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Assessing the Degree of Internationalization (DOI) and Performance Relationship in the Context of the Government-to-Government (G2G) Contracting in Peru

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Abstract: This paper analysis the relationship of the degree of internationalization (DOI), as measured by Foreign Sales over Total Sales (FATA), Foreign Assets over Total Assets (FSTS) and Foreign Affiliates over Total Assets (FATA2); and the performance relationship, as determined by the Return on Assets (ROA) through the coefficient of determination for regression for three British consultancies participating in a Government-to-Government (G2G) contracting between the Peruvian government and the Government of the UK. Results indicate that despite the low degree of predictability evidenced in the coefficient analysis, a higher DOI within a G2G contract is associated with a fruitful internationalization strategy in the short term.

Key words: G2G, DOI, performance relationship, internationalization.

INTRODUCTION

The premise of whether and to what extent a growing company could preserve its survival and sustain development when exploring new markets is one of the most addressed subjects in the reduction of uncertainty in the internationalization process (Cuervo et al., 2018). In recent decades, in the effort not only to ensure timely and quality implementation of permanent economic and social infrastructure, but also to drastically reduce collusion and fraud, the G2G practices provide a more direct and transparent contracting structure for the acquisition of critical goods and services (Mchopa et al., 2024). That means, strategic and cost-effective frameworks such as the G2G contracts tend to generate secure and lasting paths in the internationalization process of participating companies (Tunviruzzaman et al., 2021).

As a result of the gradual liberalization of the markets in recent decades, the internationalization process has several programs and public incentives with the purpose of attracting and exporting products and services in an increasingly direct way (Acevedo et al. 2020). These programs are carried out in an increasingly multipolar world where the functionality of G2G agreements between members of international associations have increased significantly, facilitating not only the development of strategic management and operational coordination, but also evidence-based decision making (Chen, 2018). However, G2G treaties can also present obstacles, such as the need to maintain political will to obtain support and resources from participating governments (Chen et al. 2018). Additionally, it is stated that the members of G2G agreements tend to present multifaceted characteristics with respect to long-term development projects. Therefore, there needs to be a clear commitment to the respective roles and responsibilities of the different G2G members, identifying common characteristics among the actors.

Moreover, Enjuto et al. (2021), who investigates the effects of the G2G contracting in the state-society relations, mention that despite the indisputable advantages that a company with pre-established connections with the government may have, that is, the existence of inequality between the actors of the G2G contract, it is also indisputable that the participation of private companies in this type of contracting increases the public sector efficiency, since it strengthens the market principle of competition. From this perspective, when the situation for multinational companies entails the question of whether a greater DOI should be reflected in greater economic performance at the business level, it must be observed from the level of the returns offered by the analysis of the DOI and performance (Loncan and Meucci 2010).

LITERATURE REVIEW

The way in which the DOI and the performance relationship will influence the internationalization process of the consultancies participating in a G2G contract is a source of analysis with many nuances and subjectivist elements. However, López and Gómez (2014), mention that because of the multiple sources of literature analyzed in its study, inarguably it is identified five general models that manage to explain the relationship between the DOI and the performance relationship. These models attempt to provide explanations for the behavior of the DOI in the performance relationship of the firm in question.

- A. **Positive And Linear Model:** Empirical evidence indicates that the relationship between DOI and performance has a positive linear relationship. It is assumed that DOI always positively impacts performance, which assumes that a company with a higher DOI in turn generates an increase in its economic benefits
- B. **Positive but Diminishing Returns Model:** The DOI with the time adversely affects the performance relationship. The DOI remains positive in the performance relationship, but the benefits begin to gradually decrease, these benefits are not as large as at the beginning of the immersion in international markets.
- C. **U-Shaped Relationship Model:** Companies initially present a negative performance when they begin the internationalization process. However, over time this trend changes little by little, ultimately becoming a positive relationship.
- D. **Inverted U-Shaped Relationship Model:** The slope of the curve is initially positive and after reaching its highest level it begins to be negative. The greater the geographical dispersion, the greater the coordination costs, hence the DOI offers the ability to take advantage of economies of scale, use the advantages of the country of origin and take advantage of cost differences among different markets.
- E. **Sigmoid Relationship Model:** Stage 1 appears with a negative slope due to the high learning costs due to lack of knowledge of the foreign market. Stage 2 is the positive slope; a greater geographic scale of operations allows for efficiency that improves performance indicators such as profit on sales or general costs per country, companies in this stage have greater access to lower costs in raw materials and can identify the best market opportunities. Stage 3, a new negative slope, since the incremental costs of further expansion within peripheral nations are greater than the incremental benefits, this affects the total performance benefits. The growth of coordination costs exceeds the benefits of the expansion of international activity, due to the complexity of managing operations in different countries simultaneously.

METHOD

Sample

To get a clear dimension of the implication of the DOI and the performance relationship of companies participating in G2G projects, it is required to analyze how specific ratios evolve over time. Consequently, the sample framework is composed by three British consultancies and its respective subsidiaries, signatories of the G2G agreement between the Peruvian Government and the UK government in 2020. These are companies with recent presence in the Peruvian market. The chosen companies are Arup Group Limited and its subsidiary Arup Peru Limited, Mace Limited and its subsidiary Mace Consultancy Peru, as well as the Gleeds Advisory Limited and its subsidiary Gleeds Peru Holding Limited.

Contrary to Arup and Mace financial statements, concerning Glead's subsidiary financial reports, which to date experience accounts overdue, for the purposes of the methodological analysis, the data for the year 2023 will be estimated based on the growth experienced by the companies during the period 2021 to 2022.

Variables and analytic method

On one hand, the DOI was initially computed as follows: DOI = The ratio of foreign sales to total sales (FSTS) + the ratio of foreign assets to total assets (FATA) + the top management international experience (TMIE) + the physic dispersion of international operations (PDIO) (Sullivan, 1994). On the other hand, the DOI methodology, as described in the research carried out by Nguyen (2017), is based on the index components, the measurement of the FSTS, FATA, TMIE, the overseas subsidiaries to total subsidiaries (OSTS), and the psychic dispersion of international operation (PDIO), which is also mentioned as a cultural phenomenon variable. However, for a holistic understanding of the application of this methodology, the FATA and the FSTS ratio will be preserved and the OSTS will be replaced by the Foreign Affiliates to Total Affiliates ratio (FATA2).

Performance relationships originally have been measured with profitability ratios obtained from financial statements that are relatively standardized and publicly available, as well as accounting or market based. In this sense, accounting-based indicators can be the following: Return on Assets (ROA), Return on Equity (ROE), Return on Capital Employed (ROCE), Return on Sales (ROS), Net operating Income, Net Income or The Zmijewski Score (Galant and Cadez, 2017). These indicators provide for the selected company accounting measures that are contemporary and reasonably comparable.

Additionally, according to the literature reviewed by Alshehhi et al. (2018), ROA ratio tends to be used almost twice as much as ROE, the second most used market-based measure. On this basis, the authors consider that profitability-related measures such as ROA, ROE, Return on Investment (ROI) and ROS historically constitute most of the measures due to their financial pressure. Regarding these observations the ROA ratio has been selected as the performance relationship indicator to measure the data in question.

FINANCIAL STAMENTS

To acquire information on the productive activities of the Arup company in its internationalization process through its participation in the G2G agreement between the UK and Peru, for the FA/TA, FS/TS, FA/TA2 and ROA variables, the following Full Accounts have been consulted in the Company Information Service of the GOV.UK.

The Financial Statements of the ARUP LIMITED 2021-2023, Company number 01312454, Nature of Business (SIC) 71122-Engineering related scientific and technical consulting activities, where the second part of the FA/TA variable will be identified and collected.

Table 1
ARUP LIMITED
Balance Sheet 2021-2023

	NOTE	2021	2022	2023
		£	£	£
Revenue		1.717.100.000	1.893.800.000	2.163.600.000
Other income		33.900.000	22.300.000	3.300.000
Assets				
Non-current assets				
Property, plant and equipment		291.900.000	299.000.000	301.600.000
Right-of-use assets				
Intangible assets		353.400.000	324.100.000	317.300.000
Investments accounted for using the equity method		4.900.000	5.200.000	8.900.000
Deferred income tax assets		-	1.200.000	3.300.000
Financial assets at fair value		62.100.000	59.900.000	88.200.000

through profit or loss				
Net investments in subleases		18.500.000	21.800.000	16.600.000
Fulfilment contract assets		100.000	200.000	100.000
Other non-current assets		900.000	800.000	700.000
		-	2.400.000	2.200.000
Current Assets	Total	731.800.000	714.600.000	738.900.000
Contract assets		190.600.000	196.000.000	204.700.000
Trade and other receivables		304.600.000	339.100.000	382.700.000
Derivative financial instruments		0.0	0.0	0.0
Cash and cash equivalents		285.800.000	307.100.000	235.100.000
		781.000.000	842.500.000	822.500.000
Assets classified as held for sale		-	1.800.000	2.800.000
Total assets	Total	1.512.800.000	1.558.900.000	1.564.200.000

Note. Arup Limited financial statement audited in accordance with ISAs UK and applicable law. Registration number 01312454. (GOV.UK, 03 January 2023).

The Financial Statements of the ARUP PERU LIMITED 2021-2023, Company number 12686337, Nature of Business (SIC) 71122-Engineering related scientific and technical consulting activities, where the first part of the FA/TA variable will be identified and collected.

Table 2
ARUP PERU LIMITED
Balance Sheet 2021-2023

	NOTE	2021	2022	2023
		£	£	£
Revenue by destination (Americas)		1.607.000	10.192.000	6.612.000
Employee benefit expense		613.000	4.526.000	3.444.000
Changes from sub-consultants		922.000	2.547.000	2.221.000
Depreciation		66.000	329.000	129.000
Communications		57.000	1.224.000	1.147.000
Net impairment losses on financial and contract assets		-	-	117.000
		1.658.000	8.626.000	7.058.000
Operating (loss) / profit		51.000	1.566.000	446.000
Finance income		-	0.0	9.000
Finance cost		1.000	35.000	132.000
(Loss) / profit before income tax		52.000	1.531.000	569.000
Income tax charge		199.000	1.998.000	816.000
Loss for the financial year		251.000	467.000	1.385.000
Assets		£	£	£
Non-current assets		302.000	86.000	44.000
Right-of-use assets		4.000	-	-
Deferred income tax assets		306.000	86.000	44.000
Current assets		1.122.000	2.627.000	1.459.000
Contract assets		148.000	2.298.000	2.990.000
Trade and other receivables		353.000	319.000	973.000
Cash and cash equivalents		1.623.000	5.244.000	5.422.000
Total assets	Total	1.929.000	5.330.000	5.466.000

Note. Part of the Arup Peru Limited, subsidiary of Arup Group Limited, audited financial statement in accordance with international Standards on Auditing (ISAs UK) and applicable law. Registration number 12686337. (GOV.UK, 05 January 2023).

The Financial Statements of the MACE LIMITED 2021-2023, Company number 02410626, Nature of Business (SIC) 70229-Management consultancy activities other than financial management, where the second part of the FA/TA variable will be identified and collected.

Table 3
MACE LIMITED
Balance Sheet 2021-2023

	NOTE	2021	2022	2023
		£	£	£
Revenue		1.933.017.000	1.892.583.000	2.356.792.000
Non-current assets				
Property, plant and equipment		22.956.000	26.993.000	33.405.000
Intangible assets				
Deferred income tax assets		51.419.000	51.949.000	43.426.000
Investments in joint ventures & associates		6.908.000	7.903.000	4.631.000
Other investments		1.341.000	944.000	251.000
Restricted cash		12.996.000	11.314.000	6.675.000
Trade and other receivables		-	244.000	252.000
		1.199.000	600.000	-
Deferred consideration		-	-	4.337.000
	Total	96.821.000	99.947.000	92.977.000
Current Assets				
Trade and other receivables		623.947.000	637.004.000	726.421.000
Development loan to join venture		80.947.000	44.430.000	33.700.000
Development work in progress		12.543.000	7.494.000	7.382.000
Asset of a disposal group classified as held for sale		-	-	-
		-	932.000	-
Current tax assets		5.578.000	1.353.000	2.143.000
Restricted cash				
Cash at bank		237.000	26.281.000	10.842.000
		164.888.000	159.974.000	172.953.000
	Total	858.477.000	876.536.000	953.441.000

Note. Mace Consultancy Peru report in accordance with (ISAs (UK)) and applicable law. Registration number 02410626. (GOV.UK, 24 July 2023).

The Financial Statements of the MACE CONSULTANCY THE AMERICAS (PERU) LIMITED 2021-2023, Company number 10874751, Nature of Business (SIC) 70229-Management consultancy activities other than financial management, where the first part of the FA/TA variable will be identified and collected.

Table 4
MACE CONSULTANCY THE AMERICAS (PERÚ)
Balance Sheet 2021-2023

	NOTE	2021	2022	2023
		£	£	£
Revenue by destination (The Americas)		-	-	-
Cost of sales		2.000	(24.000)	(123.000)
Gross (loss)/profit		2.000	(24.000)	(123.000)
Administrative expensive		125.000	(48.000)	-
Exceptional items		-	(110.000)	-

Administrative expense		125.000	(158.000)	(96.000)
Operating (loss) / profit		127.000	(182.000)	(219.000)
Interest receivable and similar income		-	7.368.000	-
Interest payable and similar expenses		(25.000)	-	(39.000)
Profit before tax		102.000	7.186.000	258.000
Tax on profit		-	(256.000)	65.000
Profit for the year		102.000	6.930.000	(193.000)
Other Comprehensive income				
Profit for the year		102.000	6.930.000	(193.000)
Foreign currency translation losses		(60.000)	(7.000)	-
Total comprehensive income for the year		42.000	6.923.000	(193.000)
Current assets				
Trade and other receivables		1.843.000	15.340.000	799.000
Cash and cash equivalents		375.000	873.000	18.000
Tax asset		-	90.000	192.000
Total		2.218.000	16.303.000	1.009.000
Total assets		£	£	£
Current liabilities				
Trade and other payables		(1.073.000)	(15.255.000)	(216.000)
Tax liabilities		(20.000)	-	(5.000)
Total		(1.093.000)	(15.255.000)	(221.000)
Net assets		1.125.000	1.048.000	855.000
Capital and reserves				
Foreign exchange reserve		(178.000)	(185.000)	2.000
Retained earnings		1.303.000	1.233.000	853.000
Shareholders' funds		1.125.000	1.048.000	855.000

Note. Mace Consultancy Peru, subsidiary of Mace Limited, report in accordance with (ISAs (UK)) and applicable law. Registration number 10874751. (GOV.UK, 11 August 2023).

The Financial Statements of the GLEEDS ADVISORY LIMITED 2021-2023, Company number 06472422, Nature of Business (SIC) 74909-Other professional, scientific, and technical activities not elsewhere classified, where the second part of the FA/TA variable will be identified and collected.

Table 5
GLEEDS ADVISORY LIMITED
Balance Sheet 2021-2023

	NOTE	2021	2022	2023
		£	£	£
Turnover		22.364.001.000	34.944.876.000	38.380.803.000

Cost of sales		(20.440.425.000)	(32.797.850.000)	(35.189.109.000)
Gross profit		1.923.576.000	2.147.026.000	3.191.694
Administrative expensive		(1.806.730.000)	(1.748.284.000)	(1.744.989)
Other operating income		13.140.000	36.165.000	35.315
Operating profit		129.986.000	434.907.000	1.482.020.000
Finance costs (net)		(5.982.000)	(18.926.000)	(30.788.000)
Profits on ordinary activities before taxation		124.004.000	415.981.000	1.451.232.000
Tax on profit on ordinary activities		(23.606.000)	(94.426.000)	(359.379.000)
		100.398.000	321.555.000	1.091.853.000
Profit for the financial year-income for the year		5.121.618.000	12.437.876.000	7.726.649.000
Current assets				
Debtors-due within one year		-	-	-
Cash at bank and in hand		-	-	-
Total current assets	Total	5.121.618.000	12.437.876.000	7.726.649.000
Amounts falling due within one year		(3.444.101.000)	(10.438.804.000)	(4.635.724.000)
Net current assets		1.677.517.000	1.999.072.000	3.090.925.000
Total assets less current liabilities, being net assets	Total	1.677.517.000	1.999.072.000	3.090.925.000

Note. Gleeds Advisory Limited, report in accordance with (ISAs (UK)) and applicable law. Registration number 06472422. (GOV.UK, 12 October 2023).

The Financial Statements of the GLEED AMERICAS (PERU) HOLDING LIMITED 2021-2022, Company number 06213794, Nature of Business (SIC) 74909-Other professional, scientific, and technical activities not elsewhere classified, where the first part of the FS/TS variable will be identified and collected. The subsidiary company, during the period 2021 to 2022, experienced a Foreign Sales growth of 0,000109 times.

Table 6
Gleeds Americas (Peru) Holding Limited
Balance Sheet 2021-2023

	NOTE	2021	2022	2023
Turnover		£	£	£
Cost of sales		-	-	-

correlation coefficient, (2) the Regression Critic allows to accept or reject the null hypothesis of the model analysis (if the value is inferior to 0,05 the hypothesis that all the regression coefficients are zero must be rejected, at least one of them are no zero), and (3) the Independent Value Probability allows to accept or reject the null hypothesis of the variance analysis (if the value is inferior to 0,05 the hypothesis that all the regression coefficients are zero must be rejected, at least one of them are no zero).

For the analysis, the following formulas will be applied for each of the companies during the three-year period, concerning the correlation coefficient and the regression model of the DOI variables in relation to the Performance Relationship variable.

Figure 1
Pearson Correlation Coefficient Formula

$$r = \frac{\sum (x_i - \bar{x})(y_i - \bar{y})}{\sqrt{\sum (x_i - \bar{x})^2 \sum (y_i - \bar{y})^2}}$$

r = correlation coefficient

x_i = values of the x-variable in a sample

\bar{x} = mean of the values of the x-variable

y_i = values of the y-variable in a sample

\bar{y} = mean of the values of the y-variable

Note. First mathematical formula proposed by Pearson in 1895. (Rodgers and Nicewander, 1988).

Figure 2

$$y = \beta_0 + \beta_1 x_1 + \dots + \beta_n x_n + \varepsilon$$

y = dependent variable

X_i = independent variable

β_i = parameter

ε = error

Multiple Linear Regression Formula

Note. The addition of multiple independent variables is the main difference between a simple linear regression and a multiple linear regression formula. (Uyanık and Güler, 2013).

Correlation Coefficient and Regression Analysis 2021

Table 7
Research Instrument Reliability Table for the year 2021

Firms	DOI	DOI	DOI	PERF. REL.
	1	2	3	4
	FATA 2021	FSTS 2021	FATA2 2021	ROA 2021
ARUP	0,0012751	0,0009359	0,0000612	0,0001659
MACE	0,0023218	0,0000528	0,0532011	0,0000440
GLEEDS	0,2142595	0,0230812	0,0003283	0,2923207

Note. This classification table of the variables DOI (FATA - FSTS - FATA2) and Performance Relationship Ratio (ROA), both for calculation of Correlation and Regression Coefficient based on the results of the 2021 financial statements consulted on the GOV.UK website, self-elaboration.

Table 8
Regression Model of the FATA 2021 Variable Based on the ROA 2021 Variable

Correlation coefficient	0,99999
R Square	0,99998
Adjusted R Square	0,99996
Standard Error	0,00110
Observations	3

ANOVA

	df	SS	MS	F	Significance F
Regression	1	0,056926	0,056926	46692,42	0,00295
Residual	1	0,000001	0,000001		
Total	2	0,056927			

	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%	Lower 95,0%	Upper 95,0%
Intercept	-0,00237	0,00079	-3,00559	0,20448	-0,01237	0,00764	-0,01237	0,00764
X Variable 1	1,37536	0,00636	216,08428	0,00295	1,29448	1,45623	1,29448	1,45623

Note. This table shows the results of the Excel Multiple Regression apply to the FSTS 2021 data of the three companies (independent variable) and the ROA 2021 data of the three companies (dependent variable), which comprises the correlation coefficient and the regression data (the Adjusted R Square, the Regression Critic Value and the Independent Variable Probability), self-elaboration.

Based on the correlation coefficient ranges, the association of the DOI variable FATA 2021 and the Performance Relationship financial variable ROA 2021 of the three British companies is 0,99 (High positive linear relationship), whereas the Regression's parameters indicate that, (1) the Adjusted R Square is 0,99 (Highly viable data model), (2) the Regression Critic Value is 0,002 (Inferior to 0,05, a reliable regression model), and (3) the Independent Value Probability is 0,002 (Inferior to 0,05, a reliable variable to do prediction).

Table 9

Regression Model of the FSTS 2021 Variable Based on the ROA 2021 Variable

Correlation coefficient	0,99944
R Square	0,99888
Adjusted R Square	0,99776
Standard Error	0,00799
Observations	3

ANOVA

	<i>df</i>	<i>SS</i>	<i>MS</i>	<i>F</i>	Significance F
Regression	1	0,05686	0,05686	891,14539	0,02132
Residual	1	0,00006	0,00006		
Total	2	0,05693			

	<i>Coefficients</i>	<i>Standard Error</i>	<i>t Stat</i>	<i>P-value</i>	<i>Lower 95%</i>	<i>Upper 95%</i>	<i>Lower 95,0%</i>	<i>Upper 95,0%</i>
Intercept	-0,00617	0,00577	-1,06916	0,47873	-0,07953	0,06719	-0,07953	0,06719
X Variable 1	12,92278	0,43289	29,85206	0,02132	7,42234	18,42322	7,42234	18,42322

Note. This table shows the results of the Excel Multiple Regression apply to the FSTS 2021 data of the three companies (independent variable) and the ROA 2021 data of the three companies (dependent variable), which comprises the correlation coefficient and the regression data (the Adjusted R Square, the Regression Critic Value and the Independent Variable Probability), self-elaboration.

Based on the correlation coefficient ranges, the association of the DOI variable FSTS 2021 and the Performance Relationship financial variable ROA 2021 of the three British companies is 0,99 (High positive linear relationship), whereas the Regression’s parameters indicate that, (1) the Adjusted R Square is 0,99 (Highly viable data model), (2) the Regression Critic Value is 0,02 (Inferior to 0,05, a reliable regression model), and (3) the Independent Value Probability is 0,02 (Inferior to 0,05, a reliable variable to do prediction).

Table 10
Regression Model of the FATA2 2021 Variable Based on the ROA 2021 Variable

Correlation coefficient	0,49653
R Square	0,24654
Adjusted R Square	-0,50692
Standard Error	0,20710
Observations	3

ANOVA

	<i>df</i>	<i>SS</i>	<i>MS</i>	<i>F</i>	Significance F
Regression	1	0,01403	0,01403	0,32721	0,66922
Residual	1	0,04289	0,04289		
Total	2	0,05693			

	<i>Coefficients</i>	<i>Standard Error</i>	<i>t Stat</i>	<i>P-value</i>	<i>Lower 95%</i>	<i>Upper 95%</i>	<i>Lower 95,0%</i>	<i>Upper 95,0%</i>
Intercept	0,14641	0,14698	0,99608	0,50125	-1,72120	2,01402	-1,72120	2,01402
X Variable 1	-2,73726	4,78521	-0,57203	0,66922	-63,53918	58,06465	-63,53918	58,06465

Note. This table shows the results of the Excel Multiple Regression apply to the FATA2 2021 data of the three companies (independent variable) and the ROA 2021 data of the three companies (dependent variable), which comprises the correlation coefficient and the regression data (the Adjusted R Square, the Regression Critic Value and the Independent Variable Probability), self-elaboration.

Based on the correlation coefficient ranges, the association of the DOI variable FATA2 2021 and the Performance Relationship financial variable ROA 2021 of the three British companies is 0,49 (Moderate positive linear

relationship), whereas the Regression's parameters indicate that, (1) the Adjusted R Square is -0,5 (Negative viable data model), (2) the Regression Critic Value is 0,6 (Superior to 0,05, a no reliable regression model), and (3) the Independent Value Probability is 0,6 (Superior to 0,05, a no reliable variable to do prediction).

Correlation Coefficient and Regression Analysis 2022

The content of each of the variables (FATA-FSTS-FATA2-ROA) responds to the three British companies selected, based on the 2022 financial results obtained by both, its global operations and those of its subsidiary in Peru.

Table 11
Research Instrument Reliability Table for the year 2022

Firms	DOI	DOI2	DOI3	PERF. REL.
	1	2	3	4
	FATA 2022	FSTS 2022	FATA2 2022	ROA 2022
ARUP	0,00341908	0,00538177	0,00002214	0,00029957
MACE	0,01669563	0,00379693	0,00723793	0,00708973
GLEEDS	0,17976741	0,00000160	0,00032835	0,00002801

Note. This classification table of the variables DOI (FATA - FSTS - FATA2) and Performance Relationship Ratio (ROA), both for calculation of Correlation and Regression Coefficient based on the results of the 2022 financial statements consulted on the GOV.UK website, self-elaboration.

Table 12
Regression Model of the FATA 2022 Variable Based on the ROA 2022 Variable

Correlation coefficient	0,47053
R Square	0,22140
Adjusted R Square	-0,55720
Standard Error	0,00499
Observations	3

ANOVA

	df	SS	MS	F	Significance F
Regression	1	0,000007	0,000007	0,28	0,69
Residual	1	0,000025	0,000025		
Total	2	0,000032			

	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%	Lower 95,0%	Upper 95,0%
Intercept	0,00375	0,00375	1,00050	0,49984	-0,04387	0,05137	-0,04387	0,05137
X Variable 1	-0,01917	0,03595	-0,53325	0,68812	-0,47594	0,43760	-0,47594	0,43760

Note. This table shows the results of the Excel Multiple Regression apply to the FATA 2022 data of the three companies (independent variable) and the ROA 2022 data of the three companies (dependent variable), which comprises the correlation coefficient and the regression data (the Adjusted R Square, the Regression Critic Value and the Independent Variable Probability), self-elaboration.

Based on the correlation coefficient ranges, the association of the DOI variable FATA 2022 and the Performance Relationship financial variable ROA 2022 of the three British companies is 0,47 (Moderate positive linear relationship), whereas the Regression’s parameters indicate that, (1) the Adjusted R Square is -0,5 (Negative viable data model), (2) the Regression Critic Value is 0,69 (Superior to 0,05, a no reliable regression model), and (3) the Independent Value Probability is 0,69 (Superior to 0,05, a no reliable variable to do prediction).

Table 13
Regression Model of the FSTS 2022 Variable Based on the ROA 2022 Variable

Correlation coefficient	0.26369
R Square	0.06953
Adjusted R Square	-0.86093
Standard Error	0.00377
Observations	3

ANOVA

	df	SS	MS	F	Significance F
Regression	1	0.00000	0.00000	0.07473	0.83
Residual	1	0.00001	0.00001		
Total	2	0.00002			

	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%	Lower 95,0%	Upper 95,0%
Intercept	0.00261	0.00273	0.95560	0.51445	-0.03209	0.03731	-0.03209	0.03731
X Variable 1	0.18221	0.66655	0.27337	0.83012	-8.28716	8.65158	-8.28716	8.65158

Note. This table shows the results of the Excel Multiple Regression apply to the FSTS 2022 data of the three companies (independent variable) and the ROA 2022 data of the three companies (dependent variable), which comprises the correlation coefficient and the regression data (the Adjusted R Square, the Regression Critic Value and the Independent Variable Probability), self-elaboration.

Based on the correlation coefficient ranges, the association of the DOI variable FSTS 2022 and the Performance Relationship financial variable ROA 2022 of the three British companies is 0,26 (Poor positive linear relationship), whereas the Regression’s parameters indicate that, (1) the Adjusted R Square is -0,86 (Negative viable data model), (2) the Regression Critic Value is 0,83 (Superior to 0,05, a no reliable regression model), and (3) the Independent Value Probability is 0,83 (Superior to 0,05, a no reliable variable to do prediction).

Table 14
Regression Model of the FATA2 2022 Variable Based on the ROA 2022 Variable

Correlation coefficient	0,99745
R Square	0,99490
Adjusted R Square	0,98980
Standard Error	0,00040
Observations	3

ANOVA

	df	SS	MS	F	Significance F
Regression	1	0,0000319	0,0000319	195,09	0,05
Residual	1	0,0000002	0,0000002		
Total	2	0,0000320			

	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%	Lower 95,0%	Upper 95,0%
Intercept	-1,41146E-06	2,92906E-04	-4,81880E-03	9,96932E-01	-3,72314E-03	3,72031E-03	-3,72314E-03	3,72031E-03
X Variable 1	0,97801	7,00207E-02	1,39674E+01	0,05	8,83120E-02	1,86771E+00	8,83120E-02	1,86771E+00

Note. This table shows the results of the Excel Multiple Regression apply to the FATA2 2022 data of the three companies (independent variable) and the ROA 2022 data of the three companies (dependent variable), which comprises the correlation coefficient and the regression data (the Adjusted R Square, the Regression Critic Value and the Independent Variable Probability), self-elaboration.

Based on the correlation coefficient ranges, the association of the DOI variable FATA2 2022 and the Performance Relationship financial variable ROA 2022 of the three British companies is 0,99 (High positive linear relationship), whereas the Regression’s parameters indicate that, (1) the Adjusted R Square is 0,98 (Highly viable data model), (2) the Regression Critic Value is 0,05 (Not superior to 0,05, a reliable regression model), and (3) the Independent Value Probability is 0,05 (Not superior to 0,05, a reliable variable to do prediction).

Correlation Coefficient and Regression Analysis 2023

The content of each of the variables (FATA-FSTS-FATA2-ROA) responds to the three British companies selected, based on the 2023 financial results obtained by both, its global operations and those of its subsidiary in Peru.

Table 15
Research Instrument Reliability Table for the year 2023

Firms	DOI	DOI2	DOI3	PERF. REL.
	1	2	3	4
	FATA 2023	FSTS 2023	FATA2 2023	ROA 2023
ARUP	0,00349444	0,00305602	0,00002159	0,00088544
MACE	0,00096424	0,00010947	0,11694747	0.00018444
GLEEDS	0,11624738	0,0000000002	0,00032841	0,000000002

Note. This classification table of the variables DOI (FATA - FSTS - FATA2) and Performance Relationship Ratio (ROA), both for calculation of Correlation and Regression Coefficient based on the results of the 2023 financial statements consulted on the GOV.UK website, self-elaboration.

Table 16
Regression Model of the FATA 2023 Variable Based on the ROA 2023 Variable

Correlation coefficient	0.64658
R Square	0.41806
Adjusted R Square	-0.16387
Standard Error	0.07103
Observations	3

ANOVA

	<i>df</i>	<i>SS</i>	<i>MS</i>	<i>F</i>	Significance F
Regression	1	0.00362	0.00362	0.71840	0.55240
Residual	1	0.00505	0.00505		
Total	2	0.00867			

	<i>Coefficients</i>	<i>Standard Error</i>	<i>t Stat</i>	P-value	<i>Lower 95%</i>	<i>Upper 95%</i>	<i>Lower 95,0%</i>	<i>Upper 95,0%</i>
Intercept	0.07273	0.05614	1.29553	0.41849	-0.64062	0.78609	-0.64062	0.78609
X Variable 1	-91.12821	107.51483	-0.84759	0.55240	-1457.23361	1274.97719	-1457.23361	1274.97719

Note. This table shows the results of the Excel Multiple Regression apply to the FATA 2023 data of the three companies (independent variable) and the ROA 2023 data of the three companies (dependent variable), which comprises the correlation coefficient and the regression data (the Adjusted R Square, the Regression Critic Value and the Independent Variable Probability), self-elaboration.

Based on the correlation coefficient ranges, the association of the DOI variable FATA 2023 and the Performance Relationship financial variable ROA 2023 of the three British companies is 0,64 (Positive linear relationship), whereas the Regression’s parameters indicate that, (1) the Adjusted R Square is -0,16 (Negative viable data model), (2) the Regression Critic Value is 0,55 (Superior to 0,05, a no reliable regression model), and (3) the Independent Value Probability is 0,55 (Superior to 0,05, a no reliable variable to do prediction).

Table 17
Regression Model of the FSTS 2023 Variable Based on the ROA 2023 Variable

Correlation coefficient	0.98607
R Square	0.97233
Adjusted R Square	0.94465
Standard Error	0.00041
Observations	3

ANOVA

	<i>df</i>	<i>SS</i>	<i>MS</i>	<i>F</i>	Significance F
Regression	1	0.00001	0.00001	35.13533	0.10640
Residual	1	0.00000	0.00000		
Total	2	0.00001			

	<i>Coefficients</i>	<i>Standard Error</i>	<i>t Stat</i>	P-value	<i>Lower 95%</i>	<i>Upper 95%</i>	<i>Lower 95,0%</i>	<i>Upper 95,0%</i>
Intercept	-0.00025	0.00032	-0.77508	0.58024	-0.00435	0.00385	-0.00435	0.00385
X Variable 1	3.65937	0.61735	5.92751	0.10640	-4.18486	11.50361	-4.18486	11.50361

Note. This table shows the results of the Excel Multiple Regression apply to the FSTS 2023 data of the three companies (independent variable) and the ROA 2023 data of the three companies (dependent variable), which comprises the correlation coefficient and the regression data (the Adjusted R Square, the Regression Critic Value and the Independent Variable Probability), self-elaboration.

Based on the correlation coefficient ranges, the association of the DOI variable FSTS 2023 and the Performance

Relationship financial variable ROA 2023 of the three British companies is 0,98 (High positive linear relationship), whereas the Regression's parameters indicate that, (1) the Adjusted R Square is 0,94 (Highly viable data model), (2) the Regression Critic Value is 0,10 (Superior to 0,05, a no reliable regression model), and (3) the Independent Value Probability is 0,10 (Superior to 0,05, a no reliable variable to do prediction).

Table 18

Regression Model of the FATA2 2023 Variable Based on the ROA 2023 Variable

Correlation coefficient	0.32136
R Square	0.10327
Adjusted R Square	-0.79346
Standard Error	0.09029
Observations	3

ANOVA

	<i>df</i>	<i>SS</i>	<i>MS</i>	<i>F</i>	Significance F
Regression	1	0.00094	0.00094	0.11517	0.79172
Residual	1	0.00815	0.00815		
Total	2	0.00909			

	<i>Coefficients</i>	<i>Standard Error</i>	<i>t Stat</i>	<i>P-value</i>	<i>Lower 95%</i>	<i>Upper 95%</i>	<i>Lower 95,0%</i>	<i>Upper 95,0%</i>
Intercept	0.05564	0.07136	0.77966	0.57842	-0.85111	0.96238	-0.85111	0.96238
X Variable 1	-46.37789	136.66244	-0.33936	0.79172	-1782.83882	1690.083	-1782.83882	1690.08305

Note. This table shows the results of the Excel Multiple Regression apply to the FATA2 2023 data of the three companies (independent variable) and the ROA 2023 data of the three companies (dependent variable), which comprises the correlation coefficient and the regression data (the Adjusted R Square, the Regression Critic Value and the Independent Variable Probability), self-elaboration.

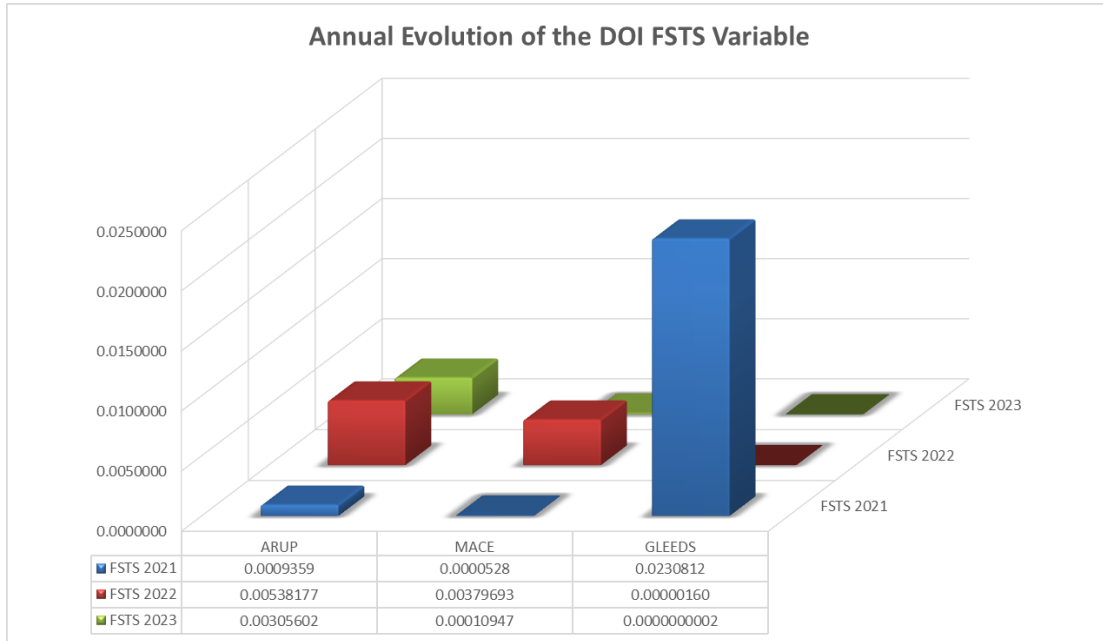
Based on the correlation coefficient ranges, the association of the DOI variable FATA2 2023 and the Performance Relationship financial variable ROA 2023 of the three British companies is 0,32 (Poor positive linear relationship), whereas the Regression's parameters indicate that, (1) the Adjusted R Square is -0.79 (Negative viable data model), (2) the Critical Regression Value is 0,79 (Superior to 0,05, a no reliable regression model), and (3) the Independent Value Probability is 0,79 (Superior to 0,05, a no reliable variable to do prediction).

DESCRIPTIVE STATISTICS

As can be seen in the following graph correlation table, there is a positive linear trend for the ARUP company with respect to its FATA variable throughout its participation in the G2G agreement, as for the MACE company, an exponential trend line prevails during the first two years, while for the GLEEDS company, a negative linear trend is observed in terms of its FATA variable throughout its participation in the G2G model. Therefore, it is observed that only for the ARUP and MACE participation in the G2G agreement between the UKDT and the ARCC has represented a relatively positive and sustained development throughout the first 3 years of the project.

Figure 3

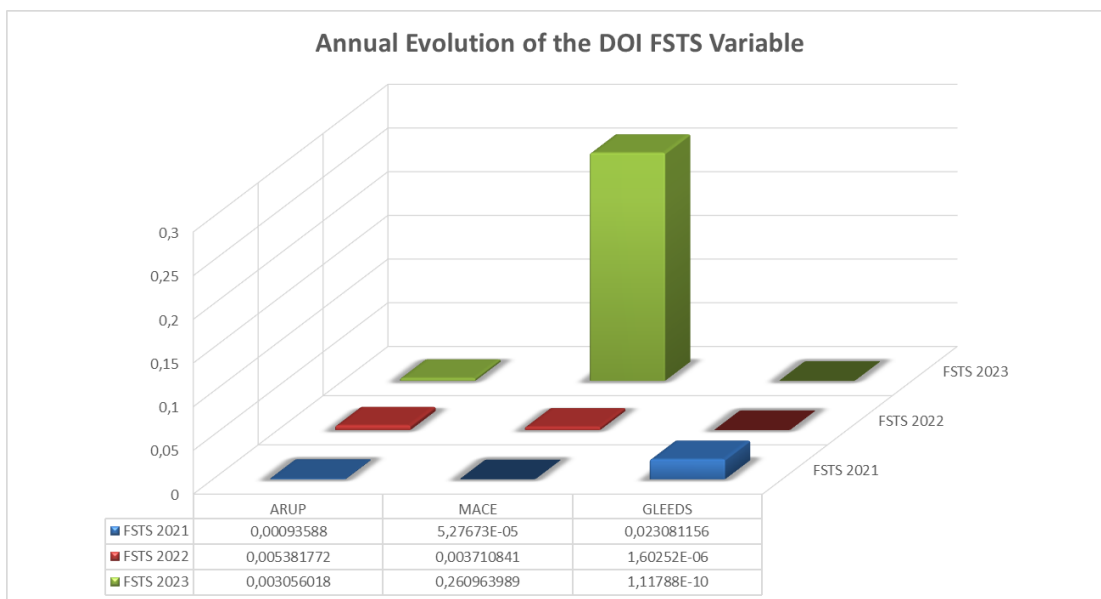
Evolution of The FATA Variable of Companies From 2021 to 2023



Note. This figure shows the variation between the FATA variables of the ARUP, MACE and GLEEDS companies throughout 2021, 2022 and 2023, that is, the significance of their participation in the G2G agreement during the last 3 years, self-elaboration.

As identified in the following graph, there is evidence of an exponential trend line for the companies ARUP and MACE during the first two years with respect to its FSTS variable, while for the GLEEDS company, a marked negative linear trend is observed in terms of its FSTS variable. Therefore, it is observed that only the ARUP and MACE participation in the G2G agreement between the UKDT and the ARCC has represented a partial positive development throughout the first 3 years of the project.

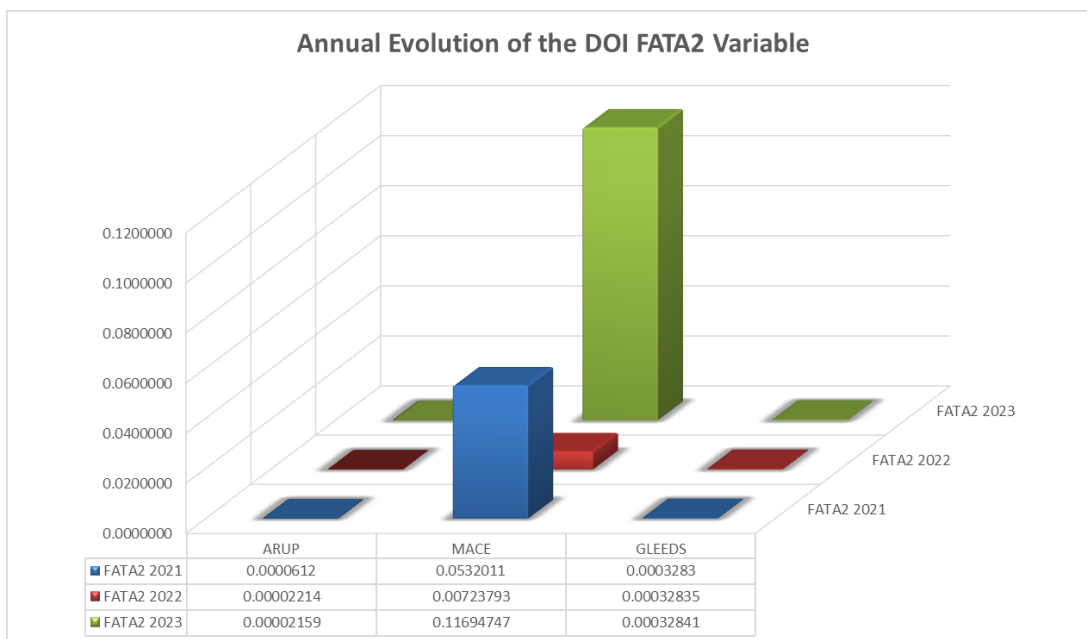
Figure 4
Evolution of The FSTS Variable of Companies From 2021 to 2023



Note. This figure shows the variation between the FSTS variables of the ARUP, MACE and GLEEDS companies throughout 2021, 2022 and 2023, that is, the significance of their participation in the G2G agreement during the last 3 years, self-elaboration.

As observed in the correlation table below, there is a negative linear trend for the ARUP company with respect to its FATA2 variable. As for the MACE company, it has been identified a marked positive exponential trend line of the FATA2 variable in the year 2022-2023, while for the GLEEDS company, a static linear trend is observed regarding its FATA2 variable throughout their participation in the G2G model. Therefore, it can be stated that participation in the G2G agreement between the UKDT and the ARCC only has represented a positive or sustained development for the MACE company during 2021-2023.

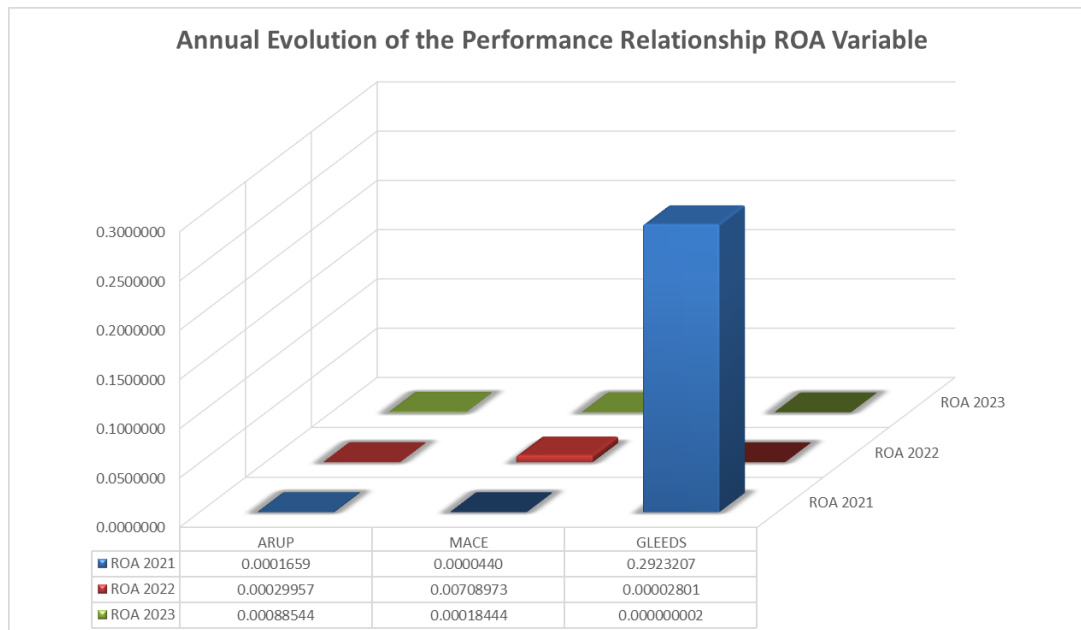
Figure 5
Evolution of The FATA2 Variable of Companies From 2021 to 2023



Note. This figure shows the variation between the FATA2 variables of the ARUP, MACE and GLEEDS companies throughout 2021, 2022 and 2023, that is, the significance of their participation in the G2G agreement during the last 3 years, self-elaboration.

As can be seen in the correlation table below, there is a positive but imperceptible linear trend for both the company ARUP and MACE with respect to its ROA variable, as for the company GLEEDS, a fairly marked negative linear exponential trend is observed between the year 2021-2022 in terms of its ROA variable. Therefore, it is observed that there is no company in G2G agreement between the UKDT and the ARCC with a positive development throughout the first 3-year period.

Figure 6
Evolution of The ROA Variable of Companies From 2021 to 2023



Note. This figure shows the variation between the ROA variables of the ARUP, MACE and GLEEDS companies throughout 2021, 2022 and 2023, that is, the significance of their participation in the G2G agreement during the last 3 years, self-elaboration.

CONCLUSION

As regression level analysis, except for the Correlation Coefficient of the FSTS variable in 2022 and the FATA2 in 2023, the rest of the coefficients indicate a moderate / high level of association among variables. Additionally, concerning the Regression Model, in 2021 one-third of the regression analysis represent inconsistent figures to be able to predict association among variables (the FATA2/ROA analysis), in 2022 two-thirds of the regression analysis represent inconsistent figures to be able to predict association among variables (the FATA/ROA and the FSTS/ROA analysis), and in 2023 all the regression analysis present inconsistent figures to be able to predict association among variables (the FATA/ROA, the FSTS/ROA and the FATA2/ROA analysis), which indicates that although the G2G agreement has been a relatively beneficial mechanism for the participating companies to insert themselves into the Peruvian market, its predictability of its development over time presents several limitations to be calculated.

Additionally, based on the data tables of the statistical analysis graphs, it can be stated that despite not all companies have participated equally in the 118 contracts required by the Peruvian Government, none of the three companies have gone through executive periods of low activity, in view of the moderate exponential linear trend observed in almost all the variables studied, except for the FATA2 variable.

As development fluctuation implication, except for the deficient trend shown by the Gleeds company, regarding the four sub variables throughout the first three years of the project, the companies Arup and Mace have presented a positive linear, an exponential growth or a static linear trend in almost all the sub-variables development during the period 2021-2023. This responds to the flexible nature of the G2G agreement in which the companies participate, which although it has allowed the organizations to intervene in all the 118 projects, not all have had the same degree of immersion in each of them.

As managerial implication, despite the lack of predictability during the project, the G2G agreement provides a framework that is considerably financially profitable in the short term for the participating companies, which exponentially increase the opportunities to obtain new contracts or extend the current ones with public or private entities.

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Declaration of Conflict of Interest

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February 16th, 2025

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I confirm that this work is original and has not been published elsewhere, nor is it currently under consideration for publication elsewhere.

I have no conflicts of interest to disclose.

Please address all correspondence concerning this manuscript to me at jhgallardo2019@gmail.com.

Thank you for your consideration of this manuscript.

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