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Exploring the Nexus: Foreign Direct Investment, Trade Openness and GDP in Mexico and the Dominican Republic

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HONORS THESIS

Exploring the Nexus: Foreign Direct Investment, Trade Openness and GDP in Mexico and the Dominican Republic

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ABSTRACT

This paper will explore the causality between foreign direct investment (FDI), trade openness and GDP within Mexico and the Dominican Republic. The paper will analyze the economy of some countries in Latin America and the Caribbean as off the turn of the century, performing a time series analysis using a multivariate causal framework evaluating the causality between the three variables and determining the long and short run relationships between the variables. The paper estimates the Vector Autoregression (VAR) or Vector Error Correction Model (VECM) of the three variables to determine the short and long run causal relationship among the variables. The results show unidirectional causation between GDP and FDI in the Dominican Republic and fail to show any other causal relationship between the variables in both countries.

INTRODUCTION

In the evolving global economic landscape, understanding the relationship among intricate key economic variables is crucial for both informed policymaking and sustainable development. Reviewing the state of certain Latin American and Caribbean economies, as well as the growth and development ever since the 21st century, foreign direct investment and trade have big implications in the development of these economies. This paper will look at developing and developed nations within Latin America and the Caribbean which prove the effect these two industries have on their economies. Trade and FDI can have both positive and negative effects on Latin American economies based on a variety of factors, for instance the level of economic development, the economic system in place and the quality of the governance.

This paper's main goal is to analyze the causal relationship that exists between FDI, trade openness ((exports+imports)/GDP), and GDP to understand both long run and short run relationships. With the use of a time series analysis, the study applies two well-known econometric techniques—Vector Autoregression (VAR) or Vector Error Correction Model (VECM)—to evaluate the relationships between the three variables. The inquiry goes beyond simple correlation to determine if the causal relationship is unidirectional or bidirectional. The paper will look at the relationship between the variables in Mexico and the Dominican Republic. We chose these countries as they have ample data are at different stages of their development, and are at the forefront of economic growth, stability and tourism in the region, which can help us draw an accurate conclusion. It is our belief that the variables will show strong bidirectional correlations in the countries at hand.

The motivation behind the project comes from trying to better understand the intricacies of macroeconomics that stem from foreign investment and trade openness. The countries studied present opportunities because of their geographic location and the tourism edge they have developed, that can be used if studied and understood. To recommend economic and fiscal policies, it is crucial to completely understand the subject at hand. The aim of this paper is to contribute to the economic development of these countries by finding opportunities for

growth. I hope to improve my understanding of these countries' economies and to contribute valuable knowledge that can inform policymakers to make the best decisions for their respective countries. The mission is to foster a sustainable development for the region.

LITERATURE REVIEW

Latin American and Caribbean Economies

The global economy looked like it would start off in the 21st century with a boom, yet the dotcom bubble thought otherwise. The late 1990's was an exciting time for investors that had their money in technology stocks, where these valuations in indexes such as the Nasdaq grew by more than 400%. However, the turn of the century was a reality check for investors when the Nasdaq fell 78% from its peak. Enormous amounts of wealth were suddenly erased from the world economy. This affected regions all over the world. The harsh stoppage in the world economy at the start of 2001 cut short hopes of any recovery for Latin American economies. "Regional outputs grew at a very slow pace and growth prospects for 2002 are not promising" (ECLAC, 2001, p.9). To give a better picture for the state of the economies in the region, the annual growth rates for the main economic indicators such as GDP, GDP per capita, consumer prices and terms of trade were the following for 1999 and 2001 respectively: 0.4 to 0.5, -1.2 to -1, 9.5 to 7 and 0.4 to -3.7. (ECLAC, 2001). As such, the region was off to a weak start for the century. As to the lead up and years after the turn of the century, clouded with waves of corruption, economic growth for the region stagnated (Rodríguez, n.d.).

Through the years, these economies have slowly moved upward. This is due to the involvement of countries in global value chains. Cheap labor in the region allows for manufacturing for bigger brands in more developed countries. "A key factor in the creation of industrial networks is geographical proximity to a major manufacturing power, usually the largest and most technologically advanced country in its region. Such manufacturing giants tend to outsource certain (usually labor-intensive) processes to neighboring countries, generally with a view to benefiting from their lower labor and operating costs." (ECLAC, 2013, p.112). This is the case for some countries in Latin America, where manufacturers outsource to smaller countries, which help the region as a whole grow economically. The Covid-19 pandemic had a massive impact on the performance and outlook for the future of the region. The UN's Economic Commission for Latin America and the Caribbean revised downward the outlook for the region's economies (ECLAC, 2022).

Foreign Direct Investment

Foreign direct investment or FDI is a crucial source of money generation for developing and even developed nations across the globe. But what attracts foreign investment to a nation? While reforms are put in place to lure investment in, a study of economic reforms is needed to understand which policies attract FDI (Biglaiser & DeRouen, 2006). "Among economic reforms, there are generally five policies to attract prospective investors: domestic and international liberalization, tax and tariff reductions, and privatization." (Biglaiser & DeRouen, 2006, p. 55). These are proven to be five of the most effective reforms to attract FDI. De Groot and Perez Ludeña argue that the Caribbean needs to integrate its development strategy as it would provide a fundamental base on where the region wants to position itself. These two have studied the macroeconomic numbers for the region and concluded that "The ratio of FDI inflows to GDP in the last year was 7 per cent for the whole sub-region, with many countries above 10 per cent. By comparison, Latin America has a ratio of 3 per cent and other developing regions do not surpass that level." (De Groot & Pérez Ludeña, 2014, p.7). As they have stated, the Caribbean still has room for vast improvement in the sector, as well as for the entire region of Latin America. 7% of GDP is a critical component for the region's economy. But was LAC attractive for foreign investors in the first place? By running an econometric analysis, Kolstad finds that Caribbean countries do better in attracting FDI than other countries over the world (2008). "The results show that the Caribbean is not disadvantaged in terms of FDI; on the contrary, countries in the region attract more FDI on average than comparable countries in other regions. Unlike Africa, the Caribbean is a host region relatively favored by foreign investors." (Kolstad, 2008, p.9). As for who the major players are in the game, we can see that this next study shows how China has great influence in the region due to their investment. For the past couple of decades China has shown keen interest in its direct association with LAC through both trade and investment (Zhou et al, 2021). "Chinese FDI in Latin America was very limited until 2010...Since 2010 Chinese FDI has continued to enter the region, at a level estimated around US$ 9 billion per year, and the pattern has remained the same in terms of the major companies, main sectors and most important target markets." (Chen & Pérez Ludeña, 2014, p.14). It could be argued that countries like China are looking to expand their sphere of influence and therefore increasing

the amount invested in developing regions (Zhou et al, 2021). "In 2019, LAC attracted US$6.4 billion FDI from China…" (Zhou et al, 2021, p.7). We can see that there is no stopping this financing as the UN states how FDI rebounded 56% in 2021, after closures in 2020 due to the pandemic, and the trend only shows foreign investment increasing in the region (*UNCTAD*, 2022). The world bank shows FDI as a percentage of GDP for Dominican Republic, Mexico, and Colombia, to be 3.12, 2.89 and 2.76 respectively, proving the impact this influx of money has in the country's economy.

Trade

Since the beginning of globalization, Latin America and the Caribbean have been heavily involved in the trade and logistics industry taking advantage of their geographic location. As the world bank reports it, trade accounts for 53% of the region's GDP (*World Bank*, n.d.). Such is the growth opportunity and presence that, "Latin American and Caribbean ports accounted for 88 percent of the net container growth of the Americas. This growth is putting pressures on Latin and Caribbean freight distribution systems, which need to develop better logistical capabilities."(*UNCTAD*, n.d.).

Trade is an enormous contributor to global GDP, and as we have seen it is the case for Latin America and the Caribbean as well. The world bank shows Trade as a percentage of GDP for Dominican Republic, Mexico, and Colombia, to be 52.73, 82.36 and 40.58 respectively, proving the impact this industry has in the country's economy. Trade can provide Latin American economies with access to larger markets, which in turn can stimulate competition, increase efficiency, and lower prices for consumers. Their cheap labor and richness in natural resources further allows them to use their comparative advantage in certain goods and services, thereby enhancing both productivity and competitiveness.

This is no surprise as efforts have been made so that this industry continues to be a factor of economic growth in these countries. The World Trade Organization (WTO), in parallel with the Doha Round – the most recent negotiation meeting within the members of the WTO – launched an initiative called "Help for Commerce" – which aimed to achieve improved

trading systems with lower barriers of entry and revised trading rules (Rueda-Junquera & Gonzalo-Delgado, 2012). Initiatives for help as well as freer trade have seen trade have a bigger impact year-over-year. LAC has over 90 trade agreements worldwide (Mukhopadhyay & Chakraborty, 2012). Mukhopadhyay & Chakraborty also prove how policies have a big impact on trade and its benefits (2012). They studied the impact of India and EU relation with the LAC region and took variables to see which of them had big impacts and how they can be used to increase trade and efficiency of commerce. "Overall, both LAC and India gain more than they lose in exports after tariff reduction. Tariff reduction between LAC and the EU broadly indicates trade creation and trade diversion under both scenarios." (Mukhopadhyay & Chakraborty, 2012, p.28).

Intra Industry Trade (IIT) is a big component of total world trade. There is an extensive amount of literature on the causes of IIT but there is little to none on the effect for a country or region. IIT refers to the practice of trading (importing exporting) similar or essentially the same product. This allows countries, companies, industries… to innovate and learn, exploit areas where products can be better. "Trade-weighted coefficients for Latin America and the Caribbean tend to fall substantially below the global IIT average… However, the results obtained are far from uniform. In most product categories, a fair degree of regional heterogeneity can be observed. Furthermore, in several cases the trade weighed IIT values approximately or even exceeded their respective global averages. The countries that most frequently exhibit relatively high IIT indexes are Argentina, Brazil, and Mexico" (Fullerton, 2011, p.34). This shows how LAC still has a lot of room to grow and cover as well as how the bigger economies have a bigger presence in the practice, and how developing economies can greatly benefit from this. Ding and Hadzi-Vaskov have found that tariffs aren't the only policy that influences trade. "Policies that improve access to higher education and enhance infrastructure quality are also found to have a significantly positive effect on the export share and comparative advantage in high-skill and technology-intensive products" (Ding & Hadzi-Vaskov, 2017, p.35). These two have studied the composition of goods traded from LAC to the world. They have studied the composition in four major dimensions and found that better

infrastructure quality, higher education enrollment and lower inequality are associated with greater more complex exports (Ding & Hadzi-Vaskov, 2017).

Existing Literature

Most of the academic articles available for study in this subject area focus solely on FDI inflows into developing countries and the factors behind it. They also chose to study the effects of FDI on the economic growth of these developing nations. Some have even gone as far as to study the directionality of the causality between the two variables, whether they were uni-directional or bi-directional. However, a couple of papers have studied the three variables at hands, yet the existing literature suffers from the following:

1. Time series. No other study has offered information on the countries selected or the region since the turn of the century. They offer longer time periods to study the difference in causality between long-run and short-run, but there is no study available that look at the past almost 25 years.
2. Causality within the region. Most studies available show different countries studied, but none showed a focus in Latin American and the Caribbean.
3. Cohesion between countries. The countries in this study were chosen as they are the two most visited countries in LAC as well as being the biggest economy in the region and one of the fastest growing respectively.

RESEARCH QUESTION

Based on personal interests, and findings from the literature review, the thesis aims to answer the following questions:

1. How do foreign direct investment and trade openness influence Latin American and Caribbean economies that thrive off tourism in different stages of their development?

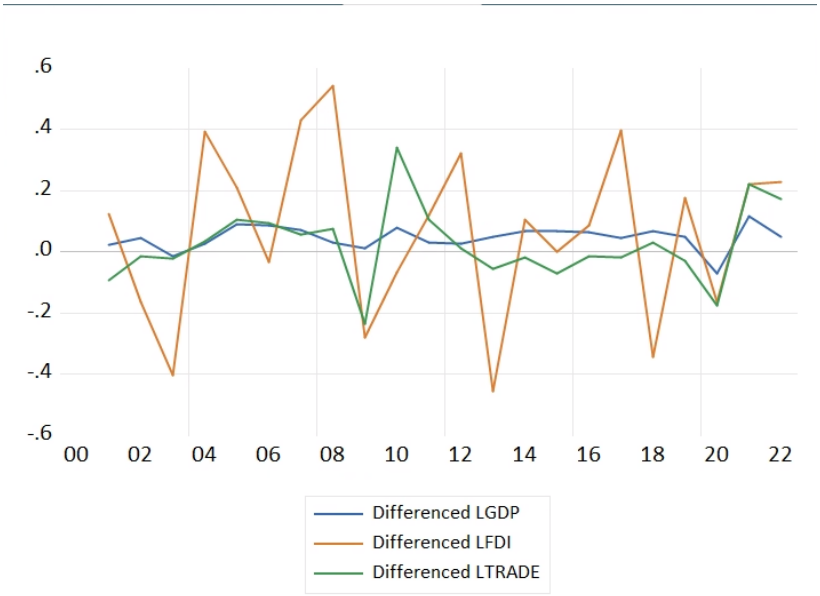
ECONOMETRIC MODEL

To follow the research methodology of using quantitative evidence to write an empirical paper, the project will run a multivariate causal framework to viably analyze and get a proper conclusion. The project will follow a number of robust steps that will lead to a thorough analysis of the data presented. The data has been collected through the World Bank Development Indicators for both countries. Some of the steps carried out have been and are not limited to data collection, processing, model specification, estimation, granger causality test, VAR and VECM model creation, forecasting, interpretation, analysis, reporting and presentation. For this time series analysis, the framework considers multiple variables at the same time. The paper seeks to understand the causal relationship between GDP, FDI, and trade openness in Mexico and the Dominican Republic.

The time series analysis is a technique used to study patterns and trends exhibited by sequential data points collected and recorded over time. To carry out this analysis we conducted unit root tests to make sure variables are stationary. The variables are all presented in their logarithmic forms. We also differentiated the data to remove the trend, and results are as follow for the Dominican Republic:

Figure 1

Dominican Republic's Data



Null Hypothesis: D(LGDP) has a unit root

Exogenous: Constant

Lag Length: 0 (Automatic - based on SIC, maxlag=4)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-5.199389	0.0004
Test critical values:	1% level	-3.788030	
	5% level	-3.012363	
	10% level	-2.646119	

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: D(LFDI) has a unit root

Exogenous: Constant

Lag Length: 0 (Automatic - based on SIC, maxlag=4)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-5.451950	0.0003
Test critical values:	1% level	-3.788030	
	5% level	-3.012363	
	10% level	-2.646119	

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: D(LTRADE) has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=4)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-4.892113	0.0009
Test critical values:	1% level	-3.788030	
	5% level	-3.012363	
	10% level	-2.646119	

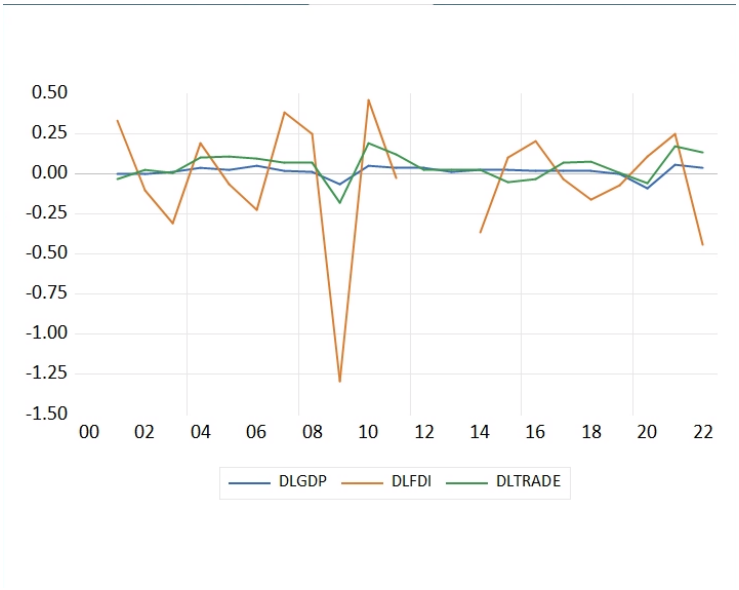
*MacKinnon (1996) one-sided p-values.

As we can see, we can reject the null hypothesis that there is a unit root proving the variables to be to be stationary at the first difference, which lets us continue to our next step, finding the optimum number of lags for the time series data. By using the Schwarz information Criterion, we determined that the optimum number of lags for this data set was 1. We then ran cointegration tests, Vector Auto Regression and Granger causality for the variables studied. Results will be discussed in the following sections.

For Mexico, the same procedure was followed, we removed the nonstationarity from the variables by differentiating them. We performed the unit root test confirming the stationarity of the variables at the first difference, continuing to find the optimum number of lags being 1 once again, and continuing to run the cointegration tests, VAR, and Granger Causality.

Figure 2

Mexico's Data



RESULTS AND CONCLUSIONS

Cointegration tests are performed to assess the long-term relationship between two or more variables. For cointegration to be present, a linear combination of nonstationary variables must be stationary. It basically refers to a stable relationship among certain variables that may not be stationary by themselves. This is a prerequisite for a valid Granger Causality analysis. Cointegration ensures that causal relationships among these variables are not random. The result for the cointegration test for the Dominican Republic shows:

Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None	0.543661	20.79645	29.79707	0.3705
At most 1	0.185488	4.321524	15.49471	0.8760
At most 2	0.000621	0.013042	3.841465	0.9089

Trace test indicates no cointegration at the 0.05 level
* Denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None	0.543661	16.47492	21.13162	0.1983
At most 1	0.185488	4.308482	14.26460	0.8254
At most 2	0.000621	0.013042	3.841465	0.9089

Max-eigenvalue test indicates no cointegration at the 0.05 level
* Denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

Unrestricted Cointegrating Coefficients (normalized by b'*S11*b=I):

LGDP	LFDI	LTRADE
3.984556	-5.646402	9.680705

5.588970	-2.364031	-5.141126
3.003495	0.505849	-0.721324

Unrestricted Adjustment Coefficients (alpha):

D(LGDP)	0.001289	0.001161	-0.000938
D(LFDI)	0.109497	0.089400	-0.001433
D(LTRADE)	-0.044429	0.030687	-0.001748

1 Cointegrating Equation(s): Log likelihood 67.30924

Normalized cointegrating coefficients (standard error in parentheses)

LGDP	LFDI	LTRADE
1.000000	-1.417072	2.429557
	(0.23631)	(0.62869)

Adjustment coefficients (standard error in parentheses)

D(LGDP)	0.005138
	(0.03763)
D(LFDI)	0.436296
	(0.23670)
D(LTRADE)	-0.177028
	(0.10754)

2 Cointegrating Equation(s): Log likelihood 69.46348

Normalized cointegrating coefficients (standard error in parentheses)

LGDP	LFDI	LTRADE
1.000000	0.000000	-2.345038
		(0.78364)
0.000000	1.000000	-3.369338
		(0.63811)

Adjustment coefficients (standard error in parentheses)

D(LGDP)	0.011629	-0.010026
	(0.06479)	(0.05778)
D(LFDI)	0.935952	-0.829608
	(0.37778)	(0.33691)

D(LTRADE)	-0.005520	0.178317
	(0.17761)	(0.15839)

Here we are failing to reject the null hypothesis of no cointegration against the alternative of a cointegrating relationship in the model. In the long run, *LFDI* has a positive impact, while *LTRADE* has a negative impact on *LGDP*, on average, ceteris paribus. The coefficients are statistically significant at the 1% level. This means that no cointegration exists between the variables during the time series studied at the exact number of lags specified which is 1. Because of this result we proceeded to perform a Vector Auto Regression which expresses each variable as a linear function of its own past values, the past values of all other variables being considered, and a serially uncorrelated error term. After running the VAR, we got the following results:

	LGDP	LFDI	LTRADE
LGDP (-1)	1.018933	0.808268	0.150815
	(0.05815)	(0.33692)	(0.17106)
	[17.5222]	[2.39900]	[0.88167]
LFDI (-1)	-0.002134	0.222616	0.024813
	(0.04264)	(0.24707)	(0.12544)
	[-0.05004]	[0.90101]	[0.19781]
LTRADE (-1)	-0.032387	0.641849	0.585851
	(0.08112)	(0.46998)	(0.23861)
	[-0.39926]	[1.36568]	[2.45522]
C	-0.402529	-2.874367	-4.563222
	(1.07239)	(6.21325)	(3.15452)
	[-0.37536]	[-0.46262]	[-1.44657]
R-squared	0.985230	0.805893	0.664844
Adj. R-squared	0.982768	0.773542	0.608985
Sum sq. resids	0.031615	1.061267	0.273560
S.E. equation	0.041909	0.242815	0.123279
F-statistic	400.2243	24.91084	11.90213
Log likelihood	40.78026	2.130726	17.04339
Akaike AIC	-3.343660	0.169934	-1.185763

Schwarz SC	-3.145288	0.368305	-0.987391
Mean dependent	24.80612	21.38515	-0.755898
S.D. dependent	0.319259	0.510249	0.197149

Determinant resid covariance (dof adj.)	7.45E-07
Determinant resid covariance	4.08E-07
Log likelihood	68.17484
Akaike information criterion	-5.106803
Schwarz criterion	-4.511689
Number of coefficients	12

For these results we formed the following equation:

$$LGDP_t = -0.402529 + 1.018933 \times LGDP_{t-1} - 0.002134 \times LFDI_{t-1} - 0.032387 \times LTRADE_{t-1} + \varepsilon_{LGDP_t}$$

After the VAR analysis we then proceeded to perform the Granger Causality Test.

Lags: 1

Null Hypothesis:	Obs	F-Statistic	Prob.
LFDI does not Granger Cause LGDP	22	0.09666	0.7593
LGDP does not Granger Cause LFDI		6.01006	0.0241
LTRADE does not Granger Cause LGDP	22	0.26310	0.6139
LGDP does not Granger Cause LTRADE		2.13539	0.1603
LTRADE does not Granger Cause LFDI	22	1.91445	0.1825
LFDI does not Granger Cause LTRADE		1.30447	0.2676

Results show that we fail to reject that *LFDI* does not Granger Cause *LGDP*, but reject that *LGDP* does not Granger Cause *LFDI*, indicating that this relationship is unidirectional and that there is possible causation between *LGDP and LFDI.* In the other observations we fail to reject the null hypothesis indicating no Granger Causality among the variables studied during this time series at the specified number of lags.

The cointegration tests for the Mexico data failed to reject the null hypothesis of no cointegration among the variables. In the long run, *LFDI* and *LTRADE* have a positive impact on *LGDP*.

Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None	0.469044	13.71973	29.79707	0.8560
At most 1	0.095231	2.324371	15.49471	0.9893
At most 2	0.028638	0.523010	3.841465	0.4696

Trace test indicates no cointegration at the 0.05 level
* Denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None	0.469044	11.39536	21.13162	0.6079
At most 1	0.095231	1.801361	14.26460	0.9946
At most 2	0.028638	0.523010	3.841465	0.4696

Max-eigenvalue test indicates no cointegration at the 0.05 level
* Denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

Unrestricted Cointegrating Coefficients (normalized by b'*S11*b=I):

LGDP	LFDI	LTRADE
-32.53696	4.420896	10.58857
-24.14017	-1.765469	8.624576
18.47916	0.493688	-10.99084

Unrestricted Adjustment Coefficients (alpha):

D(LGDP)	0.002207	0.010704	-0.000288
D(LFDI)	-0.181170	0.052746	-0.019337

D(LTRADE)	-0.022640	0.021410	0.004701

1 Cointegrating Equation(s): Log likelihood 67.85452

Normalized cointegrating coefficients (standard error in parentheses)

LGDP	LFDI	LTRADE
1.000000	-0.135873	-0.325432
	(0.03914)	(0.03974)

Adjustment coefficients (standard error in parentheses)

D(LGDP)	-0.071804
	(0.31410)
D(LFDI)	5.894725
	(2.54324)
D(LTRADE)	0.736649
	(0.70858)

2 Cointegrating Equation(s): Log likelihood 68.75520

Normalized cointegrating coefficients (standard error in parentheses)

LGDP	LFDI	LTRADE
1.000000	0.000000	-0.346130
		(0.08972)
0.000000	1.000000	-0.152333
		(0.67522)

Adjustment coefficients (standard error in parentheses)

D(LGDP)	-0.330198	-0.009141
	(0.37216)	(0.04373)
D(LFDI)	4.621419	-0.894056
	(3.11083)	(0.36552)
D(LTRADE)	0.219797	-0.137890
	(0.84888)	(0.09974)

After getting these results we moved on to the VAR analysis where we got the following results

Standard errors in () & t-statistics in []

	LGDP	LFDI	LTRADE

LGDP (-1)	0.684283	4.788756	-0.304486
	(0.27999)	(2.49969)	(0.68121)
	[2.44392]	[1.91574]	[-0.44698]
LFDI (-1)	-0.020015	0.225061	-0.106384
	(0.02748)	(0.24531)	(0.06685)
	[-0.72842]	[0.91745]	[-1.59134]
LTRADE (-1)	0.122360	-1.635142	1.158404
	(0.10973)	(0.97966)	(0.26698)
	[1.11507]	[-1.66909]	[4.33897]
C	9.308642	-115.2265	11.10546
	(7.65621)	(68.3520)	(18.6272)
	[1.21583]	[-1.68578]	[0.59619]
R-squared	0.911840	0.328798	0.920289
Adj. R-squared	0.895310	0.202948	0.905343
Sum sq. resids	0.020616	1.643146	0.122031
S.E. equation	0.035896	0.320463	0.087332
F-statistic	55.16246	2.612610	61.57486
Log likelihood	40.39549	-3.387573	22.61333
Akaike AIC	-3.639549	0.738757	-1.861333
Schwarz SC	-3.440403	0.937904	-1.662187
Mean dependent	27.73650	23.77630	-0.494773
S.D. dependent	0.110940	0.358951	0.283857

Determinant resid covariance (dof adj.)	3.10E-07
Determinant resid covariance	1.59E-07
Log likelihood	71.42511
Akaike information criterion	-5.942511
Schwarz criterion	-5.345072
Number of coefficients	12

We were then able to create the VAR equation which is as follows:

$$LGDP_t = 9.308642 + 0.684283 \times LGDP_{t-1} - 0.020015 \times LFDI_{t-1} + 0.122360 \times LTRADE_{t-1} + \varepsilon_{LGDP_t}$$

We then moved on to the granger causality analysis for the data analyzed and the results show

no apparent causality between the variables studied within the time series frame at the specified number of lags.

Lags: 1

Null Hypothesis:	Obs	F-Statistic	Prob.
LFDI does not Granger Cause LGDP	20	0.79445	0.3852
LGDP does not Granger Cause LFDI		1.03510	0.3232
LTRADE does not Granger Cause LGDP	22	1.96632	0.1770
LGDP does not Granger Cause LTRADE		0.52926	0.4758
LTRADE does not Granger Cause LFDI	20	0.22439	0.6417
LFDI does not Granger Cause LTRADE		3.38816	0.0832

The results surprised us to say the least as we believed that for both countries, there would be bidirectional causation for all the variables, but that is just another example that correlation does not mean causation.

Discussion

Some points to consider regarding the results and absence of causality between most variables are the economic dynamics of both countries, which mechanisms may lead to the unilateral causality between GDP in FDI in the Dominican Republic. Do factors such as market size, infrastructure development, investment climate and policy reforms influence this result? As per Hursthouse, "…market size measured in GDP can positively impact FDI inflows. In addition, trade openness and infrastructure development can also contribute to higher FDI inflows in the region. Higher corporate taxes and lower exchange rates could reduce FDI inflows" (2023). In this paper published by the National Institutes of Health (NIH), the authors studied the effect of external factors in FDI inflows of ASEAN+3 countries and determined GDP to be the biggest of all. A larger market size tends to attract more foreign investors as it offers greater and more profitable opportunities. It would make sense that Mexico's huge market with its 120 million population and its proximity to the US that causation would be present for the variables studied, however it could be explained away by the market being too mature, making the relationship between GDP and FDI less pronounced.

Whereas the Dominican Republic presents a large market size for the Caribbean region making it attractive for investors. It might also be that Mexico's investment climate does not provide the certainty or reliability that investors may be looking for, in fact it faces challenges such as corruption, regulatory uncertainty and security concerns that may cloud an investors mind when considering his or her options. There are also other external factors that may influence or hinder the translation of GDP growth into increased FDI inflows. Mexico's foreign investment laws (FIL) put a harsh cap on foreign investments in certain activities and industries, including and not limited to media, fishing, agriculture, and transportation. It can also be influenced by global economic conditions, political and geopolitical risks, exchange rate volatility among others.

Now looking at the Dominican Republic, the country has implemented reforms to improve the business environment, optimize bureaucratic processes, strengthen investor protection, and foster a better investment climate. The DR has strengthened intellectual rights protection, improved contract enforcement, established investment incentives, revamped Public-Private Partnerships (PPP) strengthened banking regulations and so much more in these past couple of years which have helped foster economic, commercial and investment growth in the country. The geographical place and cheap labor makes it a possible logistics hub as well as a bridge between south America and the United States. It also makes it a great option for companies looking to leave Asia's manufacturing and nearshore. Its skilled labor and human capital make it a great option for Foreign Investment explaining away the causation from GDP growth to FDI inflows. The absence of causation between GDP and trade openness may come down to the definition itself. As used in this paper, trade openness is (exports+imports)/GDP. Explained by the equation, if trade does not consistently grow at a faster rate than GDP, causation won't be present in the model, as GDP directly influences the result of the trade openness ratio. It also explains the absence of causation between FDI and trade openness.

APPENDIX

Null Hypothesis: D(LGDP) has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=4)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-4.736657	0.0013
Test critical values:	1% level	-3.788030	
	5% level	-3.012363	
	10% level	-2.646119	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LGDP,2)
Method: Least Squares
Sample (adjusted): 2002 2022
Included observations: 21 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D (LGDP (-1))	-1.088326	0.229767	-4.736657	0.0001
C	0.015976	0.008290	1.927301	0.0690

R-squared	0.541461	Mean dependent var	0.002036
Adjusted R-squared	0.517327	S.D. dependent var	0.051116
S.E. of regression	0.035513	Akaike info criterion	-3.747454
Sum squared resid	0.023962	Schwarz criterion	-3.647976
Log likelihood	41.34827	Hannan-Quinn criter.	-3.725865
F-statistic	22.43592	Durbin-Watson stat	2.022983
Prob(F-statistic)	0.000144		

Null Hypothesis: D(LFDI) has a unit root
Exogenous: Constant
Lag Length: 1 (Automatic - based on SIC, maxlag=4)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-5.891243	0.0003
Test critical values:	1% level	-3.920350	
	5% level	-3.065585	
	10% level	-2.673460	

*MacKinnon (1996) one-sided p-values.
Warning: Probabilities and critical values calculated for 20 observations
and may not be accurate for a sample size of 16

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LFDI,2)
Method: Least Squares

Sample (adjusted): 2003 2022
Included observations: 16 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D (LFDI (-1))	-2.289000	0.388543	-5.891243	0.0001
D (LFDI (-1),2)	0.623648	0.233882	2.666504	0.0194
C	-0.102515	0.083704	-1.224731	0.2424

R-squared	0.802266	Mean dependent var	-0.029064
Adjusted R-squared	0.771845	S.D. dependent var	0.685197
S.E. of regression	0.327288	Akaike info criterion	0.771409
Sum squared resid	1.392528	Schwarz criterion	0.916270
Log likelihood	-3.171274	Hannan-Quinn criter.	0.778827
F-statistic	26.37242	Durbin-Watson stat	2.031101
Prob(F-statistic)	0.000027		

Null Hypothesis: D(LTRADE) has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=4)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-4.680799	0.0014
Test critical values:	1% level	-3.788030	
	5% level	-3.012363	
	10% level	-2.646119	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LTRADE,2)
Method: Least Squares
Sample (adjusted): 2002 2022
Included observations: 21 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D (LTRADE (-1))	-1.077819	0.230264	-4.680799	0.0002
C	0.049497	0.020877	2.370890	0.0285

R-squared	0.535564	Mean dependent var	0.007982
Adjusted R-squared	0.511120	S.D. dependent var	0.123867
S.E. of regression	0.086608	Akaike info criterion	-1.964456
Sum squared resid	0.142518	Schwarz criterion	-1.864977
Log likelihood	22.62678	Hannan-Quinn criter.	-1.942866
F-statistic	21.90988	Durbin-Watson stat	2.002617
Prob(F-statistic)	0.000163		

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LGDP,2)
Method: Least Squares
Date: 03/22/24 Time: 16:44

Sample (adjusted): 2002 2022
Included observations: 21 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D (LGDP (-1))	-1.166824	0.224416	-5.199389	0.0001
C	0.054667	0.013529	4.040794	0.0007

R-squared	0.587258	Mean dependent var	0.001102
Adjusted R-squared	0.565535	S.D. dependent var	0.060964
S.E. of regression	0.040184	Akaike info criterion	-3.500305
Sum squared resid	0.030680	Schwarz criterion	-3.400827
Log likelihood	38.75320	Hannan-Quinn criter.	-3.478716
F-statistic	27.03365	Durbin-Watson stat	2.069246
Prob(F-statistic)	0.000051		

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LFDI,2)
Method: Least Squares
Sample (adjusted): 2002 2022
Included observations: 21 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D (LFDI (-1))	-1.227328	0.225117	-5.451950	0.0000
C	0.075615	0.063939	1.182614	0.2516

R-squared	0.610046	Mean dependent var	0.004875
Adjusted R-squared	0.589523	S.D. dependent var	0.447816
S.E. of regression	0.286909	Akaike info criterion	0.431090
Sum squared resid	1.564020	Schwarz criterion	0.530568
Log likelihood	-2.526447	Hannan-Quinn criter.	0.452679
F-statistic	29.72375	Durbin-Watson stat	2.054819
Prob(F-statistic)	0.000029		

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LTRADE,2)
Method: Least Squares
Sample (adjusted): 2002 2022
Included observations: 21 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D (LTRADE (-1))	-1.131376	0.231265	-4.892113	0.0001
C	0.029699	0.028138	1.055476	0.3044

R-squared	0.557448	Mean dependent var	0.012624
Adjusted R-squared	0.534155	S.D. dependent var	0.187464
S.E. of regression	0.127950	Akaike info criterion	-1.183969
Sum squared resid	0.311051	Schwarz criterion	-1.084490
Log likelihood	14.43167	Hannan-Quinn criter.	-1.162379
F-statistic	23.93277	Durbin-Watson stat	1.979302
Prob(F-statistic)	0.000101		

VAR Lag Order Selection Criteria
Endogenous variables: LGDP LFDI LTRADE
Exogenous variables: C
Date: 03/22/24 Time: 16:51
Sample: 2000 2022
Included observations: 20

Lag	LogL	LR	FPE	AIC	SC	HQ
0	10.82697	NA	9.18e-05	-0.782697	-0.633337	-0.753541
1	60.31841	79.18629*	1.63e-06*	-4.831841	-4.234401*	-4.715214*
2	65.05774	6.161137	2.69e-06	-4.405774	-3.360255	-4.201678
3	79.87841	14.82067	1.84e-06	-4.987841*	-3.494243	-4.696275

* Indicates lag order selected by the criterion
LR: sequential modified LR test statistic (each test at 5% level)
FPE: Final prediction error
AIC: Akaike information criterion
SC: Schwarz information criterion
HQ: Hannan-Quinn information criterion

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