FDI & Crime in South America: A Panel Data Analysis

Casey Doyle

Abstract:

This paper investigates the relationship between flows of FDI into South America and how it affects crime and how crime affects FDI. The paper incorporates a fixed effects model within an FDI model to examine how flows of FDI from foreign countries into South America impact crime in these countries. This study will use ten countries from South America in a panel data set from 2010 to 2016 that have different FDI intakes and crime rates. This is so that a well-rounded picture can be seen.

[a]   Department of Economics, Bryant University, 1150 Douglas Pike, Smithfield, RI02917.
Email: cdoyle5@bryant.edu

1.0 INTRODUCTION

Foreign Direct Investment (FDI) has played a key role in the advancement of South America. It has transformed underdeveloped third world nations to the developing countries they are today. FDI has been shown to be beneficial to both host and receiving countries, in terms of increased employment, increased economic boost for the host nation, etc. ("Foreign Direct Investment in Latin America and the Caribbean", 2017). In other words, it's not a zero-sum game.

This study aims to enhance understanding of the effects of FDI and how it relates to crime in the nation. From a policy perspective, this analysis is important because crime is a major impediment in the way of change for a nation. People are afraid to start a new business or attend school due to the amount of crime in their countries. The relevance of this study is that FDI in South America has been decreasing over the last years despite decades of corporations sending massive amounts of FDI into the continent. The landscape of the region has also changed dramatically recently in terms of politics and social unrest.

For better or for worse, Latin America has been seen as a hotbed for crime in the world. South America is notorious in pop culture for its drug cartels in Columbia, gang violence in the favelas in Brazil, etc. While the modernized Western world has seen violent crime steadily decreasing over the past decade, there has been little change in South America. For some countries the prevalence of crime can be explained like the dictatorship in Venezuela and failed economic policies in Argentina. FDI is seen by the government of South America as a factor in reducing the inequality and poverty that plague their nations that lead many to crime.

Foreign direct investment is when an individual, or in most cases a business owns at least 10% capital in a foreign organization. The FDI only counts as the initial money put forward to get to that 10% capital requirement. Any additional money put forward by a business entity is known as extra direct investments. 10% capital in an organization doesn't allow a controlling interest which allows the foreign organization to control the day to day operations of the company (Chen, 2019). The investor is allowed to just have a say.

FDI as stated before is of great importance to developing countries as it allows them access to previously closed markets. Governments see FDI as a better way for wealth and opportunity to come to its citizens that itself cannot provide themselves. For the investing company, FDI allows them greater access to potential customers and as such greater profits. It also allows them the chance to increase market share for their company. However, there are some drawbacks to FDI.

There is always risk when investing your money but FDI carries some unique risks. When FDI is used in developing countries, political uncertainty is always a risk. Companies can lose millions of dollars in investments and infrastructure if the government of a country decides to take over the company. Companies also face currency risk when tariffs are placed on a country. FDI has its pros and cons but it is something worthwhile for companies to use to increase their profits ("Foreign Direct Investment in Latin America and the Caribbean", 2017).
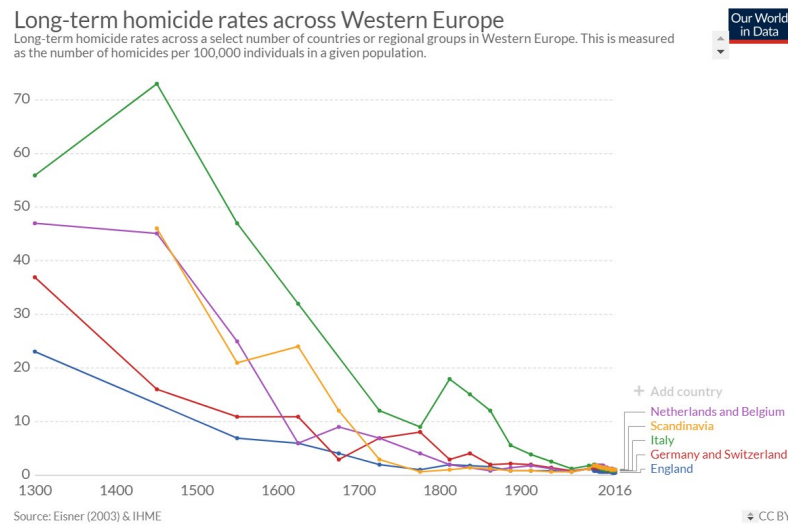
This paper was guided by three research objectives that differ from other studies: First it investigates the possibility of a relationship between flows of FDI to South America and crime using panel data. There are only a couple of papers that deal with FDI and Latin America. Second, it incorporates a fixed effects model into an FDI model to examine the influence of FDI onto crime in the region; Last it analyzes violent crime, in this case murder rate on FDI. Most literature focuses just on corruption and FDI. There is also very little empirical work in the literature concentrating on South American countries as a group using dynamic panel data model. This paper successfully fills this void. I will be using an empirical paper by Daniele & Marani (2010) as the template for my paper.

The rest of the paper is organized as follows. Section 2 outlines some trends involving the topic on hand. Section 3 gives a brief literature review. Section 4 details the empirical model. Data and estimation methodology are also discussed in section 4. Section 5 presents and discusses the empirical results. This is followed by a conclusion in section 6.

2.0 Crime Rate & FDI

For most of human existence we have been at war with each other. Out of the past 3,400 years of past history, humans have only known peace for only about 268 years of them or 8%. This war time only deals with the world and its recorded history that we can find. It doesn't take into account specific regions of the world or individual countries that left no traces of their history. But over the last decade the world has seen a reduction in crime, most notably violent crime. But what constitutes a crime? For most countries and governments, a crime is an offense that the government agrees upon to be punished. A violent crime is a step above a regular crime as it is an offense against someone else with the use of force, crimes such as murder or rape (Federal Bureau of Investigation). Europe has been home to the deadliest wars in human history: World War I, World War II, the Napoleonic Wars, etc. A consequence of all this war has been a

high crime rate across the continent for many centuries. People were killing and stealing from each other as there was little law and order in Europe. However, in figure 1, the homicide rate has been decreasing drastically over the course of hundreds of years.

Long-term homicide rates across Western Europe
Long-term homicide rates across a select number of countries or regional groups in Western Europe. This is measured as the number of homicides per 100,000 individuals in a given population.

Source: Eisner (2003) & IHME

Over the last 700 years, Europe has seen its homicide rates go from rates of over 30 murders per 100,000 people and in some cases over 70 murders per 100,000 people to rates as low as 1 murder per 100,000 people. Despite this murder rate decrease throughout the world, Latin America is still one of the deadliest places in the world. Latin America constitutes 33% of the world's murders while only having 8% of the total world population. In figure 2 you can see the discrepancy between the world and Latin America when it comes to murder rate.

Figure 2: Average homicide rate in 2012

Average homicide rate (per 100,000) in 2012
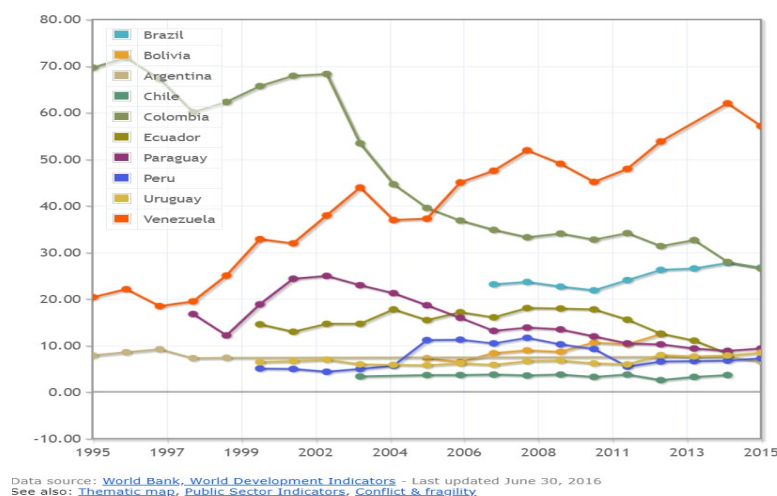
World 7
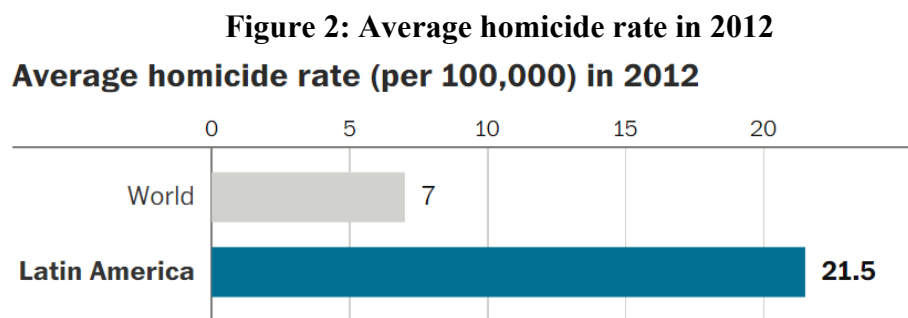
Latin America 21.5

Source: UNODC (2013); Igarape Institute - Homicide Monitor

Across Latin America the average homicide rate is 21.5 murders per 100,000 people with the majority of the murders coming from South America such as Brazil, Venezuela, and Columbia. These countries are some of the more populated countries of South America while also housing some of the world's deadliest cities. Recently as a region, the homicide rate has risen back up as shown in figure 3.

Figure 3: Homicide rates over time

Source: Igarape Institute, Homicide Monitor — THE WASHINGTON POST
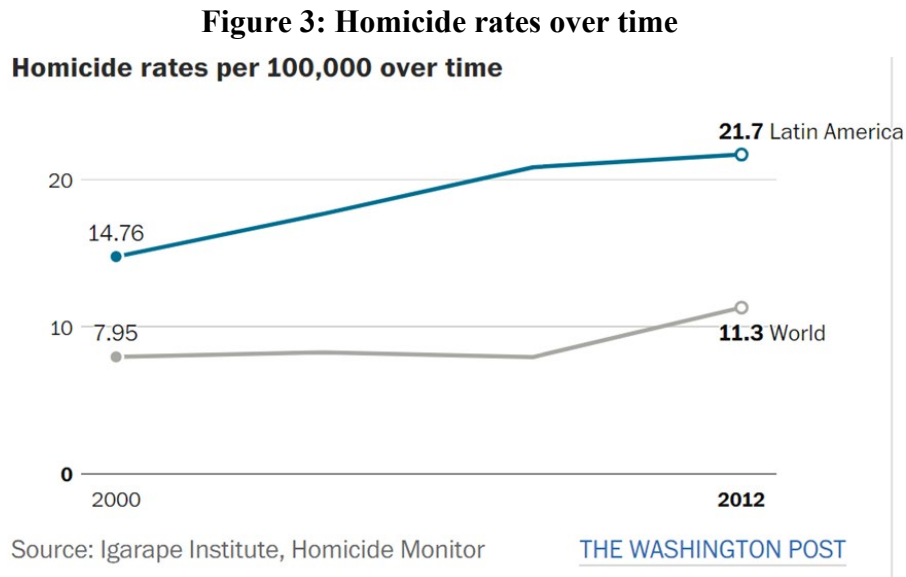
Latin America has seen some major instability in recent times to explain for its sharp increases like the revolution in Venezuela and the cartel problems in Columbia. Now strictly looking at South American countries only, figure 4 shows the vast differences of the murder rate between them.

Figure 4: Murder Rate in South American Countries

Data source: World Bank, World Development Indicators - Last updated June 30, 2016
See also: Thematic map, Public Sector Indicators, Conflict & fragility

Most of the South American countries have followed the same trajectory of the last 25 years and are sitting at around 10 murders per 100,000 people presently. However, we can see

some outliers such as Venezuela and Columbia who have historically have had murder rates of up to 40 murders per 100,000 people. It is unclear why some countries can control violent crime better than others. Figure 5 show historical data on FDI inflows into the Latin America and Caribean region.

Figure 5: Latin America and Caribbean FDI inflows from 1990-2016

Figure I.8
Latin America and the Caribbean: FDI inflows, 1990-2016
(Billions of dollars and percentages of GDP)
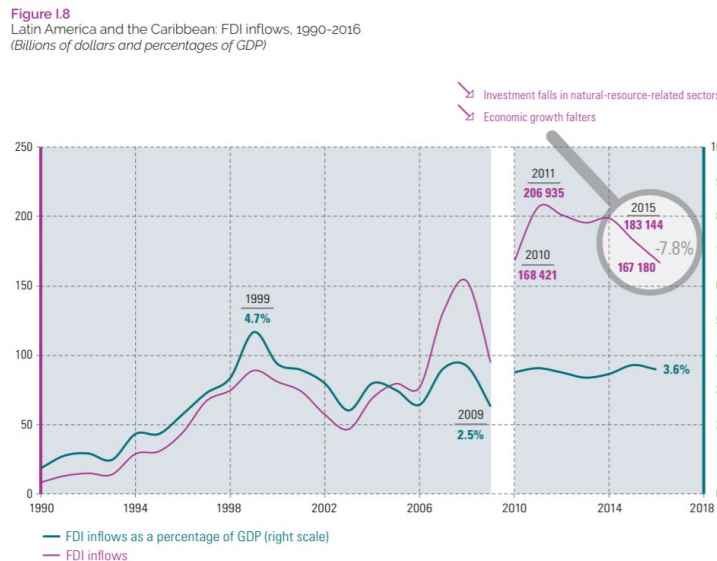
Source: United Nations

Recent trends about FDI inflows in Latin America have not been good. In 2016 FDI inflows in Latin America and the Caribbean fell by 7.8%. These levels had not been seen since 2010 and it's a far cry from its peak in 2011. The reasons cited by investors and corporations for this rapid is decline is fairly simple: weaker investment in natural resources especially in the field of metal mining, and weak economic growth ("Foreign Direct Investment in Latin America and the Caribbean", 2017). However most of the decreases are mainly in South America, the Caribbean and Central America actually saw FDI increase in South America. FDI flow decreased by 9.3% in South America with the largest drops happening in Argentina, Ecuador and Chile.

3.0 LITERATURE REVIEW

Danielle & Marani, (2011) looked at the effects of FDI and organized crime in Italy using a panel data analysis in Italian provinces. They measured organized crime by looking at the number of complaints regarding criminal offences of any kind that are generally related to mafia organization activities. The results of their paper was that the correlation between FDI and organized crime is both negative and significant. This means that crime and organized crime in general is summarized as being a deterrent for foreign investors to invest their money. Constantinou, (2011) tries to see if there is a different reaction between violent crimes and lesser

crimes (such as financial crimes) on FDI. Over a seven-year period he looks at the total amount of FDI of a country by the type of crime that is most rampant. He also separates countries by their wealth status: rich and poor. The conclusion is that financial crimes had a no effect on the FDI level while violent crimes had a profound negative effect on FDI flow.

When corporations are asked what makes them hesitant to give FDI to certain countries, the response almost always is political unrest, economic turmoil, or corruption present in these countries. One empirical paper by Aw & Tang, (2010) explores how corruption and China's inclusion into the World Trade Organization (WTO) affected the foreign direct investment (FDI) into Malaysia. China joining the WTO had a negative relationship on FDI in Malaysia in the short run, but positive in the long run. At first investors moved a majority of their money to China away from Malaysia after WTO's acceptance of China. China provided more opportunity and greater growth than Malaysia. But as time progressed Malaysia and other ASEAN countries were allowed to access China's markets. Investors were still putting FDI into Malaysia but were more observant to political and economic corruption in the short run. However, in the long run corruption was found to also have a negative correlation with FDI. Corruption seems to be a negative force in general when it comes to attracting foreign business, but there seems to be ways to mitigate it. For instance, Melo & Quinn, (2015) found that corruption had a negative relationship on FDI however, this was mitigated based on the amount of oil the receiving country produces. Countries that were high oil producing countries had no problem receiving FDI despite their corruption, this makes sense as oil is the most vital resource in the world today. The paper also brought up the idea that poorer countries are using institutionalized corruption as a way to draw FDI. This tends to have a negative effect on the long term as these countries convince themselves that they need to have corruption to continue receiving FDI. Quazi, (2014) looks further into the idea that "corruption can reduce FDI as a grabbing hand by raising uncertainty and transaction costs or facilitate FDI as a helping hand by "greasing" the wheels of commerce in the presence of a weak regulatory environment". He did his research in a panel data of African countries and found that corruption in Africa serves as the "helping hand" to FDI. In this circumstance corruption turned out to be a net positive for African countries. This is furthered by a report by Bellos & Subasat, (2011) whose results were that a high level of corruption is associated with a high level of FDI stock.

In some cases, corruption might even be necessary to have any FDI at all according to Mathur & Singh, (2013). They found that most foreign investors care about economic freedoms more than they care about political freedom. This is in sharp contrast to Pupovic, (2012) who found the exact opposite that foreign investors generally avoid corruption because it is considered wrong and it can create operational inefficiencies. There are so many different findings concerning corruption on FDI that make it hard to tell what is conclusive. Brada, et al., (2012) were unable to find conclusive evidence for home- and/or host-country corruption as the significant determinant of the volume of FDI conditional on some FDI taking place between the home and host country. Some researchers approach this topic in a different way, such as how increased levels of FDI brought on by corruption would affect people's opinion on corruption. In a study Robertson & Watson, (2004) they positively found that a rate of change of FDI would influence national perceived levels of corruption.

The way countries trade was another way researchers attempted to differentiate themselves in the topic. Khamfula, (2007) looked at the trade systems of country, countries who practiced export promotion (EP) and those that practiced import substitution (IS). His results show that when the level of corruption goes up, this leads to a strong negative influence on foreign direct investment in both IS and EP countries. However, when the level of corruption is interacted with domestic investment, the influence on foreign direct investment is positive and significant for IS countries only. Helmy, (2013) looked at the effects on corruption on FDI sorely in the Middle East and North Africa. His conclusions were that FDI increases when there is an increase in corruption signifying that corruption as indicated in the earlier studies can be a catalyst of investment rather than an obstacle to it, especially if the institutional structure in a country is weak.

4.0 DATA AND EMPIRCIAL METHODOLOGY

4.1 DATA

The study uses panel data from 2012 to 2016. Data was obtained from multiple sources such as the Economic Commission for Latin America and the Caribbean, The United Nations Office on Drugs and Crime, The Central Intelligence Agency, etc. Summary statistics for the data are provided in Table 1 while a correlation between the variables is shown in Table 2.

Table 1 Summary Statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
LNFDI	50	22.10187	1.726353	19.34494	25.29689
UnemploymentRate	50	0.06842	0.026632	0.032	0.206
LNGDP	50	25.94615	1.287118	24.02221	28.53645
DomesticCreditToPrivateSector	50	43.10286	27.54984	0	110.776
ExportsofGoodsandServices	50	23.80852	9.517734	10.246	47.166
ResidentPatientApplications	50	638.96	1436.956	0	5200

Table 2 Correlation

	LNFDI	UnemploymentRate	LNGDP	DomesticCreditToPrivateSector	ExportsofGoodsAndServices	ResidentPatientApplications	HomicideRate
LNFDI	1						
Unemploymentrate	0.3528	1					
LNGDP	0.8166	0.4802	1				
DomesticCreditToPrivateSector	0.4803	-0.1639	0.1263	1			
ExportsofGoodsandServices	-0.5026	-0.6139	-0.7702	0.2808	1		
ResidentPatientApplications	0.6611	0.2121	0.7156	0.2803	-0.4767	1	
HomicideRate	0.0943	0.5494	0.4504	-0.3057	-0.4247	0.2077	1

4.2 Empirical Model

Following Danielle & Marani (2010) this study adapted and modified organized crime, against a host of countries. I have added my own changes to their empirical model in order to get clearer and more concise results with my data.

The model can be written as follows:

$$LNFDI = \beta 0 + \beta 1\ Homicide\_Rate + \beta 2\ Exports\_of\_Goods\_and\_Services + \beta 3\ Unemployment\_Rate + \beta 4\ Domestic\_credit\_to\_Private\_Sector + \beta 5\ Resident\_Patient\_Applications + \beta 6\ LNGDP + \varepsilon$$

LNFDI is the annual FDI flow from foreign companies or investors. It represents funds that transnational corporations and others provide to their foreign affiliates.

Independent variables consist of six variables obtained from various sources, Appendix A and B provide data source, acronyms, and expected signs. In the study I used as a template for this empirical paper, it used its crime variable as a proxy variable. The authors could have used any crime statistic to represent its crime variable, they went with organized crime. I decided to use homicide rate as my crime variable in this paper. All of the variable definitions came from the World Bank's own descriptions.

First, *homicide rate* is the estimates of unlawful homicides purposely inflicted as a result of domestic disputes, interpersonal violence, violent conflicts over land resources, inter-gang violence over turf or control, and predatory violence and killing by armed groups. It is also the number of people killed out of 100,000 people. Second, *Unemployment_Rate* is the share of the

labor force that is jobless. Third, *LNGDP* is the sum of gross value added by all resident producers in the economy plus any product taxes and minus any subsidies not included in the value of the products. Fourth, *Exports_of_Goods_and_Services* represent the value of all goods and other market services provided to the rest of the world. It includes things such as the value of merchandise, insurance, transport, etc. Fifth, *Domestic_credit_to_Private_Sector* refers to financial resources provided to the private sector by financial corporations, such as through loans, purchases of non-equity securities, and trade credits and other accounts receivable, that establish a claim for repayment. Lastly sixth, *Resident_Patient_Applications* refers to worldwide patent applications filed through the Patent Cooperation Treaty procedure or with a national patent office for exclusive rights for an invention. I expect that homicide rate and unemployment rate will have a negative relationship with FDI because in theory FDI should make a host country economically better which will lead to less crime and more jobs. Based on that, I expect that LN GDP, Domestic to Private Sector, Exports of Goods and Services, and Resident Patient Applications will have a positive relationship with FDI. If the economy is improved with more FDI, then all of these variables should be seeing positive increases as well.

5.0 Empirical Results

      The empirical estimation results by themselves are presented in Table 3. Table 6 is a comparison of all the estimates from all models. I ran a Hausman test to determine which model to use for my results. The test deduced that my random effects models was found to be the preferred model. The model had an r-square of 87 which meaning that this model explains about 87% of the differences in the variables around their mean. In the random effects estimation, four variables were found to be significant: *Exports_of_Goods_And_Services* (to the 99 percentile), *LN GDP* (to the 99 percentile), *Unemployment_Rate* (to the 90 percentile), and *Homicide_Rate* (to the 90 percentile). These results make sense when you look at the effects of increased FDI flow into a country. More FDI leads to companies expanding in the market which leads to increased wages and employment. This spurs innovation and leads natives of these countries to want to start their own companies and as such there would be an increase in the number of *patent applications*. This expansion of business can also be a factor in why *LN GDP Per Capita* and *Exports of Goods and Services* was found to be positively correlated with FDI. Companies improve a nation's GDP and brings more credit to the private sector. The only results that did not meet my predictions was unemployment rate. My hypothesis on what the expected sign of homicide rate turned out to be correct. When there is opportunity in a country, it gives people a reason to stop killing each other. Unemployment rate had a positive relationship with FDI which did not make a lot of sense. FDI brings more jobs and as such should decrease the unemployment rate. One explanation could be that more FDI leads to native business being pushed out and closed. Unemployment rate also had the most impact on FDI compared to all other significant variables.

Table 3: Random Effects Results

LNFDI	Coef. Std.	Err. z P>z [95%	Conf. Interval]
UnemploymentRate	10.77355	3.85838 2.79 0.005	3.211261 18.33583
LNGDP	1.52339	.2633783 5.78 0.000	1.007178 2.039602
DomesticCreditToPrivateSector	0.0111764	.0073318 1.52 0.127	-.0031938 .0255465
ExportsofGoodsandServices	0.0694849	.0177083 3.92 0.000	.0347772 .1041925
ResidentPatientApplications	0.000016	.000196 0.08 0.935	-.0003682 .0004001
HomicideRate	-0.0388284	.0147677 -2.63 0.009	-0.0776569
_cons	-19.6641	6.886346 -2.86 0.004	-39.328194
sigma_u	0.52733117		
sigma_e	0.39816754		
rho	0.63689477	(fraction of variance due to	u_i)

Table 4: Regression Results Compared

Variable	fe	re	OLS
Unemployment_Rate	7.5090951	10.773547*	12.349393
LNGDP	0.5819861	1.52339***	1.1947341***
Domestic_Credit_To_Private_ Sector	0.00454052	0.01117637	0.01731493***
Exports_of_Goods_and_ Services	0.08804445***	0.06948487***	0.02006981
Resident_Patient_Applications	-0.00082759	0.00001595	0.00002102
Homicide_Rate	-0.13201365***	-0.03882845*	-0.03006793***
_cons	6.9126048	-19.664095	-10.481081

Note: ***, **, and * denotes significance at the 99%, 95%, and 90% percentile

respectively.

6.0 Conclusion

In summary, a majority of my estimations were found to be significant with FDI. Homicide rate, which was the central idea of what I was trying to study, was found to be negatively significantly correlated with FDI inflows into South America. This means that as more FDI flows into a country, the homicide rate decreases. If I were to make policy

recommendations for South American countries on FDI, I would recommend that they make it easier for companies to bring money into business in their countries. My estimations show that increased levels of FDI leads to decreases in the homicide rate, while also seeing positive increases in exports of goods and services, and GDP. Some ways that countries can entice more FDI would be to lower tariffs, lower their corporate tax rate, or offer any other tax incentives to prospective corporations. Countries should be wary not to give too much away to companies as unemployment rate was found to increase alongside FDI. There will always be risks when making policy. During my study, I had some limitations with the data. Some of the data was missing from a select group of countries, I had to account for that. There was also the issue of the accuracy of the data, South America is known for not having the best record keeping when it comes to economic data. Data from countries like Venezuela were found to be too good to be true. Nerveless, FDI was found to have a net positive on the impact on crime and various other economic indicators in South American countries.

Appendix A Variable Description and Data Source

Variable Name	Description	Data Source
Unemployment_Rate	Share of the labor force without work, but are actively looking	World Bank
LNGDP	sum of gross value (US$)	World Bank
Domestic_Credit_To_Private_Sector	financial resources provided to the private sector by financial corporations	World Bank
Exports_of_Goods_and_ Services	the value of all goods and other market services provided to the rest of the world.	World Bank
Resident_Patient_Applications	worldwide patent applications filed through the Patent Cooperation Treaty procedure	World Bank
Homicide_Rate	estimates of unlawful homicides purposely inflicted. Per (100,00 people)	United Nations Office on Drugs and Crimes

Appendix B: Variables & Expected Signs

Variable Name	Variable Description	Expected Sign
Unemployment_Rate	Share of the labor force without work, but are actively looking	Negative
LNGDP	sum of gross value (US$)	Positive
Domestic_Credit_To_Private_Sector	financial resources provided to the private sector by financial corporations	Positive
Exports_of_Goods_and_ Services	the value of all goods and other market services provided to the rest of the world.	Positive
Resident_Patient_Applications	worldwide patent applications filed through the Patent Cooperation Treaty procedure	Positive
Homicide_Rate	estimates of unlawful homicides purposely inflicted. Per (100,00 people)	Negative

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