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Impact of kidnappings and homicides on foreign direct investment in Mexico

Impacto de secuestros y homicidios en la inversión extranjera directa en México

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Abstract

At least since 2006, Mexico suffers an alarming increase in crime. High impact crimes such as murders and kidnappings have considerably increased. Since 2000, the Foreign Direct Investment (FDI) has stagnated in current US dollars and fallen as a proportion of GDP (from 3.9% in 2001 to 2.6% in 2017). By estimating six Vector Error Correction Models (with yearly data for the period 1997-2017), it is empirically proven the negative effect of the rate of kidnappings and murders on Total FDI, its components and the Mexican GDP. In all cases, the effects are permanent and significant. It is shown that policies focused on the recovery of the rule of law are crucial to raise economic growth.

JEL Code: C32, C52, F21, K42
Keywords: foreign direct investment and its components; kidnapping; murder; vector error correction (VECM)

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Resumen

Al menos desde 2006, México sufre un alarmante incremento de la criminalidad. Delitos de alto impacto como homicidios dolosos y secuestros han aumentado considerablemente. Desde el año 2000, la Inversión Extranjera Directa (IED) se ha estancado nominalmente y ha caído como proporción del PIB (de 3.9% en 2001 a 2.6% en 2017). Con el uso de seis Modelos de Vectores de Corrección de Error se prueba empíricamente, con datos anuales para el periodo 1997-2017, el efecto negativo, permanente y significativo de la tasa de secuestros y de los homicidios dolosos sobre la IED Total, sus componentes y sobre el PIB. Se muestra que aplicar políticas eficientes que recuperen el Estado de Derecho es crucial para elevar la capacidad de crecimiento económico.

Código JEL: C32, C52, F21, K42
Palabras clave: inversión extranjera directa y sus componentes; secuestros; homicidios dolosos; vector de corrección de error (VECM)

> The effective rule of law reduces corruption, protects people from injustice, and combats poverty. The rule of law underpins communities of equality, opportunity, and peace and serves as the foundation for development, transparent and accountable government, and respect for fundamental rights. When the rule of law is weak, there are not enough medicines in clinics, violence and crime cannot be controlled, the law is applied unfairly, and there is no foreign investment. The rule of law is an issue that not only involves lawyers and judges, but it is a concept that involves the whole of society.
>
> World Justice Project, 2018: 10

Introduction

Conventional literature on Foreign Direct Investment (FDI) states that its determinants are essentially macroeconomic. However, in recent years and for some emerging countries, other variables have been added, such as political and social stability and criminality, which consider microeconomic aspects and the business environment.

The violence that has plagued Mexico for more than a decade has had an impact on social peace. However, it also causes economic problems. FDI has been affected by the increase in high-impact crimes,

measured by kidnapping and murder rates, which send clear signals that discourage investors and international markets, relegating macroeconomic fundamentals to a secondary level.

The increase in crime and the absence of the rule of law increase social instability, depress private investment, divert (allocating to non-productive activities) public and private spending, and consequently, reduce economic activity. The above generates an increase in economic costs, consisting of the sum of the total value of goods and services used to aid citizens and those allocated to treat victims immediately. Other associated costs, which are more challenging to measure, relate to the multiple long-term consequences of the increase in morbidity (physical, emotional, and psychological) and mortality rates (UNDOC, 2007). The above, being public problems, generate externalities that the State must take into its own hands sooner or later with the consequent budgetary cost.[2] All this can condemn an economy to a low-growth trap.

This study aims to calculate the impact of the increase in the rate of kidnappings and intentional homicides on the flow of FDI in Mexico in the period 1997-2017.

Six VECMs(1) were estimated. Based on the forecast accuracy within the sample (evaluated with the Theil Coefficient) and the correct (joint) identification and specification, four were chosen to detect their best determinants and analyze the long-term sensitivity of FDI, its components, and GDP to these crimes.

The analysis was done with the annual series because only in this way do the variables show homogeneity in the order of integration.

The research results are consistent with recent literature because social stability, institutionality, and security are increasingly important for FDI inflows to Mexico and economic growth.

It is shown that, although the macroeconomic variables of the Mexican economy have been stable, the increase in the kidnapping and homicide rates has negatively and permanently affected the flow of FDI, its components, and GDP during the study period. Specifically, it is empirically proven that the "New Investments" component (FDINI)—which refers to "fresh capital"—has been falling significantly, and the Total FDI (TFDI)—which has remained stable in nominal terms since 2000—is mainly explained by the "Reinvestments" (FDIR) item. The above reflects the fact that the inflow of new flows has diminished due to insecurity conditions. However, the FDI that is already established feeds back because stopping its activities and leaving the country is more costly than staying and absorbing the cost of

[2] Becker (1968: 171) and Rizzo (1979: 177 and 178) explain that, according to the President's Commission on Law Enforcement and Administration of Justice, the cost of crime consists of the sum of the estimated market value of stolen or destroyed goods, the loss of earnings related to deaths or injuries, and the expenditure made by private agents and the State to prevent crime, for example, the expenditure on items such as the various police forces, courts, prisons, lawyers, burglar alarms and guards, among other means of protection. In addition, Becker (1968: 171) considers that these costs are highly underestimated because they do not take into account other expenditures made to prevent crime; for example, spending on cabs to prevent assaults on public roads and public transportation.

violence. Moreover, as explained in the "Analysis of results" section, this variable seems overly sensitive to the domestic market's evolution. Thus, recent economic growth, although modest, has served to counteract the negative effect of violence on FDI.

FDIR, which is the component that has grown relatively, was also found to have positive but transitory effects on GDP, probably because it has little capital accumulation effect.

Also noteworthy—and most worrying—is the capacity of crime to reproduce itself. In all cases, kidnappings and homicides show hysteresis, which indicates that being profitable activities, those who participate in them have no incentive to leave and engage in another legal activity.

In conclusion, restoring the rule of law is crucial to increasing TFDI and its component of new investments, thus reactivating the country's economic growth.

This work is divided into six parts in addition to this introduction. The first part briefly outlines the evolution of FDI in Mexico since 1970. The second part reviews the literature and considers theoretical aspects. The third part presents the stylized facts of the variables of interest in Mexico since 1997, when official series on these crimes became available. The fourth section outlines econometric aspects. The fifth section analyzes and discusses the statistical results obtained, and the final section offers the conclusions.

Evolution of FDI in Mexico

Since the beginning of globalization in the 1980s, the flow of FDI to developing countries has increased significantly. It became an essential complement to domestic investment and the engine of growth in several countries such as Ireland and China (Ríos-Morales & O'Donovan, 2006).

The causes of this phenomenon have been the subject of various studies and have given rise to different theories that attempt to explain them. Some of these studies mention the search for better market conditions, risk diversification, market expansion, favorable exchange rates, loss of competitiveness in the country of origin, productive and strategic relocation, and greater competition among large companies to expand their markets and maintain market conditions that favor their interests (Guerra, 2001 and Esquivel & Larraín, 2001).

Among the benefits attributed to FDI are a) the generation of employment; b) the incorporation of new technologies and the application of better ideas and work practices; c) the promotion and construction of industries that foster competition; d) the promotion of research and development; and e) a source of financing for the structural deficit of the current account of the balance of payments.

In summary, conventional literature considers that FDI generates significant positive spillovers (Aitken et al., 1994; Cevis & Camurdan, 2009; Findlay, 1978; Kotrajaras, 2010; Waldkirch, 2010 and Dussel et al., 2003) and, therefore, is a crucial factor in economic growth.

According to UNCTAD (2017), during the 1990s, the growth of TFDI in the world was exponential, and only in two specific periods did it fall dramatically. The first was between 2000 and 2003 when it fell by 59%. According to the organization, this was due to recessions in more than a dozen countries,[3] including the world's three largest economies. Subsequently, the Great Recession depressed it again, and as of 2016, it had not reached the level it had in 2007.

In Mexico, the share of FDI in GDP has been very erratic and has tended to drop for almost twenty years. Indeed, around 2001—which is the highest point in the entire series—it represented 3.9% of GDP, and in 2017 it fell to 2.6%, a figure similar to the one it had in 1994 (see figure 1). This evolution suggests that despite all the structural reforms implemented and even when macroeconomic fundamentals have been in order, this critical variable has not gained weight and could explain why the Mexican economy's growth has not rebounded.

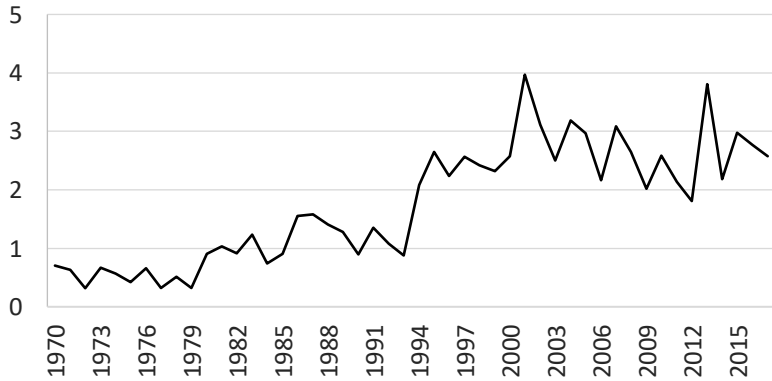

Figure 1. Mexico: FDI as a percentage of GDP, 1970-2017.
Source: UNCTAD (2017).

Finally, most FDI in Mexico has been concentrated in manufacturing and financial services. This is not fortuitous because NAFTA privileged trade liberalization, productive regional integration, and investment liberalization by linking Mexican and U.S. value chains in these sectors (see figure 2).

[3] Caused by the dot com crisis and by the ramifications of the events of September 11, 2001 in the United States.

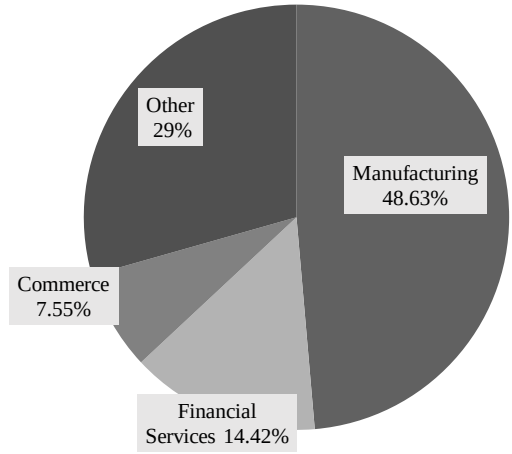

Figure 2. Mexico: FDI distribution by sector, 1999-2017.
Source: calculations done by the author based on information from the Ministry of Economy (2017). Arithmetic average of cumulative FDI for the period. Note: Other = Mining, Mass Media, Real Estate Services, Tourism Services, Construction, Agriculture, Professional Services, Health, and Education.

Literature review

Macroeconomic factors

Conventional literature agrees that FDI determinants are essentially macroeconomic, such as the level of activity and its growth rate, the degree of openness, the exchange rate, inflation, and some country risk variables. Accordingly, Oladipo (2013) points to the degree of openness, the exchange rate, the money supply, and the interest rate. Dussel et al. (2003) argue that in Mexico, it depends on GDP growth, the degree of trade openness, labor costs in the host market, and country risk measured as the ratio of the current account deficit to GDP.

Fajardo & de Jesús (2015) mention that the factors that have determined FDI in Latin America in recent years are GDP, economically active population, inflation, trade openness, growth dynamics, and market size. For their part, Abbas & El Mosallamy (2016) found that the determinants of FDI for emerging economies are the degree of trade openness, human capital, infrastructure, and the level of FDI in the

previous period. Finally, Dellis et al. (2017) suggest that the quality of institutions[4] and the economic structure[5] are essential for attracting FDI to advanced countries.

Microeconomic factors

Social aspects such as crime can be incorporated as negative factors in determining FDI if it is acknowledged that companies are averse to incurring security expenses and, especially, being victims of crime in any form.

Agyapong et al. (2016) confirm the existence of harmful effects of organized crime on growth in Africa. They mention that insecurity reduces FDI flow because crime acts as a tax on the entire economy and reduces competitiveness by generating inefficiencies and uncertainty that discourage domestic and foreign investment. Busse (2005) points out that countries with a high probability of kidnapping reduce investors' return expectations.

Bloomberg and Moody (2005) found that in World Trade Organization member countries (1980-2000), violence of all kinds depressed trade and FDI flows. In this regard, Vittorio & Marani (2008) show that, due to the presence of criminal groups, southern Italy receives a minimal share of inward FDI.

Pyshval & Suárez (2006) estimate that a 1% increase in the rate of kidnappings of company personnel in Colombia results in a decrease in FDI of 0.443%.[6] Ortiz et al. (2013) state that the kidnapping rate, also in Colombia, has had a significant adverse effect on economic growth since 1980.

Crime in Mexico

In Mexico's specific case, recent studies incorporate crime variables in the study of FDI.

Madrazo (2009) relates FDI to crime, GDP, and the minimum wage and states that intentional homicides significantly and negatively affect it. Alaimo et al. (2009) conclude that crime has a significant and negative impact on companies' performance and affects investment more than productivity, suggesting that there is a threshold level of violence that companies are willing to accept.

Bernal and Castillo (2012) state that homicides and kidnappings negatively affect FDI, especially since the beginning of the "war on drugs" in December 2006.[7] Hernández (2014) concludes

[4] Measured by the Global Competitiveness Index and the Index of Economic Freedom.
[5] Measured by Labor Costs, Market Size, and Degree of Openness.
[6] For Mexico, there is no series that only deals with kidnappings of owners or executives of companies linked to FDI.
[7] Strategy based on operations to capture the heads of the main criminal organizations (Benítez, 2009) with the idea that by eliminating them, the organizations would collapse, but instead the gangs multiplied and have increasingly fought over routes and territories, thus accentuating the violence.

that this strategy to combat crime (2006-2012) was misguided because it exacerbated the vicious cycle of violence. Torres and Polanco (2015) suggest that the increase in the homicide rate reduces interest in FDI.

FDI and violence in Mexico: stylized facts

As mentioned, contrary to what this strategy sought, crime in all its manifestations has proliferated. According to the UNDP Regional Human Development Report (2013) and Molzahn et al. (2012), since the beginning of the "war on drugs", homicide and kidnapping rates have multiplied.

According to ENVIPE (2017), during 2016, the cost of insecurity was around 1.1% of GDP, where 60.6% corresponded to economic loss as a result of crime, 35.8% to spending on preventive measures, and the remaining 3.6% to health spending as a result of being a victim of crime. According to The Institute for Economics and Peace (2017), since 2016, Mexico has become the second least peaceful country in Latin America, and since 2007 it has dropped 48 places in the Global Peace Index.

Ortiz et al. (2013) argue that while intentional homicides affect the general population, kidnappings have as their primary—though not only—target specific economic agents (owners, businessmen, and managers) who can invest and accumulate capital. Thus, even if business conditions are favorable, the increased likelihood of being a victim of crime could have more weight in the investor's decision.[8]

The two crimes analyzed here came from remarkably high levels in 1997[9] but fell rapidly and steadily until 2005. Just after the implementation of the strategy above, both variables shot up significantly. See figure 3.

[8] Because it not only implies putting their own lives at risk, but also those of their families, and the cost of avoiding or suffering this crime can be higher than the returns on investment. According to Consulta Mitofsky (2017), kidnapping is the crime that generates the most fear in the population. It is followed by armed robbery and homicides.
[9] The analysis begins in 1997 because it is the first year for which official information is available.

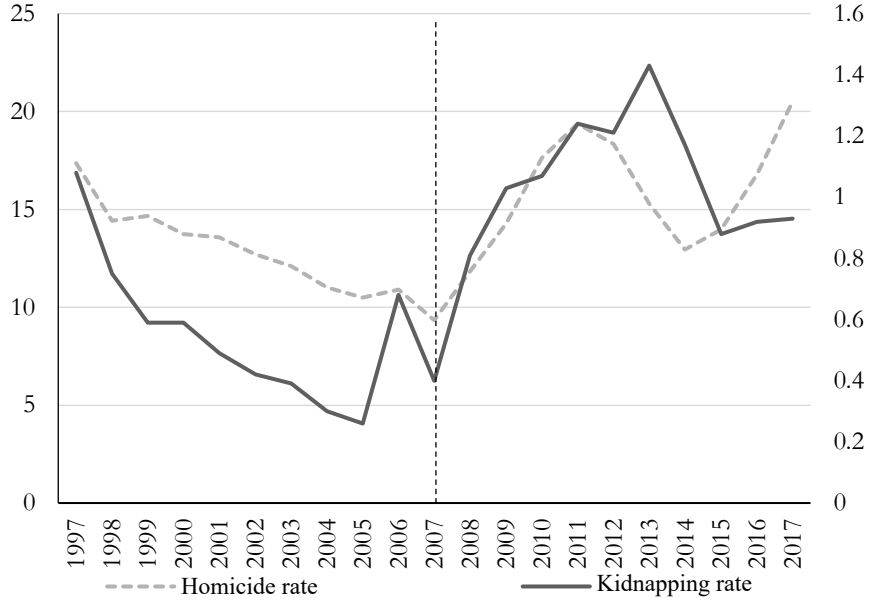

Figure 3. Mexico: Kidnapping and homicide rates, 1997-2017
(Events per 100,000 inhabitants).
Source: SESNSP (2017).
Note: kidnapping rate on the right axis and homicide rate on the left axis.

In 2017, the homicide rate (Hom) reported the historically highest rate, and the kidnapping rate (Kid) did so in 2013. However, it is essential to take into account that both figures are underestimated. According to ENVIPE (2017), the "black figure" (crimes that are not reported) of kidnapping in 2012 was 98%, and that of homicide was 30%.

In the same period, according to the hypothesis and data from the Ministry of Economy (2017), since 2007, companies with foreign capital that registered commercial or industrial activities in Mexico have decreased dramatically (figure 4). In parallel, nominal FDI has stagnated (figure 5), and its proportion to GDP has fallen since 2001. Figure 5 shows the historical evolution of nominal TFDI (in millions of current dollars) since 1970. It is noteworthy that since 2001 it has been very volatile and has stagnated.

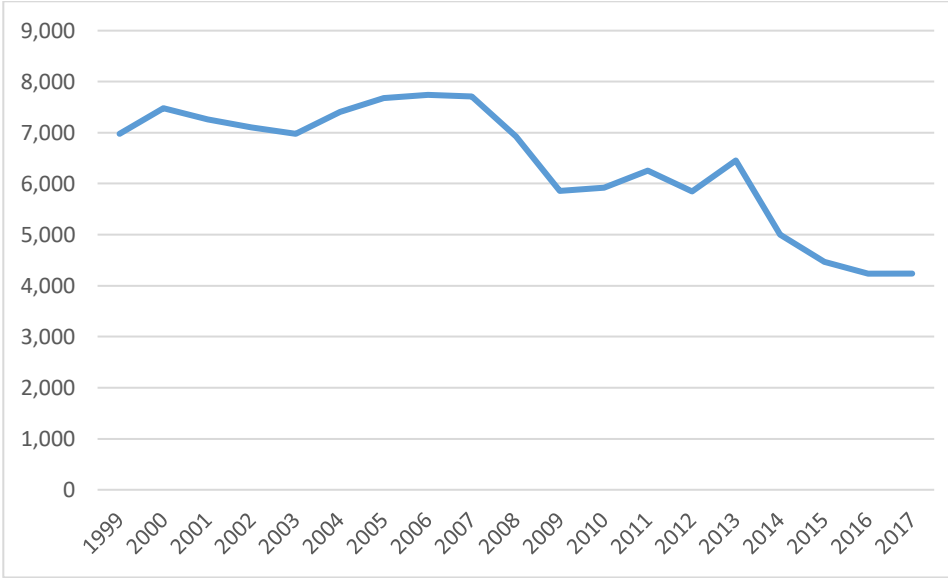

Figure 4. Mexico: Number of companies with FDI, 1999-2017.
Source: Ministry of Economy (2017).

On the other hand, there are two turning points in its historical evolution that coincide with a) the enactment of the Regulations of the Law to Promote Mexican Investment and Regulate Foreign Investment of 1989, b) the Foreign Investment Law of 1993, and the beginning of NAFTA in 1994.

A more precise analysis should be made of what has happened since 2000. Since that year, there have been three essential outliers that correspond to significant asset purchases by transnational corporations: a) in 2001, the purchase of Banamex for USD 12.447 billion, and b) the purchase of breweries in 2010 and 2012 for USD 7.7 billion and USD 20.1 billion, respectively.[10]

[10] Consequently, it is plausible to consider that these investments hardly contributed to the economic growth of those and subsequent years. See CEFP (2002), Proceso (2010), and Lara & Espinosa (2012).

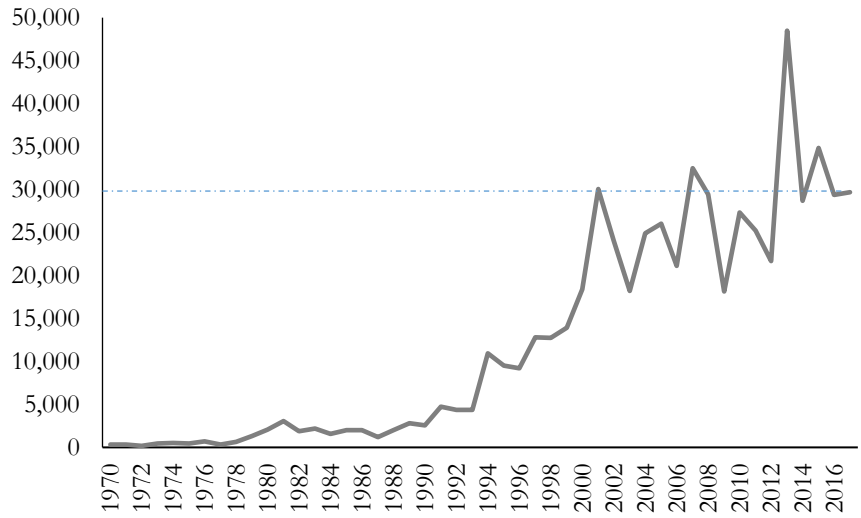

Figure 5. Mexico: Annual TFDI, 1970-2017 (Millions of current dollars).
Source: Ministry of Economy (2017).

Finally, Figure 6 shows the relative contribution of the components of TFDI.[11] The abrupt drop in FDINI, which represented 71% in 1997 and only 38% in 2017, is striking. Meanwhile, FDIR rose from 16.7% to 32.5%, while the "intercompany accounts" component grew significantly from 12.2% to 29% in the same period.

In sum, it is clear that the FDINI component, which represents "fresh capital" and is the one that would fulfill the virtuous effects of investment, has lost much weight, which favors the central hypothesis of the article.

On the other hand, the increase in the "New Investments" component could be explained because even with violence and the absence of the rule of law, closing plants and leaving Mexico may be more costly than absorbing the cost of criminality. The ECLAC (2018) warns that since 2011 the average profitability of FDI across the Latin American region has fallen. Therefore this variable might still suffer.[12]

[11] TFDI is composed of three components: a) New Investments (FDINI), b) Reinvestment of Earnings (FDIR), and c) Intercompany Accounts (Bank of Mexico, 2017b). The latter are excluded from the analysis as they are made up of loans from parent companies residing abroad to their subsidiaries in Mexico and imports of fixed assets made by companies. Thus, this work considers that only the first two more clearly reflect the behavior of TFDI in accordance with the hypothesis.

[12] This comment was added at the express request of an arbitrator. While it would be interesting to further measure the impact that profitability has and eventually would have on TFDI and its components, there are no series with the same periodicity as the one used in this work and it completely exceeds its objective.

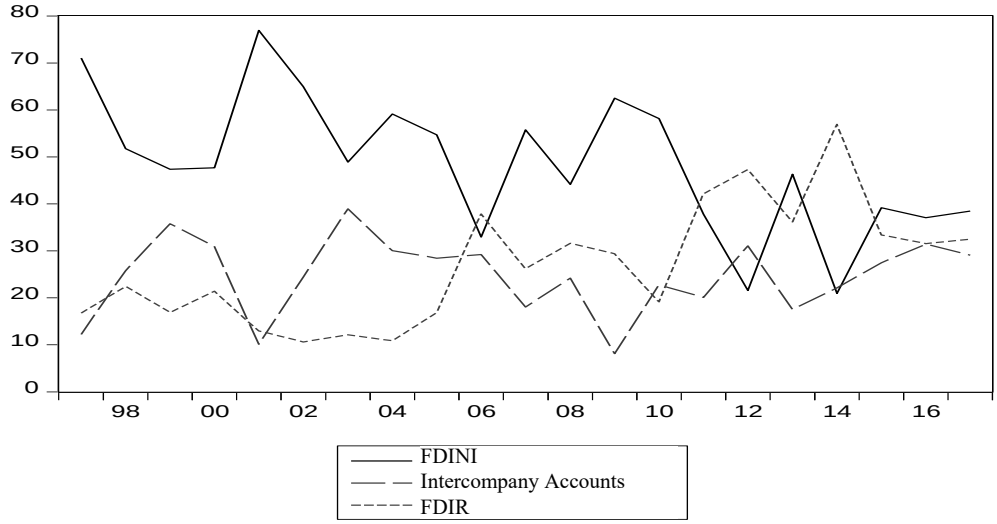

Figure 6. Mexico: components of TFDI, % of the total, 1997-2017.
Source: calculations done by the author based on information from the Bank of Mexico (2017a).

Econometric aspects

To test the central hypothesis and according to the literature review, the following set of information (Y) was chosen to analyze the socioeconomic determinants of FDI in Mexico (1997-2017):

$$Y = \{TFDI, FDINI, FDIR, Kid, Hom, GDP, CA\} \quad (1)$$

Where: TFDI, FDINI, and FDIR are the Total Foreign Direct Investment and its components of New Investments and Reinvestments, respectively (expressed in billions of USD), Bank of Mexico (2017a); Kid is the kidnapping rate, and Hom is the intentional homicide rate (both are events reported per 100 thousand inhabitants), ENVIPE (2017); GDP is the Gross Domestic Product of Mexico (in billions of constant pesos in 2008), INEGI (2018); CA is the ratio of the current account balance to GDP (in constant pesos),[13] INEGI (2018) and Bank of Mexico (2017a).

Kid and Hom's high correlation resulted in wrong signs and lack of statistical significance when incorporated as simultaneous regressors.[14] Therefore, two alternative models were estimated for each

[13] Moosa (2002) defines country risk as the exposure to economic loss in transnational operations. Dans (2012) and Dussel et al. (2003) define CA as an indicator of country risk, which justifies its negative sign to TFDI and its components.
[14] Loría & Salas (2016) demonstrate the importance and consequences of multicollinearity in the case of VEC models.

variable of interest; based on the Theil Coefficient and the statistical and economic significance, two were eliminated. Therefore, all the inference analysis was done based on the combination of four robust and correctly specified models. The series are non-stationary in their levels but stationary in the first differences, as shown in Table 1A of the annex.[15]

Table 2A proves that unique (long-run equilibrium) cointegrating relationships exist for each of the six estimated models. Because of the sparsity of degrees of freedom, all specifications have a lag, so that in all cases, there are VECMs(1).

The modern time series approach suggests that it is necessary to consider the long-run parameters and the short-run disequilibrium by letting the data speak freely (Juselius, 2006 and Lütkepohl & Krätzig, 2004). The above is a specific and important feature of the VEC methodology.

According to Patterson (2000), the necessary condition for these models to have a solution is that there is at least one cointegrating vector (r = 1) and that the system has a reduced rank$(r < k)$. To the extent that this is fulfilled, there must be a mechanism to ensure short-term dynamic adjustments. The shocks suffered by the system must correct the evolution of the variables toward their long-run equilibrium relationship around the variable defined as dependent.

The general unrestricted VEC of Johansen (1988) in reduced form and without considering exogenous variables can be expressed as follows:

$$\Delta y_t = \alpha\beta' y_{t-1} + \sum_{i=1}^{t-1} \Gamma_i \Delta y_{t-i} + \varepsilon_t \quad (2)$$

Where y_t is a vector of endogenous variables (which has been previously defined as the set of information, Y), α is the error-correction mechanism and on which weak exogeneity is tested, β is the number of cointegrating ratios (vectors), Γ_i is the coefficient matrix of the short-term VAR in first differences, and ε_t is a vector of Gaussian behavioral innovations.

All models were estimated in double logarithmic form[16] so that the estimated parameters represent constant long-run elasticities.[17]

Since two models were estimated for each variable of interest, defining the selection criteria is essential. Applied econometrics always faces the problem of selecting the "true" model or the one that most closely approximates the Information Generating Process, which is unknown to the researcher (Hendry, 1995). Therefore, the best estimable statistical model should be sought, which, in the end, should

[15] Due to the lack of degrees of freedom, it was not possible to perform unit root tests with structural change.
[16] Except for DC because it generally exhibits negative values.
[17] And semi-elasticities for the case of CC.

be the one that is the most parsimonious, plausible, and informative (Feldstein, 1982: 829). The above was achieved by following the iterative procedure by Hendry (1995) from "the general to the particular."[18]

This work faces the problem of two "alternative or rival models" per variable. In order to discern and select the model that best tests the central hypothesis, the following strategy was followed: a) complying with the usual criteria of correct specification, b) obtaining the signs of the regressors as dictated by the theory (Hendry and Richard, 1983), c) yielding the lowest systematic component (bias) of the Theil[19] through the in-sample simulation, and d) meeting the "hits-you-between-the-eyes test" by Kennedy (2002).[20]

The standardization of the six models on FDI, FDINI, and FDIR is appropriate based on testing for weak exogeneity (table 3A), requiring correct specification (Maddala, 1996; Charemza & Deadman, 1999; and Johansen, 1992). If this condition is not met, this variable, in turn, must be estimated. It was found that this condition is not met for CA in models 1, 5, and 6 but estimating it is totally outside the scope of this work.[21] Models 2 and 4 suggest that GDP could be explained by the other variables tested by the impulse-response of models 1 and 6, presented below, and supports the central hypothesis of the work. Finally, Kid and Hom are not weakly exogenous in models 6 and 4, respectively, which suggests that they would need to be explicitly modeled, but this also goes beyond the scope of this work.

Finally, and for forecasting purposes, it is required that there must be Granger causality in addition to complying with the weak exogeneity condition. Thus, the strong exogeneity condition will be met (Charemza & Deadman, 1999). According to Table 4A, this condition is met for models 2, 5, and 6, but due to the results of model 2 (which are specified below), it is only possible to consider it for the last two models. Table 1 shows the results of the estimation of the six models.

Table 1
Cointegration models. Results

	TFDI		FDINI		FDIR	
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
Constant	−24.03	−22.00	1.01	0.12	−51.22	−49.80
Kid	−0.28		−0.38			−0.10
Hom		−0.01		−1.09	−0.87	
CA	−0.07	0.01			−0.36	−0.23
GDP	1.87	1.75	0.12	0.39	3.78	3.54
Error correction	−0.96 (−2.3)	−1.39 (−4.97)	−0.72 (−1.88)	−0.69 (−1.84)	−0.55 (−3.21)	−0.45 (−1.79)

[18] Specifically, to apply the TTT strategy (test, test, test).
[19] Pindyck & Rubinfeld (1991: 336-341).
[20] "Are the signs of coefficients as expected? Are important variables statistically significant? Are coefficient magnitudes reasonable? Are the implications of the results consistent with theory?".
[21] In addition, it lacks theoretical sense in the analysis. This result seems to be more of a strictly statistical type.

mechanism α_1 *						
Global identification χ^2, 95% confidence	0.05 (0.99)	4.78 (0.44)	6.98 (0.13)	4.67 (0.09)	0.01 (0.99)	0.07 (0.99)
Maximum root of the characteristic polynomial	0.51	0.76	0.76	0.76	0.76	0.83
Lütkepohl	6.64(0.57)	8.34(0.40)	6.01(0.42)	1.27(0.97)	5.17(0.73)	8.70(0.36)
LM(6)	23.19(0.10)	14.65(0.54)	11.34(0.25)	6.75(0.66)	14.24(0.58)	17.30 (0.36)
White NC	119.51(0.49)	151.77(0.23)	55.14(0.22)	78.53(0.13)	116.24(0.58)	121.49(0.44)
Theil coefficient	0.000	0.005	0.031	0.026	0.000	0.002

Note: All models were identified by applying joint and binding constraints to the error correction and long-run parameters, i.e., that each variable individually and jointly was significant in each model (Boswijk, 1995), which is tested jointly with the test χ^2.
*With n = 20; the critical value at 95% confidence of the one-tailed t-test is 1.72, so in all cases, the null hypothesis is rejected: $\alpha_1 = 0$ (Greene, 1998: 865).

The above results, specifically the "global identification" test as represented jointly by the statistic χ^2, indicate that the identification of each cointegrating vector of each equation in terms of selecting the dependent variable is correct. This reveals that the normalization on the dependent variable, on which each equation's cointegration is proposed, is correct. Also, it proves that there is individual significance, as measured by the t-statistic, of each regressor at least at 95%. The above is what Boswijk (1995) calls that the individual and joint restrictions are binding. When this is achieved, it can be concluded that each VEC is correctly identified.

Analysis and discussion of results

Although all the models comply with correct specification assumptions, models 2 and 3 were eliminated from the analysis due to the selection criteria already mentioned. The former because the error correction coefficient is explosive and because it presents a positive sign of CA, which contradicts the assumption of dynamic stability of the model and the country risk hypothesis, respectively. Model 3 was discarded because it reported the highest Theil coefficient despite not presenting any other statistical or economic analysis problem.

On the other hand, it should be noted that CA was excluded in models 3 and 4 because the results obtained were contrary to the stylized facts and the theory.

Thus, the following analysis was based on the combination of the remaining models, which at no time presented negative results. Moreover, in all cases, the results were complementary.

Models 5 and 6 report a remarkably high elasticity of FDI to GDP (3.78 and 3.54, respectively), which reflects two important facts: a) GDP dynamics—although modest—have counteracted the negative effect of crime on the three components of FDI, and b) it shows that FDI is very sensitive to the evolution of the domestic market (3.78 and 3.54, respectively).

Models 1 and 6, particularly the former, show the negative effect of Kid on TFDI and FDIR. Thus, although it is plausible to think that Kid should have a more significant impact on all business and personal costs, the elasticities of FDINI and FDIR for Hom (models 4 and 5) turned out to be much higher.

Impulse-response functions were estimated to analyze the dynamic effects.[22] All responses have the expected signs: they are significant and permanent, except for GDP response to FDI. This response, although positive and significant (Figure 9), lasts only nine periods. In particular, quadrants 1,1 of figures 7-9 prove the central hypothesis of this work: the negative and permanent significant effect of Kid and Hom on the three types of foreign investment. It is also observed that these variables have an apparent negative and permanent effect on GDP.

The permanent nature of the effect of violence on FDI and GDP can be explained by the fact that it is not a shock that may be considered transitory. On the contrary, violence and crime are complex social phenomena that are complicated and costly to eradicate. It can then be assumed that they remain present in a society for a long time, influencing long-term investment decisions.

Also striking—and most worrying—is the capacity of crime to reproduce itself. In all cases, Kid and Hom show hysteresis probably due to the high profitability of illicit activities that deters those who carry them out from engaging in other types of non-illegal activities. The above also explains the permanence of the effect of these variables on FDI and GDP. On the other hand, the dynamic response of FDIR to Kid appears to be the largest in the system despite the low elasticity estimated (-0.10, model 6). The final observation is that GDP is essential in explaining the dynamic evolution of FDIR, but not the other way around. The above may be because this type of investment, in general, does not increase the capital stock since, for the most part, it does not substantially expand productive capacity because it is channeled to purchase existing assets and plants.

[22] In all cases the confidence bands were calculated using the Bootstrap method (percentile method) with 1,000 iterations, which makes it possible to obtain the standard deviation of the sample at 95% confidence. The VEC models presented are exactly identified both by the restrictions that are globally significant (Table 1), and by the cointegration tests (Johansen, 1995) that demonstrate the presence of a single cointegrating vector (Table 2A) which, through exogeneity defined by Granger causality (Tables 3A and 4A), allows the normalization of $\hat{\beta}$ over FDI (Lütkepohl et al., 2004: 98). Due to the above conditions, the generalized (non-cumulating) impulse method was used to avoid the sensitivity of the system to the ordering of the variables (Pesaran & Shin, 1998).

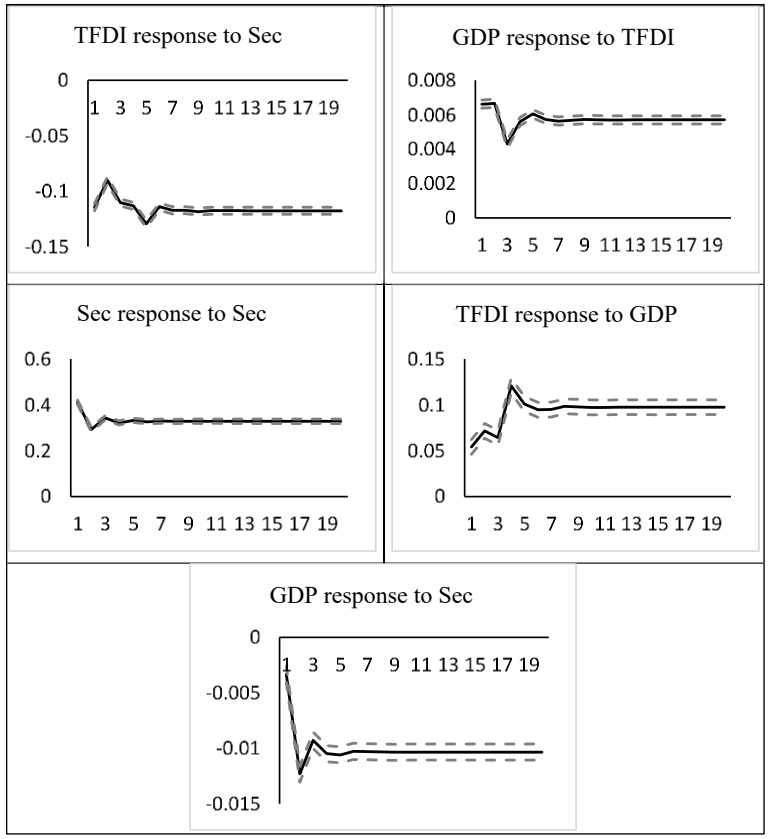

Figure 7. TFDI. Model 1. Impulse-response analysis. Generalized impulses*.

* At the request of an arbitrator, it is pertinent to point out that not all answers are convergent in a VEC model framework. In this case, since non-stationary cointegrated processes are present, there is no Wold representation because dynamic stability conditions of the VAR models are violated. However, it is possible to calculate the impulse-response analysis matrices (Φ_s), Lütkepohl et al., (2004: 167). This condition causes the responses (Φ_s) not to converge to 0, so that the responses can be transient or permanent (Lütkepohl et al., 2004: 168).

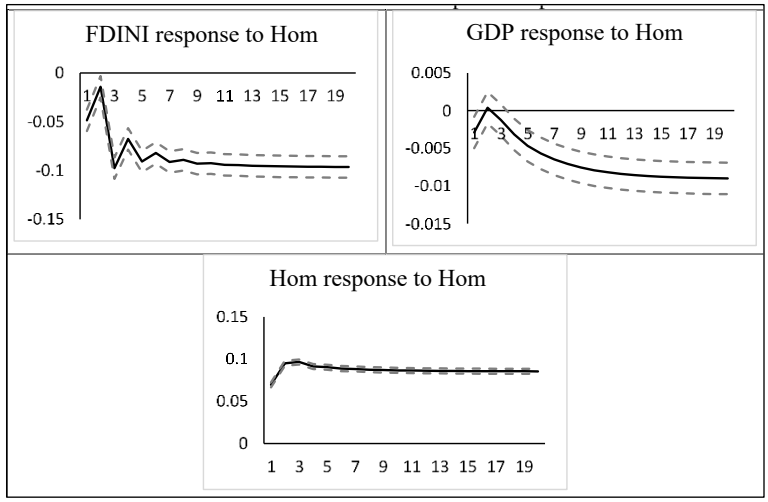

Figure 8. FDINI. Model 4. Impulse-response analysis. Generalized impulses.

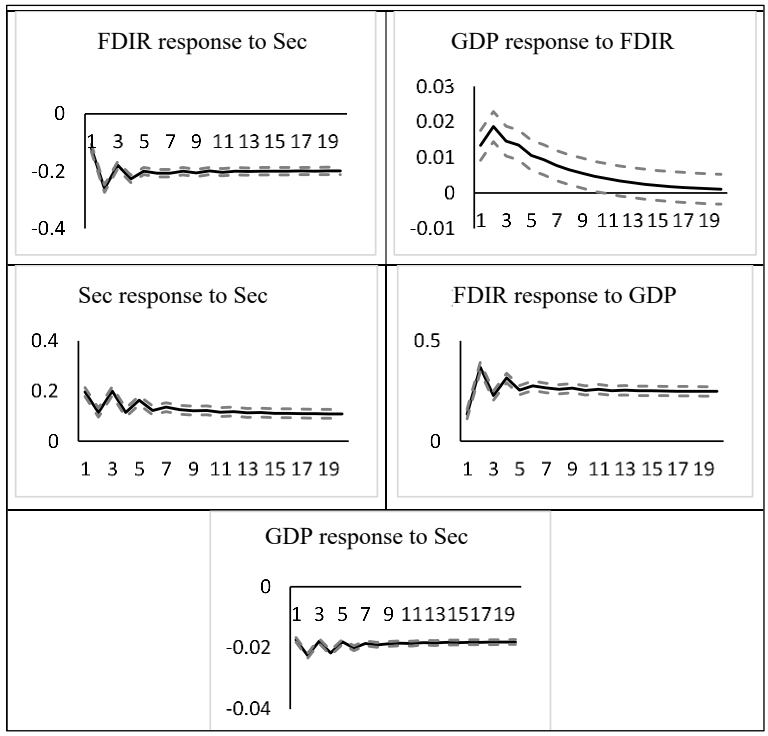

Figure 9. FDIR. Model 6. Impulse-response analysis. Generalized impulses.

Conclusions

Economic theory, regardless of its epistemological foundation or affiliation, accepts that investment is the key variable of economic growth.

Although TFDI does not represent a significant proportion of Mexico's GDP (around 3% since 2000), its flows into the country can explain how favorable the investment environment has been for the country.

Since the beginning of the 1990s, there has been a significant increase in this variable, explained by NAFTA's entry into force. After 2000, it has stagnated in nominal terms and has fallen as a proportion of GDP, despite the wave of structural reforms that have been implemented, macroeconomic stability, and the extensive economic integration with North America.

The results of this research are consistent with the recent literature consulted in the sense that social stability, institutionality, and security are increasingly important factors in the inflow of FDI to a country.

The violence that has plagued Mexico for at least a decade impacts social peace and causes economic problems. Meanwhile, FDI has been affected by the increase in high-impact crimes measured by kidnapping and intentional homicide rates.

This violence sends clear signals that discourage investors and international markets and causes macro fundamentals to take a back seat.

Using the Johansen cointegration method (1988), this study empirically demonstrates the negative and permanent effect of kidnappings and intentional homicides on TFDI and its two principal components (new investments, FDINI, and reinvestments, FDIR) and GDP. The permanence of this effect is explained by the hysteresis of the kidnapping and homicide rates, which is explained by the high profitability of these activities.

Homicides affected FDINI with an elasticity of -1.09. Kidnappings affected TFDI with an elasticity of -0.28.

All econometric results are conclusive and consistent with the central hypothesis. A crucial conclusion derived from the work is that reestablishing the rule of law is a priority to increase total foreign direct investment and its component of new investment and thus reactivate the country's economic growth.

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Annex

Table 1A
Unit Root Tests

	TFDI		FDIR		FDINI		CA		GDP		Hom		Kid	
	Levels	D	Levels	D	Levels	D	Levels	D	Levels	D	Levels	D	Levels	D
							ADF							
TI	-2.35*	-6.95	-5.15	-4.50	-1.12*	-7.95	-3.42*	-6.96	-3.44*	-5.27	-2.04*	-2.68*	-2.37*	-5.64
Cons	-1.64*	-9.06	-6.69*	-4.64	-1.53*	-7.83	-3.41	-7.04	2.60*	-4.93	-1.64*	-2.57*	-1.62*	-5.70
N	0.49*	-8.12	-6.16*	-6.31	-0.85*	-7.39	-2.25	-7.12	6.72*	-3.16	-5.56*	-2.62	-1.26*	-5.87
							PP							
TI	-2.16*	-9.38	-3.89	-6.86	-4.27	-11.80	-3.33*	-13.32	-2.83*	-5.26	-1.87*	-2.75*	-2.56*	-5.54
Cons	-1.58*	-9.36	-6.64*	-6.96	-2.23*	-13.66	-3.33	-13.19	2.42*	-4.93	-1.60*	-2.63*	-1.64*	-5.61
N	-0.65*	-8.01	-0.08*	-6.41	-0.12*	-12.36	-2.10	-13.24	5.59*	-3.02	0.09*	-2.69	-1.22*	-5.76

Note: Ho: ∃ unit root
* Indicates unit root at 95% confidence, TI = trend and intercept, Cons = constant, N = none.
By the procedure of Dolado, Jenkinson, and Sosvilla-Rivero (Enders, 2004: 213), it is concluded that all series are I(1) in their levels and are stationary in their first differences. Hence, it is appropriate to perform the Johansen (1988) cointegration procedure. For the correct specification of the ADF and PP tests, the Schwartz criterion (maximum four lags) was used.
Although applying the two statistical tests to Hom and Kid seems to report that they are I(2) series, following the procedure of Dolado et al., it was found that neither the constant nor the trend are significant, so it is concluded that they are I(1).

Table 2A
Cointegration tests

			Trace			Largest Eigenvalue		
	No. VEC Co.	Eigenvalue	Statistical	Critical value*	Prob	Statistical	Critical value*	Prob.
Model (1)	None	0.787	51.245	47.856	0.023	29.339	27.584	0.0295
	1	0.502	21.906	29.797	0.304	13.251	21.132	0.4294
Model (2)	None	0.888	71.392	47.856	0.000	41.630	27.584	0.0004
	1	0.575	29.762	29.797	0.051	16.274	21.132	0.2092
Model (3)	None	0.726	38.229	35.193	0.023	24.618	22.300	0.0233
	1	0.356	13.611	20.262	0.317	8.361	15.892	0.5053
Model (4)	None	0.764	38.761	24.276	0.000	27.399	17.797	0.0013
	1	0.372	11.362	12.321	0.072	8.836	11.225	0.1277
Model (5)	None	0.867	57.845	47.856	0.004	38.324	27.584	0.0014
	1	0.543	19.521	29.797	0.456	14.892	21.132	0.2965
Model (6)	None	0.943	70.399	47.856	0.000	54.394	27.584	0.0000
	1	0.493	16.006	29.797	0.712	12.915	21.132	0.4600

Note: * critical value at 95% confidence with MacKinnon-Haug-Michelis (1999) P-Values.

Table 3A
Weak exogeneity

	TFDI		FDINI		FDIR	
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
a_{Kid}	0.03 (0.85)		0.04 (0.83)			15.94 (0.00)
a_{Hom}		1.28 (0.25)		5.20 (0.02)	0.30 (0.58)	
a_{CC}	6.55 (0.01)	3.02 (0.08)			23.13 (0.00)	24.07 (0.00)
a_{PIB}	0.20 (0.65)	5.67 (0.01)	2.31 (0.12)	9.62 (0.00)	1.16 (0.28)	0.32 (0.56)

Note: Ho: $\alpha_i = 0$ * denotes Ho, which is met at 95 percent confidence.

Table 4A
Granger Causality Tests

	Model	Chi-sq	df	Prob.
TFDI	1	3.717305	3	0.2937
	2	16.89627	3	0.0007
TFDINI	3	1.213098	2	0.5452
	4	1.019145	2	0.6008
FDIR	5	26.69855	3	0.0
	6	16.17133	3	0.00100

Note: H_o: ∄ Granger causality. The variables are in first differences within the cointegrating VAR, which—by construction—avoids spuriousness.