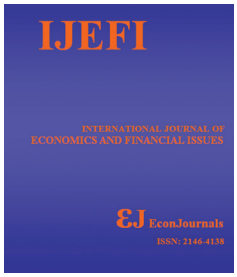

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Income Influence in Financial Inclusion: A Multivariate Analysis with Evidence from Central America

Walter Jeremías López Flores[1,2]*

[1]Postgraduate Faculty, Universidad Tecnológica Centroamericana, UNITEC, Honduras, [2]Engineering Faculty, Universidad Nacional Autónoma de Honduras, UNAH, Honduras. *Email: wjlopezf@unah.edu.hn

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ABSTRACT

Financial inclusion is a process that ensures ease of access, availability and usage of the formal financial system for all members of an economy, contributing to economic growth, poverty reduction and lower income inequality; nevertheless, there is a gap between developed countries with respect to developing economies that need to be addressed; besides, studies so far have not centered their attention in Central America. So, the purpose of this research was to determine if income has influence on the financial inclusion of the six countries of such region, through a multivariate analysis of indicators for the main formal financial services: payments, savings and credit through account and credit card ownership and access to formal loans indicators obtained from the Global Findex Database to build a one-way MANOVA model with country income level as a group factor. Results showed that there was a statistically significant difference between the country's income group on the combined dependent variables: $F(1,22) = 7.61$, $P = 0.0014$, and that multivariate financial inclusion was higher in upper-middle income countries than in the lower-middle analyzed, recommending policy-makers to implement public policies that increase their country's income in order to improve financial inclusion of their population.

Keywords: Financial Inclusion, Income, Central America, Multivariate Analysis, One-way MANOVA.
JEL Classifications: C3, C33, C58, F3

1. INTRODUCTION

Financial inclusion can be defined as a three-dimensional process that together build an inclusive financial system that ensures ease of access (1), availability (2) and usage (3) of the formal financial system for all members of an economy (Sarma, 2008). This concept had been identified as a key enabler in modern society providing family's basic economic security, empowerment and instrumental prevention from falling into poverty and for lowering income inequality (Martínez Turégano and García Herrero, 2018; Park and Mercado, 2018; Sharma et al., 2019; Ozili, 2021; Polloni-Silva et al., 2021). Nevertheless, despite there has been discussion about the close relation between financial development and economic growth, there has not been much on whether financial development implies financial inclusion, even well-developed financial systems have not succeeded in being all inclusive, leaving certain segments of their population outside the formal financial system, particularly vulnerable groups like women or poor adults (Sarma, 2008; Ozili, 2021).

Financial inclusion necessary infers accessibility and usage of financial services from formal service providers (Sarma, 2008), for aims of this study the formal access to the basic financial services: savings, payments and credit was considered. According to Demirgüç-Kunt et al. (2022) 71% of adults in developing economies now have a formal financial account, compared to 42% a decade ago when the first edition of the Global Findex Database was published by the World Bank (WB), and the gap in access to finance between men and women in developing economies

has fallen from 9 to 6 percentage points which is an important transformation for development.

Wang and Guan (2016) say that building an inclusive financial system is an important way to achieve the Sustainable Development Goals and governments should play a positive role in developing financial inclusion by incorporating it into national development strategies with relevant legislative and regulatory work at a macro-economic level; on the meso-economic level, society should strengthen the construction of financial infrastructure devoted to reducing the cost of financial services and making them affordable to the poor and on the micro-level, micro finance should be developed to improve inclusion.

Worldwide, account ownership increased by 50% in the 10 years spanning 2011 to 2021 to reach 76% of the global adult population, and from 2017 to 2021 the average rate of account ownership in developing economies increased from 63 to 71 percent. More than half of the world's unbanked adults live in seven economies: India 17%, China 9%, Pakistan 8%, Indonesia 7%, Nigeria 5%, Egypt 4% and Bangladesh 4%, being most of them women 13% and men 11% (Demirgüç-Kunt et al., 2022).

Another important services are digital payments, which can be made directly from an account without withdrawing cash in primarily two ways: using credit or debit cards or using a mobile phone or the internet, in high-income economies, 90% of adults (93% of account owners) used one of these modes to make a payment, while in developing economies 45% of adults (64% of account owners) did so (Demirgüç-Kunt et al., 2022).

About 50% of adults in developing economies borrowed money, although fewer than half used formal loans from a financial institution, credit cards were the dominant form of borrowing in high-income economies and in some developing economies such as Argentina, Brazil, China, the Russian Federation, Türkiye and Ukraine, but in developing countries borrowing only from family and friends is as common as doing so formally, with a share on average low, but that has increased over the past decade from about 16% of adults in 2014 and 2017 to 23% in 2021, in high-income economies the share remained stable at about 56% but the dominant way to borrow was by credit card, which is both a payment instrument and a source of credit (Demirgüç-Kunt et al., 2022).

Despite recent progress in the usage of alternative financial services by adult populations, financial inclusion in Latin America (LA) lags significantly not only with respect to high-income countries, but also to countries called region's comparators (countries in other regions with similar development degree), observing that the gap have not reduced generally and, in some cases, have even increased (Rojas-Suárez, 2016), also the financial systems in Latin America and the Caribbean (LAC) countries have developed significantly over the last decades transitioning from an old traditional bank-based model to a new more complex and interconnected with non-bank institutions playing a central role (Martínez Pería, 2013).

Precisely, Rojas-Suárez (2016) states that the dominant model for the provision of financial services in LA is bank-led through the rapid expansion of branches, ATMs and banking correspondents, however experiences around the world show that improvements in financial inclusion involve the continuous entrance of new institutions and agents as financial services providers with innovations and new business models on the rise as (Senyo and Osabutey, 2020) identified that the potential gained by financial inclusion in recent years was due to Fintech solutions and mobile money.

Many studies (Martínez Pería, 2013; Adalessossi and Kaya, 2015; Rojas-Suárez, 2016; Wang and Guan, 2016; Polloni-Silva et al., 2021) had addressed the issue of financial inclusion and income level in many countries with panel data across different regions around de world using the Global Findex Database or other macroeconomic indicators, but none of them have approached the Central American (CA) region, the closest geographically scope found in literature had been limited to LA or LAC region in general (that despite including CA, it does not focus on it specifically) finding a gap in literature that this study aims to fulfill; hence the purpose of this research is to determine if the country's income level has influence on the financial inclusion of the CA region through a multivariate analysis of indicators for the principal financial services. For this, the following hypothesis was formulated:

H_1: There are no significant differences across the combined financial inclusion indicators of the CA region between country income groups.

Literature generally illustrates that there are significant geographical disparities in financial inclusion, with developed countries generally having higher levels of financial inclusion compared to less developed regions. Addressing these disparities is crucial for global economic development, therefore the importance of this research focusing on a dedicated unexplored region that might contribute to effective policy and regulatory frameworks for promoting financial inclusion, helping to create an environment that supports the development and sustainability of inclusive financial systems in their economies. The remainder of this article is organized as follows: next section 2 discusses the methodology employed, section 3 presents the results obtained and lastly the discussion and conclusions of the study are presented in Sections 4 and 5 respectively.

2. METHODOLOGY

This section is structured in two parts: the mathematical explanation of the selected model with its respective assumptions, followed by the second part where variables definition, data source, population and sample, and tools for data modeling are detailed.

2.1. Theoretical Model Background

According to (Mardia et al., 1995; Cole et al., 1993; Rencher, 2002; Liu, 2016) when there are several variables measured on each experimental unit instead of just one variable, the design

is analyzed by Multivariate Analysis of Variance (MANOVA) techniques, and when there is a single factor variable it is used the one-way model explained as:

$$y_{ij} = \mu + \lambda_j + \varepsilon_{ij}, \quad i = 1,2,\ldots,k; \quad j = 1, 2,\ldots,n \tag{1}$$

where μ = Overall effect on the response vector, ε_{ij} = Independent N_p (0,∑) and λ_j = Effect due to the *j*th condition, to compare the mean vectors of the *k* samples for significant differences with the hypothesis H_0: $\mu_1 = \mu_2 = \cdots = \mu_k$ against H_1: at least 2μ's are unequal. The likelihood ratio criterion to test them is $\Lambda = |\mathbb{W}| / |\mathbb{T}|$, where

$$\mathbb{W} = \sum_{j=1}^{k}\sum_{i=1}^{n}\left(x_{ij} - \bar{x}_j\right)\left(x_{ij} - \bar{x}_j\right)' \tag{2}$$

And

$$\mathbb{T} = \sum_{j=1}^{k}\sum_{i=1}^{n}\left(x_{ij} - \bar{x}\right)\left(x_{ij} - \bar{x}\right)' \tag{3}$$

With

$$\bar{x}_j = \frac{\sum_{i=1}^{n} x_{ij}}{n_j}, \quad \bar{x} = \frac{\sum_{j=1}^{k}\sum_{i=1}^{n} x_{ij}}{n}, \quad n = \sum_{j=1}^{k} n_j \tag{4}$$

being $\mathbb{W}$ and $\mathbb{T}$ respectively the within-samples and total sum of squares and products (SSP) matrices for the MANOVA identity $\mathbb{T} = \mathbb{W} + \mathbb{B}$ where

$$\mathbb{B} = \sum_{j=1}^{k} n_j \left(\overline{x_j} - \bar{x}\right)\left(\overline{x_j} - \bar{x}\right)' \tag{5}$$

is the between-samples SSP matrix. In the multivariate case, it is assumed that *k* independent random samples of size *n* are obtained from *p*-variate normal populations with equal covariance matrices. Literature review highlights the following nine assumptions that underpin the one-way MANOVA procedure (Laerd, n.d.; Rencher, 2002; Liu, 2016):

1. There are two or more dependent variables measured at interval or ratio level.
2. There must be one independent variable (between-subjects factor) which consists of two or more categorical, independent or unrelated groups.
3. Independence of observations, which means no relationship between observations.
4. An adequate sample size with more cases per group than the number of dependent variables analyzed.
5. There should be no univariate or multivariate outliers in dependent variables.
6. Dependent variables should follow normality within population groups and there should be multivariate normality between all of them.
7. There should be a linear relationship between each pair of dependent variables for each group in the independent variable.
8. There should be homogeneity of variance-covariance matrices.
9. There is no multicollinearity between dependent variables.

2.2. Variable Definition and Data Sample

Data was obtained from the World Bank's Global Findex Database (World Bank [WB], 2022) which provides indicators on topics such as account ownership, payments, savings, credit, and financial resilience reported by country, region and income group with triennial periodicity for years 2011 to 2021 used to track progress toward the United Nations (UN) Sustainable Development Goals (Demirgüç-Kunt et al., 2022).

The dataset was made up of 1,232 data fields and 658 data records, 6 fields were control variables (country name, country code, year, adult population, region and income group) and the remaining features where country-level population percentages from the Global Findex questionnaire which 40 of them had less than 0.15% of missing data, 16 had 0.3%, other 16 had 1.52% and another 16 columns had 1.98%; the lasting 1,138 had above 25% of missing values. Four dependent variables: account, debit card, credit card and loan were selected from fields with the least blanks to represent financial inclusion indicators for the main financial services: payments, credit and savings shown in Table 1.

Countries were filtered to select only the ones from the CA region under study: Guatemala (502), El Salvador (503), Honduras (504), Nicaragua (505), Costa Rica (506) and Panama (507), getting a longitudinal data panel that was used for contrast means between their income groups. Similar methodology was used by Chang Tam et al. (2023) in a panel data of countries from Central and South America to determine whether there were statistically significant differences between various percentage indicators of their population between years with respect to the income group to which they belonged. The complete data panel used in this study is shown in Table A1 of Appendix A and was processed using the software Excel, Stata and SPSS.

3. RESULTS

The results section is structured into three parts: the exploratory data analysis phase describing the dataset and exploring data behavior, followed by the verification of assumptions and finally the model specification.

3.1. Exploratory Data Analysis (EDA)

Table A1 is a balanced dataset of 24 observations corresponding to four years for each one of six Central American countries, half of them (12 observations) classified as lower middle income (El Salvador, Honduras and Nicaragua) and the other subgroup in the upper middle class (Guatemala, Costa Rica and Panama). Summarize is shown with their respective variable's descriptive statistics in Table 2. In general terms, 36% of the CA population has a formal account in a financial institution, 22% reported having a debit card, 7% has a credit card and 13% had access to formal loans, when comparing both income groups all means resulted higher in countries with upper middle income.

Figure 1 shows that there are visual differences in behavior over time of variables account and debit card in two upper middle countries, Costa Rica and Panama, with respect to the rest of the

Table 1: Variables definition

Variable	Description	Type	Indicator
Country	Country code	Categorical (integer)	Numeric code for each Central American country (502 to 507)
Year	Year	Discrete (integer)	Year number for triennial time series (2011, 2014, 2017, 2021)
Income	Income group	Categorical (integer)	1 for lower middle income; 2 for Upper middle income
Account	Has formal account	Continuous (float)	% of adult population+15 who report having a formal account
Debit card	Owns a debit card	Continuous (float)	% of adult population+15 who report owning a debit card
Credit card	Owns a credit card	Continuous (float)	% of adult population+15 who report owning a credit card
Loan	Had a formal loan	Continuous (float)	% of adult population+15 who report had a formal loan

region, even Guatemala shares similarities in many indicators with the lower middle countries specially with Honduras. Costa Rica showed the highest rates over time in all variables, followed by Panama, Guatemala, Honduras, El Salvador and Nicaragua as last with the weakest indicators of financial inclusion of the region over the last decade. Also, the boxplot shows visual differences between countries' income groups in all variables, mainly in account, debit and credit card; but the MANOVA analysis is yet to confirm if those differences are statistically significant.

To get a picture of the current situation, the most recent measures of the variable indicators registered in 2021 are visualized by their intensity in Figure 2, showing the best results for Costa Rica in all cases, Panama was second in most indicators, only surpassed in access to formal loans by the last place country Nicaragua and then Guatemala, map (a) represents the percentage of adult population who report having an account at a formal financial institution, map (b) is the percentage of adult population who report owning a credit card; map (c) the percentage of adult population who report owning a debit card; and map (d) the percentage of adult population who report that had a loan at a formal financial institution.

3.2. Model Assumptions Verifications

As seen on Tables 1 and 2, all dependent variables are percentages of population stored in decimal format and independent variable income is categorical with two balanced classes, there is no observation in more than one group, and there are more cases in each group than the number of dependent variables, thus meeting assumptions 1-4. To verify assumption 5, the boxplot in Figure 1 did not show any univariate outliers, and as far as the multivariate outliers, Mahalanobis distances must be estimated according to (van den Berg, 2024) as:

$$D_i^2 = (x_i - \bar{x})' S^{-1} (x_i - \bar{x}) \quad (6)$$

Where D_i^2 denotes the squared Mahalanobis distance for case i; x_i denotes the vector of scores for case i; $\bar{x}$ represents the vector of means over all cases and S implies the covariance matrix over all variables. The values were computed in column "MAH_1" from Table A1 with their respective P-values in column "Prob MAH_1"; according to (Bobbitt 2020a; van den Berg, 2024) any probability <0.001 is considered an outlier, so by not obtaining any lower value, assumption 5 was met.

Univariate normality between groups was checked with the Shapiro-Wilk test, all P-values obtained were >0.05 as can be seen in Table 3, so each dependent variable is normally distributed on each income class (only debit card ownership was slightly higher than significance level in the upper income countries, but as will be seen later, this variable will undergo a different treatment in the analysis).

Table 2: Descriptive statistics

Income group	Variable	Obs.	Mean	Std. Dev.	Min	Max
Lower middle	Account	12	0.2671	0.0879	0.1376	0.4294
	Debit Card	12	0.0464	0.0157	0.0249	0.0800
	Credit Card	12	0.1406	0.0380	0.0828	0.2180
	Loan	12	0.1169	0.0434	0.0390	0.2055
Upper middle	Account	12	0.4599	0.1512	0.2232	0.6849
	Debit Card	12	0.0964	0.0335	0.0550	0.1449
	Credit Card	12	0.2985	0.1660	0.1128	0.5356
	Loan	12	0.1440	0.0397	0.0976	0.2122
All	Account	24	0.3635	0.1560	0.1376	0.6849
	Debit Card	24	0.2195	0.1427	0.0828	0.5360
	Credit Card	24	0.0714	0.0361	0.0249	0.1449
	Loan	24	0.1305	0.0430	0.0390	0.2122

Table 3: Shapiro-Wilk test results for univariate normality

Income group	Variable	Obs.	W	V	z	Prob>z
Lower middle	Account	12	0.95923	0.681	−0.748	0.77277
	Debit Card	12	0.96010	0.667	−0.790	0.78524
	Credit Card	12	0.95244	0.795	−0.448	0.67287
	Loan	12	0.97768	0.373	−1.921	0.97266
Upper middle	Account	12	0.92719	1.217	0.382	0.35126
	Debit Card	12	0.86119	2.319	1.639	0.05060
	Credit Card	12	0.88787	1.874	1.223	0.11061
	Loan	12	0.91811	1.368	0.611	0.27061

Multivariate normality verification was addressed with the Doornik-Hansen omnibus test obtaining a χ^2 (8) = 5.750 with P-value > χ^2 = 0.6752, which being greater than the significance level of 0.05 did not reject the null hypothesis of multivariate normality, proving that assumption 6 was met. Figure 3 shows in a scatter matrix that there was a visual linear relationship in all pairs of dependent variables for each income group, so assumption 7 also was fulfilled.

The Box's M test is used to proof the null hypothesis that the observed covariance matrices of the dependent variables are equal across groups (Laerd, n.d.), the results showed a Box F(10,2,313.9) = 2.63, prob > F = 0.0034 and Box χ^2 (10) = 26.47, prob > χ^2 = 0.0032, since the P-values were < 0.05 the null hypothesis was rejected; therefore, assumption 8 was not met.

To detect multicollinearity between dependent variables a metric known as Variance Inflation Factor (VIF) was used, which

Figure 1: Behavior of variables over time by country and grouped by income level

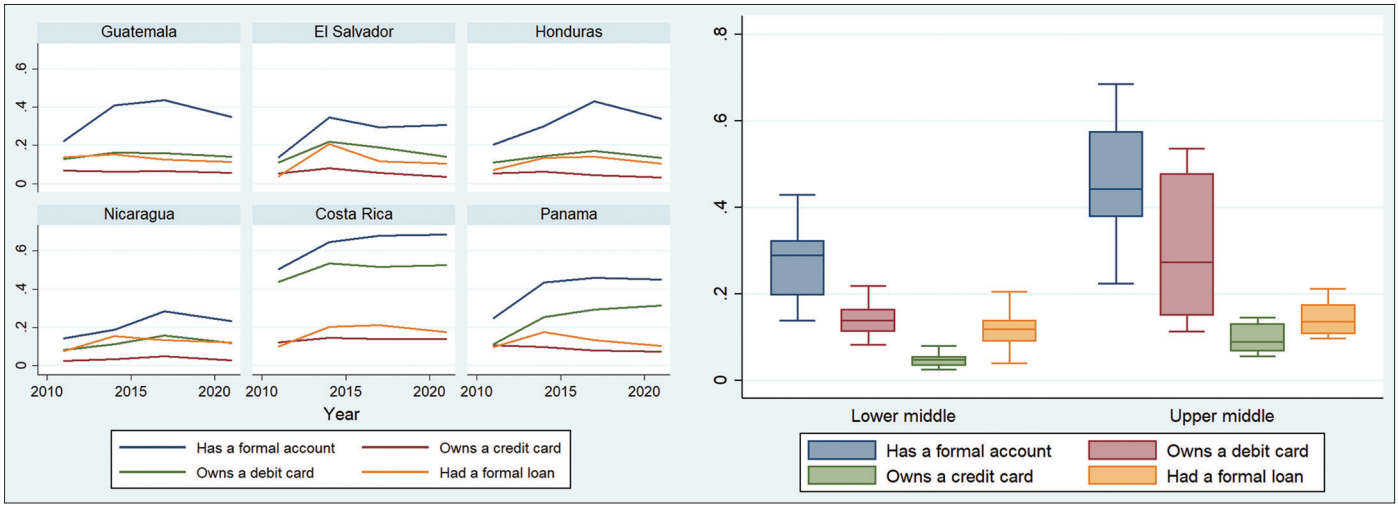
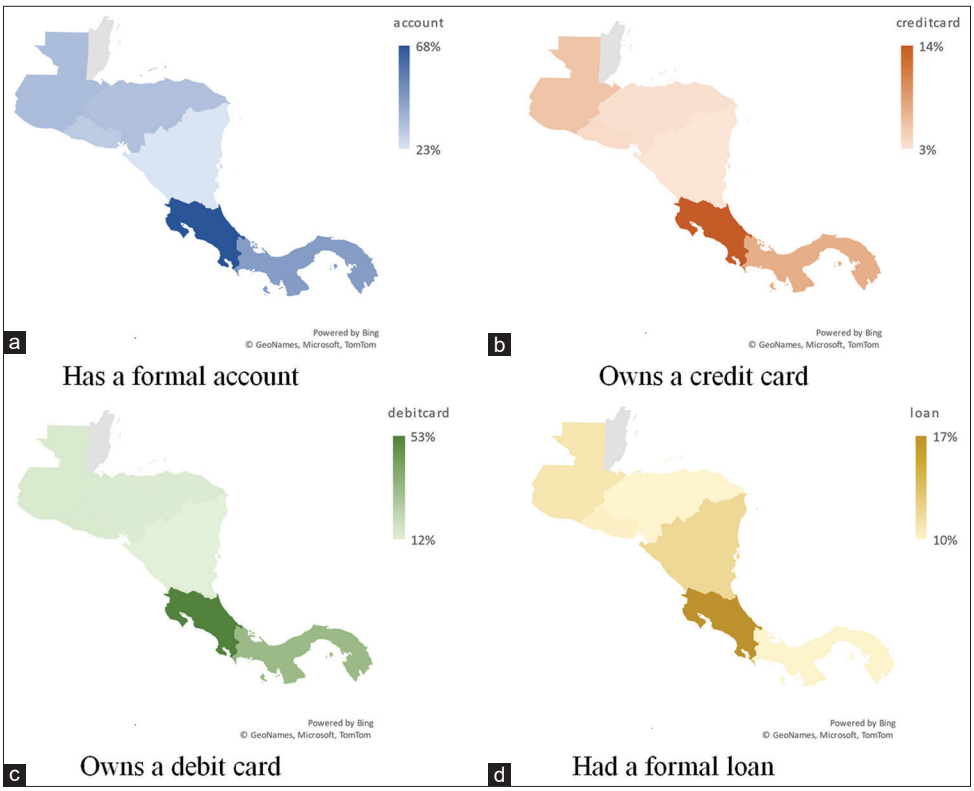


Figure 2: Population means for financial inclusion indicators of CA countries in 2021



produces a VIF value for each variable in the model starting at 1 and has no upper limit with the following interpretation: a value of 1 indicates no correlation between a given variable and any other, a value between 1 and 5 indicates a moderate correlation and > 5 indicates potentially severe correlation (Bobbitt, 2020b).

Table 4 shows in its first column that VIFs values for variables debit card and account were higher than 5, which is logical given that there is a dependency between both financial products since to have a debit card it must be linked to a bank account. Laerd, (n.d.) suggests that ideally dependent variables in the MANOVA model may be moderately correlated with each other, and (Bobbitt, 2020b) indicates that to deal with multicollinearity, redundant variables must simply be removed; in this case, by eliminating the debit card variable from the analysis better VIF indicators are obtained within the suggested range as it can be seen in Table 3, thus fulfilling assumption 9.

Table 4: Estimations of variance inflation factor between dependent variables

Variable	VIF	1/VIF	VIF[1]	1/VIF[1]
Debit Card	9.64	0.103757		
Account	7.09	0.140986	3.46	0.289312
Credit Card	4.45	0.224910	2.79	0.359048
Loan	1.81	0.551584	1.79	0.559096
Mean VIF	5.75		2.68	

[1]Excluding variable debit card

By removing variable debit card from de model, assumptions 1 to 4 are not affected and continue to be met, same with the first part of assumption 5 with respect to univariate outliers checked with the boxplot from Figure 1, but multivariate outliers were recalculated in columns "MAH_2" and "Prob MAH_2" of Table A1 and again no P-value < 0.001 was obtained, so assumption 5 still was met. New results for Doornik-Hansen test χ^2 (6) = 5.762; P-value > χ^2 = 0.4503 still demonstrate multivariate normality confirming assumption 6 once again.

Assumption 7 already confirmed with Figure 3 was not affected by the change, but assumption 8 that was not met before, obtained the following results in the Box' M test by eliminating the redundant variable: Box F(6, 3,506.7) = 1.25, prob > F = 0.2768 and Box χ^2 (6) = 7.52, prob > χ^2 = 0.2752, since the P-values were > 0.05 the null hypothesis was not rejected; therefore, assumption 8 was met this time, as well as the rest.

3.3. Model Construction

The one-way MANOVA was run with the three dependent variables that made the model meet the previous assumptions: account, credit card and loan. Table 5 below summarizes the results obtained:

All four statistical tests resulted significant with P-values of 0.0014 < 0.05, so the model was statistically significant, confirming that there were differences in the combined financial inclusion variables between the lower-middle and the upper-middle income countries from Central America. Since MANOVA is an omnibus test cannot tell where the differences are between groups, but because there were only two, through the boxplot in Figure 1 it can be inferred that multivariate financial inclusion was higher in upper-middle income countries than in the lower-middle ones from CA region.

4. DISCUSSION

There is growing evidence that financial inclusion has substantial benefits for the excluded population, especially women and poor adults in many countries, and policy makers have embraced that topic as the key to economic empowerment and solution to rising poverty levels (Ozili, 2021), the findings of these research help to understand this phenomena in one of the most unexplored region of the world with high poverty rates between its countries; however additional control variables must be included to address gender approach in further lines of investigation.

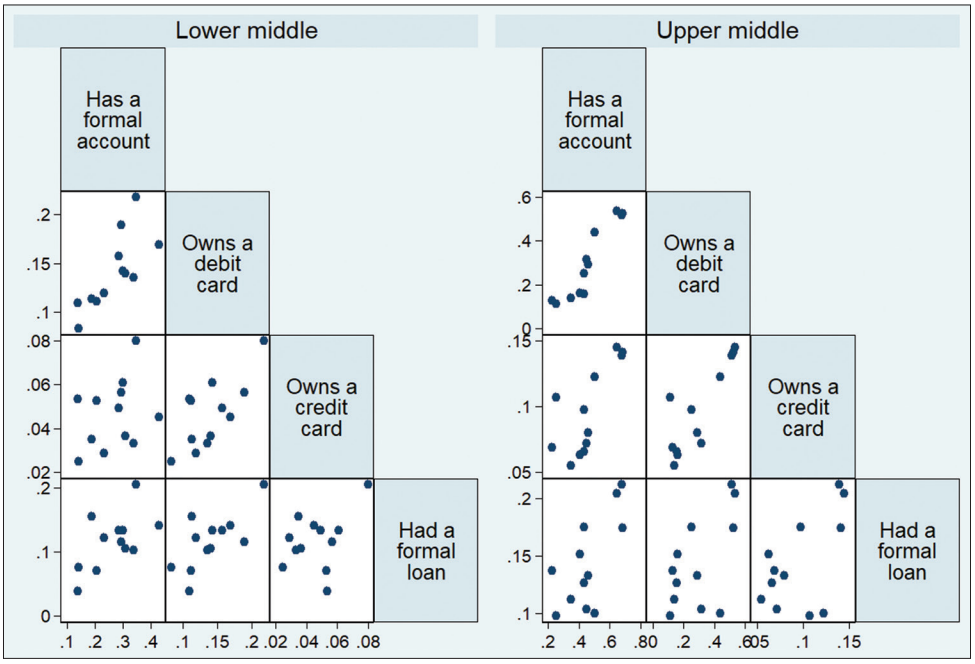
Variable selection was similar to Adalessossi and Kaya (2015) study which measured the level of financial inclusion in 41 of the 54 African countries according to their income level by means of the same database used in this research, only the model approach was different, instead they used a discriminant model classifier, which might be further investigation line for modeling CA countries income group as an outcome variable.

Table 5: One-way MANOVA output

Source	Statistic	Value	df	F(df1,df2) = F			P-value	
Income	Wilk's lambda	0.4669	1	3.0	20.0	7.61	0.0014	e
	Pillai's trace	0.5331		3.0	20.0	7.61	0.0014	e
	Lawley-Hotelling trace	0.1417		3.0	20.0	7.61	0.0014	e
	Roy's largest root	0.1417		3.0	20.0	7.61	0.0014	e
Residual			22					
Total			23					

e: Exact

Figure 3: Scatter matrix by countries' income group



Additionally, other variables might be included in further analysis like Náñez Alonso et al. (2024) who used data from the Financial Access Survey (FAS) of International Monetary Fund (IMF) to compare a South American country with the rest of its region in terms of financial inclusion indicators or a combination of sources like Bashiru et al. (2023) who crossed information between FAS, Global Financial Development Database from WB and the KOF Swiss Economic Institute to inferred that the improvement of financial globalization coupled with literacy rate improves financial inclusion in Sub-Saharan countries.

Besides, most comparisons in literature are between countries or geographical regions, but according to Ozili (2021) financial inclusion strategies in emerging regional economic blocs (also called trading blocs) have not been explored, but the countries included in this research also integrate the Central American Common Market (CACM) which clearly is a contribution to close this literature gap.

Differences might be contrasted within the same country too, as Liu et al. (2023) did finding that financial inclusion contributed to significant differences in income disparity between rural and urban areas in China as a case of study, but other demographic control variables can be considered to enrich further research. Since it was shown that income influences higher levels of financial inclusion, CA lower-middle income economies have the important task to raise their national income to improve financial inclusion, among other economic advantages that come with, which is a multifaceted challenge that involves various economic, social, and political strategies, fortunately literature provides some insights into effective methods for increasing national income:

1. Democracy and political stability are crucial, according to Madsen et al. (2015) democratic governance significantly boosts income and economic growth, empirically verifying that one standard deviation increase in democracy can lead to a 44-98% increase in per capita income.
2. Reducing income inequality can positively impact economic growth, especially in countries with high levels of inequality. Policies aimed at reducing the income gap between low-income households and the rest of the population are crucial for sustaining long-term growth (Cingano, 2014; Dorofeev, 2022).
3. Middle-income countries that transitioned to high-income status often benefited from economic integration, such as joining trading blocs, which promotes trade, capital flows, and social inclusion (Agosin, 2023).
4. Investment in education and human capital is essential for economic development countries that focus on improving education and lifelong learning can overcome the middle-income trap and achieve higher income levels; rich countries exhibit steeper experience-wage profiles compared to poor countries, enhancing human capital and reducing search frictions in the labor market can lead to higher wage growth over the life cycle (Atalay, 2015; Lagakos, 2018).

Lastly, one major challenge for the region is to succeed in the middle-income trap, a phenomenon that refers to the stagnation of economies that have achieved certain grade of economic development at middle-income levels but find it difficult to progress to high-income status (Aiyar et al., 2018; Zhou and Hu, 2020). Since all CA countries are in the middle level is a common issue for all of them, but primarily for the upper-middle group integrated by Costa Rica, Panama and Guatemala; but as Agénor (2017) recommends, effective public policies are essential to avoid and escape this trap, like improving human capital, enhancing infrastructure, ensuring better contract enforcement and intellectual property protection, economic diversification and providing access to finance.

5. CONCLUSIONS

To achieve the purpose of the study, a one-way MANOVA was run to determine the effect of income level on financial inclusion in CA countries. Three dependent variables were assessed as population percentages in the model: account, credit card and loan, finding that there was a statistically significant difference between the country's income level on the combined dependent variables: $F(1,22) = 7.61$, $P = 0.0014$. Thus, enough empirical evidence was demonstrated to reject research hypothesis H1 and conclude that upper-middle income countries present a higher level of financial inclusion than lower-middle countries from the studied region, which gives guidance to the regional decision and policy makers that increasing the income level of their countries will improve the financial inclusion for their population, so it is strongly recommended to design and implement public policies in order to achieve that goal.

To raise their income levels, countries should focus on enhancing democratic governance, reducing income inequality, integrating into global trade networks, leveraging natural resources wisely, investing in human capital and education, and implementing effective redistribution policies. These strategies, collectively contribute to sustainable economic growth and higher national income, which leads to better financial inclusion and overcomes the middle-income trap that might affect regional countries.

Research on financial inclusion is vital for understanding and addressing the barriers to accessing financial services faced by underserved populations. It highlights the significant impact of financial inclusion on economic growth, poverty reduction, financial stability, and income inequality. Finally, addressing geographical disparities in financial inclusion remains a key challenge for achieving global economic development, but the role of financial literacy, technological advancements, and effective policy frameworks are crucial in promoting inclusive financial systems.

REFERENCES

Adalessossi, K., Kaya, N. (2015), The measure of the financial inclusion in the African countries. Advances in Management and Applied Economics, 5(5), 23-32.

Agénor, P. (2017), Caught in the middle? The economics of middle-income traps. Journal of Economic Surveys, 31(3), 771-791.

Agosin, M. (2023), Economic Growth in Middle-Income Countries: A Theoretical and Empirical Approach to Development in Turbulent

Times. 1st ed. London: Routledge.
Aiyar, S., Duval, R., Puy, D., Wu, Y., Zhang, L. (2018), Growth slowdowns and the middle-income trap. Japan and the World Economy, 48, 22-37.
Atalay, R. (2015), The education and the human capital to get rid of the middle-income trap and to provide the economic development. Procedia-Social and Behavioral Sciences, 174, 969-976.
Bashiru, S., Bunyaminu, A., Yakubu, I.N., Al-Faryan, M.A.S. (2023), Drivers of financial inclusion: Insights from Sub-Saharan Africa. Economies, 11(5), 146.
Bobbitt, Z. (2020a), How to Calculate Mahalanobis Distance in SPSS. Statology. Available from: https://www.statology.org/mahalanobis-distance-spss
Bobbitt, Z. (2020b), How to Test for Multicollinearity in Stata. Statology. Available from: https://www.statology.org/multicollinearity-stata
Chang Tam, R.J., López, W.J., Cordero Najera, H., Salas Segura, J., Barrientos Boza, R. (2023), RandD Spending, Tertiary Enrollment and its Influence on the Labor Force of Central and South American Countries. In: Proceedings of the 21th LACCEI International Multi-Conference for Engineering, Education and Technology (LACCEI 2023): "Leadership in Education and Innovation in Engineering in the Framework of Global Transformations: Integration and Alliances for Integral Development. Buenos Aires, Argentina.
Cingano, F. (2014), Trends in Income Inequality and its Impact on Economic Growth (OECD Social, Employment and Migration Working Papers No. 163; OECD Social, Employment and Migration Working Papers. Vol. 163.
Cole, D.A., Maxwell, S.E., Arvey, R., Salas, E. (1993), Multivariate group comparisons of variable systems: MANOVA and structural equation modeling. Psychological Bulletin, 114(1), 174-184.
Demirgüç-Kunt, A., Klapper, L., Singer, D., Ansar, S. (2022), The Global Findex Database 2021: Financial Inclusion, Digital Payments, and Resilience in the Age of COVID-19. United States: The World Bank.
Dorofeev, M.L. (2022), Interrelations between income inequality and sustainable economic growth: Contradictions of empirical research and new results. Economies, 10(2), 44.
Laerd. (n.d.), One-Way MANOVA using Stata. Laerd Statistics. Available from: https://statistics.laerd.com/stata-tutorials/one-way-manova-using-stata.php [Last accessed on 2024 Oct 10].
Lagakos, D., Moll, B., Porzio, T., Qian, N., Schoellman, T. (2018), Life cycle wage growth across countries. Journal of Political Economy, 126(2), 797-849.
Liu, J., Puah, C.H., Arip, M.A., Jong, M.C. (2023), Impacts of digital financial inclusion on urban-rural income disparity: A comparative research of the Eastern and Western Regions in China. Economies, 11(11), 282.
Liu, X. (2016), Methods and Applications of Longitudinal Data Analysis. United States: Academic Press.
Madsen, J.B., Raschky, P.A., Skali, A. (2015), Does democracy drive income in the world, 1500–2000? European Economic Review, 78, 175-195.
Mardia, K.V., Kent, J.T., Bibby, J.M. (1995), Multivariate analysis of variance. In: Birnbaum, Z.W., Lukacs, E., editors. Multivariate Analysis. United States: Academic Press. p333-355.
Martínez Pería, M.S. (2013), Financial inclusion in Latin America and the Caribbean. In: Didier, T., Schmukler, S.L., editors. Emerging Issues in Financial Development: Lessons from Latin America. United States: The World Bank. p91-127.
Martínez Turégano, D., García Herrero, A. (2018), Financial inclusion, rather than size, is the key to tackling income inequality. The Singapore Economic Review, 63(1), 167-184.
Náñez Alonso, S., Jorge-Vazquez, J., Arias, L., Del Nogal, N. (2024), What factors are limiting financial inclusion and development in Peru? Empirical Evidence. Economies, 12(4), 93.
Ozili, P.K. (2021), Financial inclusion research around the world: A review. Forum for Social Economics, 50(4), 457-479.
Park, C.Y., Mercado, R. (2018), Financial inclusion, poverty, and income inequality. The Singapore Economic Review, 63(1), 185-206.
Polloni-Silva, E., Da Costa, N., Moralles, H.F., Sacomano Neto, M. (2021), Does financial inclusion diminish poverty and inequality? A panel data analysis for Latin American Countries. Social Indicators Research, 158(3), 889-925.
Rencher, A.C. (2002), Multivariate analysis of variance. In: Methods of Multivariate Analysis. 2nd ed. United States: John Wiley and Sons. p156-247.
Rojas-Suárez, L. (2016), Financial Inclusion in Latin America: Facts, Obstacles and Central Banks' Policy Issues. United States: Inter-American Development Bank.
Sarma, M. (2008), Index of Financial Inclusion. Indian Council for Research on International Economic Relations. Available from: https://icrier.org/publications/index-of-financial-inclusion
Senyo, P., Osabutey, E.L.C. (2020), Unearthing antecedents to financial inclusion through FinTech innovations. Technovation, 98, 102155.
Sharma, S., Bose, A., Shekhar, H., Pathania, R. (2019), Strategy for Financial Inclusion of Informal Economy Workers. Indian Council for Research on International Economic Relations. Available from: https://icrier.org/publications/strategy-for-financial-inclusion-of-informal-economy-workers
van den Berg, R.G. (2024), Mahalanobis Distances in SPSS-A Quick Guide. SPSS Tutorials. Available from: https://www.spss-tutorials.com/spss-mahalanobis-distances
Wang, X., Guan, J. (2017), Financial inclusion: Measurement, spatial effects and influencing factors. Applied Economics, 49(18), 1751-1762.
World Bank. (2022), Data Download and Documentation – Data Dashboard. The Global Findex Database 2021: Financial Inclusion, Digital Payments, and Resilience in the Age of COVID-19. Available from: https://www.worldbank.org/en/publication/globalfindex/data
Zhou, S., Hu, A. (2021), What is the "middle income trap"? In: Zhou, S., Hu, A., editors. China: Surpassing the "Middle Income Trap". Cham: Springer Nature Singapore. p1-32.

APPENDIX A

This appendix shows the complete data panel obtained from Global Findex 2021 Database for this study. Additionally, in order to check the absence of multivariate outliers assumption according to (Bobbitt 2020a; van den Berg, 2024) the Mahalanobis distances between dependent variables were estimated in SPSS software and added as new columns as follows:

MAH_1 contains the distances between all the four dependent variables (account, credit card, debit card and loan) and column "Prob MAH_1" contains the respective P-values of each of the previous distances; MAH_2 contains the distances between only three of the dependent variables (account, credit card and loan) excluding debit card, and finally, column "Prob MAH_2" contains the P-values of each of the respective previous MAH_2 distances.

Table A1: Country panel data frame with Mahalanobis distances between dependent variables

Income group	Country	Year	Account	Credit card	Debit card	Loan	MAH_1	Prob MAH_1	MAH_2	Prob MAH_2
Lower middle	El Salvador	2011	0.1376	0.0533	0.1094	0.0390	6.368	0.173	5.906	0.206
		2014	0.3463	0.0800	0.2180	0.2055	6.118	0.191	6.097	0.192
		2017	0.2934	0.0566	0.1895	0.1155	0.672	0.955	0.213	0.995
		2021	0.3071	0.0364	0.1400	0.1055	1.580	0.812	1.567	0.815
	Honduras	2011	0.2051	0.0528	0.1113	0.0710	2.228	0.694	2.227	0.694
		2014	0.3004	0.0608	0.1424	0.1343	0.657	0.957	0.392	0.983
		2017	0.4294	0.0452	0.1692	0.1417	4.178	0.382	3.321	0.506
		2021	0.3388	0.0332	0.1353	0.1032	2.901	0.575	2.828	0.587
	Nicaragua	2011	0.1422	0.0249	0.0828	0.0763	3.673	0.452	2.250	0.690
		2014	0.1885	0.0351	0.1133	0.1551	5.895	0.207	4.424	0.352
		2017	0.2843	0.0494	0.1570	0.1343	0.879	0.928	0.715	0.950
		2021	0.2319	0.0289	0.1192	0.1218	2.510	0.643	1.680	0.794
Upper middle	Guatemala	2011	0.2232	0.0691	0.1300	0.1372	2.938	0.568	2.922	0.571
		2014	0.4079	0.0630	0.1622	0.1514	2.861	0.581	0.856	0.931
		2017	0.4354	0.0659	0.1587	0.1266	5.287	0.259	1.205	0.877
		2021	0.3485	0.0550	0.1410	0.1123	1.616	0.806	0.607	0.962
	Costa Rica	2011	0.5036	0.1223	0.4380	0.1002	6.584	0.160	5.344	0.254
		2014	0.6455	0.1449	0.5356	0.2042	5.796	0.215	4.644	0.326
		2017	0.6784	0.1388	0.5165	0.2122	5.044	0.283	4.790	0.310
		2021	0.6849	0.1412	0.5258	0.1746	4.858	0.302	4.694	0.320
	Panama	2011	0.2493	0.1070	0.1128	0.0976	13.021	0.011	7.655	0.105
		2014	0.4340	0.0976	0.2531	0.1748	2.297	0.681	1.474	0.831
		2017	0.4582	0.0800	0.2926	0.1330	0.751	0.945	0.733	0.947
		2021	0.4497	0.0720	0.3153	0.1039	3.285	0.511	2.456	0.653