The Causal Nexus between Corruption and FDI Inflows: Evidence from Five Latin American Countries

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Abstract

This paper explores the nature of causality between corruption and FDI inflows in five Latin American countries. Unlike prior empirical studies that use correlation-based standard regressions, we employ dynamic cointegrated error-correction models to uncover the directions of Granger-causality between corruption and FDI inflows. The evidence is overwhelmingly supportive of causality that is either unidirectional running from corruption to FDI inflows without feedback, or bidirectional between the two variables. In addition, the results imply some challenges for policy-makers. Their attempts to control corruption as causality patterns between corruption and FDI inflows sometimes prove dynamic, i.e., changing their nature between the short- and the long-runs. Moreover, the presence of long lags in the causal effect of corruption on FDI inflows carries the risk that policymakers (given their usual short-run policy horizon) may mistakenly infer that corruption is not harmful and fighting it is rather futile.

Keywords: Corruption, FDI inflows, Causality, Cointegration, Error-Correction Models

Introduction

In an increasingly globalized and competitive marketplace, both corporations and countries recognize the importance of brand differentiation. Like corporations, countries have an external image to uphold that is shaped by the changing perceptions and evaluations of international

opinion and subsequent stakeholders. The rising importance of country branding can be seen in the intense bidding wars that ensue between countries to host mega events like the Olympics, FIFA World Cup or the World Expo despite the massive costs of doing so. The appeal of hosting these mega events lies in the potential brand image synergies acquired through signals of infrastructure development, operational competence, and showcasing their uniqueness as a destination to tourists (Sun and Paswan, 2012). Some researchers argue that mere selection of a host country elicits a positive brand image among stakeholders as it implies that the country has, or will build, the necessary infrastructure and logistics to facilitate such an event. For instance, hosting the 2008 Beijing Summer Olympics helped solidify both domestic and international legitimacy for the Chinese government and international viewers attributed positive events at the tournament accordingly (Chen, 2012).

That said, recent scandals surrounding FIFA's governing body and allegations of bribery have shed light on a corrupt underworld associated with the bidding process for hosting the highly coveted FIFA World Cup. The convictions and upheaval of various officials in FIFA and high-ranking executives in host countries demonstrates the difficulties in extricating country brands from systemic corruption. Research suggests countries with reputations that are conducive to trade accrue "soft power" that may be harnessed to attract inflows of foreign direct investments (FDI) besides tourism, immigration, and skilled labor (Dinnie, 2008; Nye, 2004). In contrast, deleterious country stereotypes and/or reputations may elicit negative emotional responses that deter these important country images (Micevski et al., 2020). According to the World Development Report (2020), corruption and bribery have soared to unprecedented levels in developing economies with a disproportionate impact on the economically vulnerable due to many reasons including inflated prices and diminished access to basic services. For a lucid theoretical discussion of corruption and its variant effects in developing economies, see Bardhan (1997).

The rapid growth of many Latin American economies has not been immune from the disparaging spiral. For instance, in response to the global pandemic, many Latin American countries mobilized massive emergency spending plans and stimulus packages to quell economic strife. However, systemic corruption and the lack of proper oversight in funding allocations have resulted in unprecedented theft and rampant misappropriations (Simon and Aalbers, 2020).

Dinnie (2008) argues that investor impressions of countries are largely based on FDI inflows which significantly contribute to perceptions of national identity and/or national image (how the country is perceived). Stemming from social identity theory (Tajfel, 1978), national identity is comprised of five distinct elements: physical (geography, climate, demography, natural resources), cultural (heritage, language, social norms), relational (government treatment of foreign and domestic business and employees), personal (flag, visual symbols, famous people), and controlled (national image portrayed to the public), (Graby, 1993). Others argue that a country's identity is comprised of the total global image of a country's political, cultural, social, economic, historical, and environmental makeup in the public domain (Fetscherin, 2010). In other words, national identity is a set of unique country characteristics that lend themselves to a collective "cultural focus" of how *internal* stakeholders (citizens and domestic entities) view themselves as well as how the country's reputation is perceived externally (Keillor et al., 1996).

Based on the national behavior-image model, countries' identities dictate the trajectory of their behaviors which in turn determine how their image is perceived and imprinted in the public sphere (Anholt, 2009). Country image is often based on subjective interpretations of public diplomacy and current events which explains why individuals view national events or conflicts through the lens of preconceived stereotypes about a country (He et al., 2020). Put differently,

country image invariably lies in the eyes of the beholder although that may not always reflect reality. Complicating matters, these image perceptions are often employed as heuristics to simplify decision making about patronizing a country and its byproducts. As such, scholars have devoted considerable attention to how perceived country images are transferred to products in the form of country-of-origin effects (Diamantopoulos et al., 2021; Kock et al., 2019).

Since the early 1990s, there has been a great deal of empirical research on the possible connection between corruption and FDI inflows in different countries. To our knowledge, most empirical studies that explore the relationship between these two variables use different regression techniques that primarily focus on the impact of corruption on inward FDI and the degree of correlation between the two variables (e.g., Alshehry, 2020; Šumah, 2018; Abdul Jalil et al., 2016; Lin and Chuang, 2016; Ravi, 2015; Delgado et al., 2014; Quazi et al., 2014; Castro and Nunes, 2013; Barassi and Zhou, 2012; Goel and Korhonen, 2011; Musila and Sigué, 2010; Al-Sadig, 2009; Treisman, 2007; Larraín and Tavares, 2004; Robertson and Watson, 2004; Bengoa and Sanchez-Robles, 2003; Habib and Zurawicki, 2002; Wei, 2000; Bardhan, 1997; and De Mello, 1997).

It should be noted that a significant coefficient of corruption in an inward FDI equation reported in some of these studies does not necessarily imply that corruption *causes* changes in FDI inflows. Clearly, correlation does not necessarily imply causation. Christensen et al. (2019), for example, contends that worsening domestic economic conditions in an emerging economy, particularly feeble international business activities like FDI inflows, could result in less economic opportunities in the hosting country. With such lack of prospects, public officials may be lured into opportunistic behaviors (e.g., bribery, extortion, subornation) that lucratively exploit their positions. As such, a deteriorating FDI inflows can induce (cause) higher chances for corrupt behavior. Pinto and Zhu (2016) also discuss related theoretical arguments where changes in FDI inflows can impact the intensity of corruption in emerging markets. Therefore, it is theoretically plausible that the causal effect may also flow from FDI inflows to corruption, in which case corruption becomes an endogenous (not exogenous) variable. In the presence of endogeneity, parameter estimates of prior studies become biased and inconsistent.

Given these theoretical considerations, standard (correlation-based) regressions cannot determine if corruption causes changes in FDI inflows, or rather causality runs in the opposite direction from FDI inflows to corruption. Despite its importance, causality research on the link between FDI inflows and corruption has been sparse. Researchers like Craigwell and Wright (2011) and Fahad and Ahmed (2016), among others, have examined the nature of causality between corruption and FDI inflows in some countries. However, they employ panel causality analyses with cross-section data which primarily explore the long-run causal relationships.

We employ proper statistical methods and longitudinal data to explore the link between corruption and FDI inflows in five emerging Latin American economies: namely, Brazil, Chile, Costa Rica, Mexico, and Peru. Notwithstanding the broad policy insinuations that can be gleaned from investigating the causal link between corruption and FDI inflows, marketing implications also abound from a closer look at this relationship.

Given the alarming ascent of corruption in emerging economies in Latin America and the dependence of these countries on foreign investment for growth (Onody et al., 2022), this research contributes to the debate on whether corruption 'sands' or 'greases' growth in developing countries. The traditional viewpoint is that countries known for corruption will suffer from attrition by investors due to the volatility of bribes and lack of transparency associated with 'under the table' expenses. The opposing viewpoint holds that corruption may also be considered an

economic lubricant since investors may perceive corruption in a high growth market as an opportunity to capitalize and gain a competitive advantage. The present research utilizes longitudinal data to shed light on these competing hypotheses in the context of five emerging economies in Latin America.

The remainder of the paper proceeds as follows. In the next section, we provide an overview of corruption and FDI inflows along with a closer look at corruption in Latin American countries. Then we discuss the tested hypotheses, followed by an outline of the methodology used. Then we present and discuss the empirical results. We conclude the paper with some theoretical and practical implications of our findings.

Background

With the rapid integration of technology and globalization, international markets have witnessed unprecedented convergence in consumer needs and the availability of goods and services. Competition has subsequently intensified, prompting policymakers to invest in attracting more foreign direct investment which could lead to a positive global image (Montanari et al., 2018).

Similar to the way a CEO's misbehavior may impact corporate perceptions, the strength of country image is also highly susceptible to political turmoil or disreputable government policies and practices (Fetscherin, 2010). Corruption refers to the misuse of public office for private gain, or the abuse of an entrusted position to obtain illegal material benefit (Treisman, 2000; Šumah, 2018). Unfortunately, many developing countries suffer from malignant corruption that is engrained in the public psyche and systematized through government institutions. Among the most influential and widely used indicators of corruption is the Corruption Perception Index (CPI) published annually by Transparency International. First introduced in 1995, CPI ranks roughly 180 countries and territories on their respective levels of corruption on a scale of 1 to 100, with higher scores indicating lower levels of corruption.

Corruption is a systemic problem in emerging markets, including Latin American countries, that has eroded confidence and trust in public institutions and government officials (Husted, 2002). In fact, most Latin American countries measured 50 or below on the CPI scale (Transparency International, 2020). In addition, GAN Integrity (2021) ranked many Latin American countries on several corruption risk dimensions, such as judicial system, police, public services, etc., from moderate to high levels of corruption risk. Andres and Ramlogan-Dobson (2011) argue that corruption and inequality have long persisted in Latin America as a result of colonization where only a sliver of the population was granted access to resources while the vast majority was restricted from resources and political power. This persistent inequality is reflected in the ousting of numerous presidents and leaders of Latin America who have lost their positions and/or reputations due to corruption charges (Canache and Allison, 2005).

Culture is often touted as a key factor behind corruption (Harrison, 2000). More specifically, it is argued that culture influences social norms and institutions, and culture also impacts the tolerance and systemization of corruption (Banuri and Eckel, 2012). Arguably, the most popular method for measuring and comparing culture across countries is the five-dimensional construct proposed by Husted (1999) and Hofstede (2011) who suggest three cultural dimensions (power distance, uncertainty avoidance, and masculinity) have a significant positive effect on corruption. Apart from culture, Morris (2004) showed that the level of corruption in Latin American countries is negatively correlated to the rule of law, and confidence in the government;

and positively correlated to government spending, the burden of administrative regulations, the percentage of income owned by the richest 10%, competitiveness, and credit rating. Sex, age, social class, interpersonal trust, and political interest were also found to have a significant impact on perceived corruption in Latin American countries (Canache and Allison, 2005).

Hypotheses Development

There are well-established theoretical grounds for expecting a close association between corruption and FDI inflows. Simple correlation analysis and plots of these two variables in the five Latin American countries (not shown here to conserve space) suggest close associations between movements in the two constructs. However, the time pattern of these relationships is unclear and incapable of discerning whether corruption significantly causes (or rather caused by) changes in FDI inflows. Simple correlations cannot discriminate among four alternatives, and equally plausible, causality hypotheses. They are:

H1: corruption unidirectionally causes changes in FDI inflows.

H2: causality rather runs in the opposite direction from FDI inflows to corruption.

Christensen et al., (2019), for example, argue that worsening domestic economic conditions, particularly feeble international business activities (e.g., FDI), could result in fewer economic opportunities in the country. With a lack of prospects, public officials may leverage their positions to capitalize on business opportunities (e.g., bribery, extortion, subornation). As such, deterioration in FDI inflows can lead to (cause) higher chances for corrupt behavior. Pinto and Zhu (2016) also discuss similar theoretical arguments where changes in FDI inflows may impact the intensity of corruption in the domestic market. Thus, rising FDI inflows could increase market concentration, resulting in higher rents that public officials can and do demand from market actors.

H3: causality is bidirectional between corruption and FDI inflows. Thus, while corruption causes changes in FDI inflows, these FDI inflows feedback and cause changes in corruption.

H4: both H1 and H2 are rejected, implying that corruption and FDI inflows are causally independent.

This last hypothesized possibility means that the observed simple correlations between corruption and FDI inflows are illusive, implying that such correlations between the two variables are the outcome of other variable(s) driving corruption and/or FDI inflows.

Methodology

To distill a more definitive conclusion about the nature of causality between corruption and FDI inflows in the five Latin American countries, we turn our attention next to using a more appropriate statistical analysis. This paper employs a multivariate Granger-causality testing in the context of cointegrated-error correction systems. The Granger definition of causality states that a time series (x) is said to Granger-cause another time series (y) if the prediction error from regressing (y) on (x) significantly declines by using past values of (x) in addition to past values of

(y). Granger causality tests require variables free of unit roots whose stochastic properties do not vary over time. Phillips (1986), Stock and Watson (1989), and Harris (1995), among others, argue that if one or more variables in a given model have unit roots, the estimated regressions will likely be spurious (with inflated R-squares and biased test statistics including t and F ratios). Therefore, pre-testing for the presence of unit roots is important to avoid spurious regressions.

Granger (1986) argues that unit root in a given variable can be removed if differenced appropriately. To find the proper degree of differencing (order of integration), we employ two popular unit-root tests; namely, the popular non-parametric Phillip-Perron (PP) test and the popular Augmented Dickey-Fuller (ADF) test. In their extensive simulation study, Arltova and Fedrova (2016) concluded that among several possible tests, the most powerful unit root tests, especially for short time series (as is the case in this paper), are the PP and ADF tests. The null hypothesis under both of these tests is that the variable contains a unit root. Perhaps the main flaw of these two tests is that they ignore the possibility of structural break. Consequently, we also use the Zivot and Andrews (ZA) (1992) unit root test which allows for single structural breaks in the data series.

Eliminating unit roots from time series, though desirable, may filter out low-frequency (long-run) information if the variables in the model are cointegrated. A variable having a unit root, by definition, tends to wander extensively over time, but a pair of unit-root variables may move together through a particular linear combination. Consequently, the two variables are said to be cointegrated, meaning they have a long-run (equilibrium) relationship. Equations estimated with variables having no unit roots, but ignored the underlying cointegration, become misspecified due to an omitted variable bias which can distort the model inferences (Granger, 2004). Furthermore, Granger (1986) also contends that cointegration and causality are closely related concepts. In particular, if two or more variables are cointegrated, then there must be Granger-causality flowing between them in at least one direction. In this paper, we test for possible cointegration among the variables using Johansen's (1988, 1991) efficient approach which uses maximum eigenvalue and trace statistics. Several studies like Cheung and Lai (1993), Gonzalo (1994), and Enders (2015) provide ample evidence in support of the Johansen testing approach.

If the variables are found to be cointegrated, then testing for Granger causality requires the estimation of a dynamic error-correction model (ECM). In this case, the variables enter the model in their stationary forms but with the addition of a lagged error-correction (EC) term as another regressor that is derived from the underlying cointegrating relationship. This EC term represents slow-frequency information, i.e., the long-run (equilibrating) process. In the context of ECMs, the statistical significance of the lagged coefficients of an independent variable indicates the presence of short-run Granger causality, while the statistical significance of the coefficient on the lagged EC term reflects long-run Granger causality.

Before discussing our empirical results for the five Latin American countries, it is important to note that bivariate models containing corruption and FDI inflows may suffer from an omitted-variable bias. In particular, FDI inflows can impact living standards (as measured for example by the unemployment rate) which in turn could influence the level of corruption. Therefore, we enlarged our model by introducing the effect of unemployment in each country. Although the resultant trivariate models are superior to the bivariate systems, it remains possible that variables other than the unemployment rate may also impact corruption and/or FDI inflows. However, preliminary results from Ramsey's Link test (Kennedy, 2008) generally suggest the absence of significant omission of variable-biases in the trivariate models that contain corruption, FDI inflows, and the unemployment rate. This paper uses these trivariate models to investigate Granger-causality between corruption and FDI inflows in the five Latin American countries.

Empirical Results

The empirical models variables for each of the five Latin American countries; namely, the Corruption Perceptions Index (CPI), the inflows of Foreign Direct Investment (FDI), and the unemployment rate (UNE). CPI ranks countries and territories based on their perceived levels of state-run corruption. Created in 1995, the CPI index is the most widely used indicator of corruption worldwide. It is a composite index formed by the allocation of 13 surveys that measure different dimensions of corruption. The CPI index ranges from 0 (highly corrupt) to 100 (very clean). The index measures the degree of misuse of public office for personal gain and includes items related to bribery, kickbacks, embezzlement, and the strength and effectiveness of anti-corruption efforts as perceived by resident and non-resident managers as well as country analysts (Spencer and Gomez, 2011). We use annual data over the period of 1995-2019 for Brazil, Chile, Costa Rica, Mexico, and Peru (data after 2019 are excluded to avoid contaminating the results by the COVID-19 pandemic). The World Bank Statistics Database provides annual data on FDI and UNE for the five Latin American countries. We begin our empirical analysis by testing for unit roots in the variables.

Unit Root Tests Results

Table 1 displays the results from the PP, ADF and ZA unit root tests in the five Latin American countries for three variables; namely, CPI, FDI inflows and UNE. Due to the sensitivity of the results to the lag lengths used, we choose the proper lags in these tests based on the Akaike Information Criterion (AIC). Ahking and Miller (1985), among others, argue that the use of a common lag for all variables in a given model is overly restrictive and theoretically baseless.

There are two possible outcomes that may emerge from testing the model variables for the presence of unit roots. The first possibility is that all variables in the model are free from unit roots (integrated of order one, I (1)) which opens the theoretical possibility that these variables may be cointegrated. In this case, the Johansen cointegration test is required to assess whether cointegration does in fact exist among these variables. The second possibility is that the variables are integrated of different orders, which theoretically implies that these variables cannot be cointegrated (Harris, 1995).

The results assembled in Table 1 from both the ADF and PP tests suggest that, for the five Latin American countries, all variables in levels have unit roots, but they become free of unit roots once converted to first differences. However, the results from ZA test with single-break (also displayed in Table 1) contradict some of the results from the PP and ADF unit root tests for Brazil and Chile. Specifically, the ZA test results significantly reject the null of unit root for FDI inflows in Brazil, and also significantly reject the null of unit root in Chile for CPI and UNE. Since FDI inflows and CPI in these two countries are integrated in different orders then theoretically FDI and CPI cannot be cointegrated in Brazil and Chile.

To avoid spurious regressions in these two countries (Brazil and Chile), corruption and unemployment in Brazil should enter the Granger-causality tests in first differences, while FDI inflows should enter these tests in levels. And for Chile, FDI inflows should enter the Granger-causality tests in first-differences, while corruption and unemployment should enter the Granger-causality tests in levels. As for the other three countries (Costa Rica, Mexico, and Peru), all three variables in these three countries should enter the Granger causality tests in first-differences.

Table 1 : Unit Root Test Results

Country	PP	ADF	ZA (Break Year)
Brazil			
Variables in levels			
Corruption Perception Index (CPI)	-2.727	-2.703	-3.995 (2012)
Foreign Direct Investment (FDI)	-2.510	-2.520	-6.301** (2010)
Unemployment Rate (UNE)	-2.063	-1.662	-3.266 (2010)
Variables in first differences (Δ)			
Δ CPI	-4.318*	-4.325*	
Δ FDI	-5.138**	-4.911**	
Δ UNE	-3.441*	-3.445*	
Chile			
Variables in levels			
Corruption Perception Index (CPI)	-3.424	-3.170	-5.396* (2003)
Foreign Direct Investment (FDI)	-1.810	-1.068	-2.970 (2011)
Unemployment Rate (UNE)	-2.989	-2.983	-5.829** (2010)
Variables in first differences (Δ)			
Δ CPI	-5.061**	-4.914**	
Δ FDI	-4.416**	-4.424**	
Δ UNE	-5.931**	-4.050*	
Costa Rica			
Variables in levels			
Corruption Perception Index (CPI)	-2.095	-2.178	-4.307 (2001)
Foreign Direct Investment (FDI)	-1.978	-1.951	-2.942 (2004)
Unemployment Rate (UNE)	-2.480	-1.118	-3.961 (2009)
Variables in first differences (Δ)			
Δ CPI	-6.402**	-6.279**	
Δ FDI	-5.021**	-4.665**	
Δ UNE	-5.120**	-5.123**	
Mexico			
Variables in levels			
Corruption Perception Index (CPI)	-2.359	-2.670	-4.037 (2001)
Foreign Direct Investment (FDI)	-2.523	-2.605	-4.896 (2000)
Unemployment Rate (UNE)	-2.445	-2.445	-3.655 (2015)
Variables in first differences (Δ)			
Δ CPI	-7.084**	-6.434**	
Δ FDI	-8.793**	-5.241**	
Δ UNE	-3.077 *	-3.148 *	

TABLE 1 (continued)

Peru			
Variables in levels			
Corruption Perception Index (CPI)	-1.630	-1.630	-3.847 (2003)
Foreign Direct Investment (FDI)	-1.268	-1.338	-3.307 (2005)
Unemployment Rate (UNE)	-0.787	-0.761	-3.681 (2002)
Variables in first differences (Δ)			
Δ CPI	-4.684**	-4.684**	
Δ FDI	-6.028**	-5.930**	
Δ UNE	-4.104**	-4.131**	

Notes: PP is the Phillips-Perron non-parametric test, ADF is the Augmented Dickey-Fuller test, and ZA is the Zivot-Andrews single-year break test. The optimal lags are determined by the Akaike Information Criterion (AIC). * and ** indicate rejection of the null of unit root at the 5% and 1% levels of significance, respectively.

We move next to using the Johansen cointegration test to verify if corruption, FDI inflows and unemployment in Costa Rica, Mexico and Peru are indeed cointegrated.

Cointegration Test Results for Costa Rica, Mexico, and Peru

Table 2 assembles the cointegration test results from the Johansen test. We follow Harris (1995) and use the Pantula principle to test three basic models and compare the Trace and Maximum Eigenvalue test statistics for models 2, 3, and 4 (in that order) to their critical values, starting with the smallest number of cointegrating vector and stopping when the null hypothesis of no cointegration cannot be rejected for the first time. The results from the Trace and Maximum Eigenvalue tests for these three countries indicate that model 4 is their proper model, with one significant cointegrating vector in each of these countries. These results clearly suggest the presence of significant cointegrating (long-run equilibrium) relationships in these countries binding together corruption, FDI inflows, and unemployment.

Since the three variables (corruption, FDI inflows, and unemployment) in Costa Rica, Mexico, and Peru are significantly cointegrated, we move to estimating dynamic error-correction models (ECMs) to explore the extent of short-run and long-run Granger causal links among these variables in these countries. In the case of Brazil and Chile, their variables are not cointegrated and thus theoretically can only exhibit short-run Granger causality relationships, which we discuss in the next section.

Multivariate Granger-Causality Test Results

Based on the unit root and cointegration results, we turn to explore the directions of Granger-causality between corruption and FDI inflows in the five Latin American countries. In the case of

Table 2: The Johansen Cointegration Test Results

	Trace Statistics			Max-Eigenvalue Statistics		
	Model 2	Model 3	Model 4	Model 2	Model 3	Model 4
Costa Rica						
CPI, FDI, UNE						
r=0, and r=1	43.96**	36.56**	42.52*	24.54*	22.23*	24.58*
r≤1, and r=2	19.42	14.33	17.92	12.19	7.90	10.85
r≤2, and r=3	7.23	6.43	7.08	7.22	6.43	7.07
Mexico						
CPI, FDI, UNE						
r=0, and r=1	38.11*	32.65*	55.14**	23.14*	22.35*	31.14**
r≤1, and r=2	14.97	10.29	24.00	11.24	7.51	19.30
r≤2, and r=3	3.72	2.78	4.70	3.73	2.78	4.70
Peru						
CPI, FDI, UNE						
r=0, and r=1	48.19**	44.32**	48.30*	28.56*	28.48**	28.71*
r≤1, and r=2	19.62	15.84	19.59	12.93	12.48	14.07
r≤2, and r=3	6.69	3.35	5.52	6.69	3.35	5.52

Notes. See Notes of Table 1 for the definitions of CPI, FDI and UNE. Both cointegration tests for the three countries indicate the presence of one significant cointegrating vector at the 5% (*) and 1% (**) levels of significance.

Costa Rica, Mexico, and Peru, the directions of Granger-causality are tested both in the short- and the long-run by estimating the following two error-correction models (ECMs):

$$DFDI_t = \gamma_0 + \sum_{i=1}^{h1} \gamma_{1i} DFDI_{t-i} + \sum_{i=1}^{h2} \gamma_{2i} DCPI_{t-i} + \sum_{i=1}^{h3} \gamma_{3i} DU_{t-i} + \gamma_4 EC_{t-1} + \eta_t \quad (1)$$

$$DCPI_t = \delta_0 + \sum_{i=1}^{k1} \delta_{1i} DCPI_{t-i} + \sum_{i=1}^{k2} \delta_{2i} DFDI_{t-i} + \sum_{i=1}^{k3} \delta_{3i} DU_{t-i} + \delta_4 EC_{t-1} + \psi_t \quad (2)$$

where FDI is the FDI inflows, CPI is the corruption perceptions index, U is the unemployment rate, D denotes the first difference operators of the variables as required by the unit root tests, EC is the error-correction term based on the cointegration test results; the h's and the k's refer to the chosen lag lengths, and η_t and ψ_t denote the associated white-noise disturbance terms.

In the case of Brazil, FDI inflows are I (0) and thus enter the models in levels, but both CPI and unemployment are I (1) and thus enter the models in first differences. The directions of short-

run Granger-causality can be tested for Brazil by estimating the following two Granger-causality models:

$$FDI_t = \Omega_0 + \sum_{i=1}^{h1} \Omega_{1i} FDI_{t-i} + \sum_{i=1}^{h2} \Omega_{2i}\, DCPI_{t-i} + \sum_{i=1}^{h3} \Omega_{3i} DU_{t-i} + \upsilon_t \qquad (1)$$

$$DCPI_t = \delta_0 + \sum_{i=1}^{g1} \delta_{1i}\, DCPI_{t-i} + \sum_{i=1}^{g2} \delta_{2i} FDI_{t-i} + \sum_{i=1}^{g3} \delta_{3i} DU_{t-i} + \kappa_t \qquad (2)$$

As to Chile, its two short-run Granger-causality models are similar to those of Brazil, except that FDI should enter the two equations in first-difference {I (1)}, while CPI and unemployment should enter the two equations in levels {I (0)}. It is also worth noting that specifying multivariate models with long lags can quickly deplete scarce degrees of freedom, especially in small samples. Consequently, we start the annual lag profiles in the estimated models with four years, with the final lag structures are determined by Hendry and Doornik's (2014) General-to-Specific modeling criterion to conserve on the degrees of freedom. Moreover, to avoid potential shifts and ensure reliable statistical inferences, both estimated ECMs equations for Costa Rica, and the FDI equation in Mexico included significant (0,1) dummy variables.

The above models investigate the four causality hypotheses mentioned earlier. As to Costa Rica, Mexico, and Peru, short-run Granger-causality from corruption to FDI inflows in ECM (1) exists if the group coefficient γ_{2i} prove statistically significant; while long-run Granger-causality flowing from corruption to FDI inflows is present if the coefficient γ_4 of the lagged EC term proves statistically significant. Testing the reverse short- and long-run Granger causality from FDI inflows to corruption can be performed using ECM (2). As to the other two countries (Brazil and Chile), they have only short-run Granger-causality which can be explored by the second set of the testing models.

Table 3 displays the short- and long-run Granger-causality results. A variety of causality implications emerge across the five Latin American countries. These results clearly reject H4 that corruption and FDI inflows are causally independent across all five Latin American countries. Likewise, the second hypothesis (H2) that FDI inflows unidirectionally cause corruption receives some support, but only from Chile in the short-run.

Our empirical results assembled in Table 3 decisively indicate that causality in the short- and long-runs across the five Latin American countries is mostly either unidirectional from corruption to FDI inflows without feedbacks (H1) as is the case in Peru in the short- and long-runs, and in Costa Rica in the long-run. The results also suggest that causality is bidirectional flowing from corruption to FDI inflows with significant feedbacks (H3) in Mexico in both the short- and long-runs, as well as in Brazil and Costa Rica in the short-run. Such significant feedback between corruption and FDI inflows supports the theoretical arguments of Christensen et al. (2019) and Pinto and Zhu (2016) which cast serious doubts on most previous empirical studies that ignore such important feedback.

It is also worth mentioning that the results in Table 3 suggest that H1 and H3 alternate over time in the case of Costa Rica. While causality between corruption and FDI inflows are bidirectional in the short run, but such causality changes and becomes unidirectional from corruption to FDI inflows over the long run (suggesting that the causal effect of FDI inflows on

corruption appears to have weakened over time). These results could imply that causality between corruption and FDI inflows may be dynamic, changing their nature over time.

Table 3: F-Statistics of Multivariate Granger-Causality Tests

Null Hypotheses	Short-Run	Long-Run
Brazil		
Corruption does not cause foreign direct investment	5.08*	---
Foreign direct investment does not cause corruption	9.53**	---
Chile		
Corruption does not cause foreign direct investment	3.51	---
Foreign direct investment does not cause corruption	4.15*	---
Mexico		
Corruption does not cause foreign direct investment	6.64*	56.95*
Foreign direct investment does not cause corruption	17.69**	30.61**
Costa Rica		
Corruption does not cause foreign direct investment	21.13**	65.57**
Foreign direct investment does not cause corruption	14.12**	0.10
Peru		
Corruption does not cause foreign direct investment	7.02*	25.61**
Foreign direct investment does not cause corruption	3.37	4.16

Notes: The optimal lags in the ECM models are determined by Hendry and Doornik's (2014) General-to-Specific modeling criterion. *, and ** indicate rejection of the null hypotheses at the 5%, and 1% levels of significance, respectively.

Conclusion and Discussion

This paper explores the nature of causality between corruption and FDI inflows in the case of five Latin American countries. In contrast to the correlational approach of many prior studies on the topic, our empirical analysis investigates short and long-run Granger causality using a dynamic cointegrated error-correction modeling framework. Our results generally suggest that corruption and FDI inflows are neither causally independent (H4), nor causally unidirectional from FDI inflows to corruption (H2) in the majority of the five Latin American countries (the only exception is Chile in the short-run, where FDI inflows 'Granger cause' corruption without feedback).

A possible explanation for the finding that cointegration between corruption and FDI only exists in Costa Rica, Mexico, and Peru (but not in Brazil and Chile) may rest in the discrepant manner which bribe-demanding bureaucrats are structured in these countries. That is, while none of the countries discussed in this paper are immune from corruption, the arbitrariness (the degree of uncertainty) of corruption may be generally lower in Brazil and Chile compared to that of Costa Rica, Mexico, and Peru. Specifically, it is our contention that corruption appears to be more systematic in the dynamics of Brazilian and Chilean politics and industry. Unlike tax payments, bribes lack transparency and regulations and thus entail weaker, informal agreements between the transacting parties. Given the institutionalized and well engrained nature of corruption in Brazil and Chile (see Zirker, 2021), bureaucrats in these two countries may have a more translucent bribery process in place with more assurance of the eventual fruition of bribes paid. In contrast, the outcomes from bribe payments in Costa Rica, Mexico and Peru may be less guaranteed and thus less prone to materialize as consistently. In such ambiguous circumstances, investors may instead be solicited by a 'revolving door' of bureaucrats demanding bribe payments before the end result is finally achieved.

Taken together, the empirical evidence is overwhelmingly supportive of causality that is either unidirectional from corruption to FDI inflows (H1) as in Peru in both the short and long-runs, and in Costa Rica in the long-run; or that causality is rather bidirectional between the two variables (H3), as in Brazil and Costa Rica in the short-run, and Mexico both in the short and long-runs. Such robust evidence for significant bidirectional causality between corruption and FDI inflows in the majority of the Latin American countries casts serious doubts on prior empirical studies that *a priori* dismiss feedback effects from FDI inflows to corruption. One plausible explanation for the significant causal FDI feedback may be that a global image of economic prosperity coincides with improving business ventures and more opportunities for public officials to lucratively exploit their positions. Therefore, any viable corruption reforms may require Latin American policymakers to enforce consistent and equitable governance and regulatory controls on foreign contracts and business ventures. That said, these findings do not insinuate that corruption is merely a developing country problem. Massive scandals and governmental breaches of trust have sent shockwaves throughout the developed world as well. A recent survey of 40,000 citizens in 27 European Union countries reveals that more than half believe their countries are run by private interests and another 45% believe the problem is in a downward spiral (Transparency International, 2020). In Germany, for instance, members of federal and state parliaments were recently indicted on corruption allegations related to 'highly lucrative deals' struck in the dissemination of COVID-19 masks to the public, triggering a series of political resignations (Morris, 2021).

Our empirical results further indicate that causality between corruption and FDI inflows may be dynamic (as is the case in Costa Rica), changing its nature between the short and the long-run. Therefore, blind applications of standard short-run Granger-causality tests that ignore the

underlying degree of cointegration would yield spurious causality inferences since they ignore possible long-run causal relationships. In addition, the presence of such long lags in the causal effect of corruption on FDI inflows may be an inherent risk for countries with policymakers mistakenly adopting short-run policy horizon outlooks based on the assumption that corruption is not harmful over the long run. We hope this research propels further examination of corruption in Latin America and elsewhere to gain a more generalizable sense of the problem and further identify causal determinants and consequences of this rampant phenomenon.

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