Correlation between violence and forced migration

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Massive migrations are usually produced by economic reasons or wars, but there is another reason of migration that has not been studied appropriately: violence. In the last two decades or so Mexico and several countries in Central America have suffered violence produced by the economic globalization of the drug business, the Mexican drug war and the direct and indirect violence it produces through assaults, hijacks, etc. This type of violence is different from that in wars and affects all economic strata of society. In Mexico and Guatemala, the number of homicides has increased to levels never seen in recent history, and has prompted a wave of asylum requests into the United States that has reached a number robust enough to study it with statistical metrics. In this article asylum immigration data from Mexicans and Guatemalan people is correlated to violent-crime indicators in these countries. It is determined that taking into account the appropriate time delays for the immigration to take place and for the asylum to be processed, the data from asylum requests and homicides in Mexico correlate positively showing a causal connection between violence and migration.

Keywords: migration, violence, asylum, Mexico, Guatemala, USA, drug war.

Introduction

Mexico has experienced an increase in violence without precedent in recent times. The ultimate cause for this situation is the economic globalization of drug smuggling, a trade which is estimated to be worth over $40 billion annually. But illegal trade is not new and one need to look at recent developments to understand the increased levels of violence. As it will be detailed in the following section, it was under president Calderon's war on drugs that violent deaths skyrocketed into levels never seen since the Mexican revolution of the 1920s. This in turn has prompted a new type of social phenomenon: forced migration.

The Mexican war on drugs has increased the violence to unprecedented levels. One unexpected effect of this war has been to reduce the police activities leaving many Mexican towns and cities defenseless to the attacks of the drug cartels, gangs, and other criminals. This, in turn, has prompted a wave of crimes ranging from homicides, thefts, per-ransom kidnapping, extortion, etc. which have induced a migration wave into the USA. In this investigation we hypothesize that such growth of violence is the cause of a large surge of asylum requests into the USA, and use statistical tools to quantify such relationship and determine the temporal delay between cause and effect.

In the following section an overview of the Mexican immigration into the USA is presented, followed by a brief introduction to the Mexican drug war. The article continues with a description of the data and the correlation proposed to quantify the violence-migration link for the cases of Mexico and Guatemala. The article closes with some conclusions.

Mexican immigration, violence and their connection

Mexican immigration trends

Throughout its history the immigration from Mexico into the United States has been related to the economy of both countries. In the first half century after the Treaty of Guadalupe Hidalgo (that ended the US invasion in 1848 and transferred half of the Mexican territory to the USA), the total number of Mexican immigrants living in the USA probably reached 100,000 by 1900[1]. As the Great War created the need for workers, the Immigrant Act of 1917 allowed the number of Mexicans in the USA to grow to 1,500,000. When the war ended the numbers dwindled mostly due to the implementation of the Mexican Repatriation Act which forced an estimated 500,000 Mexicans (and many US citizens of Mexican descent too) out of the United States between 1929 and 1939. It was not until the Second World War that, in 1942, the *Bracero* program was instituted to allow the legal entrance of Mexicans to work mainly in the farms (*Bracero* refers to somebody who works with his arms). Between its initiation and until President Johnson ended it in 1964, the number of Braceros ranged between 100,000 to almost 500,000 per year. Around the same time the smaller H2 program was also created for low-skill workers.

Besides the legal immigration of the Bracero program, the illegal one also existed but was combated by the *Operation Wetback*, which was established in 1954 and returned about 1,000,000 Mexicans. In the following decades the

estimated number of Mexican born population in the USA grew steadily to 760,000 in 1970, to 2,199,000 in 1980, to 4,500,000 in 1990, to 9,752,000 in 2000, and to 12,671,000 in 2010. Besides these, the illegal immigrants from Mexico –which are harder to count— reached about 1,445,000 in 1991 (41% of the total US undocumented population), and 2,700,000 in 1995 (54%). Likewise, the temporary workers (under the H2-A visa program) grew from 4,808 Mexican in 1987 to 111,769 in 2013. Figure 1 shows the trends of legal, illegal and temporary Mexican migration into the USA per year[2]; clearly seen are the peaks on the temporary workers due to the Immigrant Act of 1917, the Bracero program, and the H2-A guest workers program. Nowadays Mexican immigrants, legal or not, comprise 32% of all immigrants living in the USA, followed by Filipinos with only 5%[3].
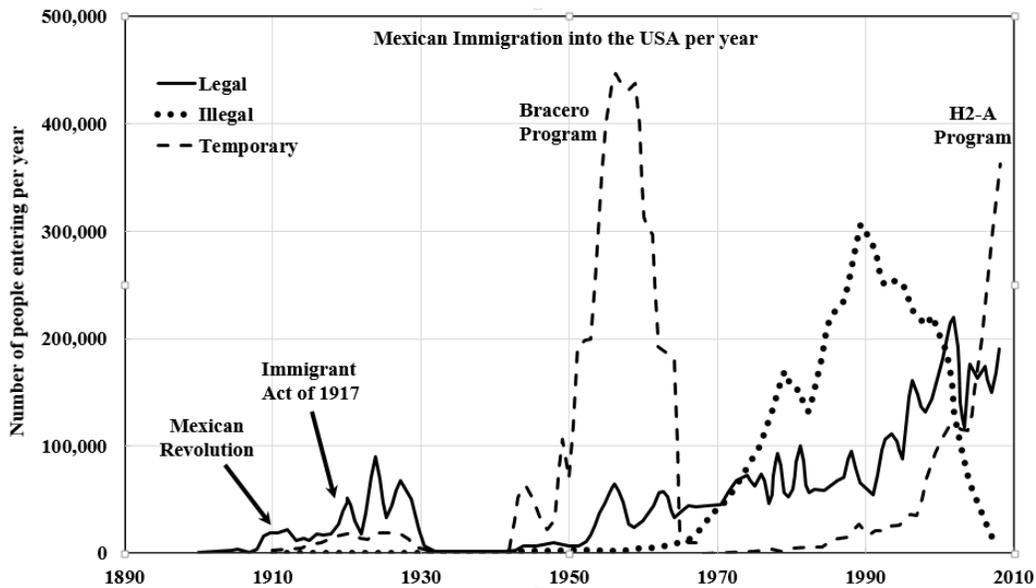

Figure 1. Trends of yearly legal, illegal and temporary Mexican migration.

The overall trend of Mexican immigration into the USA appears to be changing. Recent reports by the Pew Research Center[4] show that the current total migratory influx from Mexico is not only decreasing but becoming negative as many Mexicans leave the US; this can be seen in the steep decline of the yearly illegal Mexican immigration in Figure 1. In addition to the usual reasons for this decline (enforcement of detention programs and the US economic recession since 2007), the study of the Pew Research Center links this phenomenon to family reunification. Between 2005 and 2010, 1.39 million people moved from the US to Mexico 70% of whom were migrants and the rest were their families, including many US-born family members. The effects of this reversed migration are a reduction of the total population of Mexicans in the USA down to 11.7 million in 2014, and an increase of 115% of the US-born population in Mexico from 343,000 in 2000 to 739,000 in 2010[5].

On top of all of these trends, there is a seemingly unrelated phenomenon that has an impact on yet another type of migration: the violence in Mexico.

The violence in Mexico

Violence is not new in Mexico but it reached war levels after the newly elected President Felipe Calderon started the so-called Drug War in 2007. The official motive to initiate the war was to end drug violence in Calderon's native State of Michoacan, but it was later extended to the rest of the country. The fact that Calderon's election was surrounded with fraud accusations[6] that prompted

tumultuous social unrest, gives the impression that putting troops on the streets of Mexican cities could have also had political motives.

According to data from Mexico's National Institute of Statistics and Geography[7], compared to the estimated 60,000 homicides during the Fox presidency (2000-2006), the 120,000 killings during the Calderon mandate (2006-2012) represented a departure from normalcy which has not fully settled down during the Peña Nieto presidency. Figure 2 shows the monthly count of homicides in Mexico compiled by Diego Valle-Jones[8], the gray bars denote the transfer of powers from a president to the next one, which happens every six years on December 1st; it is easy to see the steep departure in 2007 from the smooth background in the pre-Calderon years.
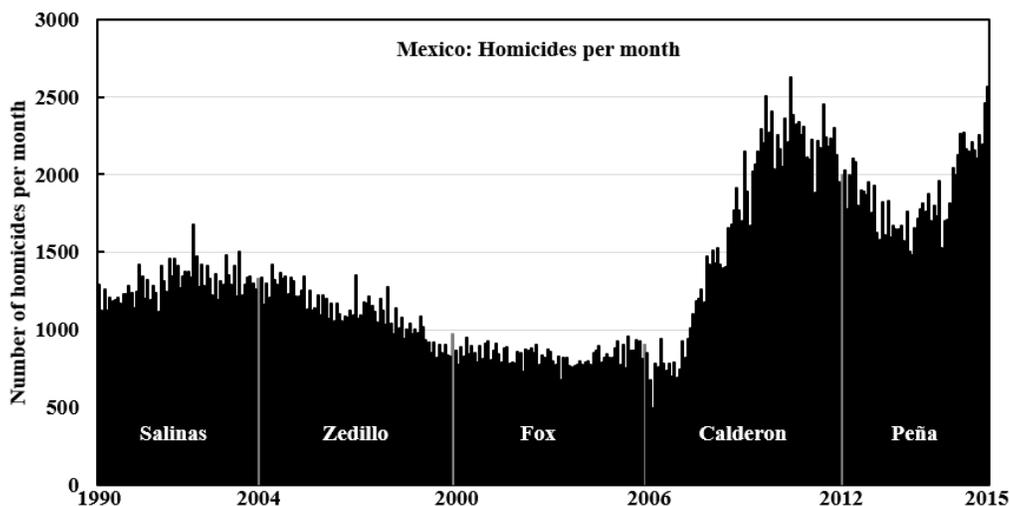

Figure 2. Number of homicides in Mexico per month.

For purposes of the present investigation, it is necessary to describe a bit of the mechanics of the drug war. As narrated by Valle Jones[9], the pre-Calderon cartels were coexisting in quasi-pacific terms until the war was declared by the Federal government. The intrusion of the Mexican army favored the Sinaloa Cartel (either intentionally or coincidentally, you decide); in a war where thousands were being killed, the army suffered only tens of deaths (39 in 2009, mostly by accidents), while —at a difference with the troops— the police of many towns suffered hundreds of deaths. Figure 3 shows the yearly trend of the deaths of army troops and policemen[7]; the difference between the two is notable.
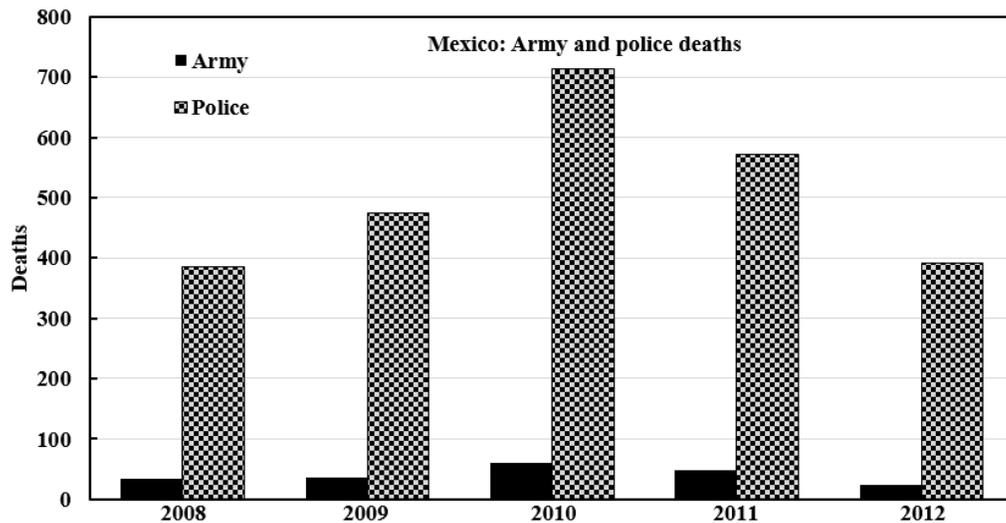

Figure 3. Number of deaths of army troops and city, state and federal police.

Due precisely to the killing of policemen, the security of cities and small towns rapidly deteriorated yielding to a situation of chaos. Anecdotal information,

difficult to quantify and not reported in academic journals, suggests that the assassination of policemen reduced their participation in their security activities. The not-so-secret message of playing a *norteño* drug-related song in the police radio band by cartel members, was understood by everybody in the Ciudad Juarez police as a stop of activities for the next half an hour, while a killing took place on the streets of the city. Carjacking, kidnapping, domicile thefts, business extortion, male and female abductions, and rapes all proliferated in the absence of police vigilance. Figure 4 shows the yearly trend of kidnappings in Mexico[10], at a difference with the homicides, the growth starts in 2008 and not in 2007, showing a one year delay between the start of the war and the increase of kidnappings. Further anecdotal information connected some of these crimes to army and federal police members.
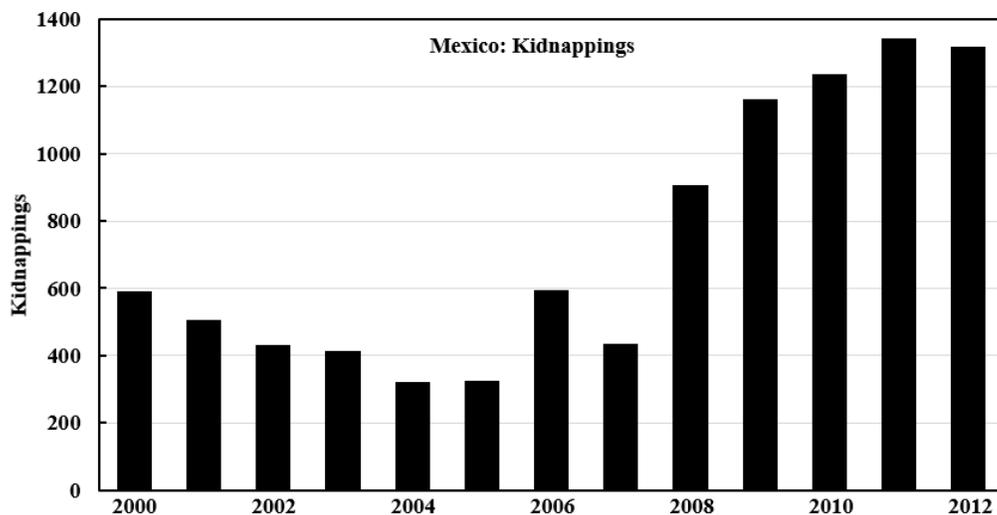

Figure 4. Number of kidnappings in Mexico per year.

Entire libraries could be filled with the Narco-stories of this period. Of special interest would be those related to the killing of three of Calderon's Secretaries (two by the suspicious downing of a jet and an helicopter in Mexico City), the capture-escape-recapture-reescape-rerecapture of the infamous El Chapo, the assassination of 94 politicians and 118 journalists during Calderon's mandate (at a rate of almost one of each per month, see complete list in Ref.[11]), etc. But for our purposes it suffices to know that 1) compared to the average number of deaths of the Fox presidency (837 homicides per month), Calderon's average rose suddenly 100% to 1673 killings/month, and that 2) such situation led to a chaotic condition in many cities and small towns throughout Mexico. In the next subsection a hypothesis connecting this violence and immigration into the United States will be presented, and will be put to a statistical test in the following Section.

Connecting Mexican violence and immigration

In their article "Criminal violence and displacement in Mexico," Laura Rubio and Sebastián Albuja[12] present the narrative of ordinary people that migrated from their place of origin due to the violence that resulted from the drug war. Rubio and Albuja indicate that the number of people abandoning violent municipalities is between four or five times larger than those moving away from non-violent towns; a survey from a university in Ciudad Juarez estimated that 115,000 persons moved from that city to the USA in 2010. Rubio and Albuja found a statistical connection between homicide rates and population census data:

towns hit with intense violence experienced increased levels of out-migration. It must be remarked that the individuals seeking refuge away from home are common people who fear systematic kidnappings, thefts, mass murders, and other threats to life, physical security and loss of livelihoods. It should also be emphasized that the violence and insecurity is not occurring in a civil war, the victims do not have a political agenda, an ideology, and do not represent a threat to political parties or drug cartels; they are –to put it in modern terms— strictly collateral damage. The interest of Rubio and Albujo is to provide arguments to prove that this unjust situation meets most of the criteria for the existence of a non-international armed conflict and –*de facto*— it constitutes a humanitarian crisis.

This investigation hypothesizes that the wake of violence originated by the drug war is the engine behind the migration of victims and their families. And to prove it –albeit statistically— a metric is proposed to link violence to migration in a causal manner. In the next section the violence-migration hypothesis is explored further from a statistical point of view, and it is tested specifically on the migration from Mexico into the United States.

Quantifying the violence-migration connection

Mexican immigration data

At a difference with the types of immigration into the USA we dealt with before in this manuscript, namely legal, illegal and temporary, the violence-prompted

immigration takes a different route, that of the asylum based on humanitarian grounds. People escaping from their hometowns for fear of losing their lives usually reach the US border and ask directly for asylum; the Government of the United States classifies such request as an application for *affirmative asylum*. The other option, the *defensive asylum*, is the one that occurs when an individual already in the USA resorts to a request of asylum to avoid deportation; this option is rarely used by migrants escaping violence. Affirmative asylum applicants are rarely detained, and are allowed to remain in the country while the application is pending.

The asylum seekers must demonstrate that back home they have suffered persecution due to their race, religion, nationality, membership in a particular social group, or political opinion. Although the case of having been a victim of violence does not fit in any of these classifications, providing proof that your life is in danger and that your government is not able or willing to protect you will serve to initiate an asylum request. Asylum requests can include spouse and children.

An example can help illustrate the process of petition of asylum. The Talancon family (not their real name but a real story) used to reside near the Boquilla water dam of Los Conchos River in the northern state of Chihuahua. At some point in 2014 the local drug dealer (there is one in every town) made an offer to the Talacon for their waterfront property. After the initial refusal to sell, a gang member killed a 21 year old son of the property owner. In a matter of weeks

the conflict degenerated and left dead a cousin and the father of the first boy killed. At that point in time the extended Talancon family, composed of two complete families plus their grandparents and grandchildren (31 in total), left Boquilla and went to a port of entry in El Paso, Texas and requested asylum. All family members were allowed to remain in the USA while the asylum application was processed. Unfortunately, as such processes take several years and are rarely approved, several of the Talancon returned to their hometown in 2016, a few more are still waiting for their pending application, and two more married US citizens and received permanent residency.

Chances are that the asylum request of the Talancon family will never be approved, only about 10% of all applications are ever approved. Albuja[13] analyzed 203 cases most of which were rejected for failure to show reliable proof of persecution; Leticia Calderón Chelius[14] documents that in 2011 only 2% of the asylums requests were granted, which prompted to the formation in 2012 of a group called "Mexicans in Exile" to publicize that indeed their cases had political bases.

Court decisions ruled that fear of "general country conditions" or "indiscriminate violence" were not ground for asylum. To be successful, an asylum request had to present a well-articulated case of why and how they would be harmed, providing specific names of cartel, police members, hospital or police reports, and witness testimonies.

Because of their high rejection rate, the best estimator of violence refugees is not the number of asylums granted, but the number of asylum requests, especially those requested as affirmative asylum. Figure 5 shows the yearly trend of the number of asylum requests superimposed on the Mexico monthly homicide counts. The asylum requests were received either by the US Citizenship and Immigration Services or the US Executive Office of Immigration Review, and compiled by the United Nations High Commissioner for Refugees[15].
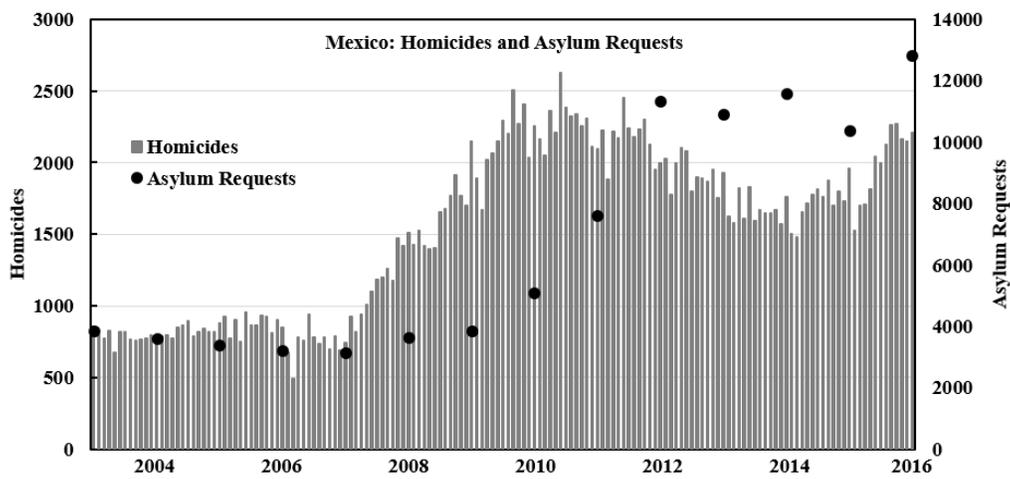

Figure 5. Number of kidnappings in Mexico per year.

The similarity of the trends of homicides and asylum requests is hard to miss; except for a time shift of a few years both trends could be said to have the same temporal behavior. The fact that homicides, kidnappings and asylum

requests follow similar tendencies is what prompted the use of these time series in this study to determine causality between violence and migration.

Correlation between violence and migration

To determine dependence of one time series to another one usually resorts to the Pearson correlation. In layman terms, this and other correlations basically treat each time series as vector in a multidimensional space (with as many dimensions as entries in the time series) and use them to calculate the inner product between the two vectors, i.e. between the two time series. From the inner product it is possible to calculate the angle between the two vectors, the cosine of such angle is known as the Pearson correlation. Small angles will correspond to quasi parallel vectors showing a great dependence between the two series, i.e. knowing one series is sufficient to predict the corresponding values of the second one; these cases have values of the cosine of the angle (the Pearson correlation) close to 1.0 which denotes high correlation. On the contrary, if the two time series are at 90 degrees with respect to one another, the growth of one will have no inference on the second one and the series are said to be uncorrelated; these cases correspond to Pearson correlations of near zero value. More information on the calculation of the Pearson correlation can be obtained in[16].

Unfortunately, as is, the Pearson correlation between the homicides time series and the asylum requests yields a meager 0.64, showing a timid relationship but not enough to argue causality between the two series. The reason for this is

easy to see in Figure 5, the homicides series is ahead of the asylum one by a few

years. In cases like this one, it is common to resort to what is called the cross-

correlation[17], which is a measure of similarity of two series as a function of the

displacement of one relative to the other. Figure 6 shows that the approximate

time displacement between the two series is of about 32 months. The simple

interpolation trends (continuous and dashed lines) used for both series are for

illustration only, for a more accurate estimate it is best to use the sliding cross-
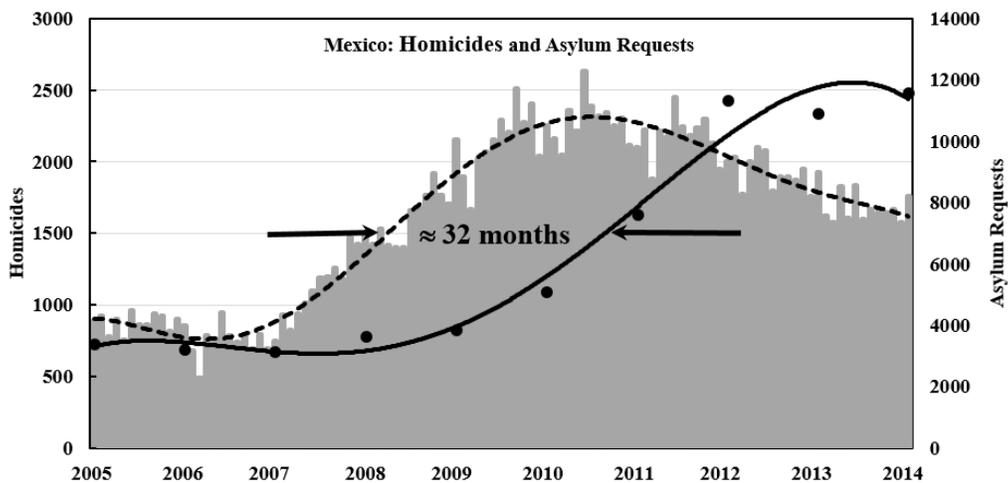
correlation.

Figure 6. Time displacement between the homicides and the asylum requests.

Repeating the calculation of the Pearson coefficients shifting one series

with respect to the other one, it is possible to determine the shift for which the

Pearson correlation reaches its maximum value. Figure 7 shows the values of the

Pearson correlation obtained as a function of the shifting of the asylum data with respect to the homicides series. It is easy to see that the maximum occurs at a displacement of 3 years much in agreement with the approximate estimate of Figure 6; notice that since the asylum request data is annual, the cross-correlation was only done at integer yearly shifts. The maximum value of the correlation, 0.955, indicates that, with a shift of three years, the two series are extremely related to each other. And given the fact that the homicides series precedes the asylum requests, one must conclude that one is causing the other one, thus proving the causal relationship between violence and migration.
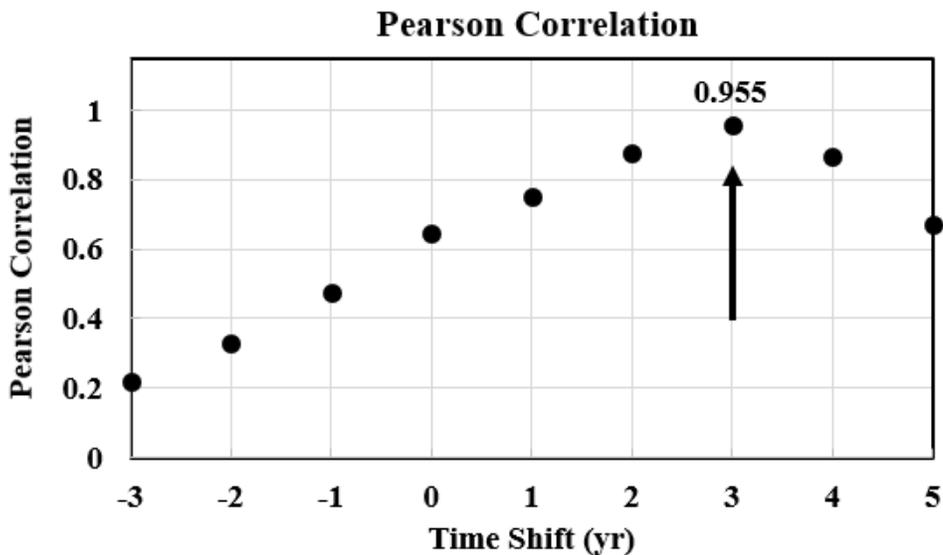

Figure 7. Values of the Pearson correlation as a function of the relative time shift of the homicides and asylum requests series.

The case of Guatemala

As in the case of Mexico, books have been written about the dire situation of this Centro American country, but for our purposes let us limit the discussion to just the time evolution of the homicides and asylum requests, as in the Mexican case.

Homicides

Guatemala had a civil war between 1960 and 1996 that resulted in over 200,000 deaths and left the country accustomed to violence. The incompetent and corrupt institutions of the war (security and intelligence units, police and military officers) mutated into criminal organizations now in charge of money laundering, extortion, kidnapping, etc.[18], and created a perennial situation of violence. Although the Guatemalan violence is perhaps as bad as the one in Mexico, it had a different origin and has a vastly different temporal behavior. Figure 8 shows the yearly trend of homicides after the war in Guatemala ended; the data were obtained from the United Nations Office on Drugs and Crime[19]. Although these Guatemalan numbers also show a crescendo like the Mexican trend, its rise is much smoother and does not appear to have a clear beginning.

Asylum requests

Following the same procedure as described for the Mexican case, Figure 9 shows the trend of the requests Guatemalan citizens made for asylum in the USA, plotted over the background of homicides. Also shown is the number of unaccompanied minors that were captured by the immigration authorities (dotted line), which

follow a similar overall trend that the requests for asylum. The asylum requests

data were obtained from[15], and the unaccompanied children from[20]. Both curves

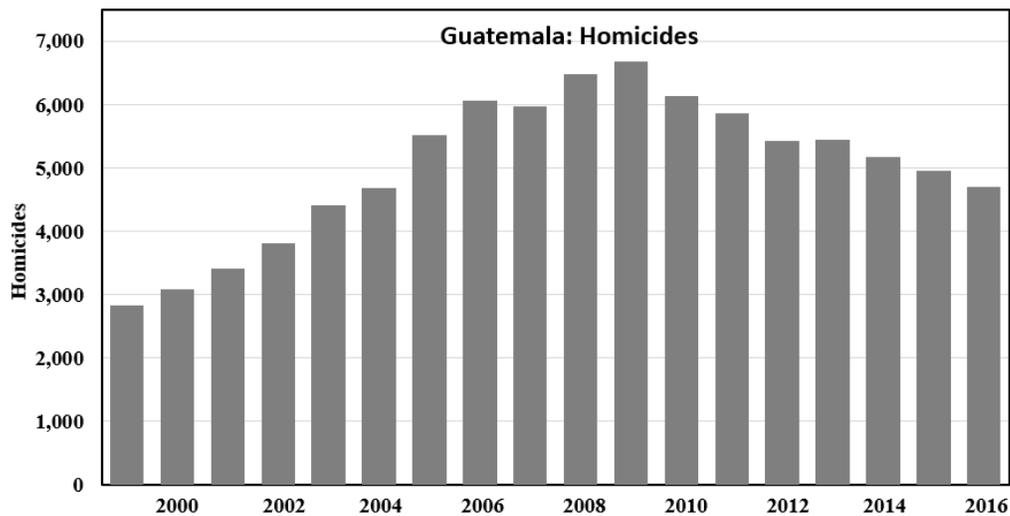show a late rise, after a smooth steady background, and without an apparent

detonator.

Figure 8. Annual count of homicides in Guatemala [19].

Correlation between violence and migration

Repeating the cross-correlation study described before for the Mexican case, we

find, not surprisingly, a large time delay between homicides and asylum requests.

Figure 10 shows the values of the Pearson correlation as a function of the time

shift used in the cross-correlation; a time shift of 11 years appears to give the

highest correlation of 0.946.

Unfortunately this long time delay is unrealistic, and cannot be used to assign a cause-and-effect relationship between violence and migration in the Guatemalan case. Indeed, in this case we must conclude that the high degree of correlation found is due solely to the fact that –if shifted 11 slots to the left— the asylum requests series would sit on top of the rising trend of the homicides, thus yielding a high correlation. Such shift, unfortunately, would not take into account the decrease in homicides that starts in 2010. In other words, the high degree of correlation found in the case of Guatemala is nothing more than an artifact of the large time shift used. If the asylum requests were to peak in 2016 and decrease afterwards, the proposed cause-and-effect signal could then be taken as real with a time delay of about 7 years.
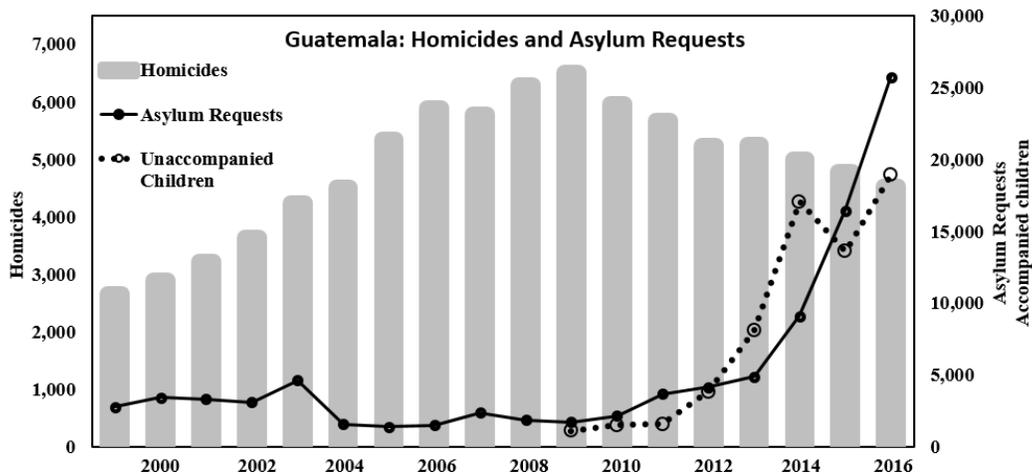

Figure 9. Asylum requests, accompanied children apprehended, and homicides in Guatemala.
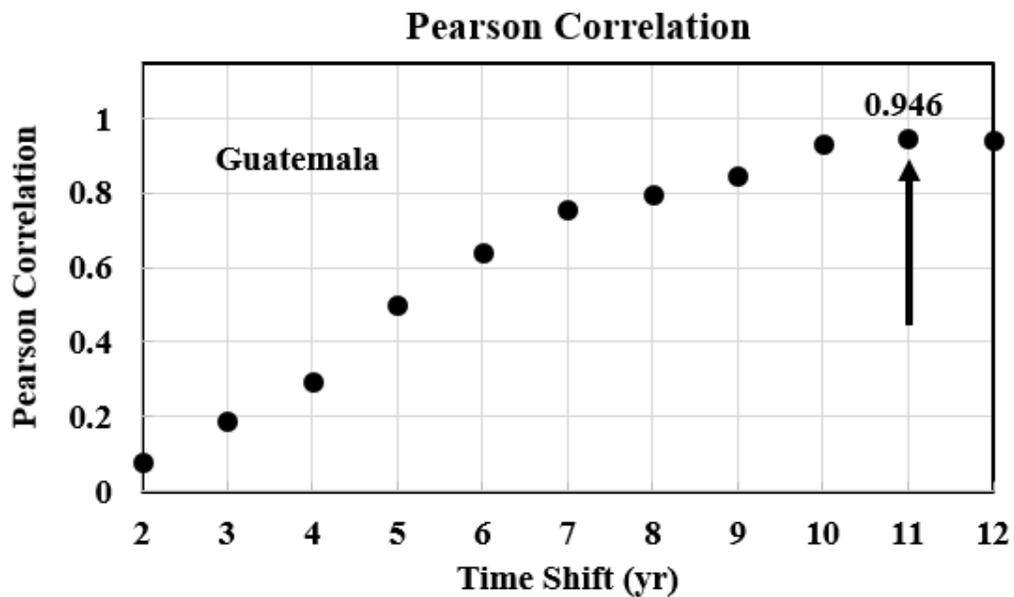
Figure 10. Values of the Pearson correlation versus the time shift of the cross-correlation.

Conclusions

This study continues the investigations of Rubio and Albuja[12] trying to establish a causal relationship between violence and migration. Focusing on the number of homicides in Mexico and correlating it with the number of requests of Mexican nationals for asylum in the United States, a positive signal is found when cross-correlating the two time series. The average time for the asylum requests to arrive at the US border after the initiation of the drug war violence was found to be a very reasonable three years. The same metric, however, failed to give positive results in the case of Guatemala probably due to the lack of more asylum request

data, or of a detonator, such as the start of the war on drugs initiated in 2007 in Mexico.

It is the hope of this article to document the linkage between violence and migration through rigorous methodologies, and that this serves to activate or modify existing international protection laws to help this type of migrants whom, up to now, fail to be classified within existing legal categories. It is clear that the problem of forced migration will not cease to exist for as long as the economic globalization of the drug trade keeps feeding corruption in local, state and federal authorities in Mexico which, in turn, produce a void of security exposing the citizens to crimes, violence, theft, and other social struggles.

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Figure captions

Figure 1. Trends of yearly legal, illegal and temporary Mexican migration.

Figure 2. Number of homicides in Mexico per month.

Figure 3. Number of deaths of army troops and city, state and federal police.

Figure 4. Number of kidnappings in Mexico per year.

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Figure 6. Time displacement between the homicides and the asylum requests.

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