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Macroeconomics and Suicide in Mexico and Central America

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Our life Will pass away like the traces of a clouds, and be scattered like mist (Wisdom of Solomon, 2, 4).

Abstract

This paper aims to identify the macroeconomic variables that determine the female and male suicide rates in Mexico, the Dominican Republic, El Salvador, Guatemala, and Costa Rica, using panel data from the 2000-2018 period. The results show that macroeconomics exerts important effects on suicide, especially those effects originating in the labor market: unemployment and self-employment increase it while salaried employment and in the service sector decrease it. Likewise, variables associated with social exclusion, such as homicides and the poverty gap, increase it, while remittances reduce it, and deindustrialization increases the suicide rate. Of particular importance is the role of monetary and credit contraction, as well as interest rate rises, in increasing the suicide rate. The paper explores some adjustment mechanisms that do not rely on monetary contraction but on increasing aggregate supply by increasing female employment The paper ends with a series of conclusions.

Keywords: gender, suicide, remittances, inflation targetting, education expenditures

JEL classification: A12, A13, J16, B22, C23, I38.

1. Introduction

In the field of psychology, an extensive literature has analyzed suicide from the perspective of emotional pathologies of the individual, such as depression, bipolar disorder and persistent self-criticism (Note 1). Important components of this literature are recent studies that have proposed that motivation to commit suicide tends to arise from two situations: one, ongoing mental pain, experienced by a person (Levi-Belz et al., 2014; Levi-Belz, et al., 2018), and, another, the feeling of rupture or break with belonging to a social group, ("thwarted belongingness"), (Van Order et al., 2010), which causes "discomfort", or "annoyance" with life; in these situations suicide appears as a solution.

This literature has also analyzed preventive measures to dismantle the relationship between people's pain and the act of suicide, and has offered guidelines for early detection of suicidal inclination, as well as appropriate social psychology measures for its prevention, and the identification of triggering events.

In contrast, the economic sciences have given limited attention to the study of suicide and have not incorporated its study into the "mainstream" of their research. This is not surprising, since economic events such as unemployment can cause mental pain in unemployed individuals, who can also suffer from separation from their social group, which could lead to an association between unemployment and suicide.

The same can happen to people who work in self-employment, that is, in the informal sector, where every day the individuals suffer from their exclusion from the official sector, as well as from the abuses they suffer on a daily basis.

In the same sense, the cut in credit to companies can affect their costs and production levels, thus generating mental pain in their owners who struggle daily to keep their businesses afloat, and in their employees who feel the stress of the possibility of losing their jobs. In this way, an association between credit to the private sector and suicide could be established.

These considerations indicate the need to give greater attention to the issue of suicide in economic sciences, and, in particular, to identify the consequences of economic policies on it, and to seek harmony between the performance of the national economy, the networks of social protection, and the protection of people's lives.

It should be noted that suicide is a serious problem: the World Health Organization reported that in 2019, 800,000 people committed suicide globally, a number that is higher than that of homicides.

An important reason to analyze suicide from the perspective of economics is that important inputs for the design of economic policies can result from its study. For example, identifying the role of inequality in income distribution, or inequality of opportunity, in fueling suicide may motivate governments to increase social spending.

Likewise, the clear exposition of the link between economic policies, or their absence, with suicide, can serve to support the insistence of citizens that national economic management must honor and protect life.

Studies on suicide and the economy of Latin American countries are scarce, apart from the important study by Nordt and his collaborators (2015), published in The Lancet Psychiatry, which analyzed the relationship between unemployment and suicide in the period 2000-2011 in four regions of the world, including Mexico and Brazil, no reference can be made to another study that analyzes the determination of this phenomenon in the Latin American region.

This paper presents an analysis of the influences of macroeconomic variables in determining female and male suicide, based on the estimation of Var models using panel data from Mexico, the Dominican Republic, Guatemala, El Salvador, and Costa Rica. The data series for Honduras and Nicaragua were incomplete, which is why they were not included in this study.

The next section presents a brief review of the selected literature, which is followed by the presentation of the data used in the analysis. Next, the Var model to be estimated is presented, and the results obtained are discussed. A following section deals with the design of heterodox macroeconomic adjustment mechanisms. The work ends with a section of conclusions and recommendations.

2. Literature Review

In his precursor study, Durkheim (1987) proposed that society controls the individual in two ways: by instilling in him a set of ideals and purposes, which integrates him into the social conglomerate, and, another, through a regulation that attenuates his desires and aspirations. He introduced an economic dimension, postulating that economic boom and recession weakened social integration and regulation, leading to an increase in suicide. From this work the literature has grown substantially; below is a reference to a selection of the most relevant studies.

Few studies on suicides have been published in the case of Latin American countries. Next, reference is made to a study for Mexico, by Fernández et al. (2016), who analyzed the seasonality of the monthly time series of suicide in Mexico, from the period 2000-2013. The authors detected that suicides increase the day after holidays such as Christmas, Mother's Day, and September 16, which they explained by pointing out that these dates accentuated people's feelings of loneliness. They offered another explanation in terms of excessive alcohol consumption on those holidays. The authors also found that suicide is an urban phenomenon, resorted to by men with a low level of education. Another observation they made is the upward trend in suicide after 2007, year when the war on drugs began; In addition, they found that suicides increase in the month of May and fall in February.

The increase in suicide in the first months of spring has been detected in other countries and has been explained by the endocrinological changes that people experience when the high-temperature season begins, which make their nervous systems more sensitive. Petridou et al. (2002) have reported, in the case of 20 developed countries, that suicides reach their highest value in June in the countries of the northern hemisphere, and in December in those of the southern hemisphere. Durkheim's work presents another explanation for the influence of hot weather on suicide, considering that in the summer and spring months social activities increase, which creates high levels of stress in some people who, given the difficulties of establishing social relationships, they choose to commit suicide.

Henry and Short (1954) postulate that suicide has a countercyclical relationship with the business cycle, increasing in times of recession and decreasing in times of economic boom. In times of economic recession, individuals who lose their position or rank on the scale of status and social influence feel frustration that leads them to aggression against themselves, which manifests itself in suicide.

According to Ginsburg (1966), suicide results from the discrepancy between the individual's aspirations and what he actually gets for his efforts. In times of economic expansion, individual aspirations increase, but there are situations when individual achievements in the midst of an economic boom do not satisfy the individual, and that discrepancy activates the consideration of suicide. On the contrary, in times of economic recession,

aspirations tend to fall more sharply than achievements, which reduces suicides.

Breinerd (2001) presented an analysis of the extraordinary increase in suicides of both sexes that occurred in the member countries of the former Soviet Union, which extended from the Baltic countries, passing through Belarus, Russia and Ukraine. This author estimated equations with panel data from 22 countries, from the period 1988-1998. The results showed that GDP per capita and the employment-to-population ratio did not lead to an increase in female and male suicide; but these increased with the divorce rate, while alcohol consumption fueled female suicide. Life expectancy at age 65 had a negative effect on suicide rates, while crime rate had no effect.

Viren (2005) estimated a model to explain the suicide rate in Finland with data from the period 1978-1999, through the estimation of cointegration equations. The results indicated that the average age of the population and the percentage of primary sector production in GDP were the main determinants of suicide, while the percentage of the population living in urban areas was not significant. The bankruptcy rate and the stock market index had positive and negative relationships, respectively, with female and male suicide rates.

Laanani, Moussa et al. (2014) analyzed the repercussions of the unemployment rate on suicide in eight countries of the European Union with data from the period 2000-2010, using the quasi-Poisson model methodology. The results showed that a ten percent increase in the unemployment rate was associated with a 0.3 percent increase in the suicide rate. The authors computed the "excess" suicides in each country as the difference between the actual numbers for 2008, 2009, and 2010, and the suicides that would have occurred if the unemployment rate had remained at the 2007 value, finding that in some countries the "excess" was high, especially in France, with 564, the United Kingdom, 456 and the Netherlands with 57 suicides.

Gunnell et al. (1999) analyzed the effect of the unemployment rate on the suicide rate of people aged 15-44 in England and Wales. They found that, for this population group, there was a close association between unemployment and suicide between 1921 and 1995, and that this association was more pronounced in young people. The authors also pointed out that the increase in unemployment generates intra-family tensions, falls in income, poverty and insecurity, situations that motivate suicide. They point out that the drop in unemployment in the second half of the 1980's was not accompanied by a reduction in suicides, which they explained by the existence of feelings of job insecurity.

Andrés (2005) analyzed the determination of suicide rates in 17 countries of the European Union, with data from the period 1970-1998. The results of the estimation of equations with panel data and fixed and temporary effects showed that the Gini coefficient and the unemployment rate did not have significant coefficients in the estimated equations, while the rates of economic growth and fertility had negative coefficients and were significant. The coefficient of per capita alcohol consumption was positive and significant in the equations for both sexes, but the divorce rate showed a positive and significant coefficient only in the case of male suicide.

Minoiu and Rodriguez (2008) analyzed the determinants of female and male suicide rates in the US, using panel data from the 50 states for the period 1982-1997, using the GMM estimation method. The results showed that the coefficients of the unemployment rate, of the state GDP, and of the inequality of the distribution of state income, were not significant, while the coefficient of the divorce rate was positive and significant. An important result was that state health spending and state population density showed negative and significant coefficients for male suicides. For its part, state spending on social services ('welfare'), showed negative and significant coefficients,

Berk, Dodd, and Henry (2005) analyzed suicide rates in Australia in the period 1968-2002, with a sample of 51,845 male and 16,327 female suicides. The results indicated that the male suicide rate had a high positive correlation with the unemployment rate, especially in the 20-34 age range, while female suicide showed a strong positive association with unemployment in the 30-49 years age range. Male and female suicide rates rose and fell, respectively, with rising interest rates in the mortgage market. Both rates had a low correlation with the consumer sentiment index, so the authors concluded that suicide is determined by the reality of economic events.

Meda et al. (2021) studied the incidence of economic variables on suicide in a sample of 175 countries, using data from the period 1991-2017. The results indicated that a 1 percent increase in the unemployment rate was associated with a 1 percent increase in male suicides, but in the population between 30 and 45 years of age the increase in suicide was 3 percent. They further found that the $1,000 increase in GDP per capita led to a 2 percent drop in suicide, that men had a 1.63 times greater risk of suicide than women, and that this risk increased with age.

Vandoros and Kawachi (2021) studied the role of economic uncertainty on the suicide rate in the US, using monthly data from 50 states for the period 2000-2017. The results of panel equation estimation showed that different definitions of economic uncertainty had positive impacts on suicide; increasing the uncertainty rate by 1 percent resulted in an increase in the suicide rate of 0.08 percent per million people. It should be noted that the

coefficients of the state unemployment rate were insignificant. They also found that uncertainty is a better predictor of suicide than the unemployment rate because it plays well with the impulsive nature of suicidal people.

3. Stylized Facts

According to the World Health Organization, globally, in 2019 there were 804,000 suicides, which represents a rate of 9 per 100,000 inhabitants, 15.0 for men, and 8.0 for women. This figure is higher than that of 2017 when the rate for men was 13.9 and 6.3 for women. This Organization estimates that in 2020 suicide represented 2 percent of deaths from disease.

Suicide represents 1.3 percent of total global deaths, with this percentage being particularly high in South Korea (4.5%), and Qatar (3%), and very low in Greece and Indonesia. In terms of the population, in 2019 globally the suicide rate was 9 per 100,000 inhabitants. This rate is high, around 20 in Eastern European countries, in South Korea, Guyana, and Suriname, and low, less than 5, in North African, Middle Eastern, Peru, and Mediterranean countries. The average rate in Latin American countries is 11 per 100,000 inhabitants.

It should be noted that the female suicide rates of the countries included in this study tend to converge, as shown in Figure 1, a result that has not been reported in the literature (Note 2).

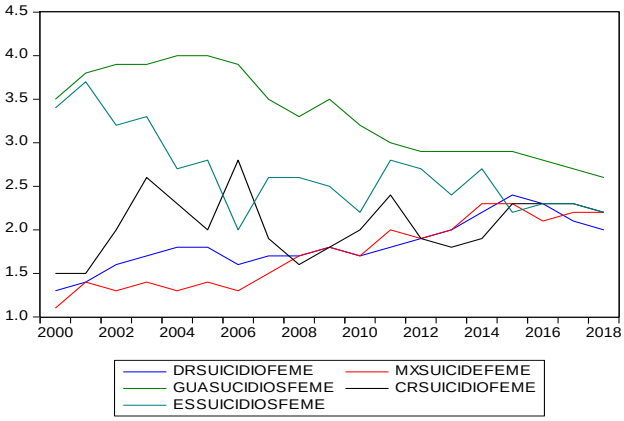

Figure 1. Convergence of female suicide rates

The convergence could be explained by the fact that the economies are highly open, and the variables that determine suicide, such as deindustrialization and unemployment, have evolved in a similar way since the reforms of the 1990s; given that the determinants of suicide have behaved similarly, they impart convergent tendencies to current suicide rates. In other words, there could be a regional or common trend behind female suicide, which could be the liberalization of foreign trade, and the consequent de-industrialization and tertiarization that countries have incurred.

The rates increase in Mexico and El Salvador, which could be associated with the increase in homicides, and fall in the other countries.

The male suicide rates are presented in Figure 2. As in the case of female suicide, there is a tendency towards convergence. Male suicide rates increase in Mexico and the Dominican Republic and decrease in other countries.

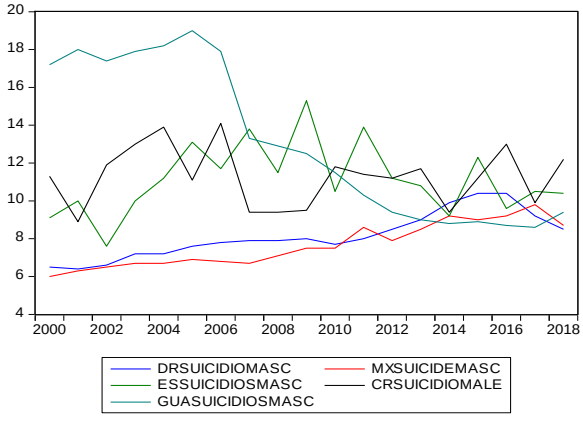

Figure 2. Male suicide rates

The upward trend in the suicide rate in Mexico is explained by the increase in homicides in the period; In this country, there is a positive relationship between the rates of male suicide and homicide, which is presented in Figure 3.

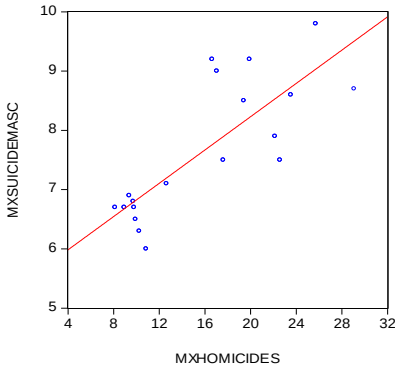

Figure 3. Male homicide and suicide rates in Mexico

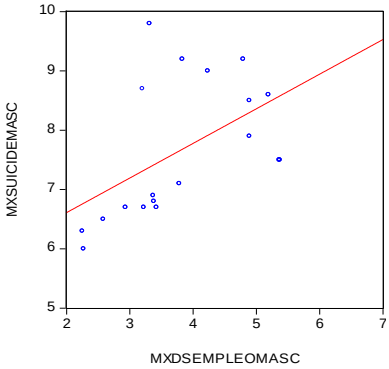

Figure 4. Male unemployment and male suicide rates in Mexico

Likewise, in Mexico the increase in male suicide is also explained by the increase in the male unemployment rate, see Figure 4.

In the Dominican Republic, the tendency of male suicide to increase is related to the drop in the participation of the manufacturing sector in GDP, which fell from 21 percent to 14 percent between 2000 and 2017; the relationship between these two variables is shown in Figure 5:

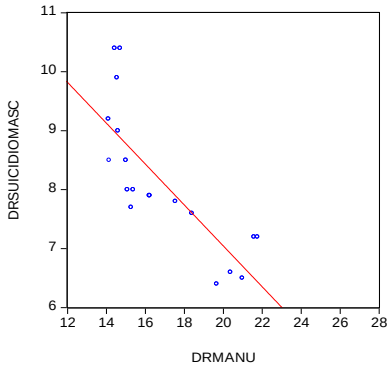

Figure 5. Participation of the manufacturing sector in GDP and male suicide rate in the Dominican Republic

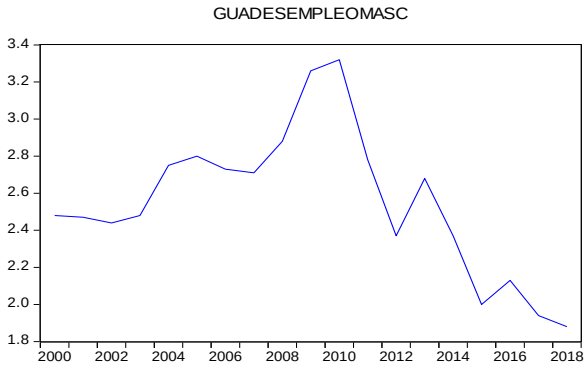

Figure 6. Male unemployment rate in Guatemala

The drop in male suicide in Guatemala can be associated with the drop in the male unemployment rate that occurred after 2010 (Figure 6). Figure 7 shows that the drop in unemployment led to the reduction in the male suicide rate:

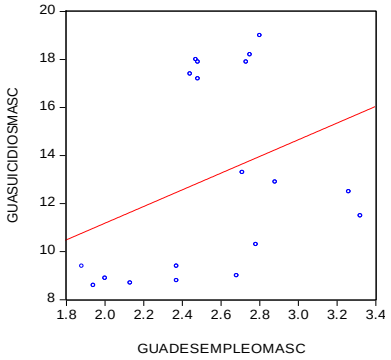

Figure 7. Unemployment and male suicide rates in Guatemala

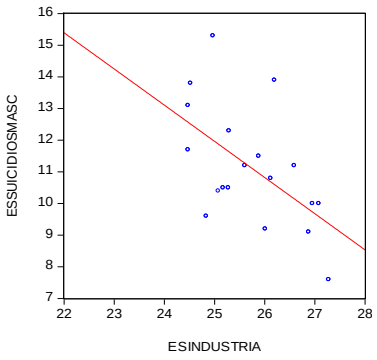

Figure 8. Participation of the industrial sector in GDP and male suicide rate

Likewise, the deindustrialization experienced by the countries has led to an increase in suicide rates, the case of El Salvador is observed in Figure 8. This Figure shows that as the participation of the industrial sector in GDP decreases (it fell from 27 to 24 percent between 2000 and 2017), the male suicide rate increases.

This relationship is also observed in the Dominican Republic, where the fall in the industrial sector has been accompanied by increases in the female suicide rate (Figure 9).

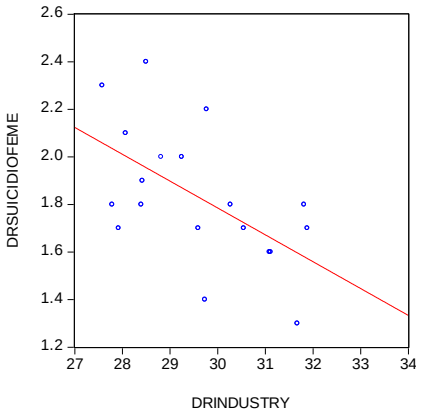

Figure 9. Participation of the industrial sector in GDP and female suicide rate in the Dominican Republic

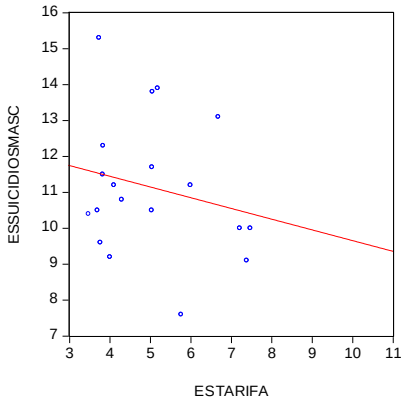

Figure 10. Tariff on imports and male suicide rate in El Salvador

The contraction of the industrial sector is associated with the drop in tariffs on imports, which is why there are negative relationships between the tariff and the suicide rate; The case of El Salvador is shown in Figure 10.

It should be noted that the female suicide rate decreases with the increase in the fertility rate of adolescents (Figure 11), that is, despite their economic and other limitations, adolescents fulfill their role as mothers, and not leave room to consider suicide.

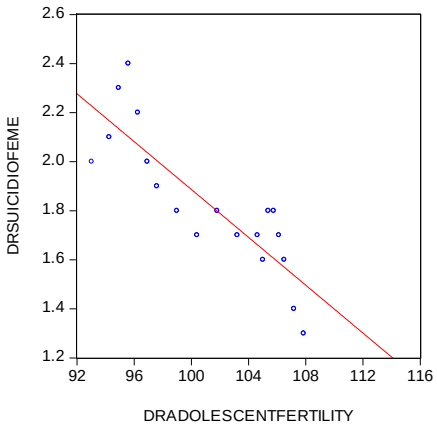

Figure 11. Adolescent fertility rate and female suicide rate in the Dominican Republic

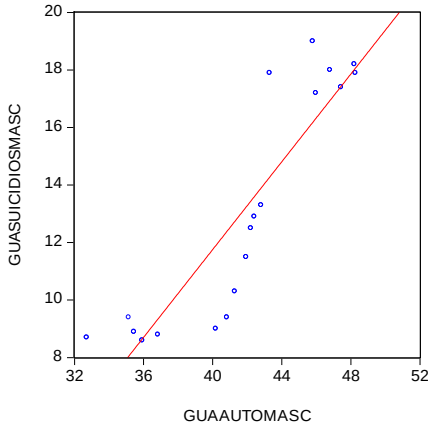

Figure 12. Rate of male self-employment and male suicide in Guatemala

We must also highlight the role of self-employment in motivating suicide; the case of Guatemala is shown in Figure 12, which shows that self-employment, that is, employment in the informal sector, is an important determinant of male (and female) suicide.

4. Data and Its Statistical Properties

The data used in the estimates of the Var models were taken from the World Development Indicators, of the World Bank, and correspond to the period 2000-2018. Table 1 shows the average values and standard deviations of the variables used in this work.

Table 1. Average values and standard deviations of the variables

Variable	Mean	standard deviation
Growth	3.332	2.3113
Female suicide*	2.3667	0.7358
Male suicide*	9.3722	3.2949
Female unemployment	6.0473	
Male unemployment	4.7580	2.8866
Young female unemployment	13.5715	6.9534
Young male unemployment	9.4208	4.2865
Self employment female	38.6545	18.0800
Self employment masc	38.8257	24.5400
Female industrial employment	16.6497	4.5458
Industrial employment masc	25.1157	2.8757
Feme services employment	66.5526	24.7213
Employment services masc	44.4286	13.3702
Female employment/population	28.0000	3.3039
Employment/masc population	56.0622	8.8577
Manufacture**	16.5531	2.1761
Services**		
Tariff	6.7500	3.4390
Imports**	37.3681	7.1318
Exports**	28.9606	5.9968
Money**	45.3552	10.3078
Credit**	31.1264	12.7174
Students/teacher ratio	26.6816	7.3426
Remittances**	7.9786	6.4007
Homicides*	28.3884	20.822

*Per 100,000 inhabitants.

** Percentage of GDP.

4.1 The Var Model

The model is as follows: (Remittances, male unemployment, female unemployment, X, male suicide, female suicide), where X represents different variables that enter the Var to analyze their repercussions on suicide. The most exogenous variable is remittances, followed by unemployment rates, while the most endogenous variables are suicide rates.

The variables that enter the Var were selected based on their relationship with economic growth and suicide and are grouped according to four categories; The first includes variables related to social exclusion, such as remittances, the number of students per teacher, and homicides. In another category are variables associated with the labor market, such as self-employment rates, and employment in the industrial and service sectors. Another group includes variables associated with deindustrialization, such as the percentages occupied by the manufacturing and service sectors in GDP, and the tariff on imports. The last category comprises variables that belong to the monetary sector, such as credit to the private sector, and broadly defined money, both as a percentage of GDP.

The Var was estimated by including qualitative variables to represent the countries, except Mexico, and thus control for fixed effects, which is a common practice in the literature; a recent application is found in Saadi and Xu (2020). All the variables entered the Var in levels. The estimation of the Var models makes it possible to obtain the responses of the suicide rates to increases of one standard deviation of other variables.

5. Results

5.1 Social Exclusion Variables

Figure 13 shows that the male and female suicide rates fall when the ratio of remittances to GDP increases by one standard deviation. This is a result that has not been recognized in the extensive literature on the economic and social repercussions of remittances. The implication is that the liquidity provided by remittances, and the consequent increase in household consumption capacity, discourage women and men who receive them from

considering suicide. These responses are more significant than the other responses reported in this paper. It should be noted that the drop in female suicide is more significant and larger than that of male suicide, which could mean that women suffer financial straits more than men.

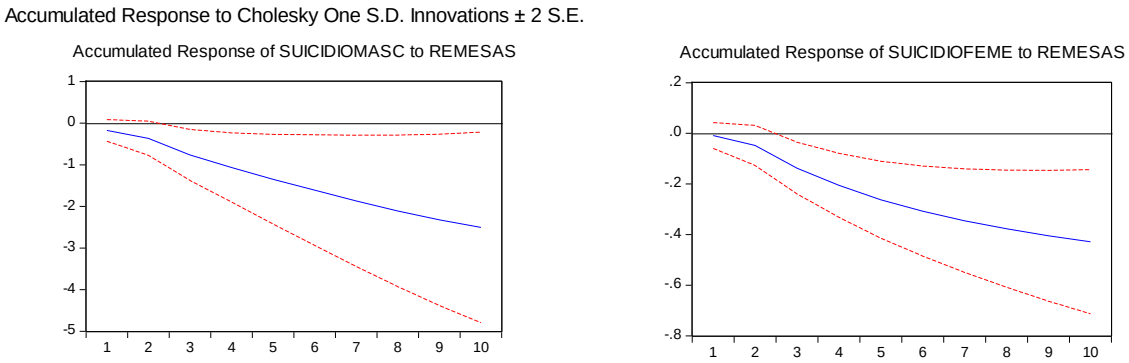

Figure 13. Responses of suicide rates to the increase in remittances

Male suicide falls significantly due to the increase in the female unemployment rate (Figure 14). One interpretation could assume that given the increase in female unemployment, men enter the labor market to occupy positions previously held by women, which could increase male employment and therefore reduce the male suicide rate.

The female suicide response is also negative; this could mean that faced with adverse situations in the labor market, women increase their efforts to provide for the home.

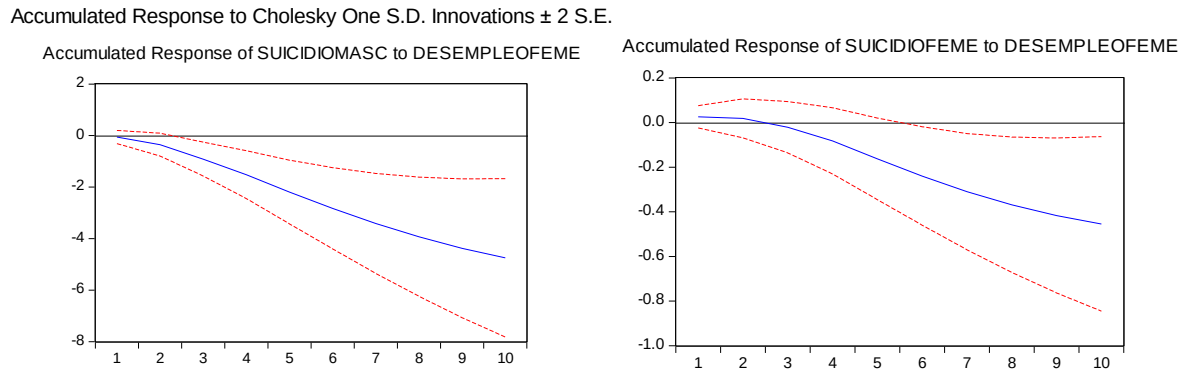

Figure 14. Responses of suicide rates to the increase in female unemployment

Figure 15 shows that the male suicide rate responds positively to the increase in male unemployment, but it is only significant in the first three years. On the contrary, the response of female suicide is positive and significant. This response could mean that the increase in male unemployment generates friction and conflict at home, as well as acts of violence against women, who, in response, opt for suicide.

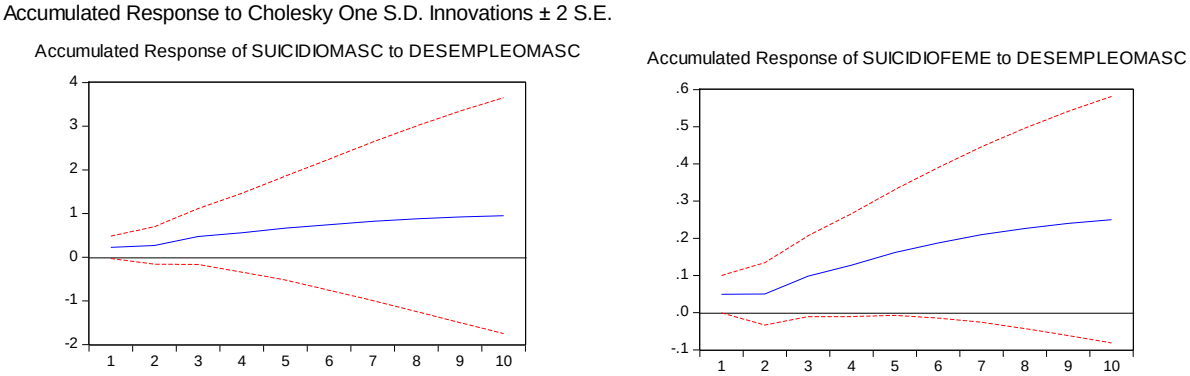

Figure 15. Responses of suicide rates to the increase in the male unemployment rate

It can be seen in Figure 16 that the male suicide rate increases significantly when the homicide rate increases, but the response of the female suicide rate is positive, but not significant.

This result could be interpreted by the fact that men are the main victims of homicides and therefore the environment of violence would generate greater feelings of apprehension in men than in women.

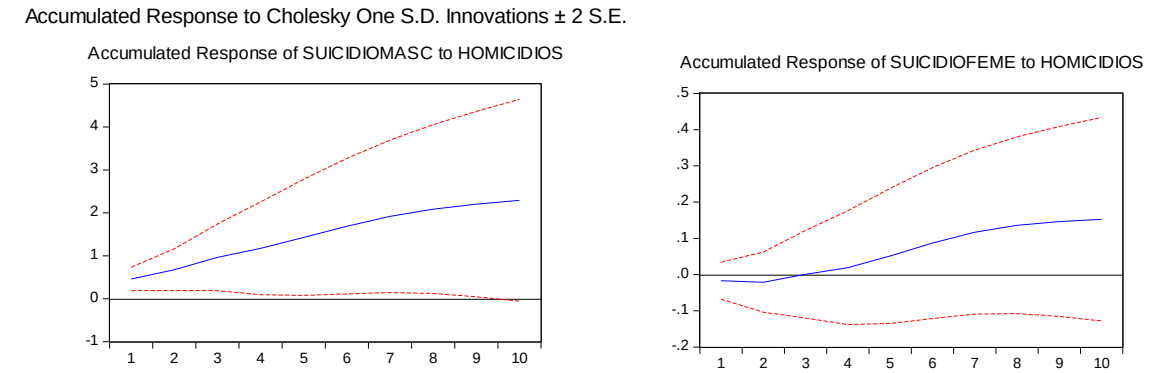

Figure16. Responses of suicide rates to increases in the homicide rate

Figure 17 shows that the male suicide rate falls due to the increase in the poverty gap (Note 3). This would indicate that when poverty increases, men feel called to ensure the well-being of their families, which precludes considerations of suicide.

The female suicide response is different, as it increases marginally significantly in the first three years. This is another result that shows the effect of financial straits on women.

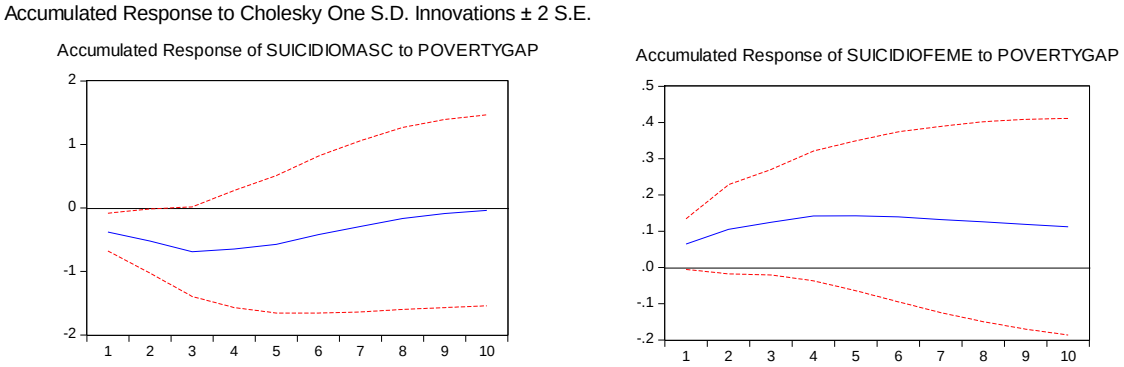

Figure 17. Suicide rate responses to increases in the poverty gap

Figure 18 shows the responses to increases in the student-teacher ratio in primary school. This ratio represents a measure of the quality of education; The evidence from Latin American countries indicates that the increase in this ratio leads to an increase in school dropouts and female self-employment. Therefore, it is not surprising that the responses of both kinds of suicide are positive and significant. It should be noted that the response of the male suicide rate is larger and more significant than the female rate.

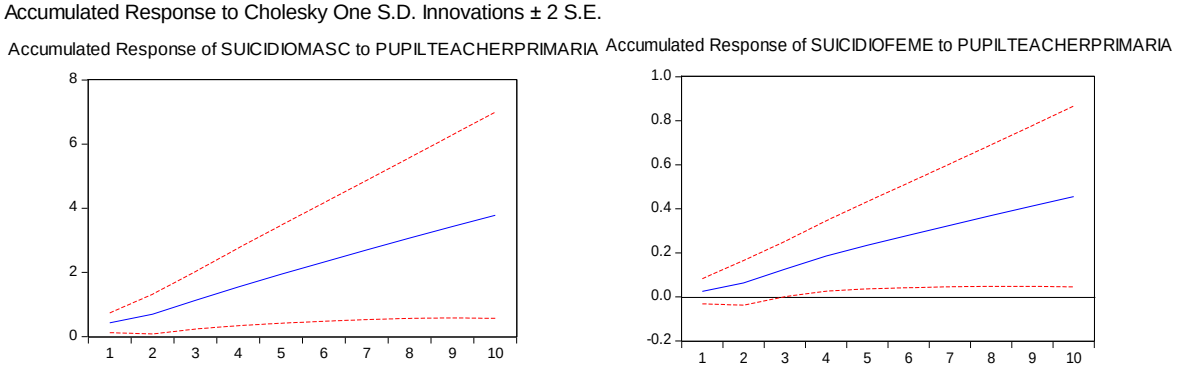

Figure 18. Responses to increases in the student-teacher ratio

5.2 Variables Related to Deindustrialization

Figure 19 shows that the male suicide rate falls in response to the increase in the percentage share of the manufacturing sector in GDP. This implies that the deindustrialization that countries have experienced would have contributed to the increase in male suicide and, likewise, that reindustrialization would have, among other benefits, a reduction in suicide rates.

The response of the female suicide rate is not significant, which would be explained by the fact that employment in this sector is mainly male (Standing, 1999).

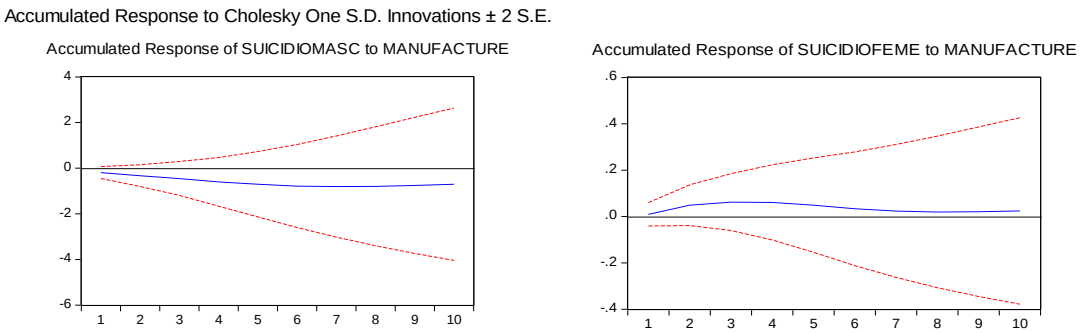

Figure 19. Participation of the manufacturing sector in GDP and suicide rates

A similar relationship can be seen in Figure 20, which shows that male suicide falls due to the increase in the ratio of the manufacturing sector to imports, which shows that the loss of ground in national manufacturing production to imports creates a favorable environment for suicide as a result of job losses, and, on the contrary, reindustrialization would help reduce it.

The female suicide rate response is negative but insignificant.

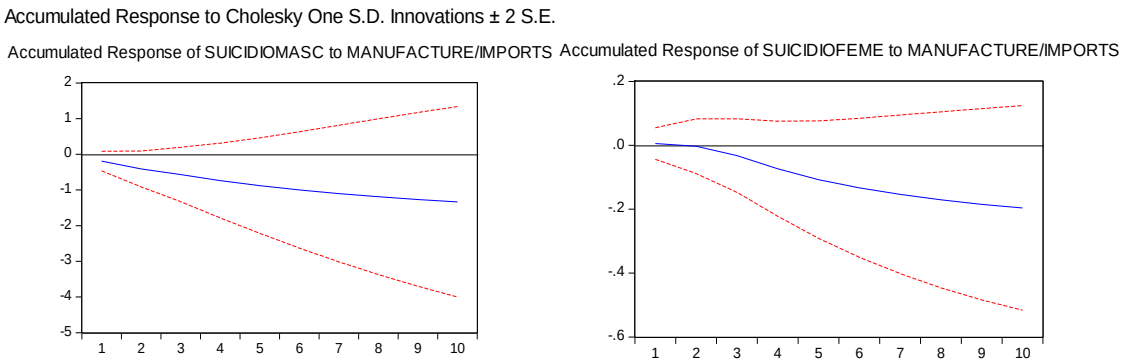

Figure 20. Responses to the ratio of manufacturing to imports

Given deindustrialization, men who lose their jobs in the manufacturing sector will find it difficult to find a job in the same sector, which could motivate them to commit suicide. This relationship is observed in Figure 21, which shows that the fall in industrial employment is associated with the increase in male suicide.

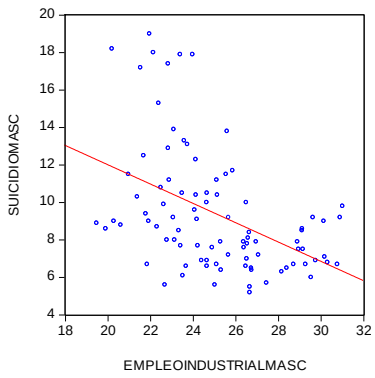

Figure 21, Male employment in the industrial sector and male suicide rate

It should be noted that the association between globalization, unemployment and suicide has also been detected in developed countries. Tregenna (2016) has reported that the liberalization of imports in European countries led to the loss of 50 percent of their industrial employment.

These results are corroborated by the responses of suicide rates to the increase in tariffs on imports, which are shown in Figure 22. It can be seen that both responses are negative and significant, indicating that the virtual elimination of tariff protection has fueled male and female suicide rates. In other words, trade liberalization has a lethal component.

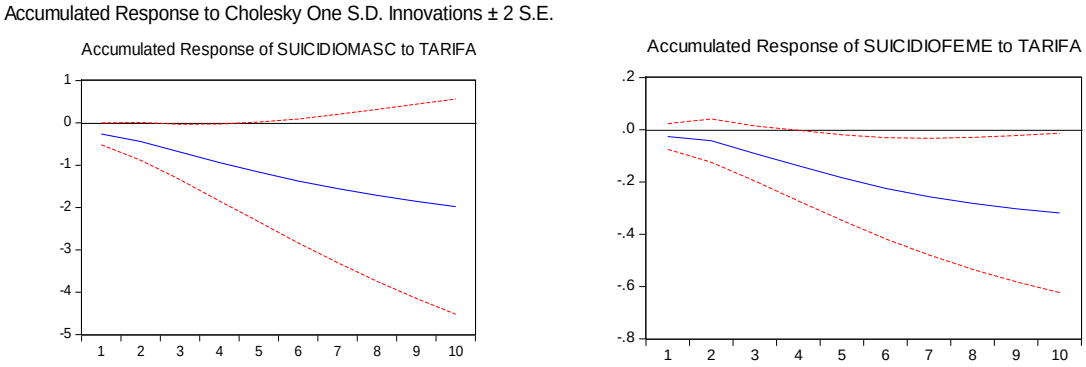

Figure 22. Responses of suicide rates to the increase in tariffs on imports

5.3 Labor Market Variables

Figure 23 shows that suicide rates fall with the increase in the employment rate in the service sector. This sector has grown significantly in the period under study and may have contributed to the fall and convergence of suicide rates.

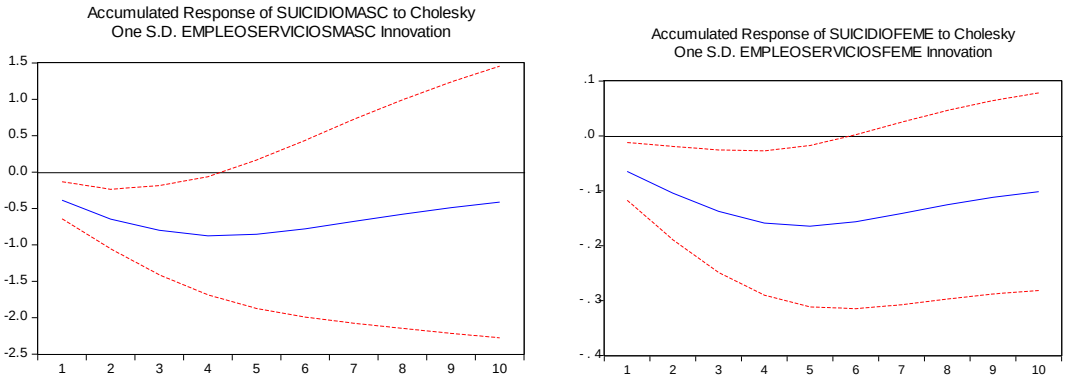

Figure 23. Responses to increases in employment in the services sector

A similar case can be seen in Figure 24, where it can be seen that both suicide rates fall with increases in the respective salaried employment rates. As in the previous case, the drop in the female suicide rate is larger and more significant than that of the male. This result shows another benefit of quality employment, with benefits and contracts.

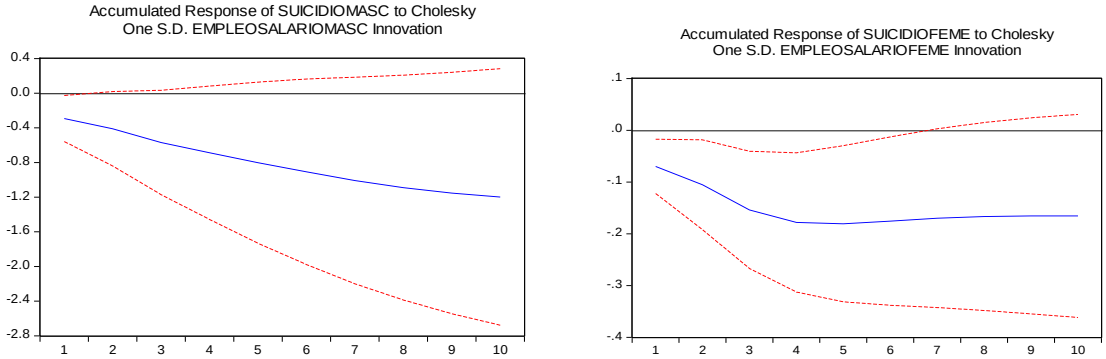

Figure 24. Responses of suicide rates to increases in salaried employment

Of particular importance are the positive responses of suicide rates to increases in self-employment rates. It can be seen in Figure 25 that the female suicide response is more significant than the male one. This result contradicts the argument that self-employment, that is, work in the informal sector, results from the interest of men and women to work within a framework of flexibility. The working conditions in the informal sector are especially arduous and it is a sector where abuse predominates.

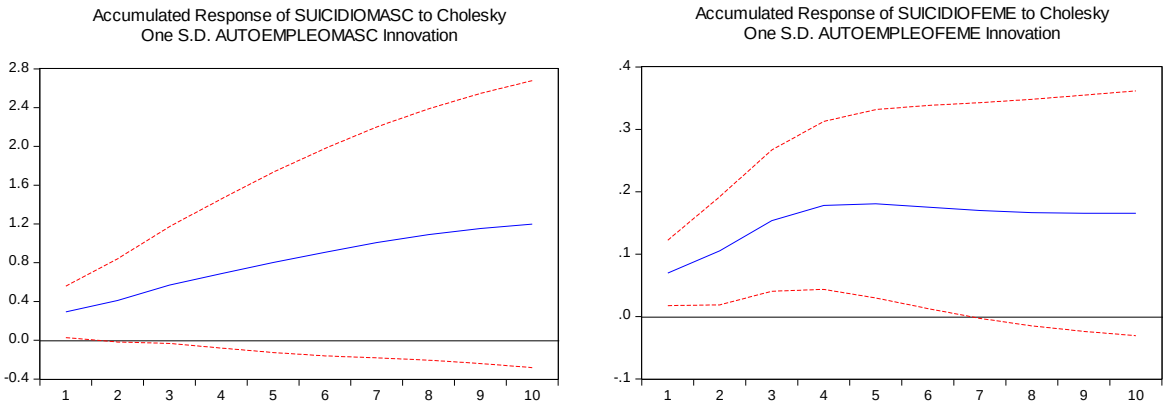

Figure 25. Responses of male and female suicide rates to increases in self-employment rates

5.4 Variables of the Monetary Sector

It can be seen in Figure 26 that male suicide falls throughout the period when the broadly defined money supply increases, (M2), while the female suicide rate increases, but the response is only significant in the first three years.

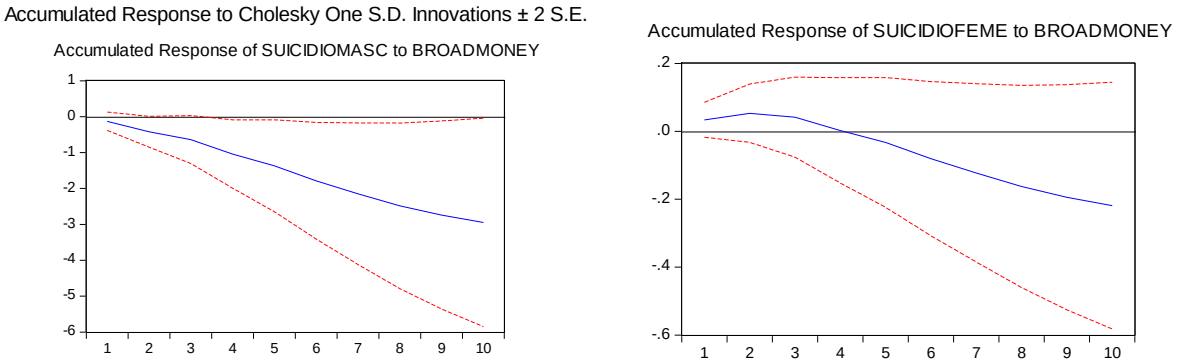

Figure 26. Responses of suicide rates to an increase in the money supply

In Figure 27 it is observed that both suicide rates increase in response to the increase in the loan interest rate, but the responses are only significant in the first three years.

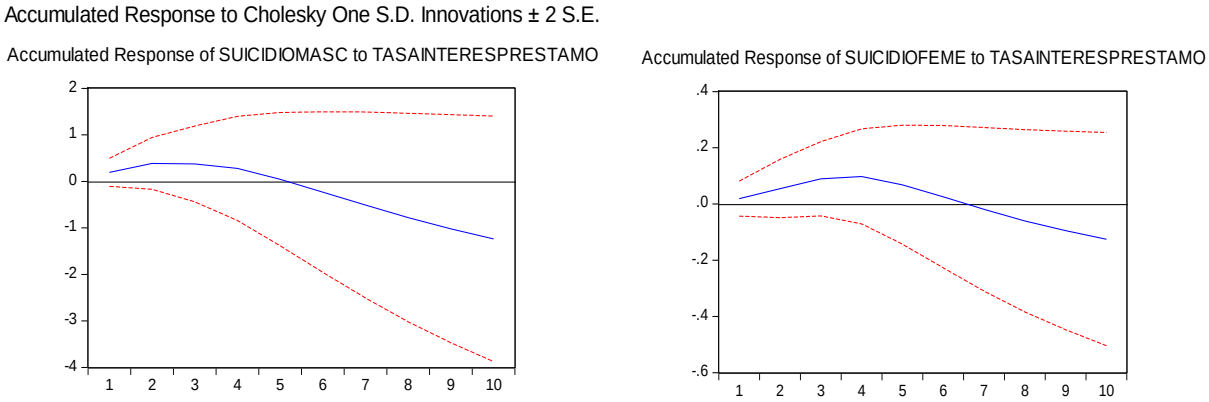

Figure 27. Suicide rate responses to increases in loan interest rates

Similar responses are observed when the spread between lending and deposit interest rates increases, see Figure 28.

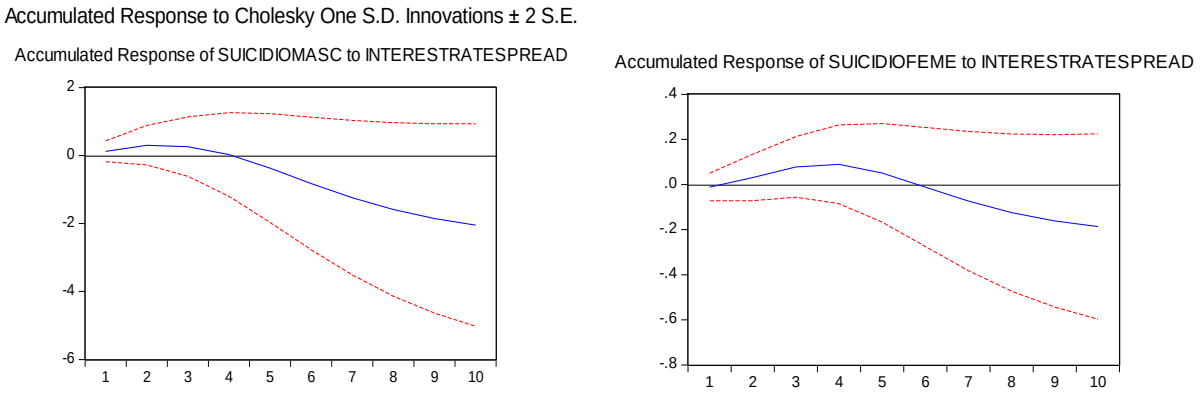

Figure 28. Suicide rate responses to increases in the spread

Suicide rates fall due to the increase in credit to the private sector (Figure 29). The drop in male suicide is only marginally significant, while that of female suicide is highly significant at the beginning of the period. This could be explained by the fact that credit to the private sector is directed mainly to the service sector, where female employment predominates.

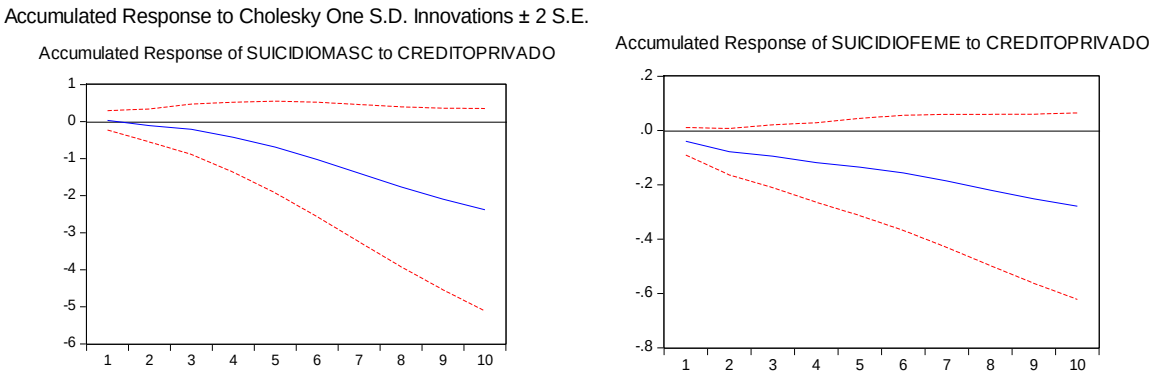

Figure 29. Responses to the increase in credit to the private sector

5.5 Other Variables

Figure 30 incorporates the rate of economic growth, Growth, as the independent variable. Suicide rate responses are negative as expected but are only significant in the first three years.

This indicates that economic growth by itself does not necessarily allay household economic concerns, contrary to the role played by employment and remittances.

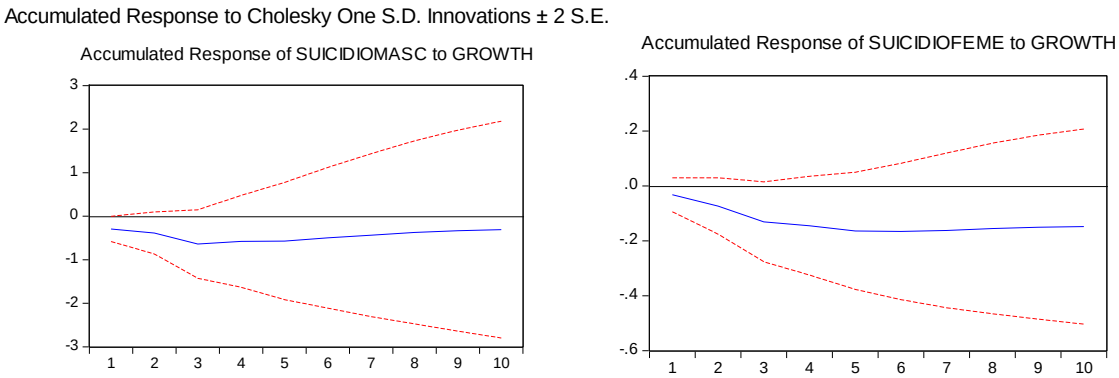

Figure 30. Responses of suicide rates to an increase in the rate of economic growth

It can be seen in Figure 31 that male suicide increases as the concentration of the population in the capital city increases; this could indicate that the greater the population size in a capital city, the possibilities of social contact for residents in other cities decrease, which could give rise to feelings of isolation and therefore an inclination to suicide. The female suicide rate response is positive but not significant.

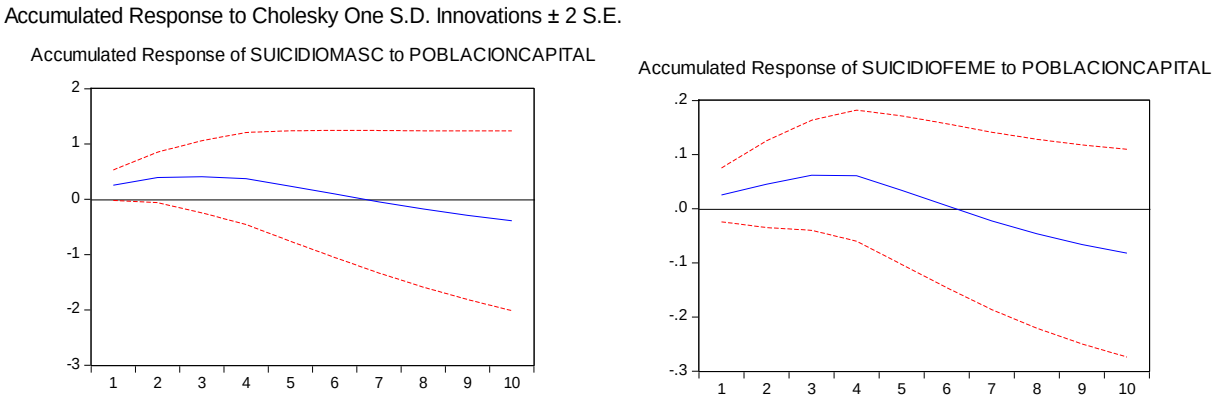

Figure 31. Responses to an increase in the percentage of the total population residing in the capital city

Figure 32 shows that the responses of the male and female suicide rates to increases in the respective youth unemployment rates are not significant. That is, there is no inclination of youth to commit suicide in the face of unemployment that affects them, especially among young women, whose response is virtually zero in the first half of the period.

The explanation could be that youth have the option to emigrate, which could allay anxiety caused by unemployment; in the case of young women, another explanation could be that they always have the "option" of working at home, where they can take care of infants and the elderly.

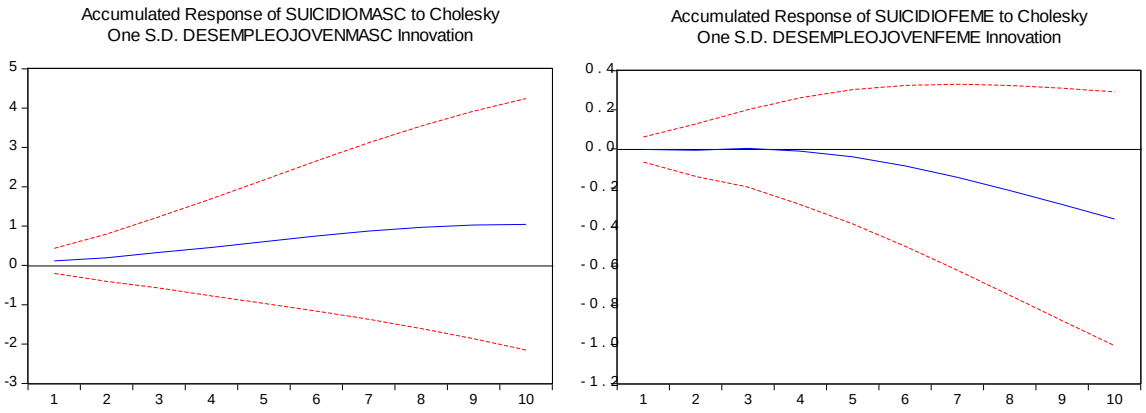

Figure 32. Responses of suicide rates to increases in youth unemployment

5.6 Role of Economic Integration

It is valid to state that in an economic integration scheme, the economic activity of a given country increases to the extent that its exports to other member countries increase; these exports depend on the growth rates of the importing countries, so it can be argued that the member countries share economic growth with each other.

A Var was estimated including the growth rate of the countries with which the countries have the highest amounts of trade, in the case of Mexico it is the economic growth rate of the US, for Guatemala it is the economic growth rate of El Salvador, for this country it is the rate of Guatemala, while for Costa Rica the growth rate of El Salvador was used.

In Figure 33 shows that given the increases in the growth rates of the most important partner countries, the responses of the suicide rates are negative, as expected, but they are not significant.

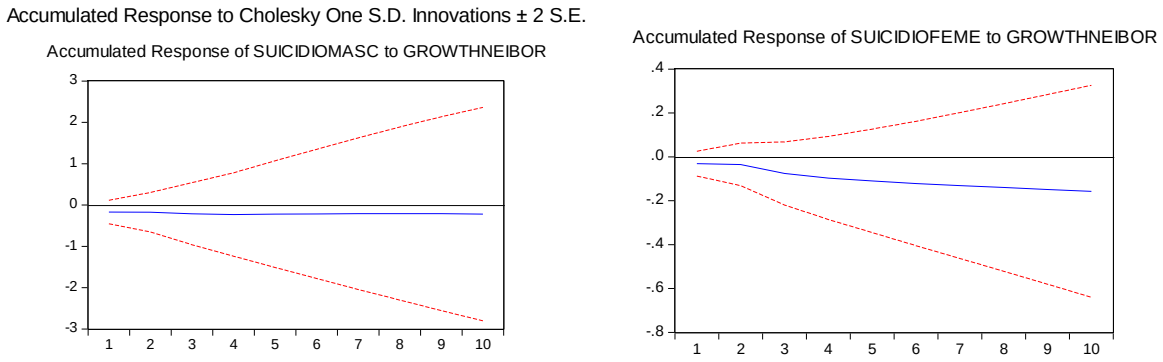

Figure 33. Responses of suicide rates to increases in the growth rates of the countries to which greater amounts of exports are destined

Another Var was estimated including the remittances received by the countries with which there are the highest amounts of exports, with data only from the three Central American countries. The results are shown in Figure 34 where it can be seen that the response of the male suicide rate is negative, as expected, but it is only marginally significant, while the response of the female suicide rate is also negative, but it is not significant. The explanation lies in the fact that intra-Central American trade is made up mainly of manufactured goods, and the employment in the manufacturing industry is mainly made up of men.

This is a topic that deserves further analysis.

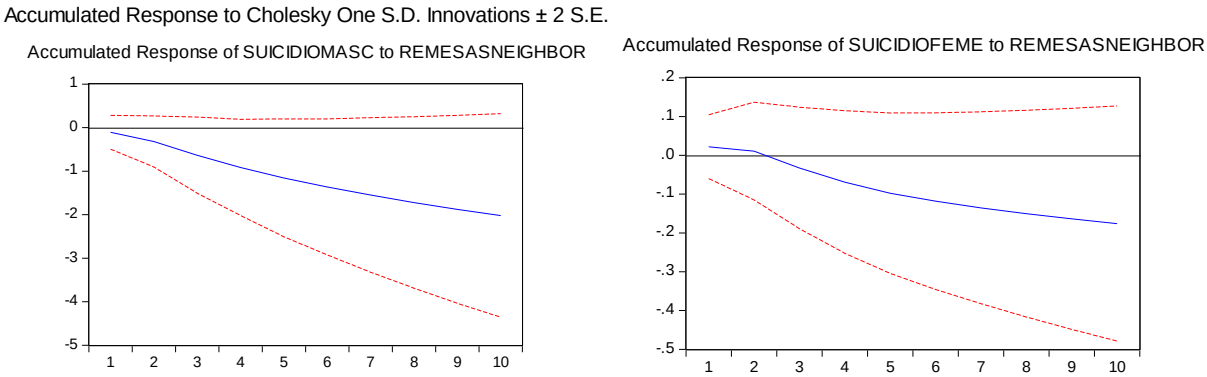

Figure 34. Responses of suicide rates to the increase in remittances received by countries with which it has greater amounts of exports

5.7 Alternative Methods of Macroeconomic Adjustment

The result that monetary and credit contractions give rise to increases in female and male suicides makes it necessary to investigate alternative macroeconomic adjustment mechanisms that do not have these effects.

Reference should be made to the study by Caceres (2020) which showed that the increase in female employment in relation to male employment leads to an increase in the domestic savings rate, and therefore, increases investment and thus in the productive capacity of the economy and, therefore, it can exert deflationary effects.

The relationships between the female to male employment ratio and the inflation rate are shown in Figures 35 and 36, for the cases of El Salvador and the Dominican Republic.

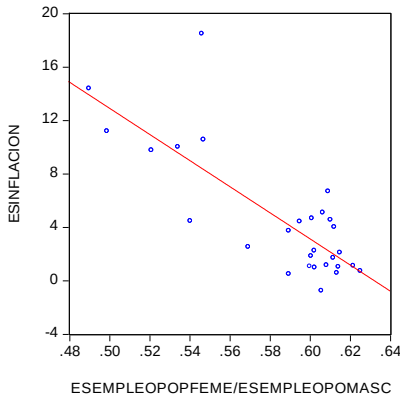

Figure 35. Female to male employment ratio and inflation rate in El Salvador

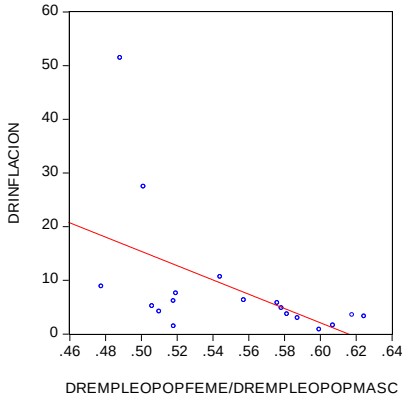

Figure 36. Female to male employment ratio and inflation rate in the Dominican Republic

The following equations show that this employment ratio has a clear negative effect on the inflation rate.

Table 2. Inflation rate in terms of female to male employment ratio

	México	El Salvador	Republica Dominicana
Constant	47.1020	66.5174	45.7007
	(3.26)	(5.34)	(2.03)
Employment ratio	-90.0746	-105.8954	-70.1040
	(3.38)	(5.02)	(2.03)
Crédito\ to private sector	0.4455		
	(1.68)		
R2	0.33	0.55	0.14

It is observed in these equations that the employment ratio has negative and significant coefficients, which show its negative impact on inflation; the broadly defined money variable was not significant, but the ratio of credit to the private sector to GDP was marginally significant in the case of Mexico.

To emphasize the deflationary role of the employment ratio, for the case of the data panel of the five countries included in this work, a Var model was estimated that showed that the female to male employment ratio has deflationary effects, as can be seen in the Figure 37. This indicates that female employment is an instrument of macroeconomic stabilization.

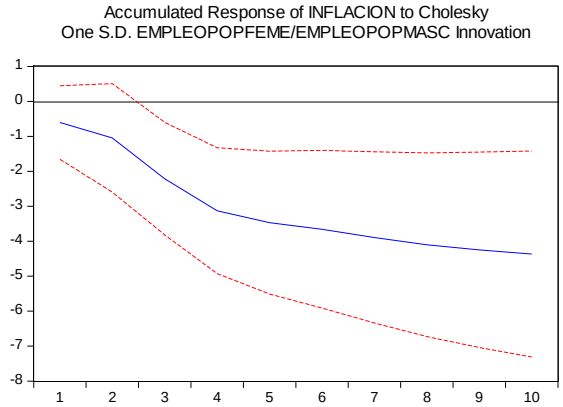

Figure 37. Response of the inflation rate to the increase in the ratio of female to male employment

Another mechanism to reduce inflation lies in labor productivity. The evidence for Central American countries shows that inflation is negatively affected by labor productivity (Caceres 2021). This relationship for the Dominican Republic is shown in Figure 38.

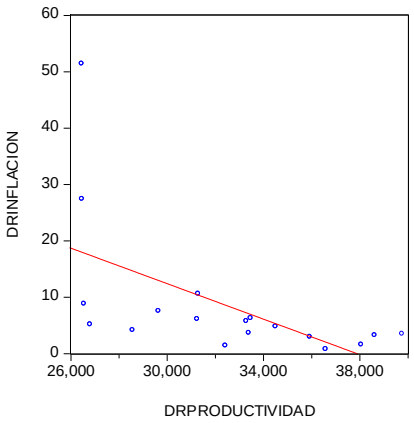

Figure 38. Labor productivity and inflation rate in the Dominican Republic

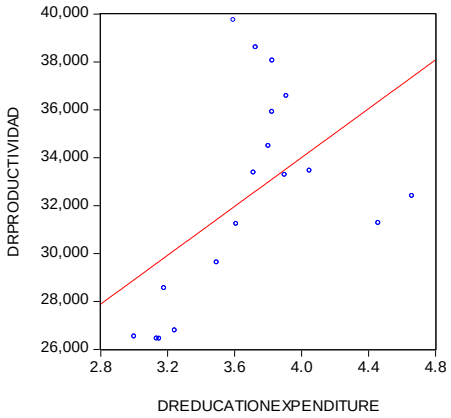

Figure 39. Expenditure on education as a percentage of GDP and labor productivity in the Dominican Republic

Caceres (2021) has also shown that in Central American countries labor productivity depends on spending on education. In fact, in the Dominican Republic, productivity increases with the increase in public spending on education, as can be seen in Figure 39:

Therefore, a negative relationship is obtained for this country between the increase in public spending on education and the inflation rate, which is shown in Figure 40:

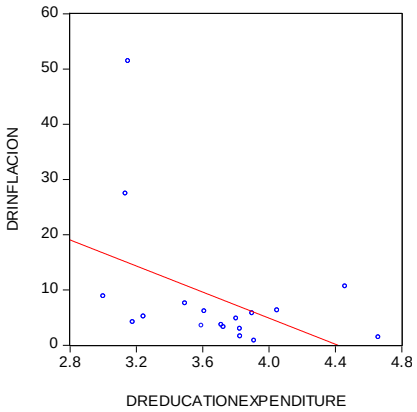

Figure 40. Expenditure on education as a percentage of GDP and inflation rate in the Dominican Republic

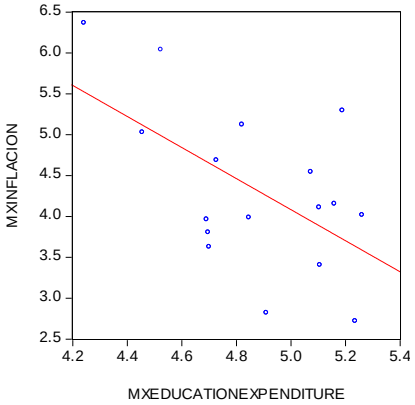

Figure 41. Public spending on education and inflation rate in Mexico

This association is also observed in Mexico (Figure 41).

These relationships make it possible to express the inflation rate in the context of an inflation targeting; Equations for the Dominican Republic are presented in Table 3, where Money is the ratio of M2 to GDP, and education and health expenditures are represented as a percentage of GDP.

Table 3. Inflation and spending on education in the Dominican Republic and Mexico.

	República Dominicana		México
Constant	-19.8598	-9.0275	20.9332
	(0.31)	(0.68)	(6.45)
Money	1.5201	1.2991	0.0048
	(3.65)	(2.98)	(0.08)
Education expenditure (-1)	6.6823		
(Education expenditure +		9.4924	
health expenditure)/2		2.50)	
Health expenditure			-3.4278
			(4.45)
R cuadrado	0.36	0.46	5.54

These equations point out the importance of increasing spending on education to create a "shield" or "protection" against inflationary pressures, so that the contraction of money would not be necessary as a means of reducing inflation.

Of special importance is that education spending has the effect of reducing male and female suicide rates, as observed in Figures 42 and 43:

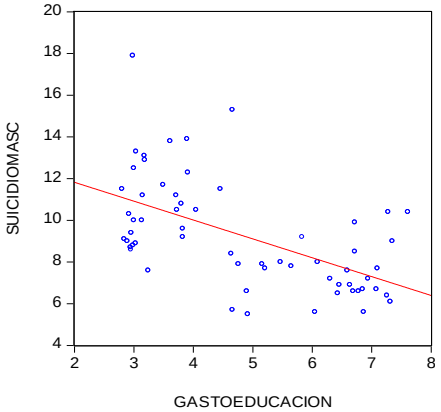

Figure 42. Expenditure on education as a percentage of GDP and male suicide rate

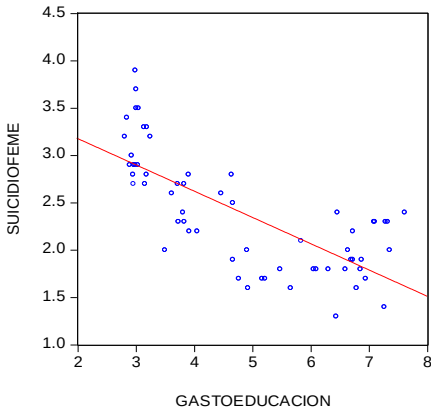

Figure 43. Expenditure on education as a percentage of GDP and female suicide rate

These Figures show that spending on education protects life.

On the other hand, it must be considered that the contraction of credit to the private sector as a percentage of GDP is associated with the increase in the poverty gap.

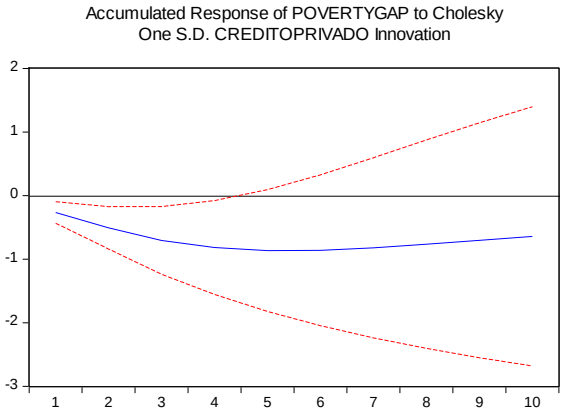

Figure 44. Response of the poverty gap to the contraction in credit

At this point, the result of Banerjee y Duflo (2007) must be taken into account, which showed that poor people die at an earlier age than non-poor people; this shows that credit contraction can lead to increases in poverty, which could threaten people's lives.

6. Conclusions

This work has presented evidence that macroeconomics exerts important effects on suicide, especially those effects originating in the labor market: unemployment and self-employment increase it while salaried employment and in the service sector decrease it. Likewise, variables associated with social exclusion, such as homicides and the poverty gap, increase it, while remittances reduce it, while deindustrialization increases the suicide rate.

Of particular importance is the role of monetary and credit contraction, as well as interest rate rises, in increasing the suicide rate. This can be associated with the evidence that monetary and credit contraction lead to increases in unemployment.

Globally, unemployment has been identified as one of the main causes of suicide; Nordt et al. (2015) have reported that the 2008 banking crisis caused 5,000 suicide deaths in European countries. In the same sense,

Chang et al. (2009) reported that the economic recession of 1997-1998 in Asia led to increases in suicide rates in the countries of that continent.

The effect of unemployment in leading to suicide is only one extreme consequence of unemployment, but there are other "intermediate" type consequences that wreak havoc in people's lives as well. There are devastating psychological effects described by Clark and Oswald (1994) in terms of increased divorces, mental depression, and individual unhappiness; Goldsmith, Veums, and Darity Jr. (1996) have shown that people who have suffered from unemployment tend to suffer from depression and anxiety, and suicidal tendencies.

Reference should be made to the evidence that the daughters and sons of people who went through periods of unemployment, themselves have experiences of unemployment when they reach adulthood, that is, parents give their experiences of unemployment as "inheritance" to their daughters and sons (Johnson & Reid, 1996).

Evidence indicates that suicide has a "contagion" effect generated by the publicity poured out by the media in relation to people who have committed suicide. The World Health Organization has prepared guidelines for the media so that their news on this matter is prudent. These guidelines should be adopted by Mexico, the Dominican Republic and the Central American countries.

The previous results make it necessary to design social policy measures aimed at eliminating the perverse repercussions of certain economic variables on people's lives.

One measure should be the introduction or expansion of unemployment benefits to the unemployed. Of special importance would be to prevent workers from going into unemployment or underemployment in times of economic recession, through the adoption, by companies, of a system in which they reduce production, but leave the workforce unaffected, to which they would pay a percentage of the contracted salary, and the rest would be paid by the governments.

This measure would avoid having to train new employees incorporated into the companies once the recession has passed, which would help to maintain labor productivity.

Likewise, the execution of emergency employment programs activated due to the increase in unemployment in the country would be valuable to avoid psychological damage and others that threaten the lives of people.

These, and other employment protection measures, have costs for governments, but they are measures that save lives, prevent pain for the family group and strengthen social cohesion. The costs involved will be lower than the costs associated with family disruption, crime, violence, fragmentation of society, and drug use.

There is evidence that suicide occurs mainly in low-income people. This indicates that their orphaned daughters and sons could see their aspirations to achieve high levels of education cut short and thus they themselves would have lives marked by poverty. In other words, suicide can generate an intergenerational transmission of poverty.

Given their low-income situations, suicidal people could hardly have obtained private psychological care, which makes it necessary to expand these services to low-income social strata. Several authors have pointed out that the characteristics of people who commit suicide are related to mental pain and broken relationships and are aggravated when people are impulsive and have little ability to make decisions, pay attention to and solve problems, aspects that can be treated with careful psychological therapy (Gvion et al., 2015; Zalsman, 2016).

The effects of the money and credit crunch on suicide should receive special attention, particularly in the context of macroeconomic adjustment programs. In this framework, it is especially important that researchers carry out econometric analyses to compute the number of suicides that are expected to occur because of the adjustments and "austerity" included in the macroeconomic adjustment programs. Cummigs (2018) has reported that austerity measures implemented in the UK in 2007 led to significant increases in the female suicide rate, while Nordt and colleagues found that both male and female suicide increased with the introduction of austerity measures. Such austeritt measures are usually the results of "fiscal consolidation" policies but in its core they exihibit the clearest example of Sado-Economics.

The indicated econometric exercises would allow establishing dialogues leading to the search for alternative methods of macroeconomic adjustment, which does not have the cost of pushing people towards death.

From the review of the literature presented above, it can be deduced that the expansion of social spending is a suicide prevention measure (Nordt et al., 2015; Zimmerman et al., 2002); therefore, actions aimed at reducing these expenses have a clear criminal nature.

In the same category can be placed the measures of "fiscal responsibility", which could still denote a racist or classist disdain towards certain groups of people. It is valid to maintain that the main fiscal responsibility of governments is to the lives of citizens. "Fiscal responsabilty" and "austerity" would prevent governments to

deliver improvements of peoples lives, and, as a result, the framework of democracy may be seen by disadvantaged groups as a cruel soap opera, and thus these groups may opt and resort to the "exit" option, in detriment of institutions.

This forces us to consider the advisability of creating bodies higher than governments, such as a national ethics committee, which have the last word in relation to economic policy measures. This committee would be made up of people recognized for their high moral principles and for their independence from power groups.

Or, it could even be considered, a future in which economic policy decisions pass through the filter of citizens through consultations on the Internet, such as a referendum or plebiscite, with the aim of safeguarding the integrity and life of families.

In view of the adverse repercussions on people's lives caused by macroeconomic adjustment measures such as monetary and credit contraction, the design of alternative macroeconomic adjustment mechanisms is especially important. This work has shown that the female to male employment ratio has a clear deflationary effect, which calls for great efforts to give it a programming framework. In this sense, it could be beneficial to carry out "female employment targeting" exercises, which shed light on the increases in the female-to-male employment ratio that should be obtained in the medium term with a view to keeping inflation below certain levels. Within this framework, facilitating measures to obtain increases in female employment are of particular importance,

An exercise that would be very illustrative would be the calculation of the costs involved in the expansion of daycare centers to demonstrate that these costs are recovered by themselves, by virtue of the increase in female employment that would sustain increases in savings, investment, and economic growth, and due to the low inflation rate, all of which would generate tax revenues in amounts greater than the investments involved in the expansion of daycare centers. It is appropriate to structure a Central American regional day-care program that would serve to achieve the benefits, but would also help mothers continue their studies, which would be another input for economic dynamism.

In the search for alternative macroeconomic adjustment mechanisms, it is valuable that this topic be incorporated into the dialogue of the Central American countries (and Mexico and the Dominican Republic), with a view to achieving the commitment of designing programs that value life, attack poverty and irregular emigration.

It is of special importance that Latin American countries adopt the suicide prevention models structured by the World Health Organization, based on the analysis of available evidence on measures that are effective (WHO, 2014).

As a complement to the policies recommended by the WHO, there would be valuable economies of scale for the Central American countries in the design and execution of suicide prevention programs. Among other aspects, a regional program could include the following subprograms:

-Expansion of psychological therapy and counseling services throughout the national territory.

-Expansion of permanent psychology services in public schools of all levels.

Expansion of administrative instances to combat labor discrimination in dependencies of the public and private sectors.

-Expansion of psychological therapy services for the elderly, LGBT people, people with disabilities.

-Terapy support to young people to liberate them from addiction to electronic-internet devises.

Expansion of therapy and protection services for abused women.

-Psychological support for daughters and sons whose parents have emigrated.

-Expansion of 'hot lines' services to answer calls from people in emergency situations.

It must be borne in mind that these measures, as well as the expansion of social protection spending, will comply with the provisions of article number three of the Universal Declaration of Human Rights, which stipulates that:

Every person has the right to life.

And to fulfill the Commandment:

You shall not murder.

In memory of Juan Jose Zoreda, my friend.

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Notes

Note 1. See reviews by Levi-Belz, Gvion and Apter (2019), O'Connor and Nock (2014).

Note 2. The data used in this section were taken from the World Development Indicators, of the World Bank.

Note 3. The poverty gap measures how far poor people are, on average, from the national poverty line.