñoz et al. \(2014\)](#), who found in service companies that the number of workers is negatively related to service innovation. The results could be explained because in service companies, they require greater development of skills and abilities ([Storey and Kahn 2010](#)) to innovate services than the knowledge required to innovate processes. The results are different from what was mentioned by [Ma and Yu \(2021\)](#), who found that the number of workers, especially R&D workers, increases the R&D capabilities and the innovative potential in the company. This is explained because service companies may have a lower level of R&D ([Durst et al. 2015](#)), because a portion of the knowledge required for service innovation can come from the knowledge of workers and be created outside of formal R&D activities ([Capozza and Divella 2019](#)), such as knowledge in the customer relationship network or at the points of contact between customers and employees ([O’Cass and Wetzels 2018](#)).

Regarding the hypothesis H2 workers with higher education that represents the skills and abilities achieved by workers with higher education, the results indicate that it was not related to service innovation. These results are in agreement with those found by [Van Uden et al. \(2017\)](#), [McGuirk et al. \(2015\)](#), and [Sánchez Muñoz et al. \(2014\)](#), who found no relationship between higher education of workers and service innovation, but are contrary to those found by [Smith et al. \(2005\)](#), [Barasa et al. \(2017\)](#), and [Na \(2021\)](#), who did find a relationship between the higher education of workers and innovation in services. The results can be explained in a similar way, the knowledge provided by formal education increases organizational knowledge, but this knowledge is more useful to innovate processes, since to innovate services companies require greater development of skills and abilities ([Storey and Kahn 2010](#)). The results are also explained by the fact that Ecuadorian companies have a low percentage of workers with a complete university education, so this variable contributes to process innovation in service companies but does not provide the skills and knowledge necessary for service innovation.

Regarding the H3 hypothesis, training in innovation activities, a positive relationship was found with the innovation of the service, which is in accordance with the results of [Van Uden et al. \(2017\)](#), [Chang et al. \(2011\)](#), [Martínez-Ros and Orfila-Sintes \(2012\)](#), [Nieves and Quintana \(2018\)](#), [Ottenbacher et al. \(2006\)](#), [Prajogo and Oke \(2016\)](#), [Goodarzi et al. \(2015\)](#), [Chatterjee \(2017\)](#) and [Na \(2021\)](#). The results can be explained by the fact that training in innovation activities manages to develop those skills that innovation require and that are generally not obtained with higher education, such as skills to work with specific knowledge, which generate new uses for knowledge or can combine existing knowledge to gain new knowledge and skills and knowledge that increase absorptive capacity. The results show that the variable training in innovation activities is an important variable in Ecuadorian service companies since through training in innovation activities workers increase their skills and abilities to develop and innovate services, while the other variables workers of the company and workers with university education only they affect process innovation, that is, they increase organizational knowledge to improve processes.

As for the company seniority, the results indicate that this variable is not related to innovation, this could be explained because innovation is produced mainly for knowledge and in these companies the knowledge accumulated by the seniority of the company does not affect service innovation, similarly the variable R&D intensity (R&D/sales expenses) is only related to process innovation, which could be explained by the companies that spend the most in R&D they are not necessarily the ones that acquire more knowledge for the development of innovation, since service innovation requires a higher level of expertise than process innovation.

The research has theoretical implications because Ecuadorian service companies have low levels of investment in R&D and level of education of workers. Likewise, the environment of the service industry in Ecuador corresponds to companies that do not manage complex levels of knowledge, and it is a type of company in developing countries for which there is little empirical evidence on how human skills contribute to innovation, because the empirical evidence on the relationship between human capital and innovation in service companies is concentrates on companies with fast-growing economies ([Ma et al. 2019](#)) and companies that handle complex knowledge ([Buenechea-Elberdin et al. 2018](#)) or knowledge-intensive services companies, or those that provide sophisticated knowledge-based services ([Doloreux and Frigon 2020](#)). The research contributes to the literature that these companies, through training in innovation activities, develop the skills and abilities necessary to influence innovation in the service, despite the limitations in investment in R&D and the level of staff education, because the training develops specific skills for innovation, which are not developed by higher education that provides skills for process innovation in these companies.

The research has practical implications for managers and administrators of service companies, in terms of the knowledge that increasing training in innovation activities can increase the company's human capital and this can increase the potential to innovate

services, so increasing the level of training of workers increases human capital and this can increase the potential to innovate the processes of service companies.

6. Conclusions

This research aims to examine the relationship between human capital variables and innovative performance in service companies in Ecuador, a developing country, to contribute to the gap in the literature on how human skills can affect innovation in service companies. The human capital variables that were examined were: company workers, workers with higher education, and training in innovation activities.

6.1. Main Conclusions

The main findings are that in the service companies of Ecuador training in innovation activities is positively related to service innovation, and the other two variables examined: company workers and workers with higher education are related to process innovation in service companies. This implies that training in innovation activities improves workers' skills and abilities that are specific and necessary for service innovation, such as skills to manage knowledge or find new uses for knowledge, provide new innovation ideas, which are skills and abilities that they are not obtained in higher education, which provides general skills for work in the company, nor with company workers, which represents the general stock of knowledge in the company.

6.2. Theoretical Implications

The research has theoretical implications due to the fact that the service companies examined have low levels of investment in R&D and level of education of the workers. Likewise, the environment of the service industry in Ecuador corresponds to companies that do not manage levels knowledge complexes, and it is a type of developing country company for which there is little empirical evidence of the relationship human capital and service innovation, given that the empirical evidence is concentrated in companies with fast-growing economies and in companies that manage complex knowledge or knowledge-intensive service companies, or those that provide sophisticated knowledge-based services. The theoretical implication is that these companies, through training, develop the necessary skills and abilities to achieve service innovation, despite the limitations in investment in R&D and the level of education of the staff.

6.3. Practical Implications

The research has practical implications for managers and administrators of service companies in similar contexts, in terms of the knowledge that increasing training in innovation activities can increase the company's human capital and increase the potential to innovate services, as well increasing the number of workers with higher education can increase the potential for process innovation in these companies.

This research has social implications because a representative number of service companies in developing countries have deficiencies in qualified human resources and low levels of R&D and this knowledge allows you to understand that training in innovation activities is a main variable that allows them to develop skills and abilities of the staff to increase human capital and improve their innovative performance. Through this, they can improve their social environment.

6.4. Limitations and Future Lines of Research

The results of this research should be considered as limited due to the temporality of the data and the scarce empirical evidence of the relationship in companies of service of human capital and innovative performance in developing countries. Future research is recommended to obtain more empirical evidence of these relationships in other developing countries, in addition to the availability of longitudinal data that allows validating the evidence provided on the variables that affect innovation in service companies in these

countries. It is recommended to study how the co-creation process affects human capital in service companies and to carry out studies on knowledge-based human resources management practices that impact the human capital of a service company, producing greater performance in innovation, in developing countries.

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References

- Agostini, Lara, Anna Nosella, and Roberto Filippini. 2017. Does intellectual capital allow improving innovation performance? A quantitative analysis in the SME context. *Journal of Intellectual Capital* 18: 400–18. [\[CrossRef\]](#)
- Aleknavičiūtė, Rasa, Viktorija Skvarciany, and Simona Survilaitė. 2016. The Role of Human Capital for National Innovation Capability in Eu Countries. *Economics and Culture* 13: 114–25. [\[CrossRef\]](#)
- Allameh, Sayyed Mohsen. 2018. Antecedents and consequences of intellectual capital: The role of social capital, knowledge sharing and innovation. *Journal of Intellectual Capital* 19: 858–74. [\[CrossRef\]](#)
- Barasa, Laura, Joris Knobens, Patrick Vermeulen, Peter Kimuyu, and Bethuel Kinyanjui. 2017. Institutions, resources and innovation in East Africa: A firm level approach. *Research Policy* 46: 280–91. [\[CrossRef\]](#)
- Barney, Jay. 1991. Firm resources and sustained competitive advantage. *Journal of Management* 17: 99–120. [\[CrossRef\]](#)
- Bogers, Marcel, Henry Chesbrough, and Carlos Moedas. 2018. Open innovation: Research, practices, and policies. *California Management Review* 60: 5–16. [\[CrossRef\]](#)
- Brauer, Matthias F., and Margarethe F. Wiersema. 2012. Industry divestiture waves: How a firm's position influences investor returns. *Academy of Management Journal* 55: 1472–92. [\[CrossRef\]](#)
- Buenechea-Elberdin, Marta, Josune Sáenz, and Aino Kianto. 2017. Exploring the role of human capital, renewal capital and entrepreneurial capital in innovation performance in high-tech and low-tech firms. *Knowledge Management Research and Practice* 15: 369–79. [\[CrossRef\]](#)
- Buenechea-Elberdin, Marta, Josune Sáenz, and Aino Kianto. 2018. Knowledge management strategies, intellectual capital, and innovation performance: A comparison between high- and low-tech firms. *Journal of Knowledge Management* 22: 1757–81. [\[CrossRef\]](#)
- Capozza, Claudia, and Marialuisa Divella. 2019. Human capital and firms' innovation: Evidence from emerging economies. *Economics of Innovation and New Technology* 28: 741–57. [\[CrossRef\]](#)
- Carter, Anne P. 1989. Knowhow trading as economic exchange. *Research Policy* 18: 155–63. [\[CrossRef\]](#)
- Chang, Song, Yaping Gong, and Cass Shum. 2011. Promoting innovation in hospitality companies through human resource management practices. *International Journal of Hospitality Management* 30: 812–18. [\[CrossRef\]](#)
- Chatterjee, Joydeep. 2017. Strategy, human capital investments, business-domain capabilities, and performance: A study in the global software services industry. *Strategic Management Journal* 38: 588–608. [\[CrossRef\]](#)
- Chowhan, James. 2016. Unpacking the black box: Understanding the relationship between strategy, HRM practices, innovation and organizational performance. *Human Resource Management Journal* 26: 112–33. [\[CrossRef\]](#)
- Civelek, Mehmet, Aleksandr Ključnikov, Vendula Fialova, Andrea Folvarčná, and Milan Stoch. 2021. How innovativeness of family-owned SMEs differ depending on their characteristics?. *Equilibrium. Quarterly Journal of Economics and Economic Policy* 16: 413–28. [\[CrossRef\]](#)
- Cohen, Wesley M., and Daniel A. Levinthal. 1990. Absorptive capacity: A new perspective on learning and innovation. *Administrative Science Quarterly*, 128–52. [\[CrossRef\]](#)
- Crisuolo, Paola, Keld Laursen, Toke Reichstein, and Ammon Salter. 2018. Winning combinations: Search strategies and innovativeness in the UK. *Industry and Innovation* 25: 115–43. [\[CrossRef\]](#)
- Doloreux, David, and Anthony Frigon. 2020. Innovation in knowledge intensive business services (KIBS). *Canadian Journal of Administrative Sciences/Revue Canadienne des Sciences de l'Administration* 37: 122–34. [\[CrossRef\]](#)
- Durst, Susanne, Anne-Lauren Mention, and Petro Poutanen. 2015. Service innovation and its impact: What do we know about? *Investigaciones Europeas de Dirección y Economía de la Empresa* 21: 65–72. [\[CrossRef\]](#)

- Figueiredo, Ronnie, João J. Ferreira, Rogério Guerra Silveira, and Alvaro Teixeira Villarinho. 2019. Innovation and co-creation in knowledge intensive business services: The Spinner model. *Business Process Management Journal* 26: 909–23. [CrossRef]
- Fonseca, Tiago, Pedro de Faria, and Francisco Lima. 2019. Human capital and innovation: The importance of the optimal organizational task structure. *Research Policy* 48: 616–27. [CrossRef]
- Gallié, Emilie-Pauline, and Diègo Legros. 2012. Firms' human capital, RandD and innovation: A study on French firms. *Empirical Economics* 43: 581–96. [CrossRef]
- Gómez, Jaime, Idana Salazar, and Pilar Vargas. 2016. Sources of Information as Determinants of Product and Process Innovation. *PLoS ONE* 11: 0152743. [CrossRef]
- González, Xulia, Daniel Miles-Touya, and Consuelo Pazó. 2016. RandD, worker training and innovation: Firm-level evidence. *Industry and Innovation* 23: 694–712. [CrossRef]
- Goodarzi, Mohammad Reza, Anahita Goodarzi, and Effat Goodarzi. 2015. The Role of Human Capital Development and Innovation in Healthcare organizations of Markazi Province in Iran. *Journal of Health Management and Informatics* 3: 20–25. Available online: http://jhmi.sums.ac.ir/article_42660_aaaff51204355ba9dd2eb32db9236461.pdf (accessed on 12 February 2022).
- Gopalakrishnan, Shanthi, Paul Bierly, and Eric H. Kessler. 1999. A re-examination of product and process innovations using a knowledge-based view. *Journal of High Technology Management Research* 10: 147–66. Available online: <https://www.infona.pl/resource/bwmeta1.element.elsevier-d3f8d0f1-ce25-3aae-80ae-bd996f44ad9c> (accessed on 12 February 2022). [CrossRef]
- Grant, Robert M. 1996. Toward a knowledge-based theory of the firm. *Strategic Management Journal* 17: 109–22. [CrossRef]
- Guillard, Charlotte, and Mónica Salazar. 2017. *The Experience in Innovation Surveys of Some Latin American Countries*; Inter-American Development Bank. Washington, DC: BID. Available online: <https://publications.iadb.org/publications/english/document/The-Experience-in-Innovation-Surveys-of-Selected-Latin-American-Countries.pdf> (accessed on 12 February 2022).
- Hewitt-Dundas, Nola. 2006. Resource and capability constraints to innovation in small and large plants. *Small Business Economics* 26: 257–77. [CrossRef]
- Hidalgo, Antonio, and Rafael Herrera. 2020. Innovation management and co-creation in KIBs: An approach to the ICT services sector. *Technological Forecasting and Social Change* 161: 120278. [CrossRef]
- Jones, Barbara, and Damian Grimshaw. 2012. *The Effects of Policies for Training and Skills on Improving Innovation Capabilities in Firms*. Compendium of Evidence on the Effectiveness of Innovation Policy Intervention. NESTA. Manchester: Manchester Institute of Innovation Research, University of Manchester, p. 38. Available online: https://media.nesta.org.uk/documents/the_effects_of_policies_for_training_and_skills_on_improving_innovation_capabilities_in_firms.pdf (accessed on 10 January 2022).
- Kianto, Aino, Josune Sáenz, and Nekane Aramburu. 2017. Knowledge-based human resource management practices, intellectual capital and innovation. *Journal of Business Research* 81: 11–20. [CrossRef]
- Kozak, Marcin. 2009. What is strong correlation? *Teaching Statistics* 31: 85–86. [CrossRef]
- Laursen, Keld, and Ammon Salter. 2006. Open for innovation: The role of openness in explaining innovation performance among U.K. manufacturing firms. *Strategic Management Journal* 27: 131–50. [CrossRef]
- Lefebvre, Virginie Marie, Hans De Steur, and Xavier Gellynck. 2015. External sources for innovation in food SMEs. *British Food Journal* 117: 412–30. [CrossRef]
- Lewandowska, Anna. 2021. Interactions between investments in innovation and SME competitiveness in the peripheral regions. *Journal of International Studies* 14: 285–307. [CrossRef] [PubMed]
- Lin, Bou-Wen, and Chung-Jen Chen. 2006. Fostering product innovation in industry networks: The mediating role of knowledge integration. *International Journal of Human Resource Management* 17: 155–73. [CrossRef]
- Ma, Biyu, and Dingming Yu. 2021. Research on the influence of RandD human resources on innovation capability—Empirical research on GEM-listed enterprises of China. *Managerial and Decision Economics* 42: 751–61. [CrossRef]
- Ma, Li, Xin Zhai, Weiguo Zhong, and Zhi-Xue Zhang. 2019. Deploying human capital for innovation: A study of multi-country manufacturing firms. *International Journal of Production Economics* 208: 241–53. [CrossRef]
- Mariz-Pérez, Rosa M., M. Mercedes Teijeiro-Alvarez, and M. Teresa García-Alvarez. 2012. The relevance of human capital as a driver for innovation. *Cuadernos de Economía* 35: 68–76. [CrossRef]
- Martínez-Ros, Ester, and Francina Orfila-Sintes. 2012. Training plans, manager's characteristics and innovation in the accommodation industry. *International Journal of Hospitality Management* 31: 686–94. [CrossRef]
- McGuirk, Helen, Helena Lenihan, and Mark Hart. 2015. Measuring the impact of innovative human capital on small firms' propensity to innovate. *Research Policy* 44: 965–76. [CrossRef]
- Meekaewkunchorn, Nusanee, Katarzyna Szczepańska-Woszczyzna, Chaiyawit Muangmee, Nuttapon Kassakorn, and Bilal Khalid. 2021. Entrepreneurial orientation and SME performance: The mediating role of learning orientation. *Economics and Sociology* 14: 294–312. [CrossRef]
- Miles, Ian Douglas, Veronika Belousova, and Nikolay Chichkanov. 2018. Knowledge intensive business services: Ambiguities and continuities. *Foresight* 20: 1–26. [CrossRef]
- Na, Kyunga. 2021. The effect of on-the-job training and education level of employees on innovation in emerging markets. *Journal of Open Innovation: Technology, Market, and Complexity* 7: 47. [CrossRef]
- Nieves, Julia, and Agustin Quintana. 2018. Human resource practices and innovation in the hotel industry: The mediating role of human capital. *Tourism and Hospitality Research* 18: 72–83. [CrossRef]

- O’Cass, Aron, and Martin Wetzels. 2018. Contemporary issues and critical challenges on innovation in services. *Journal of Product Innovation Management* 35: 674–81. [CrossRef]
- OECD/Eurostat. 2018. Oslo Manual. In *Guidelines for Collecting, Reporting and Using Data on Innovation*, 4th ed. The Measurement of Scientific, Technological and Innovation Activities. Paris: OECD Publishing, Luxembourg: Eurostat. [CrossRef]
- Oliveira, Márcio, Paulo Pinheiro, João M. Lopes, and José Oliveira. 2021. How to Overcome Barriers to Sharing Tacit Knowledge in Non-Profit Organizations? *Journal of the Knowledge Economy* 1: 1–32. [CrossRef]
- Onkelinx, Jonas, Tatiana S. Manolova, and Linda F. Edelman. 2016. The human factor: Investments in employee human capital, productivity, and SME internationalization. *Journal of International Management* 22: 351–64. [CrossRef]
- Ottbacher, Michael, Vivienne Shaw, and Andrew Lockwood. 2006. An investigation of the factors affecting innovation performance in chain and independent hotels. *Journal of Quality Assurance in Hospitality and Tourism* 6: 113–28. [CrossRef]
- Pejić Bach, Mirjana, Anđelko Lojpur, Sanja Peković, and Tatjana Stanovčić. 2015. The Influence Of Different Information Sources On Innovation Performance: Evidence From France, The Netherlands And Croatia. *South East European Journal of Economics and Business* 10: 89–101. [CrossRef]
- Pekovic, Sanja, Anđelko Lojpur, and Mirjana Pejić Bach. 2015. Determinants of innovation intensity in developed and in developing economies: The case of France and Croatia. *International Journal of Innovation Management* 19: 1550049. [CrossRef]
- Penrose, Edith Tilton. 1959. *The Theory of the Growth of the Firm*. New York: Sharpe.
- Prajogo, Daniel I., and Adegoke Oke. 2016. Human capital, service innovation advantage, and business performance. *International Journal of Operations and Production Management* 36: 1–32. [CrossRef]
- Ruiz-Pava, Guillermo, and Clemente Forero-Pineda. 2018. Internal and external search strategies of innovative firms: The role of the target market. *Journal of Knowledge Management* 24: 495–518. [CrossRef]
- Rupietta, Christian, and Uschi Backes-Gellner. 2019. Combining knowledge stock and knowledge flow to generate superior incremental innovation performance—Evidence from Swiss manufacturing. *Journal of Business Research* 94: 209–22. [CrossRef]
- Samad, Sarminah. 2020. Achieving innovative firm performance through human capital and the effect of social capital. *Management and Marketing. Challenges for the Knowledge Society* 15: 326–44. [CrossRef]
- Samoliuk, Natalia, Yuriy Bilan, and Halyna Mishchuk. 2021. Vocational training costs and economic benefits: Exploring the interactions. *Journal of Business Economics and Management* 22: 1476–91. [CrossRef]
- Sánchez Muñoz, Paloma, Asunción López López, and Juan Carlos Salazar Elena. 2014. Gestión del Capital Intelectual y Desempeño Innovador. Resultados para España a partir del PITEC. Available online: <https://cpage.mpr.gob.es/producto/gestion-del-capital-intelectual-y-desempeno-innovador/> (accessed on 10 January 2022).
- Shahtaheri, Seyed Ali, and Kaveh Teymournejad. 2020. Effects of knowledge-based, intellectual capital and innovation methods on human resource management: Case study of ministry of education, Tehran district 7. *International Transaction Journal of Engineering Management and Applied Sciences and Technologies* 11: 1–9. [CrossRef]
- Smith, Ken G., Christopher J. Collins, and Kevin D. Clark. 2005. Existing knowledge, knowledge creation capability, and the rate of new product introduction in high-technology firms. *Academy of Management Journal* 48: 346–57. [CrossRef]
- Storey, Chris, and Kenneth B. Kahn. 2010. The Role of Knowledge Management Strategies and Task Knowledge in Stimulating Service Innovation. *Journal of Service Research* 13: 397–410. [CrossRef]
- Tadic, Ivana, Željana Aljinovic Barac, and Nikolina Plazonic. 2015. Relations between human capital investments and business excellence in croatian companies. *International Journal of Social Education, Economics and Management Engineering* 9: 745–50. Available online: <https://pdfs.semanticscholar.org/fb6f/e44e7a55ce1295a8d4527915f0a5a656dd7b.pdf> (accessed on 12 February 2022).
- Ullah, Irfan, Bilal Mirza, and Amber Jamil. 2021. The influence of ethical leadership on innovative performance: Modeling the mediating role of intellectual capital. *Journal of Management Development* 40: 273–92. [CrossRef]
- Van Uden, Annelies, Joris Knoben, and Patrick Vermeulen. 2017. Human capital and innovation in Sub-Saharan countries: A firm-level study. *Innovation* 19: 103–24. [CrossRef]
- Wernerfelt, Birger. 1984. A resource-based view of the firm. *Strategic Management Journal* 5: 171–80. [CrossRef]
- World Bank. 2021. Expenditure on Research and Development (% of GDP). Available online: <https://datos.bancomundial.org/indicador/GB.XPD.RSDV.GD.ZS> (accessed on 12 February 2022).
- Zanello, Giacomo, Xiaolan Fu, Pierre Mohnen, and Marc Ventresca. 2016. The creation and diffusion of innovation in developing countries: A systematic literature review. *Journal of Economic Surveys* 30: 884–912. [CrossRef]
- Zieba, Malgorzata, Ettore Bolisani, Marco Paiola, and Enrico Scarso. 2017. Searching for innovation knowledge: Insight into KIBS companies. *Knowledge Management Research and Practice* 15: 282–93. [CrossRef]