



THE ROLE OF SOCIAL CONTROL IN BRAZILIAN HOMICIDE RATES (1991-2010)

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Resumo:

Violent crime in Brazil have grown since the 1980s. The state authorities are unable to ubiquitously monitor illegitimate activities. Less effective and more territorially diffused, social controllers can act as a primary control by socializing positive (negative) beliefs of adhering (violating) to rules. The criminal-deviance density of a place could carry information about the moral cost of entering the crime "industry", because the levels of transgression can indirectly signal the level of this deterrence. We analyze the qualitative effect of social control to illegitimate choices, along with state deterrence. In a sample of comparable minimum areas, the latent factors were extracted from a set of rules-breaking phenomena (defined as "devianceness by incapacitation", "family-religious devianceness" and "adult educational devianceness"), by exploratory factor analysis, then associated with homicide rates by fuzzy-set qualitative comparative analysis. High family-religious devianceness (lower coactivity) is consistently associated with high homicide rates, when combined with high law enforcement.

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INTRODUCTION

The crime rates in Brazil in the last thirty years has been alarming. Among the several crimes and extent of their consequences, violent crime is the most mentioned, due to its impacts on the individuals and organizations involved, particularly the victims, friends, relatives and the authorities responsible for combating and controlling violence. The number of intentional homicides has displayed a systematic trend of growth since the 1980s (Waiselfisz, 2014) and of diffusion on national territory, with a reversal of this trend in a few locations like Rio de Janeiro and São Paulo (Cerqueira et al., 2013). Increased expenditure on public safety corroborates these trends. All the government spheres increased their expenditure on this budgetary item throughout the 2000s. This is due to the increase in crime, not only in the urban zones but also in country towns and those with a smaller population (Peres et al., 2016). Expenditure with law enforcement, the prison system and social and educational measures in 2016 reached 1.38 per cent of the Brazilian GDP (Brazilian Forum on Public Security, 2016).

The immediate response is strengthening the public criminal deterrence system. “Inflating” the current penal structure is somewhat attractive. Public agents are more effective at combating criminals, but private agents also operate in dissuasive process. They, with a different motivation, contribute indirectly, establishing their demands for private security goods and services and seeking to reduce the probability of victimization; can also socialize positive beliefs about adherence to social rules and negative ones to violating them. Although diffused in the territorial space and relatively less effective at administering sanctions, they constitute the first barrier against illegitimate activities.

Since criminal decisions are extreme deviance, involving a moral cost, exceptional punishments, risks, uncertainties and social costs, the decision-making process involves a level of complexity, which requires credible information if the potential criminal seeks a positive return from the illegal activity, in comparison to legitimate ones. An evaluation of the illegal returns requires information which are not readily available. A potential criminal needs to use alternative parameters in their decision-making process. Criminal decisions, which did not bear the costs associated to them, or only partially, and deviance decisions¹, which did not suffer social sanctions, transmit information indicating that their net benefits may have been positive. Thus, an

¹ Here the terms deviance and devianceness do not seek to have a biased meaning, but to indicate types of violations of exclusively non-extreme rules, such as violations of social norms, conventions, and moral codes, as opposed to violations of extreme rules such as crimes.

increase in the number of these violations would indicate a greater dissemination of these phenomena in the community and, possibly, lower levels of state and social control. Therefore, *ceteris paribus*, better criminal opportunities are available.

The objective is to find out the relation between social control (henceforth coactivity) and crime in the comparable minimum areas (CMAs)²; specifically, use the latent interdependences the relevant deviant and criminal behaviors in social and economic lives as an indirect measure of social control, in order to compare them with a crime measurement. *If it was possible to extract the common factors of transgression-crime measures, how are the relations of these factors with the crime measurement (homicide rate) in a sample of the CMAs with the highest deviance and crimes rates?* The hypothesis is that a potential criminal (including a re-offender) evaluates the “price” of illegitimate behavior from the “prices” of acts of a similar nature, their own, and other deviant behavior and crimes, which are environmentally diffused. It is envisaged that higher deviance “density” indicates a lower social control and, consequently, a lower barrier (lower moral cost) to entering crime, leading to a higher criminal “density”.

The use of a data sample provides information for the empirical response to the research question by determining the association of the interdependences of deviance and crimes with homicide rates. The extraction of common factors in a selection of deviance-criminal phenomena using Factor Analysis, similar to that proposed by Kunčič (2014), provides input for the following stage of the empirical strategy, by applying Qualitative Comparative Analysis (QCA), in which the latent factors, taken as causal conditions, are compared with the homicide rates. The relative stability of the compositions of these phenomena in the common factors enables an evaluation of consistency for the homicide rates over the years. Factor Analysis, in the three years, identifies three latent factors, called “devianceness by incapacitation”, “family-religious devianceness” and “adult educational devianceness” factors, according to the compositions of the deviance phenomena in each one: the first factor groups add variables which appear to most reflect the non-intentional violation of social norms, due to material deprivation, rather than an intentional violation; the second factor, phenomena related to violations of family and religious norms; and the third, made up of the educational deviance of adults variable. QCA enables definition of the configurations of causal conditions (combinations of latent factors) which implies, in the sense to be consistent sets, high homicide rates.

The configurations of qualitative levels (high/low) of the three devianceness factors associated to the qualitative levels of homicide rates emerge. The resulting configurations show the relevance of social control (particularly family-religious), measured indirectly by the devianceness factors over the homicide rates. It is revealed that higher family-religious devianceness combined with high adult educational devianceness is the most relevant and consistent causal combination for the high homicide rate for every year. That is, CMAs with higher proportions of family-religious devianceness, combined with higher proportions of adult educational devianceness, are consistent with higher homicide rates.

The next section provides the theoretical arguments based on the economic literature of institutions, particularly informal institutions literature. Section 3 presents the empirical strategy

² "Comparable minimum areas" (CMAs) form a panel of geographic areas, enabling consistent comparisons, at two or more points in time, of social, economic and demographic information at the municipal level (Reis et al. 2010).

with a exploratory statistical technique and a configurational analysis, as well as it deals with the set of characteristic variables. Section 4 discusses the main findings. The paper concludes with some summary remarks.

RELATING DEVIANCE AND CRIMINAL DENSITIES

It can be assumed that crime levels in a society are related, although indirectly, to their deviance levels. Firstly because they derive from similar decision-making processes, since they follow a subjective comparison mechanism (perceptions) of the benefits and costs of the decision for the violation, involving negative sanctions and a level of effectiveness of the effects of legal and social control (Becker, 1968; Ehrlich, 1996; Kim and Lee, 2001). Secondly, because they are decisions which imply social costs, although in distinct scales of impact on society. While the social costs of deviance directly affect the individuals and organizations close to the deviant, the social costs of the crimes affect society as a whole, requiring state apparatus for control and combat. In taking crime as a complementary activity or alternative to obtain an income (even non-pecuniary), the individual requires parameters in order to compare the returns of legitimate activity with those of illegitimate activity (Becker, 1968). An evaluation of the legitimate returns is more direct because there is relatively widespread information on labour markets; the same cannot be said for the illegal markets. An evaluation of illegal returns should consider information related to the benefits and costs of execution, costs of arrest and conviction and moral disutility. Not only the contumacious criminal but, primarily, the potential criminal, needs to collect information on the benefits and costs of the specific illegal act which s/he wishes to carry out. Therefore, the experiences of other individuals are particularly informative in the decision-making process.

Social interactions and socialization are essential in agents' decision-making processes (Glaeser and Scheinkman, 2002; Bisin and Verdier, 2011); including adhesion and/or violation of laws and social norms (Kim and Lee, 2001; Heavner and Lochner, 2002). The information available and transmitted on social networks and/or by media, including the transfer of knowledge and beliefs related to social control systems, through investments in human and social capital (Becker, 1975; Durlauf and Fafchamps, 2004), serve individuals in their daily choices and to update their mental models of interpreting the environment (Denzau and North, 1994). This structure is also applicable to illegal and anti-social decisions.

Since the violation of penal laws is a relatively riskier act than violating social norms, because they incorporate the expected costs of arrest and conviction, their decision requires additional credible information. The crime and deviance practiced by other individuals may contain this information. The criminal decisions which did not bear these costs and the deviance decisions which did not suffer sanctions transmit information that the net benefits of these actions suggest they were positive; especially when the number of violators increases, indicating greater dissemination of these phenomena in the community. The information implied is that there are lower levels of state and social control in society, respectively. The criminal will evaluate the "price" of an additional crime from the "prices" of acts of a similar nature, their own deviant behavior and crimes and those of others, which are environmentally diffused.

The social controllers (coactivity), by administering negative sanctions and socializing negative beliefs regarding violation (and positive with regards to adhesion), imposes a generic negative incentive (Ehrlich, 1996) for rules violation, acts as a primary barrier to entering into illegal activities (Wynarczyk, 2002). Thus, it acts complementarily to state deterrence (or coercivity), established to control and combat the most extreme violations. However, more evidence of deviance and crimes have indicated, respectively, less social and state deterrence, because it would increase social and state controllers' *per capita* efforts of pro-norm and pro-law monitoring activities. Every social controller would perceive the increased cost of separately administering the appropriate negative sanctions, when others do not do it, reducing the probability of the violator being morally punished.

Potential transgressors will take advantage of this favorable change in reducing the expected moral cost of deviance, by observing the relative ineffectiveness of the social control system. *Ceteris paribus*, the reduction of this cost is carried to decision-making in crimes, being a similar activity, through the "moral cost" component of the illegitimate act. It becomes "cheaper" to violate rules, even if the expected costs of arrest and conviction and of execution remain stable. It is not the real coactivity and coercivity levels in the environment which matter in the criminal decision-making process but the perceived ones (Heavner and Lochner, 2002). The deviance "density" could provide guides to the potential criminal of the magnitude of the expected moral cost of violating rules.

There are studies which link crimes; others, crimes are conditioned by criminogenic elements, such as illegal possession of a firearm and taking illicit drugs. It is noted that the criminogenic elements considered conditioning factors of violent crimes are decisions which also constitute crimes. Being crimes, their criminogenic elements require exploration; it could be considered "deviance elements" of criminogenic elements. Empirical instances have been identified between deviance and crimes (Ellis et al., 2009; Buonanno et al., 2012; Keuschnigg and Wolbring, 2015). Some studies link crimes and private decisions, which reflect the violation of rules in the family, educational and religious spheres, such as single parenthood, particularly for females, pregnancy in young girls, children and young people's school dropout and irreligiousness (Comanor and Phillips, 2002; Lochner and Moretti, 2004; Johnson and Jang, 2010).

These phenomena partially make up the deviance "density" of a society, since they indicate violations which took place in a restricted set and the circumstances of individual actions. It seems appropriate to expand the group of transgressions which reflect the deviance density of a location. Other social phenomena in the decision-making spheres of the family/home, school, religious group, and others, could also be selected to produce measures which capture both the deviance density and indirect effect of social coactivity, although they are not necessarily directly related to the crime, such as divorce, juvenile marriage, non-religious union, school drop-outs by adults and illegally disposed waste.

Naturally emerges the controversial question about these phenomena as social deviance, even though it does not seek to make value judgments of the individual decisions underlying them. Some of these may derive from social rights and needs which, according to Kerstenetzky (2012), are justified and legitimized, limited to the fact that market economies generate social costs with diffuse causes and effects. However, they stem from economic and social decisions involving cultural and social conditions, such as stigmatizing, discriminatory or segregational socially shared norms and practices, which restrict the access of specific social groups to the resources available, leading them

to low quality resources or even curtailing potential enjoyment. Nor is the cultural nature of the rule violation overlooked, especially with regards to Brazil, in which the issue of transgressive culture may return to public debate (Cardoso and Moreira, 2008).

The suggested phenomena give rise to the violation of rules in their respective areas, even though the social sanctions associated to them cannot be identified and were not necessarily administered (Posner and Rasmusen, 1999). They appear to conform to the concepts of social norms; they refer to actions in which people have control and are supported by shared expectations regarding what is prescribed in different social situations; they allude to situations opposing self-interest, when reciprocity and cooperation are required, or doing something which involves bearing the material cost or give up some benefit. Therefore, they are phenomena which lead to conflicts of interest, but have the potential for mutual gain (Bicchieri, 2006; Elster, 2007). An additional justification for taking these phenomena as social transgressions could be based on the empirical dimension. Some factors which condition criminal activity also predict other social problems (Ellis et al., 2009). Therefore, the term “deviance”, or alternatively “transgression”, is used with an instrumental purpose in order to group several decisions with a similar nature (involving rule violation and administering sanctions), in a single category open to scientific analysis.

METHODS AND DATA

The empirical strategy comprises two successive stages; exploratory factor analysis is used in the first, to summarize the deviance-criminal characteristics of the populations in the CMAs in latent dimensions. The second stage comprises the application of qualitative comparative analysis (QCA), which uses the latent factors (interdependences) of the measures of transgression and crime, extracted from the factorial models, as the conditions required and/or sufficient for the homicide rates.

The factorial model assumes that the deviation of each variable in relation to its average is measured by a deterministic part, linearly dependent on m latent and non-observable variables (common factors), F_1, F_2, \dots, F_m , and a random part, which are the specific p factors, $\varepsilon_1, \varepsilon_2, \dots, \varepsilon_p$, constituted in the specific variation sources; in the matricial form $(\mathbf{X} - \boldsymbol{\mu})_{p \times 1} = \mathbf{L}_{p \times m} \mathbf{F}_{m \times 1} + \boldsymbol{\varepsilon}_{p \times 1}$, such that $\mathbf{L}_{p \times m} = \{\lambda_{ij}\}$ e λ_{ij} is the factor loading of the i -nth variable in the j -nth factor. By the principal components method, if $m < p$, the correlation matrix is $\boldsymbol{\Sigma} \cong \mathbf{L}\mathbf{L}' + \boldsymbol{\Psi}$, where $\mathbf{L}\mathbf{L}'$ is the common variance and $\boldsymbol{\Psi}$ the specific variance. Applying spectral decomposition on $\boldsymbol{\Sigma}$, the factor loading matrix under this method can be found. When the data is not multivariate and normally distributed, Bartlett's approach is used (Johnson and Wichern, 2007).

QCA is a new method and has little empirical application in economic studies, particularly those on crimes (Thiem and Dusa, 2013) but its nature of addressing complex causality, it has proven to be suitable to investigate the causes and conditions of crime. In QCA the concept of causality cannot be mistaken with the concept of causality of regression analysis because it draws on possible multiple configurations (multicausality) potentially present (or absent) for the same phenomenon (Drass and Miethe, 2001). The phenomena whose relation is empirically determined are represented by sets of real numbers called “causal conditions” and “result”, similar to “explanatory/independent

variables” and the explained/dependent variable in regression analysis. However, the nature of the causality is distinct, since it involves the concept of complex causation, which is made up of three dimensions: equifinality (combinations of conditions may lead to a single result), conjunctural causality (conditions do not necessarily lead to the result in an isolated way from another but they may be combined to reveal causal patterns of a result) and asymmetric causality (not only the occurrence of the phenomena requires separate analysis but also its absence because the presence/absence of the conditions may produce differences in the result). The term “relation” refers to the set relation – result set with combinations of the causal condition sets – and not, as occurs in conventional statistics, as a correlation (Schneider and Wagemann, 2012). Thus, the terms “imply”, “explain” and “cause” synonymously mean the “consistent subset”; on the other hand, the term “causal relation” is the multiple conjunctural causation. The solutions in QCA do not “prove” causal relations, but reveal patterns of association between sets, contributing as an initial stage to investigate the existence of causal relations (Schneider and Wagemann, 2010).

An evaluation of the empirical matches between the sets by QCA variant with fuzzy sets (fsQCA), incorporating the qualitative and quantitative dimensions of each measurement, ranks the units of observation according to the magnitude of the transformed score of each of the “causal conditions” and “result” sets. This fuzzy transformation requires definition of the qualitative anchors (calibration), which are the boundaries of belonging to the subsets of each set. The establishment of scores of belonging for the cases in each set involves the combination of empirical evidence and theoretical knowledge. The qualitative anchors cannot be exclusively defined from the empirical information or are based on knowledge external to the data (Schneider and Wagemann, 2012).

The adequacy of the fsQCA solution final requires consideration of the cutoff frequency criteria of the cases, the consistency cutoffs for the complex combinations in relation to the result and more appropriate selection of the combination of solution consistency and coverage measurements. This procedure is recommended because the final solutions are sensitive to the complex combinations considered in the Boolean minimization stage, and its consistencies for the result (Olsen and Nomura, 2009). The first criterion identifies the more relevant complex combinations (primitive combinations, containing all the conditions and which describe the cases) in representative terms. The second distinguishes the complex combinations which are consistent with the result of those which are not because it uses the consistency measurements to compare the extent to which the cases share each combination of conditions with the result. The third criterion, by comparing the consistency and coverage measurements, derived from the cutoffs selection in the two previously applied criteria, selects the final solution. The first two criteria are executed from the truth table for fuzzy sets (list of the complex combinations, along with the number of empirical instances and consistency measurements for each of these combinations), for each year and the third, from the outcomes of the minimization operations.

Consistency measurements are descriptive measurements to evaluate the force of the empirical support established by the theoretical argument and are the main criterion to validate QCA (Ragin, 2006). They evaluate the level to which the cases which share a specific condition (or combination of conditions) agree with the result and vice-versa. A relation of sufficiency between combinations of conditions and result is established if the majority of cases significantly satisfy this property; when more than 80 per cent of the scores of a specific combination of conditions are consistently lower or equal to their respective membership scores in the result set, then the researcher may state that the causal condition or causal combination is “almost always” sufficient

for the result (Olsen and Nomura, 2009).

The coverage measurements provide quantification of the empirical relevance. They evaluate the level to which a causal condition or combination of causal conditions count for a result; seem the coefficient of determination in the econometric context (Thiem, 2010). Total coverage (or solution coverage) measures the membership proportion in the result which is explained by the final solution, and raw coverage measures the membership proportion in the result, which is explained by each path (simplified combination of the conditions resulting from the entire QCA application process; also called the “causal path”). The unique coverage quantifies the membership proportion in the result which is not covered by the other path. Supposing that there are two conjunctural causations for the result, the unique coverage of the first path is calculated by the difference between the total and raw coverage of the second path. The scores calculated from the measurements may reveal that, even though there are numerous sufficient causal combinations which satisfy equifinality (various paths for a single result), few of them have high coverage.

The transformation of the “homicide rate” and “devianceness condition” sets in a fuzzy set, identification of the consistent logical configurations and solutions are obtained from the Stata/SE 12.0 for Windows program. The truth tables for fuzzy sets and the Boolean minimizations of the complex combinations, in order to find the final solutions, were executed with the fs/QCA 2.5 program.

Information collected from the Mortality Information System of the Unified Health System (SUS) (SIM-DATASUS) and demographic censuses from the Brazilian Institute of Geography and Statistics (IBGE) were used for the empirical procedures. The time period includes the years 1991, 2000 and 2010³, and the geographical coverage of 604 comparable minimum areas. Since optimum level for deviance and crime do not exist for a community, both territorially and over time, the provision of a benchmark would allow comparisons. Cluster and discriminant analyses, by providing validated discriminations of the groups of CMAs by level of transgressions and crimes, enabled identification and to select the sample of CMAs, which are more relevant in deviance-criminal terms, as executed by XXX (2017). The CMAs are not arbitrarily classified but, instead, are classified from their deviance and criminal characteristics. Three distinct groups of high, intermediary and low deviance and crimes were revealed. The set of CMAs belonging to the high and intermediary groups of deviance-criminality with a population size of over 50,000 inhabitants is taken as a sample. The selection of this sample is justified because the social costs of the crimes are monotonically related to the number of crimes (Becker, 1968) and the high crime rates are concentrated in the high population densities (Glaeser and Sacerdote, 1999).

The sample for each year is based on the classifications of population size and groups for 2010, in order to incorporate the CMAs which did not belong to such classes in a specific year but were the following year(s). This procedure has the purpose of allowing an evaluation, in a temporal perspective, both from the compositions of the communalities extracted in the factor analysis, and the combinations of conditions of high homicide rates in the stage of applying fuzzy set QCA. There are two levels of measurements: microdata from the demographic censuses and information on homicides at CMA level. For any variable constructed from censuses, the occurrence rates were

³ Years of the last demographic census.

calculated as percentages of people from the CMA who declared the event, in relation to the size of the population in the CMA.

The demographic censuses provide information which displays individual decisions, made in a previous period or in the year of collection which, under theoretical argument, could be taken as violations of state or organizational rules⁴. The variables are grouped together and tentatively in sets defined according to the field in which the transgression refers or whose adverse effects are more likely to relapse (family, religious, educational and community). Family deviance involve divorce, monoparentality, adolescent pregnancy and juvenile marriages, and address the violations referring to the stability of the organization which provides investments in human and social capital, and division of labour in socializing positive (negative) beliefs of adhering (violating) to laws and social norms; or the violation of norms related to sexual activity or married life before the socially prescribed period. Those from the religious scope, non-religious union and absence of religion, seek to capture the detachment from statistical normality, which is affiliation to a religious organization. Educational deviance are phenomena which display the truncation of investments in human capital, such as school drop-outs by children and young people and adults who have not completed their formal education in the past. The measurement of violating community norms refers to waste disposal. An important aspect of community life concerns the disposal of human and domestic waste. The interest is in the illegitimate disposal of domestic waste such as waste burned and thrown on wasteland or into rivers, lakes or the sea.

Since the intention is to cross-check the influence of social coactivity compared with state coercivity (public law enforcement) on the homicide rates, a variable of the state dissuasive effect is introduced. It is suggested that the percentage of people employed in national defense and public safety activities as proxy for the effectiveness of public police activity (or for the probability of failure in illicit activity), since sentencing and conviction rates at CMA level are not available.

There are problems regarding crime measure (under-reporting and the lack of rates for crimes against patrimony and other disaggregated measurements of crime) and the available information are limited and of a questionable quality. Homicide (intentional) is selected as the proxy for crime, as it is an internationally comparable indicator, the most readily computable and the most robust for the level of safety (UNODC, 2014) and a less under-reported crime. An additional justification for using homicide rates as representative of crime levels is based on the extent of empirical evidence compiled by Ellis et al.(2009), of a high correlation between the various crimes.

The homicide rates were constructed from the number of deaths deriving from third party aggression (homicides) from the International Classification of Diseases sub-categories: CID-9 sub-categories for 1991 and CID-10 for 2000 and 2010 (Appendix Table A). To avoid cyclical fluctuations, the three-year averages were calculated (1990-1992, 1999-2001 and 2009-2011). The use of three-year averages reduces the cases of CMAs with a null *quantum*.

Since statistical analyses of variables which measure events and social phenomena of a given

⁴ Some of the selected phenomena are criminal decisions in Brazil, although they are dealt with here as social norm violations, such as juvenile marriage and, possibly, many cases of pregnancy in young girls (crime of pedophilia), illegal disposal of domestic waste and intellectual drop-outs (children/adolescents not attending school or who dropped out of school criminalizes their parents or guardians).

municipality cannot be adequately executed, nor of evolution over time, if the territorial and population alterations derived from breaking up and/or annexation are disregarded, then the concept of “comparable minimum areas” is employed (Reis et al., 2010).

There is the question of low frequency phenomena, particularly in small populations (phenomena with a null frequency or is close to zero in many CMAs are “adolescent pregnancy”, “juvenile marriage”, “population without a religion” and “homicide”). It is inappropriate to use gross rates (percentage or rate per 100,000 inhabitants), as it leads to poorly represented estimates with a high variability. The solution is to replace them with measure calculated by Bayesian smoothing techniques or empirical Bayes estimators, based on corresponding information of the municipality’s neighborhood (Pringle, 1996). The queen contiguity matrix is selected because is less restrictive than the rook matrix, as it considers information from neighboring CMAs. Spatial empirical Bayes rates were obtained from the Institute of Economic and Applied Research’s IPEAGeo program, version 2.1.15_04_17.

RESULTS

Devianceness factors

Apart from prior analysis of the sample distributions⁵ and correlation coefficient matrixes, the satisfactory application of factorial analysis also requires analysis of the adequacy of the variables (Johnson and Wichern, 2007), comprising evaluating the determinant of the variance-covariance matrix, value of the Kaiser-Meyer-Olkin (KMO) criterion, Bartlett’s test of sphericity and Cronbach’s alpha (1951). Evidence indicates that multicollinearity is not present⁶, that the variables are intercorrelated (there are statistically different coefficients of zero in the correlation matrix) and the KMO sample adequacy measurements for 1991, 2000 and 2010 are equal to 0.799, 0.797 and 0.757, respectively. Therefore, the data can be represented in lower dimensionality.

The statistical tests for each year⁷ suggest using the principal component method to extract the common factors, as multivariate normality is not verified. The Kaiser’s Varimax method (1958) is applied for every year, orthogonally rotating the factor loadings in order to facilitate interpreting the models; and the least squares method is used, weighted to estimate the factorial scores. The 1991, 2000 and 2010 information matrixes enable factorial models with three common factors (Table 1) to be selected.

⁵ Analyses of original variable distributions, with the assistance of Kernel density graphs and statistical tests (Shapiro-Francia and symmetry and kurtosis tests) identify assymetrical distributions. Transformations of the original variables with the Box and Cox method lead to symmetrical distribution for a number of variables (divorce in 1991, monoparentality in 2000 and population without religion in every year). Non, uni and multivariate normality of the distributions make application of the maximum likelihood method impossible (Johnson and Wichern 2007).

⁶ The determinants of the variance and covariance matrixes are higher than 0.0001.

⁷ Lawley (equal correlation coefficients), Jennrich (variable independence), Mardia *mSkewness*, Mardia *mKurtosis*, Henze-Zirkler and Doornik-Hansen (normality) statistical tests.

Table 1. Devianceness Factors (1991, 2000, 2010)

Variable	Devianceness by incapacitation			Family-religious Devianceness			Adult educational Devianceness		
	1991	2000	2010	1991	2000	2010	1991	2000	2010
Divorce	<u>-0.48</u>	<u>-0.91</u>	<u>-0.91</u>	<u>0.78</u>	-0.04	-0.14	-0.04	0.12	0.10
Monoparentality	<u>-0.66</u>	<u>-0.44</u>	-0.26	<u>0.50</u>	<u>0.53</u>	<u>0.60</u>	-0.22	-0.33	0.38
Adolescent pregnancy	<u>0.81</u>	<u>0.86</u>	<u>0.84</u>	0.30	0.34	0.33	0.01	-0.16	-0.23
Juvenile marriage	<u>0.72</u>	<u>0.82</u>	<u>0.79</u>	0.27	0.33	0.36	0.03	-0.04	-0.24
Non-religious union	0.27	0.14	0.38	<u>0.82</u>	<u>0.89</u>	<u>0.66</u>	0.09	0.17	0.18
Population without a religion	0.10	0.19	0.16	<u>0.78</u>	<u>0.87</u>	<u>0.89</u>	0.32	-0.07	-0.16
School drop-outs by children and young people	<u>0.89</u>	<u>0.85</u>	<u>0.76</u>	-0.13	0.02	-0.06	0.08	0.28	-0.15
Not completed formal education by adult people	0.03	-0.08	-0.16	0.10	0.05	-0.03	<u>0.96</u>	<u>0.94</u>	<u>0.95</u>
Illegally disposed waste	<u>0.87</u>	<u>0.90</u>	<u>0.89</u>	-0.09	-0.06	-0.09	-0.02	-0.02	-0.01
Eigenvalues	3.48	4.02	3.79	2.34	2.06	1.85	1.09	1.15	1.25
% of the total variance	0.39	0.45	0.42	0.26	0.23	0.21	0.12	0.13	0.14

Source: Autor's elaboration

Note: Factorial model statistical tests

1991 - Cronbach's test: 0.7533; Kaiser-Meyer-Olkin (KMO): 0.7404; Bartlett's test: 3070.119 (p-value = 0.0000).

2000 - Cronbach's test: 0.8032; KMO: 0.799; Bartlett's test: 3694.566 (p-value = 0.0000).

2010 - Cronbach's test: 0.8278; KMO: 0.7706; Bartlett's test: 3442.648 (p-value = 0.0000).

For 1991, although Kaiser's criterion suggests retaining two factors with higher eigenvalues than the unit, observation of the screeplot reports a third factor as the eigenvalue equal to 0.9994. Factors 1, 2 and 3 represent 38.62, 26.02 and 12.12 per cent of the information matrix's total variance, accumulating 76.76 per cent. For 2000, the factors comprise 80.34 per cent of the total variance, with specific variances lower than 0.42 (the monoparentality variable has a specific factor of 0.4203, but was not removed from the model). It is noted that the divorce variable has an almost null factor loading in the second factor, but gains magnitude (negative) in the first factor; while the opposite occurs with monoparentality. In the 2010 data, 76.49 per cent of the total variance are expressed by the factors and the communalities are higher than 0.61⁸, except for monoparentality, with a specific factor of 0.4331. The distinction, in relation to those of 1991 and 2000, is that the monoparentality factor loading becomes less negative, ceasing to be part of the first factor. In each year the first three factors satisfy Pearson's criterion, since they accumulated more than 70 per cent of the data total variation.

The pattern which emerges in the three years defines common factors for the deviance-crime rates with relatively stable compositions over twenty years. As well as interpreting the model for each year, this enables an intertemporal analysis, although cautiously, since the compositions of the first and second factors do not maintain a constant nature over time. This relative stability in the communality of the transgressions enables a characterization of each of the common factors on account of the similarities of the 604 CMAs. In the three years, the first factor groups together the young people's family deviance, child-adolescent education and community transgression measurements, with subtle differences; the second factor summarizes the family (adult) and

⁸ The juvenile marriage variable is slightly higher than 0.40 (0.4031) but was not removed from the model.

religious deviance and the third factor is exclusively comprised of adult educational deviance. The magnitudes and indicators of the variable factor loadings do not change significantly over the years.

The first factor indicates that comparable minimum areas with higher (lower) pregnancy rates for young girls, juvenile marriage, school drop-outs for children and adolescents and illicit waste disposal have positive (negative) factor scores and those with higher (lower) divorce and monoparentality rates have negative (positive) scores. Thus, CMAs with high family deviance rates also have high school drop-out rates for children and young people and for illegal waste disposal, but low rates for divorce and single parenthood. Before configuring relations between violations of family, educational and community norms, deriving from a possible lesser effort of negative social sanctions by social controllers (family, school and the community), the correlations between the variables which make up this factor display material deprivation. Thus, this factor could be defined as “devianceness by incapacitation”.

From the standpoint of each variable which makes up this first factor, the factor loading of the divorce variable decreases in magnitude in 2000, when compared with 1991, and stabilizes in 2010, indicating that it is increasingly more inversely correlated to the others over time. The continuous annulment of the magnitude of the monoparentality loading indicates cancellation of the correlation with the other variables which make up this factor. However, it is observed in 1991, in the second factor, which summarizes family-religious devianceness that this variable continues to be highly correlated with divorce, but is disassociated from 2000. The possible justification is in the distribution of the adult population among the other conjugal alternatives (for example, cohabitation, which has increased over the last twenty years, and the status of being single. These trends show that divorce and single parenthood, which were related in the past, are not necessarily due to the decision-maker’s material deprivation.

The relation between pregnancy of young girls and juvenile marriage, besides arising from responses to economic and educational deprivation, may still indicate the level of socialization of these deviances. To the extent that juvenile sexuality is associated to the socialization process among young people (Madeira et al., 2014), although parents instill positive beliefs of norms associated to sexual activity in the adult phase, oblique socialization of opposite beliefs, especially from their peers, causes a conflict of values. It is noted that family transgressions are associated but not in a uniform pattern. Juvenile family deviance are positively related, but jointly they are inversely related to adult family deviance which, in turn, are positively related. This inverse relation between the two classes of family deviance is unexpected, since it is conjectured that the reduction in the expected moral cost of transgression would positively impact transgressions within the CMA.

While the factor loadings of the “illegal waste” variable remain stable over time, those for school drop-outs for children and young people decrease slightly, losing the correlation with the others. This appears to stem more from the effort to universalize education during the 1990s and the conditions of income transfer programs (Neri, 2009), than the increase in the moral cost expected from dropping out of school.

The second factor, called “family-religious devianceness”, delimits the interdependences between the family (adult) and religious transgression variables, so that the CMAs with higher (lower) rates for divorce, single parenthood, non-religious unions and population without religion are related and have positive (negative) scores. By linking the four variables with higher factor

loadings, it appears to reflect the low cost of transgressing family and religious norms. All other things being equal, it is morally less costly to raise children who suffer paternal abandonment, divorce in non-religious unions and not affiliate to a religion in contexts of the low effectiveness of family and religious organizations coactivity, which is more common in higher population densities. In these contexts, the most frequent social interactions, particularly with weak ties and high information flow, generalized normative innovations (Granovetter, 1983; Glaeser and Scheinkman, 2002; Heavner and Lochner, 2002). In the more populous CMAs, the moral disutility expected for violating norms is relatively less than in the CMAs with lower population sizes. Firstly, because the impersonal and not repeated interactions increase an individual's anonymity in them, reducing the probability that s/he suffers negative social sanctions; secondly because the type, magnitude and extent of the sanction are mitigated by the free ride effect, which adversely influences the isolated effort of each controller, reducing the force of community and even family coactivity.

The expansion of family (adult) and religious transgression rates over twenty years suggests that there was a reduction in activities of negative sanctions to their transgressors and socializing positive beliefs of adhering to their norms by religious organizations, particularly with respect to seeking positive religious sanction for a marital union and maintaining that union over time. The high correlation between non-religious union rates and those for the population with no religion is expected. People without religion do not seek positive religious sanctions for marital agreements but legal endorsement. These unions are relatively less costly to dissolve, as they involve a lower number of agents, limiting the reach of negative externalities generated; for example, they dispense with intermediation by a religious organization. Being less stable, they result in separations and divorces, including part of monoparentality phenomenon.

While the other variables remain closely related throughout the years, the divorce variable suffers an abrupt reduction in its factor loading from 1991, becoming more negatively related to the others. This could characterize the loss of transgressive content of decisions on marital dissolution. The factor loading of a "non religious union" grows in the 1990s and decreases in the following decade. Given that cohabitations, which have risen significantly since 1991, are included in this variable, and perhaps are, as is taking place with divorce, gradually ceasing to be considered a family-religious deviance. Lastly, the "population without religion" variable loading increases in the first decade and then stabilizes. These relations and trends reflect secularization of the Brazilian population in the same period (Neri, 2011). The migration between Christian denominations, particularly Catholic to Evangelical, although maintaining a common Christian institutional matrix, they differ with regards to the norms of ecclesiastical organizations; for example, Evangelical churches are less rigid than the Catholic Church about divorce.

The third factor is characterized by the factor loading of the past adult school drop-outs variable. Its isolation from the other variables (for example, school drop-outs for children and young people variable in the "devianceness by incapacitation" factor) suggest that the deviance in the educational area do not involve such restrictive moral considerations as the family and religious areas. The low correlations between the school drop-out variables do not provide empirical support to the hypothesis that decisions to violate educational rules are positively related, deriving from the low level of family and educational organizations coactivity. Evidence of a reduction in school drop-outs since the 1990s is more the result of governmental efforts to criminalize educational transgressions of children and young people, prohibition of non-schooling and financially encourage the maintenance of educational practices for children and young people (Neri, 2009), than a

conscious family effort to socialize positive beliefs of these practices and administer negative sanctions for their violation.

Homicides, social coactivity and state coercivity

In the second stage of the empirical strategy, the common factors – “devianceness by incapacitation”, “family-religious devianceness” and “adult educational devianceness” –, along with law enforcement condition, are considered as conditions to apply fsQCA, in which the scores are used to verify if they demonstrate relations of sufficiency with the result variable (homicide rates). If positive, then potentially they are causal relations of high (or low) homicide rates and present empirical matches between the conditions and the result. It is observed that the fsQCA solutions do not prove the existence of causal relations but reveal the patterns of empirical association between the fuzzy sets, which may, in turn, serve to support the existence of causal relations established in theoretical literature (Schneider and Wagemann, 2010).

To defining the qualitative anchors for the set of homicide rates, the measurement of 10 homicides per 100,000 inhabitants could be used, which is the criterion defined by the World Health Organization, as the indifference point between the disjointed subsets of high and low homicide rates. However, the sample has more consideration for the high rates in detriment to the low ones. For the “devianceness by incapacitation”, “family-religious devianceness” and “adult educational devianceness” causal conditions, there is no boundary which positions each CMA in each set; nor empirical evidence and theoretical recommendation for this. Furthermore, as they represent concepts involving decisions which generate externalities, whose socially optimal magnitudes vary from community to community (Ehrlich, 1996), restricted by the expected social coactivity in the case of transgressions, and expected state coercivity in the case of crimes, these sets with arbitrarily established anchors cannot be dichotomized. It seems appropriate to use standard calibration with three qualitative anchors – 1 (full membership), 0.5 (indifference point) and 0 (full non-membership) – for fuzzy transformation of the sets of homicide rates and devianceness factors and to verify the sufficiency and necessity conditions by Boolean algebra.

The creation of configurations requires that all the variables are represented by a letter; capitals (lowercase) indicate the high (low) scores of cases (CMAs) in each of the fuzzy sets. Since the nature of the common factors, especially the first and second factors extracted in the factor analysis stage, do not remain constant over the three years, these distinctions are preserved at this methodological stage: homicide rates per 100,000 inhabitants (H), devianceness factor by incapacitation (A for 1991 and 2000 and E for 2010), family-religious devianceness factor (B for 1991 and D for 2000 and 2010) and the adult educational devianceness factor (C for every year); the state coercivity measurement – rate of persons employed in national defense and public safety, called “law enforcement” is denoted by the letter Z.

The coincidence matrixes (Table 2) demonstrates that the isolated “family-religious devianceness” condition B in 1991 and D in 2000 and 2010, is the most highly correlated, with high homicide rates (H); followed by law enforcement, except for 2010. The “high family-religious devianceness” (B/D), for example, would be the most suitable condition leading to high homicide rates, as approximately 79 per cent of these two sets are shared (coincident). The association between “high homicide” and “high law enforcement” is unexpected, faced with the theoretical implication of the inverse relation between crime and the dissuasive effect of the punishment

expected (Becker, 1968). This enables us to consider the presence of endogeneity between law enforcement and crimes, but the measurement used as the proxy for state coercivity groups together the people occupied in public safety activities and those in national defense activities, with greater representativeness in the higher population densities (particularly the state capitals).

Table 2. Coincidence Matrixes (1991, 2000, 2010)

1991						2000						2010					
	H	A	B	C	Z		H	A	D	C	Z		H	E	D	C	Z
H	1					H	1					H	1				
A	0.69	1				A	0.67	1				E	0.76	1			
B	0.79	0.68	1			D	0.79	0.67	1			D	0.79	0.66	1		
C	0.7	0.67	0.68	1		C	0.68	0.7	0.67	1		C	0.69	0.7	0.67	1	
Z	0.74	0.57	0.76	0.68	1	Z	0.72	0.6	0.73	0.68	1	Z	0.68	0.61	0.72	0.69	1

Source: Autor's elaboration

The law enforcement (Z) condition also reveals a higher share, particularly with high family-religious deviance rates of between 72.2 and 75.8 per cent. If this devianceness condition reflects low family-religious coactivity, then the high association between them support Cooter (2000) arguing that laws serve to correct the failures existing in “social norm markets”, and Wilson (1983) that laws become more important when informal social control becomes less important. Therefore, lower social coactivity may require greater state coercivity and in agreement with what was conjectured regarding the complementary relation between these dissuasive effects.

From the set theory, it is known that if there are k elements, then 2^k possible logical combinations are obtained. Therefore, the three conditions generate sixteen possible logical combinations for every year, which lead to high and low homicide rates. The selection of more appropriate consistency-coverage pairs leads to final solutions with consistencies higher than 0.75 (Ragin, 2008), presented in Table 3. With slight differences in the A/E and B/D conditions, the final solutions are equal every year, except for an additional solution term in 2010. High incapacitation and family-religious devianceness (AB, AD and ED) or high family-religious devianceness and high state coercivity (BZ and DZ) are always present, implying a high homicide rate. In 2010, besides these solution terms, there is a further logical path for the high homicide rate, which is high incapacitation and adult educational devianceness, combined with low law enforcement (ECz).

Before interpreting these solutions, the relative importance of each path and the final solutions should be measured. The total coverage quantifies that a minimum of 72.4 per cent of the cases overlap the multiple causal configurations with the set of high homicide rates (H) and the representativeness of each causal path is less similar between them. In 1991 and 2000, the conjunctural causation “high family-religious deviance and high state coercivity (BZ and DZ)” is more relevant to imply high homicide rates than the alternative path (AB and AD), but loses importance over time. On the other hand, its unique coverage is always higher than the others, at between 13 and 19 per cent, indicating the specific influence of the family-religious and state dissuasive combined effects to express high homicide rates. These adjustment measures provide evidence that the deviance conditions configurations imply high homicide rates.

Table 3. Final solutions for the high homicide rate (1991, 2000, 2010)

Year	Configuration ^a	Consistency	Coverage ^b	
			raw	unique
1991	AB	0.848	0.573	0.122
	BZ	0.847	0.639	0.188
2000	AD	0.824	0.553	0.150
	DZ	0.863	0.574	0.171
2010	ED	0.918	0.607	0.075
	DZ	0.826	0.551	0.129
	ECz	0.847	0.467	0.080

Source: Autor's elaboration

Note: ^a Solution consistency: 0.812 (1991), 0.817 (2000), 0.803 (2010).

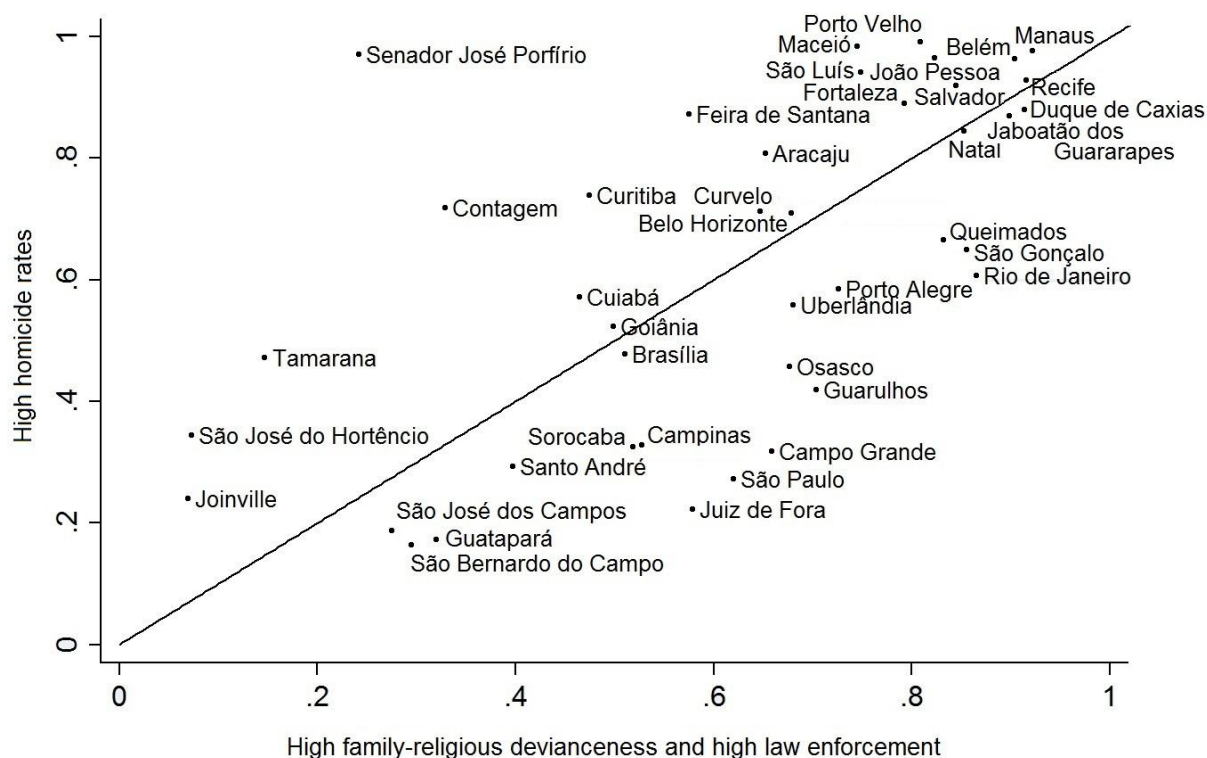
^b Solution Coverage: 0.761 (1991), 0.724 (2000), 0.815 (2010).

The conjunctural causation “high family-religious devianceness and high law enforcement (BZ and DZ)”, which is relatively more important, particularly regarding its specific weight in explaining high homicide rates, seems to reinforce the qualitative influence of the effects of social (family-religious) and state sanctions combined, to deter illegitimate activities. If laws (penal) correct failures or weakening of informal activities of negative sanction (Wilson, 1983; Cooter, 2000) by social controllers (Posner and Rasmusen, 1999), when the social norms cease to complement laws (North, 1990), then lower social coactivity may require greater state coercivity. In the three years, high incapacitation and family-religious devianceness (AB, AD and ED) lead to high homicide rates. This empirical instance is in line with the hypothesis that high deviance density is associated to high crime rates. In addition, if high devianceness by incapacitation reflects high material deprivation, then it also fits with the hypothesis of the relation between poverty and crime. This perspective is only feasible if associated to low family-religious coactivity. Lastly, the additional configuration, which arises in 2010, of “high incapacitation and adult educational devianceness with low law enforcement (ECz)”, although less representative, suggests that high material deprivation, a low level of adult education and low law enforcement imply high homicide rates. Therefore, it is a well-adjusted configuration for economic crime literature which evaluates the effect of poverty and education on crime.

For illustrative purposes, the diagram in Figure 1 shows the relation of sufficiency among the condition “high family-religious devianceness and high law enforcement” and the result “high homicide rate” in 2010, for the CMAs with more than 500,000 inhabitants.

Although police activity has a superior dissuasive capacity than social dissuasion, the functional aspect of non-penal rules, as a primary dissuasive effect to illegitimate acts and complementary to legal control, in a potential criminal's decision-making process, cannot be ignored. There is evidence that family-religious-educational coactivity could act as a barrier to entering into an unlawful life (Winarczyk, 2002).

Figure 1. Sufficient “high family-religious devianceness and high law enforcement” for “high homicide rates” in more populous CMAs (2010)



Source: Autor's elaboration

CONSIDERAÇÕES FINAIS

The main purpose of this paper was to examine the relationship between social and state deterrence and crime in Brazilian comparable minimum areas in the years 1991, 2000 and 2010. The hypothesis of the common structure of the decision-making processes of criminal behavior and deviant behavior substantiated empirical strategy, so that the interdependences underlying the transgressions were conjectured as indirect measures of social control, and compared with the homicide rates. Selection of the phenomena, even if controversial, was justified based on its adequacy for the concept of social norms and violating rules; its relevance in the decision-making process in people's social and economic lives, in the sense that they are decisions with current and futures adverse effects, as well as potentially generating social costs; and empirical evidence, such as predictive factors of crime. It drew on the phenomena which could be observed, such as a divorced person, a single mother/father, young woman with children, juvenile marriage, a person in a non-religious union, person who declared that they had no religion, child/young person not attending school, adult who has not completed a formal education and a person who illicitly disposed of their domestic waste, directly taken from the demographic censuses of 1991, 2000 and 2010; and homicides (death by thirty party aggression), from the Mortality Information System of the Unified Health System (SUS) (SIM-DATASUS).

An empirical strategy in two stages was used; in the first, factor analysis provided the deviance-criminal interdependences, which are the inputs for qualitative comparative analysis. The results indicate three common factors for all the years, called “devianceness by incapacitation”, “family-religious devianceness” and “adult education devianceness”. If these three latent devianceness indirectly reflect levels of social coactivity, then they could be taken as causal conditions and compared with the homicide rates. QCA uses the devianceness conditions and homicide rates as fuzzy sets,. Of the various combinations of conditions, “high family-religious and adult educational devianceness” persistently implies (meaning “consistent subset”) a high homicide rate between 1991 and 2010 in the 604 Brazilian CMAs. Evaluation of the effect of high state deterrence in isolation does not imply low homicide rates. However, from the large share of high family-religious deviance (or low family-religious coactivity) and high state coercivity, two relevant results emerge: that the combination of both implies high homicide rates and that this combination appears to demonstrate that laws become more important when informal social control becomes less important. Possibly, lower social coactivity may require a relatively more effective dissuasive mechanism.

The results do not imply that we should criminalize decisions selected as deviance, by some public policies or institutional changes. Otherwise, a police state is formed, due to state interference in private decisions. It is a more subtle issue. When the legislative authorities change laws related to family organization, they alter incentives for decision-making processes within this organization; altering the maintenance of organizational stability, the division of domestic labour, including investments in human and social capital, and socializing beliefs regarding social norms. Promoting penal-judicial-police reforms and disregarding the force of the effect of social coactivity could be as reckless as promoting reforms of traditional social organization, ignoring the dynamic of specific incentives to direct its members’ choice of social and economic life; because the structures to penalize rule-violating behaviors may be interdependent.

This research has a number of limitations. Consider a single measurement of crime (homicides), although it is the most robust measurement of crime levels. The limited set of social phenomena to extract the common factors appears to be less than adequate; work environment deviance (for example, job abandonment, just cause for dismissal and others), economic crimes (illicit act committed by an individual or group of individuals to obtain a financial or professional advantage), crimes against patrimony, and others, were not considered. Some aspects were abstracted, such as the influence of migration on the transgression and crime rates and on the dynamics of social interactions and mechanisms of socializing positive beliefs of adhering to rules and negative beliefs regarding their violation.

By way of application and extension, an immediate application would be to use other crime measurements (against patrimony and non-lethal violent crimes) as a joint result in QCA, in order to verify if the combinations of consistent causal conditions for homicides are also preserved for these measurements. Furthermore, extending the set of criminal factors beyond devianceness factors measures is suggested, for example, positive incentives to criminal practice as the causal conditions.

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Appendix Table A. List of variables, abbreviations, form of construction and source.

Classes of rule violation	Variable	Variable construction
Crime	Homicide ^a	Consolidation of the number of deaths by homicide and injuries intentionally caused by another person (sub-categories E960-E978 of CID-9) and aggression, physical blow and lethality of firearm with an undetermined intention (sub-categories X85-Y09; W50; W32-W34 of CID-10); three-year average (current, previous and next years).
	Divorce/legal separation	Population of those who are separated, legally separated and divorced, calculated from the “separated”, “legally separated” and “divorced” categories of the question which refers to marital status.
Family context	Monoparentality	Adults with children and without a spouse: for 1991, the declarations of people who said they did not have a spouse (“person who does not live with a spouse”) and have children was used. For 2000 and 2010, the “woman without a spouse and with children” and “man without a spouse and with children” categories of the question which refers to the type of family.
	Adolescent pregnancy	Women aged between 10 and 17 who declared that they had children.
	Juvenile marriage	People aged between 10 and 14 who declared that they “live” with a spouse/partner.
Religious context	Non-religious union	People who declared that their union is a non-religious union or cohabitation.
	Population without religious	People who declared that they did not have a religion.
Education context	School drop-outs by children and young people	People aged between 5 and 18 who do not attend a school or pre-school.
	Not completed education of adult people	People aged over 18 who did not complete the last grade in which they were enrolled.
Community context	Illegally disposed waste	People who declared that their waste is burned or thrown on wasteland or into a river, lake or the sea.
State dissuasive effect ^b	Law enforcement	People employed in national defense and public safety activities.

Source: Autor’s elaboration

Note: ^a Source: SIM-DATASUS; Other variables: Census/IBGE.

^b Variable that does not consist a classe of rule violation, but is used as a causal condition in the QCA.