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Contribution of Teachers' Qualification Level on Employability in African Economies, through Econometric Estimation of the Generalized Method of Moments, 2016–2020 — A Secondary Publication

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Abstract: Both education and its quality supply are closely linked to employability and labour productivity. The present study aimed to analyze the contribution of the level of teacher qualification on the employability variable in African economies, for the period 2016–2020. Regarding the methodology, a quantitative analysis of the data was conducted through the Generalized Method of Moments in Differences, two stages and with standard error correction. Based on the results, it was possible to determine the existence of a negative, inverse and significant relationship between the degree of qualification of teachers on the unemployment rate; therefore, it could be concluded that a higher level of qualification of teachers has a direct contribution on the increase in the levels of employability for the African business sector. Through the results of Hansen's Test (P-value = 0.540), the validity of the model's specificity in terms of instrument utilization was tested. Based on the first (P-value = 0.009) and second order (P-value = 0.148) autocorrelation tests, the validity of the consistency of the Generalized Method of Moments econometric estimators in differences, two stages and with corrected standard errors was tested.

Keywords: Autocorrelation; Teacher qualifications; Unemployment; Employability; Generalized method of moments

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1. Introduction

First, education and human capital have become determinants of the development process of entrepreneurial activities; in particular, these aspects have direct implications for labour productivity variables and economic growth. In close correspondence with the previous statement, there is also a direct relationship between

cognitive skills and labour income, and consequently economic growth. In the context of technological innovation and globalisation, labour market demands for skills development have increased [1]. Concerning previous information, it is important to specify that increasing human capital is one of the main instruments for achieving improvements in labour outcomes; indeed, young people who want to be part of the employed Economically Active Population (EAP) and therefore belong to the labour market, require acquiring both cognitive and socioemotional skills [2].

In terms of the employability of the youth population, the decision to remain in the education system or to enter the labour market is more complex and difficult in the context of developing economies compared to developed countries. In most cases, the fact that young people choose to get a job and to some extent neglect their educational attainment can be explained by the economic needs that may arise. In contrast, the decision to remain in the education system and postpone their entry into the labour market presupposes that young people may have higher levels of employability and therefore have a greater probability of finding a suitable job in the future. For the previous premise, the macroeconomic context plays an important role in decision-making regarding entry into the labour market; young people may choose to continue their studies if they consider that there are greater job opportunities, specifically those jobs that require more skilled labour [3].

Statistically speaking, there are differences between regions when looking at the figures for labour participation of 15–19-year-olds; in regions where young people decide to continue their studies, this figure is lower than the global average. On the other hand, in countries where the economic context is not adequate, young people will have to drop out of school and try to find a job, whether formal or not. As of 2017, the labour participation of young people in Sub-Saharan Africa (45.2%) and Southeast Asia and the Pacific (32.6%) is higher compared to the global average; in the case of Latin America and the Caribbean region, more than 10% of young people are both studying and working at the same time. Consequently, this scenario means that a considerable percentage of young people do not have an adequate level of skills, which is reflected in the results of the PISA test, where the problems around basic skills in young people are evident. Similarly, this context means that organisations do not have the skilled labour required to perform certain tasks [3].

Regarding employment opportunities for adolescents and young people, the implementation of internships for secondary school students is of utmost importance, as one of the main benefits of these programmes is the development of skills that enable an easier transition from school to the workplace. Likewise, these strategies will contribute greatly to the students' ability to complete their secondary education, since in their corresponding work environment, these young people will be able to learn about the degree of appreciation that companies give to secondary education. In this scenario, students will value the education they receive at school even more highly, and will therefore have greater incentives to complete their secondary education [4].

In close agreement with the previous premise, the intervention of government authorities is fundamental in terms of policies aimed at reducing unemployment rates in different regions, as is the case in Latin America. In particular, one of the most prominent initiatives in terms of the search for a close link between school and the labour market is the regulation of learning, through which the promotion of strategies that contribute to the development and improvement of the competencies and skills that students require to access more and better job opportunities is carried out [4].

In specific terms, the law in question determines that all medium and large companies should have between 5% and 15% of workers between the ages of 14 and 24 as part of their workforce. About the above information, both parties benefit from the implementation of this strategy, since young people have a new mechanism for entering the labour market and companies not only receive a tax incentive but also the possibility of having human capital that may have the potential to develop in the long term. It is also important to note that this type

of project has direct implications for the construction of a close link between schools and the labour market [4].

Future trends in labour market requirements have directly contributed to the approach not only to the acquisition of new skills but also to the need for a process of shaping a new educational environment. Regarding the first aspect, the focus on competency-based education and the training of skills required for specific tasks is highlighted; in particular, the importance of the processes of measuring and understanding interpersonal and complex thinking skills, such as soft skills, is emphasised [5–6]. In this sense, the generation and improvement of certain teaching models will have a direct contribution to the development of these skills; in addition, the use of certain tools such as artificial intelligence and data analysis can facilitate the process in question [5–7].

Regarding the need for a process of creation and structuring of a new educational ecosystem, the role of teachers and their level of dynamism in the pedagogical process are of utmost importance for this particular context; indeed, it is required that the modification of teaching models can materialise in the process of transition from an approach based on the transfer of knowledge (auditorium) to an approach linked to the existence of a collaborative environment (laboratory In close correspondence with the previous premise, it is necessary that the educational process be developed in a scenario where the exploration is directed by a certain student and can play a very important role in the development of the knowledge and skills that are required by the new work environment. Indeed, it is required that teaching models can adopt new approaches such as the work-based learning process; in this scenario, it is necessary to work together with employers regarding the performance of certain work tasks that enable the development of skills demanded in a particular professional field [5–6].

As the previous statement, the configuration of a new pedagogical ecosystem requires the implementation of training for teachers, so that they not only acquire cognitive, interpersonal and instructional skills but also they can be provided with the necessary guidance so that they can interact with employers. Similarly, it is of utmost importance to develop research that can address the topics linked to the teaching of new skills through a dynamic teaching model in line with the new demands of the work environment. In this context, the joint work between the actors of the business sector and the teaching staff of educational institutions is a key element for the transformation of the pedagogical ecosystem [5–6].

Given the problems regarding the employment situation of young people and the importance of the provision of quality education in terms of employability, the main objective of this study was to analyse the contribution of the level of qualification of teachers on the employability variable in African economies for the period 2016–2020.

2. Methodology

Regarding the data used in this study, the information required corresponds to the variables of the degree of qualification of the teaching staff, unemployment rate, aggregate production, economically active population, and internet servers, among other reference variables. In close agreement with the previous premise, the data required for this research were extracted from the World Bank, Mo Ibrahim Foundation, and the databases of the Global Change Data Lab [8–10].

Regarding the methods that have been employed in this study, a quantitative analysis of the data was carried out through the Generalised Method of Moments (GMM) in differences, two stages and with standard error correction, to evaluate and analyse the contribution that the degree of qualification of the teaching staff has on the employability variable in the African business sector, for the period 2016-2020. Indeed, the basic dynamic panel model can be represented by **Equation 1**.

$$y_{it} = a_i + x_{it}^{'}B + \delta y_{i,t-1} + \epsilon_{it} \quad (1)$$

Where: y_{it} is the dependent variable; x'_{it} is the matrix of independent variables; $y_{i,t-1}$ is the lagged dependent variable; β is the coefficients of the independent variables; δ is the coefficient of the lagged dependent variable; α is the group-specific error term; and ϵ_{it} is the disturbance term.

Generally, the GMM method is based on the assumption that the estimation of a given parameter can be performed by replacing a population moment condition with its sampling analogue [11]. By way of introduction, one can conceptualise the term μ as the mean of a population that is independent and identically distributed; in this context, the first population moment is equal to zero as shown in **Equation 2**.

$$E(y - \mu) = 0 \quad (2)$$

The result of applying the principle of the GMM method to **Equation 2** is expressed in **Equations 3 and 4.**

$$\frac{1}{2}\sum_{i=1}^{N}(y_i - \hat{u}) = 0 \quad (3)$$

$$\hat{\mu} = \frac{1}{2}\sum_{i=1}^{N} y_i \quad (4)$$

The term μ^ can be defined as the Method of Moments (MoM) estimator. In this sense, the following mathematical expressions are framed in the context of an Ordinary Least Squares (OLS) regression:

$$y = x^{'}B + u \quad (5)$$

$$E(u|x) = 0 \rightarrow E(xu) = 0 \quad (6)$$

$$E(xu) = E_x\{E(xu|x)\} = E_x\{xE(u|x)\} = 0 \quad (7)$$

By replacing one of the terms in **Equation 7**, the following expression is obtained:

$$E(xu) = E\{x(y - x^{'}B)\} = 0 \quad (8)$$

The result of the application of the analogy principle is presented in **Equations 9 and 10**:

$$E\{x(y - x^{'}B)\} \rightarrow \frac{1}{2}\sum_{i=1}^{N} x_i(y_i - x_i^{'}B) = 0 \quad (9)$$

$$\hat{B} = (\sum ix_i x_i^{'})^{-1}\sum ix_i y_i \quad (10)$$

Its corresponding matrix equivalent can be expressed by **Equation 11**:

$$\hat{B} = (X^{'}X)^{-1}X^{'}y \quad (11)$$

In this scenario, the disturbance term may affect one or more components of *x*; therefore, the OLS estimator cannot be used; therefore, the existence of a vector z that meets the following conditions is assumed:

$$E(zu) = 0 \quad (12)$$

$$rang\ E(z^{'}z) = l \quad (13)$$

$$ramg\ E(z^{'}x) = k \quad (14)$$

Where: l = number of moment conditions; *k* = number of parameters

For the case of l = *k*, the GMM estimator can be used; for l < *k*, the Generalised Least Squares (GMM) estimator chooses the value of β^ that minimises the following quadratic function of moments:

$$\widehat{B} \equiv argmin_B\{\frac{1}{N}\sum iZ_i u_i(\beta)\}'\{\frac{1}{N}\sum iZ_i u_i(\beta)\} \quad (15)$$

In the context of the OLS regression method, **Equation 16** is framed as follows.

$$u_i(\beta) = y_i - x_i'\beta \quad (16)$$

When considering the quadratic function expressed in **Equation 17**:

$$\widehat{B} \equiv argmin_B\{\frac{1}{N}\sum iZ_i u_i(\beta)\}' W\{\frac{1}{N}\sum iZ_i u_i(\beta)\} \quad (17)$$

Where W is a positive definite symmetric matrix; hence the GMM estimator can be represented by **Equation 18**:

$$\widehat{B} = \arg min_\beta Q(\beta) \quad (18)$$

For the case of the linear regression expressed in **Equation 5**, the matrix W can be defined as follows:

$$W = (\frac{1}{N}\sum iz_i z_i')^{-1} \quad (19)$$

Consequently, the 2-Stage Least Squares estimator (2SLS) is obtained:

$$\widehat{B} = \{(\frac{1}{N}\sum ix_i z_i')(\frac{1}{N}\sum ix_i z_i')^{-1}(\frac{1}{N}\sum ix_i z_i')\}^{-1} \times (\frac{1}{N}\sum ix_i z_i')(\frac{1}{N}\sum ix_i z_i')^{-1}(\frac{1}{N}\sum ix_i z_i') \quad (20)$$

3. Results

Regarding the findings of this paper, **Table 1** presents the estimated coefficients of the dynamic panel econometric model using the Generalised Method of Moments (GMM) in differences, two stages and with corrected standard errors, on the estimation of the relationship between the degree of qualification of the teaching staff and the unemployment rate in the African business sector for the period 2016–2020.

Table 1. Econometric estimation through the Generalized Method of Moments in Differences, two stages and with corrected standard errors

Unemployment	**Coefficient**	**Corrected S.E.**	**t**	***P*>|*t*|**	**[95% Conf. Interval]**	
Unemployment L1.	-2.7536	4.812004	-0.57	0.578	-13.2381	7.730856
lnteacherQualif	-2.32119	1.227881	-1.89	0.083	-4.99651	0.35413
lnServInter	0.108949	0.416417	0.26	0.798	-0.79834	1.016243
year	0.227345	0.136214	1.67	0.121	-0.06944	0.524129
y_2	-0.14115	0.178976	-0.79	0.446	-0.53111	0.2488
Arellano-Bond test for AR (1) in first differences:			z	2.62	Pr > *z*	0.009
Arellano-Bond test for AR (2) in first differences:			z	1.45	Pr > *z*	0.148
Sargan test of overid. restrictions:			chi2(1)	0.17	Prob > chi2	0.678
Hansen test of overid. restrictions:			chi2(1)	0.38	Prob > chi2	0.54
Group variable	id	Number groups	12	Obs per group: min		3
Time variable	year	N. instruments	6	Obs per group: avg		3
				Obs per group: max		3

Based on the results of the Generalised Method of Moments (GMM) in differences, two stages and with standard error correction, it was determined the existence of a negative and significant (90% confidence) impact of the degree of qualification of teachers on the unemployment rate in the African business sector, for the period 2016–2020. In close correspondence with the above assertion, as the level of teacher qualification increases, there is a greater generation and accumulation of human capital, which has a direct contribution to the greater likelihood that young people will be able to access more job opportunities where skilled labour is required. In this sense, policy strategies aimed at increasing the level of teacher qualification will have direct implications for the reduction of unemployment rates in the African business sector for the period 2016–2020.

Based on the results presented in **Table 1**, the *P*-value of the Arellano-Bond test on first-order autocorrelation was equal to 0.009, a value less than 0.05, so the null hypothesis postulating the non-existence of first-order autocorrelation could be rejected. Consequently, first-order autocorrelation does exist in the first differences of the disturbance terms. On the other hand, the P-value of the Arellano-Bond test on order 2 autocorrelation was equal to 0.148, a value greater than 0.05, which meant that the null hypothesis denying the existence of second-order autocorrelation was not rejected; therefore, there is no second-order autocorrelation in the first differences of the disturbance terms. In close agreement with the above information, It was possible to verify the validity in terms of consistency of the estimators in the case of the dynamic panel econometric model with the use of the Generalized Method of Moments, because there is first-order autocorrelation, but not second-order. Generally, validity in terms of instruments implies that the null hypothesis referring to correct over-identification in the equations of the econometric model does not have to be rejected. Concerning the results presented in **Table 1**, the P-value of Hansen's test statistic was equal to 0.540, a value greater than 0.05, so the null hypothesis stating the existence of a valid over-identification in the equations in question could not be rejected. Based on the results of Hansen's test, the specificity validity of the dynamic panel econometric model through the Generalised Method of Moments was tested in terms of the use of instruments.

In close agreement with the above premise, **Table 2** presents the estimated coefficients of the econometric estimation using the Within and GLS methods for the relationship between labour participation and unemployment rates in the African business context for the period 2016–2020 (Model I).

Table 2. Static panel econometric estimation (Model I).

	lnvaract	**Coefficient**	**S.E.**	**z**	***P*>|*z*|**	**[95% Conf. Interval]**	
GLS Econometric regression	lndesempleov	-0.0538079	0.0091008	-5.91	0.000	-0.071645	-0.0359707
	lnevh	-0.2807826	0.10415	-2.70	0.007	-0.4849129	-0.0766523
	Constant	5.468786	0.4223957	12.95	0.000	4.640906	6.296667
	Group variable	Id	Wald Test Statistic		Number of groups		12
	R-sq: within	0.4786	Wald chi2(3)	47.43	Obs per group: min		5
	R-sq: between	0.3516	P-value Wald test		Obs per group: avg		5
	R-sq: overall	0.3520	Prob > chi2	0.0001	Obs per group: max		5
	lnvaract	**Coefficient**	**S.E.**	**t**	***P*>|*t*|**	**[95% Conf. Interval]**	
Within Econometric regression	lndesempleov	-0.0493259	0.0096366	-5.12	0.000	-0.0687233	-0.0299286
	lnevh	-0.3325239	0.1075693	-3.09	0.003	-0.5490497	-0.1159981
	Group variable	Id	Statistic F-test		Number of groups		12
	R-sq: within	0.4825	F (2, 46)	21.45	Obs per group: min		5
	R-sq: between	0.3025	P-value F-test		Obs per group: avg		5
	R-sq: overall	0.3033	Prob > F	0.0000	Obs per group: max		5

Based on the coefficients of the GLS and Within econometric estimations, it was possible to determine the existence of an inverse, negative and significant (99% confidence) relationship between employability levels and the unemployment rate for the period 2016–2020. In this sense, as the unemployment rate increases by 1%, there is a reduction in employability levels in the African business sector equivalent to -0.0538% and -0.0493% for the cases of the GLS and within models, respectively. These results therefore complement the results of the estimated coefficients of the Generalised Method of Moments promptly, because a sequential and causal line can be drawn between the variables of teacher qualification, unemployment rate and employability levels. Concerning the previous premise, higher teacher qualifications will have direct effects on reducing unemployment rates and increasing employability levels in the business sector for the period 2016–2020.

Based on the results of the Wald test (*P*-value = 0.0001), the null hypothesis that the value of the coefficients was equal to zero was rejected; therefore, the independent variables are significant as they have added value to the econometric model in question. Similarly, through the results of the *F*-test for joint significance (*P*-value = 0.0000) it was concluded that the econometric model used has an adequate level of fit with the present data. In correspondence with the previous information, **Table 3** presents the estimated coefficients of the static panel models with standard error correction for the estimation called Model I.

Table 3. Econometric static panel estimation with standard error correction (Model I)

	lnvaract	**Coefficient**	**S.E.**	**z**	**P > |z|**	**[95% Conf. Interval]**	
GLS Econometric regression (Robust S.E.)	lndesempleov	-0.0538079	0.0155595	-3.46	0.001	-0.084304	-0.0233118
	lnevh	-0.2807826	0.0848659	-3.31	0.001	-0.4471168	-0.1144485
	Constant	5.468786	0.3581477	15.27	0.000	4.76683	6.170743
	Group variable	Id	Wald Test Statistic		Number of groups		12
	R-sq: within	0.4786	Wald chi2(3)	15.42	Obs per group: min		5
	R-sq: between	0.3516	P-value Wald test		Obs per group: avg		5
	R-sq: overall	0.3520	Prob > chi2	0.00040	Obs per group: max		5
	lnvaract	**Coefficient**	**S.E.**	**t**	***P > |t|***	**[95% Conf. Interval]**	
Within Econometric regression (Robust S.E.)	lndesempleov	-0.0493259	0.017457	-2.83	0.017	-0.0877485	-0.0109034
	lnevh	-0.3325239	0.0587468	-5.66	0.000	-0.4618248	-0.203223
	Constant	5.672201	0.2506788	22.63	0.000	5.12046	6.223941
	Group variable	Id	Statistic F-test		Number of groups		12
	R-sq: within	0.4825	F (2, 11)	16.12	Obs per group: min		5
	R-sq: between	0.3025	P-value F-test		Obs per group: avg		5
	R-sq: overall	0.3033	Prob > F	0.0005	Obs per group: max		5

As presented in **Table 3**, through the coefficients of the GLS econometric estimation with corrected standard errors, an inverse, negative and significant (99% confidence) relationship was found to exist between employability levels and the unemployment rate in the African business sector for the period 2016–2020. Consequently, as the unemployment rate increases by 1%, there is a reduction in employability levels in the African business sector equivalent to -0.0538%. Concerning the above premise, higher teacher qualifications will have direct effects on reducing unemployment rates and increasing employability levels in the African business sector for the period 2016–2020.

Regarding the coefficients of the within econometric estimation presented in **Table 3**, it was concluded

that there is an inverse, negative and significant (95% confidence) relationship between the levels of employability and the unemployment rate in the African business sector for the period 2016–2020. Therefore, the employability and unemployment rate variables are inversely proportional, since as there is an increase in one of them, the other variable will behave oppositely.

Based on the results of the Wald test (*P*-value = 0.0004), it was possible to reject the null hypothesis that the value of the coefficients was equal to zero; therefore, the independent variables are significant as they have added value to the econometric model. Similarly, through the results of the joint significance *F*-test (*P*-value = 0.0005), it was concluded that the econometric model has an adequate level of fit with the present data.

In this sense, the relevance of the teacher qualification variable can be presented through its contributions in terms of educational attainment and aggregate output. **Table 4** presents the econometric estimation through the Within and GLS methods, regarding the quantification of the relationship between teacher qualification and economic activity in the African context for the period 2016–2020 (Model II).

Table 4. Static panel econometric estimation (Model II).

	lnvaract	**Coefficient**	**S.E.**	**z**	***P*>|*z*|**	**[95% Conf. Interval]**	
GLS Econometric regression	lnteacherQualif	0.0814905	0.0204803	3.98	0.000	0.0413499	0.1216311
	lnpibpc	1.11314	0.0765954	14.53	0.000	0.9630156	1.263264
	Constant	15.25177	0.6943159	21.97	0.000	13.89094	16.61261
	Group variable	Id	Wald Test Statistic		Number of groups		12
	R-sq: within	0.8654	Wald chi2(2)	293.51	Obs per group: min		5
	R-sq: between	0.0245	P-value Wald test		Obs per group: avg		5
	R-sq: overall	0.0257	Prob > chi2	0.0000	Obs per group: max		5
	lnvaract	**Coefficient**	**S.E.**	**t**	***P*>|*t*|**	**[95% Conf. Interval]**	
Within Econometric regression	lnteacherQualif	0.080422	0.0204911	3.92	0.000	0.0391756	0.1216685
	lnpibpc	1.127352	0.0771916	14.6	0.000	0.9719733	1.28273
	Constant	15.15559	0.525288	28.85	0.000	14.09824	16.21294
	Group variable	Id	Statistic *F*-test		Number of groups		12
	R-sq: within	0.8654	F (2, 46)	147.87	Obs per group: min		5
	R-sq: between	0.0245	*P*-value *F*-test		Obs per group: avg		5
	R-sq: overall	0.0257	Prob > *F*	0.0000	Obs per group: max		5

Based on the coefficients of the econometric estimations GLS and within, a direct, positive and significant (99% confidence) relationship was found between the level of teacher qualification and aggregate output for the period 2016–2020. In this sense, as the level of teacher qualification increases by 1%, there is an increase in aggregate output equivalent to 0.0814% and 0.0804% for the cases of the econometric models GLS and within, respectively.

Consequently, the importance of the teaching qualification variable is not only reflected in its contribution to employability but also its direct effect on aggregate output. Concerning the previous premise, policies and strategies aimed at increasing the degree of teacher qualification will have implications for the employability and aggregate output variables.

Based on the results of the Wald test (**P**-value = 0.0000), the null hypothesis that the value of the coefficients was equal to zero was rejected; therefore, the independent variables are significant as they have

added value to the econometric model. Similarly, through the results of the joint significance **F**-test (**P**-value = 0.0000), it was concluded that the econometric model used has an adequate degree of fit concerning the present data. In close correspondence with the previous premise, **Table 5** presents the estimated coefficients of the econometric models with standard error correction for the estimation called Model II.

Table 5. Econometric static panel estimation with standard error correction (Model II)

	lnvaract	**Coefficient**	**S.E.**	**z**	***P*** **> |*z*|**	**[95% Conf. Interval]**	
GLS Econometric regression (Robust S.E.)	lnteacherQualif	0.0814905	0.0259746	3.14	0.002	0.0305812	0.1323998
	lnpibpc	1.11314	0.1246536	8.93	0.000	0.8688232	1.357457
	Constant	15.25177	0.651376	23.41	0.000	13.9751	16.52845
	Group variable	Id	Wald Test Statistic		Number of groups		12
	R-sq: within	0.8654	Wald chi2(2)	138.47	Obs per group: min		5
	R-sq: between	0.0245	P-value Wald test		Obs per group: avg		5
	R-sq: overall	0.0257	Prob > chi2	0.00040	Obs per group: max		5
	lnvaract	**Coefficient**	**S.E.**	**t**	***P*** **> |*t*|**	**[95% Conf. Interval]**	
Within Econometric regression (Robust S.E.)	lnteacherQualif	0.080422	0.0264722	3.04	0.011	0.022157	0.138687
	lnpibpc	1.127352	0.1263205	8.92	0.000	0.8493223	1.405381
	Constant	15.15559	0.8508131	17.81	0.000	13.28297	17.02822
	Group variable	Id	Statistic F-test		Number of groups		12
	R-sq: within	0.8654	F (2, 11)	70.73	Obs per group: min		5
	R-sq: between	0.0245	P-value F-test		Obs per group: avg		5
	R-sq: overall	0.0257	Prob > F	0.0000	Obs per group: max		5

Through the coefficients of the GLS econometric estimation with standard error correction, it was possible to determine the existence of a direct, positive and significant (99% confidence) relationship between the level of teacher qualification and aggregate output in the African context of 2016–2020. Consequently, as the level of teacher qualification increases by 1%, aggregate output increases by 0.08149%. About the above assertion, higher teacher qualification will not only have direct effects on reducing unemployment rates and increasing employability but also on aggregate output in the African context for the period 2016–2020. Concerning the econometric estimation, it was concluded that there is a direct, positive and significant (95% confidence) relationship between teacher qualification and aggregate output for the period 2016–2020.

Based on the results of the Wald test (*P*-value = 0.0004), the null hypothesis that the value of the coefficients was equal to zero was rejected; consequently, the independent variables are significant as they have added value to the econometric model. Similarly, through the *F*-test of joint significance (*P*-value = 0.0000), it was concluded that the econometric model has an adequate level of fit concerning the present data.

In terms of the importance of the degree of qualification of teaching staff in terms of educational attainment, **Table 6** shows the econometric estimation using the Within and GLS methods, for the relationship between educational attainment and the degree of qualification of teaching staff, and the relationship between educational attainment and the degree of qualification of teaching staff in terms of educational attainment in the education sector and the level of teacher qualification in the African context for the period 2016–2020 (Model III).

Table 6. Static panel econometric estimation (Model III)

	lnvaract	Coefficient	S.E.	z	*P* > |*z*|	[95% Conf. Interval]	
GLS Econometric regression	lnteacherQualif	0.0618029	0.0141283	4.37	0.000	0.034112	0.0894937
	lnespervtot	1.127509	0.2990995	3.77	0.000	0.5412852	1.713734
	Constant	-3.21773	1.202617	-2.68	0.007	-5.574815	-0.860645
	Group variable	Id	Wald Test Statistic		Number of groups		12
	R-sq: within	0.5939	Wald chi2(2)	69.93	Obs per group: min		5
	R-sq: between	0.0362	*P*-value Wald test		Obs per group: avg		5
	R-sq: overall	0.0386	Prob > chi2	0.0000	Obs per group: max		5
	lnvaract	**Coefficient**	**S.E.**	**t**	*P* > |*t*|	**[95% Conf. Interval]**	
Within Econometric regression	lnteacherQualif	0.0621035	0.0144513	4.30	0.000	0.0330146	0.0911923
	lnespervtot	1.123848	0.3085015	3.64	0.001	0.5028664	1.744829
	Constant	-3.203973	1.231713	-2.6	0.012	-5.683282	-0.7246642
	Group variable	Id	Statistic *F*-test		Number of groups		12
	R-sq: within	0.5939	*F* (2, 46)	33.63	Obs per group: min		5
	R-sq: between	0.0361	*P*-value *F*-test		Obs per group: avg		5
	R-sq: overall	0.0385	Prob > *F*	0.0000	Obs per group: max		5

Based on the results of the econometric estimations GLS and Within, it was possible to determine the existence of a direct, positive and significant (99% confidence) relationship between the degree of teaching qualification and the educational attainment in the African context for the period 2016–2020. Consequently, as the level of teacher qualification increases by 1%, there is an increase in the educational attainment variable equivalent to 0.0618% and 0.0621% for the GLS and Within econometric models, respectively. Consequently, the importance of the teacher qualification variable is not only reflected in its contribution to employability but also its direct effect on educational attainment. For the above information, policies and strategies aimed at increasing the degree of teacher qualification will have implications not only on the employability and aggregate output variables but also on educational attainment.

Based on the results of the Wald test (*P*-value = 0.0000), it was possible to reject the null hypothesis that the value of the coefficients was equal to zero; therefore, the independent variables are significant as they have added value to the econometric model. Using the *F*-test for joint significance (*P*-value = 0.0000), it could be concluded that the econometric model used has an adequate level of fit to the present data. In correspondence with the previous premise, **Table 7** presents the coefficients of the econometric estimations with standard error correction for the case of Model III.

Table 7. Econometric static panel estimation with standard error correction (Model II)

	lnvaract	Coefficient	S.E.	z	*P* > |*z*|	[95% Conf. Interval]	
GLS Econometric regression (Robust S.E.)	lnteacherQualif	0.0618029	0.021907	2.82	0.005	0.018866	0.1047398
	lnespervtot	1.127509	0.2752782	4.10	0.000	0.587974	1.667045
	Constant	-3.21773	1.117554	-2.88	0.004	-5.408095	-1.027365
	Group variable	Id	Wald Test Statistic		Number of groups		12
	R-sq: within	0.5939	Wald chi2(2)	41.03	Obs per group: min		5
	R-sq: between	0.0362	P-value Wald test		Obs per group: avg		5
	R-sq: overall	0.0386	Prob > chi2	0.0000	Obs per group: max		5
	lnvaract	**Coefficient**	**S.E.**	**t**	***P* > |*t*|**	**[95% Conf. Interval]**	
Within Econometric regression (Robust S.E.)	lnteacherQualif	0.0621035	0.0223026	2.78	0.018	0.0130157	0.1111912
	lnespervtot	1.123848	0.2925452	3.84	0.003	0.4799601	1.767735
	Constant	-3.203973	1.160555	-2.76	0.019	-5.758337	-0.6496096
	Group variable	Id	Statistic F-test		Number of groups		12
	R-sq: within	0.5939	F (2, 11)	19.43	Obs per group: min		5
	R-sq: between	0.0361	P-value F-test		Obs per group: avg		5
	R-sq: overall	0.0385	Prob > F	0.00020	Obs per group: max		5

Based on GLS econometric estimation with corrected standard errors, it was possible to determine the existence of a direct, positive and significant (99% confidence) relationship between the level of teacher qualification and educational attainment in the African context for the period 2016–2020. Thus, as the level of teacher qualification increases by 1%, there is an increase in the educational attainment variable equivalent to 0.0618%. For the above assertion, higher teacher qualification will not only have direct effects on reducing unemployment rates and increasing employability and aggregate output but also on educational attainment in the African context for the period 2016–2020. Regarding the results of the Within econometric estimation, it was concluded that there is a positive and significant (95% confidence) relationship between teacher qualification and educational attainment for the period 2016–2020.

Based on the results of the Wald test (*P*-value = 0.0000), the null hypothesis that postulated that the value of the coefficients was equal to zero was rejected; consequently, the independent variables are significant as they have added value to the econometric model. Similarly, through the results of the joint significance *F*-test (*P*-value = 0.0002), it was concluded that the econometric model has an adequate level of fit concerning the present data.

4. Discussion

Based on the coefficients of the econometric estimation using the Generalized Method of Moments (GMM) in differences, two stages and with corrected standard errors, it was determined the existence of a negative and significant impact of the degree of teacher qualification on the unemployment rate for the context of African economies in the period 2016–2020. For the above assertion, it was possible to conclude the direct effect of higher teacher qualifications on increasing employability levels in the African business sector. For the results of the Arellano-Bond tests on first (*P*-value = 0.009) and second-order autocorrelation (*P*-value = 0.148),

the validity of the consistency of the estimators of the GMM econometric model could be verified. Based on the results of Hansen's test (*P*-value = 0.540), the validity of the specificity of the present dynamic panel econometric model using GMM in terms of the use of instruments was tested.

When contrasting the results of the present study with the work of, similarities were found, because in this work an investigation was carried out based on 46 articles that have been reviewed, to identify both the topics addressed as well as the main results regarding the educational practices that have the greatest impact on employability [12]. In close correspondence with the above information, the following categories emerged from the content analysis of the 46 articles: Cross-cutting competencies for employability (12 articles), equity and employability (4), fostering employability (10), student mobility and employability (3), educational programmes and employability (10), and university- labour market relationship.

(7). About the category linked to the variable of transversal competencies for employability, the articles studied have emphasised the relevance and importance of the development of information skills in the context of educational institutions, as part of the set of strategies required to prepare students in terms of their insertion into the labour market [12].

Regarding the category of equity and employability, the articles analysed in the research have focused on the study of the existence of gaps in education and work, according to the dimensions of gender, ethnicity, socioeconomic level, sexual orientation and beliefs. Indeed, some studies have found that for women, higher education has been an important source of employment opportunities.

In addition, it was reported that they are still susceptible to gender discrimination in their respective work environment. In terms of the category linked to the promotion of employability, certain studies reported the non-existence of a level of correspondence and concordance between the competencies that students develop in their university education and those skills that are required and demanded by the labour market. About the above assertion, based on this information, administrators and teachers can join forces in terms of the development of educational programmes and strategies aimed at fostering the competencies demanded by the labour sector; in particular, these strategies may have implications for addressing the topics of graduate unemployment and the shortage of qualified human capital at the business level [12].

About the category of employability and internationalisation, the articles analysed have focused on the degree of value given by employers to the competencies developed by students in their work and academic experiences abroad. In contrast, students have not fully considered the variable of international mobility as a relevant factor for the development of skills and competencies for the labour market. About the previous premise, in the case of students who have completed a specific international experience at the initial stage of the labour market insertion process, these students attach a high degree of value to the direct effect that this experience has on employability. In close agreement with the above information, work and academic experiences abroad have fostered the competencies that students require to enter the labour market more easily.

About the category of educational programmes and employability, the articles analysed have addressed the degree of effectiveness that the implementation of educational programmes has on the preparation required by students in terms of employability. Specifically, some studies have concluded that the development of virtual work placements has contributed directly to the generation of competencies closely linked to employability. Similarly, strategies linking communication technologies to the process of adopting certain non-traditional educational perspectives, within the framework of promoting students' employability, stand out in this category. Faced with this scenario, it is essential to develop the documentation of initiatives aimed at promoting employability through research work.

In this sense, the categories of employability that have been derived from the content analysis of the articles

studied can be constituted as lines of research that can be addressed by teaching staff and administrators in the sector who have an interest in promoting employability among students. Regarding the previous premise, the publication of scientific articles can have a direct contribution to the process of promoting employability; this process is facilitated by the support that academic administrators can provide to teachers in the implementation of strategies aimed at promoting employability through teaching and research/

For its part, the findings of this research work are consistent with the results of the study by García (2020), where a proposal was developed regarding public programmes that can offer solutions to the problems that may arise regarding the employability of young people at a global level. In close correspondence with the above information, the need to establish a close connection between the education system and job creation policies is highlighted. In the case of several regions of the world, the formal education that young people receive is inadequate, because the pedagogical systems and methodologies have not been adapted to the changes that have been taking place in the educational ecosystem. In this sense, strategies aimed at achieving improvements in terms of employability must necessarily focus on the development not only of technical skills but also on specific issues related to flexibility and adaptation to change. Similarly, the development of theoretical knowledge needs to be accompanied by practical training, so that young people can have the skills they will be able to use in future work tasks (García, 2020).

In the case of economies where the greatest problems of school dropout and dropout are reported, the results of this type of project must not only materialise in the increase in school enrolment rates, but also the increase of competencies linked to the topics of mathematics, reading, writing and comprehension. Concerning the above statement, it is extremely important and relevant to have a high degree of coordination between the supply of educational training and the supply of labour, in order not only to increase the employability levels of young people but also to promote new areas of knowledge, as in the case of skills closely linked to the digitisation process.

Likewise, the results of this research partially resemble the results of the work of Aguirre and Barraza, since in this work, a pedagogical proposal was designed around the variable of collegial work among teachers [13]. In close correspondence with the previous premise, the concept of collegial work is closely linked to the term collaborative work, and among its main objectives is the introduction of improvements in teaching performance. Through the results of a survey applied to 17 teachers, it could be determined that teachers have been aware of the demands that the implementation of collegial work presupposes in a given educational institution. In particular, among this set of demands, those related to organisation and work culture (institutional level) and those that refer to ethical and academic topics (personal level) stand out.

When contrasting the results with those of Sosa, there were coincidences in the findings, as this study concluded that there is a significant correlation (Spearman correlation coefficient = 0.712) between the management of didactic resources and the quality of pedagogical processes [14]. In terms of the dimensions of the study variables, it was found that the educational material correlated positively and significantly (Spearman's coefficient = 0.505) with the relevance dimension of the quality of pedagogical processes variable. Similarly, a positive and significant correlation (Spearman coefficient = 0.581) was found between classroom organisation and the efficiency dimension of the quality variable. In this sense, it was possible to conclude that there was a positive and significant correlation (Spearman coefficient = 0.484) between the human potential dimension and the efficiency dimension for the quality variable of the pedagogical processes.

For their part, the results of the research coincide with the results of the study by Medina (2021), because in this work it was determined that among the set of lines of action required to achieve improvements in terms of the comprehensive training of students, is the educational qualification of teaching staff. Likewise, it is

highlighted that the importance of the qualification of teachers is not only reflected in the improvement of their work performance but also in their contribution to the development of knowledge within the community of professionals in the field of education [15].

5. Conclusion

Based on the results of the econometric estimation through the Generalised Method of Moments (GMM) in differences, two stages and with corrected standard errors, the existence of a negative and significant (90% confidence) impact of the degree of qualification of teachers on the unemployment rate in the African business sector for the period 2016–2020 was determined. In close correspondence with the previous assertion, as the degree of teacher qualification increases, the human capital of young people increases, which will enable them to have more tools to access jobs that require skilled labour. In this sense, it was possible to conclude the direct effect that a higher degree of qualification in teaching staff has on increasing levels of employability. Based on the results of the first (*P*-value = 0.009) and second order (*P*-value = 0.148) autocorrelation tests, the validity of the consistency of the econometric estimators of the Generalised Method of Moments in differences, two stages and with corrected standard errors could be verified. Similarly, through the results of Hansen's test (*P*-value = 0.540), it was possible to test the validity of the specificity of the econometric model in terms of the use of instruments.

Furthermore, through the results of the econometric estimations GLS and Within with corrected standard errors, it was possible to verify the existence of a positive and significant impact of the variable of the degree of qualification of the teaching staff on both educational attainment and aggregate production in the African context for the period 2016–2020. Based on the results of the Wald test, it was possible to reject the null hypothesis that the value of the coefficients was equal to zero; hence, the independent variables are significant as they have added value to the econometric model. Similarly, through the results of the joint significance *F*-test, it was concluded that the econometric model has an adequate level of fit to the present data. Based on these results, it was possible to assert the importance of the teacher qualification variable not only in terms of its contribution to increased levels of employability but also in terms of educational attainment and aggregate output growth.

In close correspondence with the previous statement, the implementation of strategies aimed at improving the degree or level of qualification of the teaching staff will have a direct contribution to the increase of employability, the reduction of the number of teachers, and the reduction of the number of teachers who have been trained. The impact of these measures on unemployment rates, educational attainment and aggregate output growth, for the African context, will not be the same in all cases, due to the different inherent characteristics of each African economy. In this sense, the impacts of these measures in these countries will not be the same for all cases, due to the different characteristics inherent to each African economy; however, the trend or pattern will be closely linked to the existence of a direct relationship between the level of teacher qualification and employability in the African business sector for the period 2016–2020.

Disclosure statement

The authors declare no conflict of interest.

Reference

[1] Portfolio, 2022, The Role of Education in Maximising Job Opportunities, https://www.portafolio.co/tendencias/el-papel-de-la-educacion-para-maximizar-las-oportunidades-laborales-573684

[2] Franco AP, Ñopo H, 2018, Being Young in Peru: Education and Work. Development Analysis Group (GRADE), https://www.grade.org.pe/wp-content/uploads/AI37.pdf

[3] García J, 2020, The Employment Situation of Young People and a Proposal for Public Policies to Tackle Youth Unemployment. Latin American Journal of Social Law, 1(30): 65. https://doi.org/10.22201/iij.24487899e.2020.30.14072

[4] Ber M, Biber F, 2018, The Importance of Work-based Learning Opportunities for Secondary School Students, https://www.unicef.org/lac/historias/la-importancia-de-las-oportunidades-de-aprendizaje-laboral-para-estudiantes-de-secundaria

[5] Deegan J, Martin, N, 2018, Demand Driven Education: Merging Work and Learning to Develop the Human Skills that Matter, https://safesupportivelearning.ed.gov/resources/demand-driven-education-merging-work-and-learning-develop-human-skills-matter

[6] Guijosa C, 2018, Education must Respond to the Demands of the Labour Market, according to Pearson, https://observatorio.tec.mx/edu-news/la-educacion-debe-responder-al-mercado-laboral/#:~:text=de%20la%20Educaci%C3%B3n-,La%20educaci%C3%B3n%20debe%20responder%20a%20las%20demandas%20del%20mercado%20laboral,que%20requiere%20el%20mercado%20laboral.

[7] Bitar S, 2019, The Future of Work in Latin America: How will Digitalisation Impact and what to do? https://www.thedialogue.org/analysis/el-futuro-del-trabajo-en-america-latina-como-impactara-la-digitalizacion-y-que-hacer/?lang=es

[8] World Bank 2023, World Development Indicators, https://databank.worldbank.org/source/world-development-indicators

[9] Mo Ibrahim Foundation, 2023, The Most Comprehensive Dataset of African Governance, https://iiag.online/data.html

[10] Our World in Data, 2022, Research and Data to Make Progress against the World's Largest Problems, Teachers and Professors, https://ourworldindata.org/

[11] Greene W, 2018, Econometric Analysis (8th ed.). Pearson Education.

[12] Díaz ER, 2019, Education for Employability: Approach to Educational Research. Educational Research Magazine of the Rediech, 10(19): 221–238. https://doi.org/10.33010/ie_rie_rediech.v10i19.715

[13] Aguirre FJ, Barraza L, 2021, Collegiate Work and its Implications: Design of a Pedagogical Proposal. Education Magazine, 45(2): 478–497. https://doi.org/10.15517/revedu.v45i1.42985

[14] Sosa C, 2014, Management of Didactic Resources and Quality of Pedagogical Processes in Pre-school Teachers, thesis, César Vallejo University.

[15] Medina IL, 2021, Teaching Qualification and its Contribution to the Optimization of the Work of Teachers in Latin America. Observatory of Social Sciences in Ibero-America Magazine, 2(9): 1–7.

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