Imputation process for Adapted Picatto-Hidalgo-Lajous Mexico Historical XX Century Crime Rates Database for Decades Analysis

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The (Piccato, Hidalgo and Lajous 2017) goes from 1928 to 2008. However, not all years have homicide observations, with systematic gaps in the 1940's, 1970's and 1980's (see figure 1). Therefore, we adopted specific strategies to have a more balanced dataset.

Figure 1.- Homicide rates for 32 Mexican States from 1928 to 2008

In the first place, we decided to proceed with a simple imputation process: we calculated homicide growth rates (HGR) for each gap using the homicides from the first-year registered observation after the gap in data against last year observation before the gap. This a simple procedure used in demography projections (Keyfitz, 1968), with the advantage that we are not using calculation on expected future changes; instead, we use data already registered. Noted in this way:

$$HGR = \frac{h(t_2) - h(t_1)}{h(t_1)(t_2 - t_1)}$$

If growth rates were negative, we divided the rate between the number of years with gaps. We subtracted the homicide observation proportionally before the data gap until we have all gaps imputed and vice versa when growth rates are positive. Noted in this way:

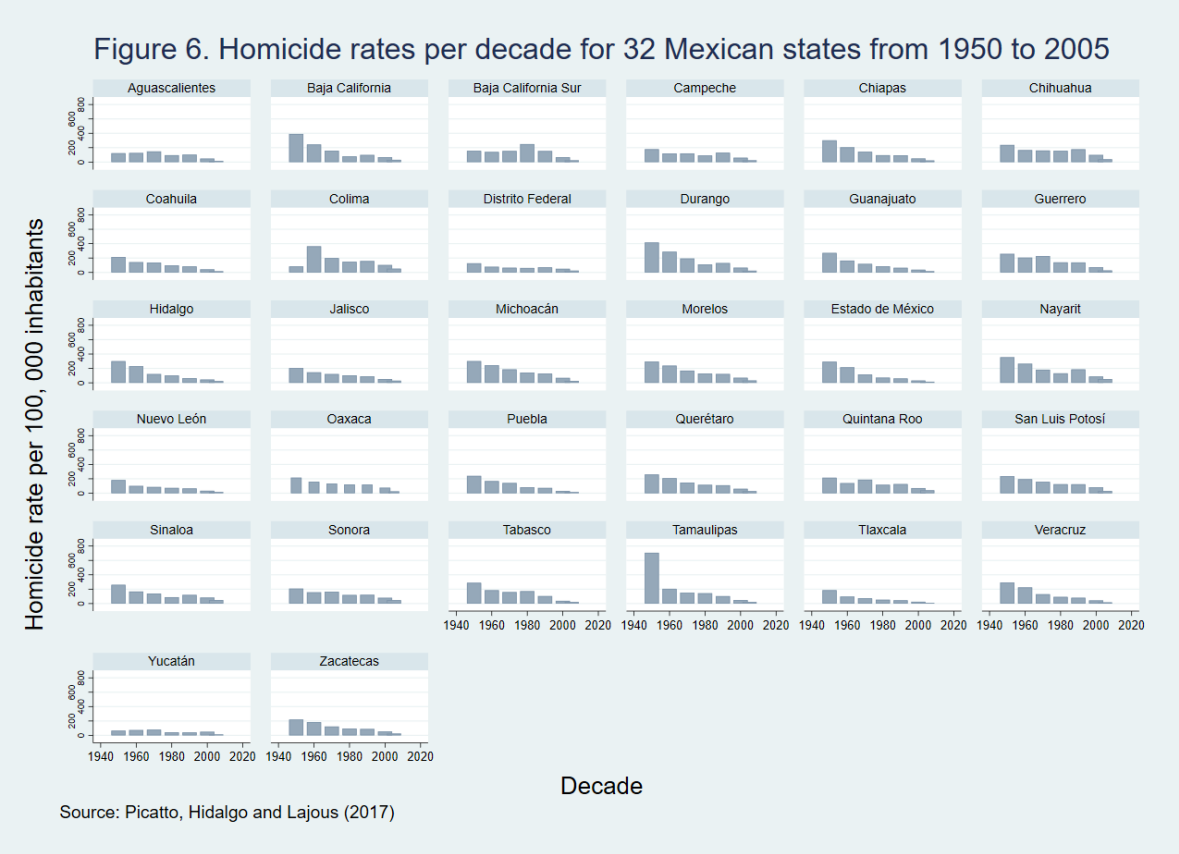
$$\sum_{t^2 - t^1} \frac{HGR}{n}$$

In Figure 2, we can see the result. Nevertheless, some words of caution are necessary. This calculation assumes that all other demographic and violence trends remained unchanged in the periods imputed. Even if data are imputed for already known trends rather than projections, we are cautiously affirming that this imputation must be taken as probabilistic homicide rates (Kailman, 2001). For the overall trends, the imputations correspond with the declining tendency of homicides, but new judicial or administrative data in the future could show higher homicide figures. This paper does not address political, criminal, or social events in the Mexican states. Therefore, the study of homicide trends in individual states requires more in-depth historiographical data collection which is beyond the scope of this research.

Figure 2.- Imputed homicide rates per 100, 000 inhabitants for 32 Mexican States (1950-2008)

In the second place, for having comparable data with homicide rates for many variables of interest, we decided to use census information for each ten-year wave from 1950 until 2005 when INEGI conducted an inter-census survey. Therefore, we collapsed homicide observations by decade and calculated rates by using the population in each census. We created a panel for seven decades for 32 states with this procedure, with a total of 224 observations. We can see the overall changes in the homicide rates per decade in Figure 3.

Figure 3.- Homicide rates per decade for 32 Mexican states from 1950 to 2005.



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