Does Economic Inequality Breed Murder? An Empirical Investigation of the Relationship between Economic Inequality and Homicide Rates in Canadian Provinces and CMAs

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Objective

- Inpact of Economic inequality - topic of scrutiny in social science research as well as media attention.
- Research generates empirical links between economic inequality and social outcomes, such as homicide rates and health status.
- What do we see in Canada?
- The level of geography - Provincial (regional) versus City

Evaluation of Literature

Previous research - greater economic inequality and higher homicide rates

- Especially at the national or regional level - inequality affects homicide rates, whereas a society's average income level does not.
- Relative rather than absolute economic deprivation that is the key determinant of homicide rates

However, this relationship is not always apparent when more disaggregated data at the city or municipal level is used. Indeed, the choice of data in terms of its level of aggregation can affect results.

- Time span and geographic coverage do seem to be factors in the results

Summary of Our Findings

- Longitudinal Canadian Provincial level data $\rightarrow$ positive correlation between inequality and homicides rates.
- Longitudinal Canadian City (CMA) level data $\rightarrow$ relationship between income inequality and homicide rates reverses.
- Moreover, the province level result between greater inequality and homicide rates also appears to break down once regional effects are taken into account.

Data Sources

- Data from 10 Canadian Provinces (1982 to 2017) and 35 Canadian Census Metropolitan Areas (CMAs) (2000 to 2017)
  - Provincial Unemployment rate/Employment levels
  - CMA Unemployment rate/Employment levels
  - Provincial Gini coefficients (based on total income)
  - Median income excluding zeros (2015 constant dollars)
  - Median income by top 1 percent, bottom 50 percent, top 5 percent
  - Homicide Rate per 100,000 people
  - Police per 100,000 people (1986-2017)
  - immigration, percentage male, minimum wage, low income portion

All these taken from Statistics Canada's public database

Inequality Measures

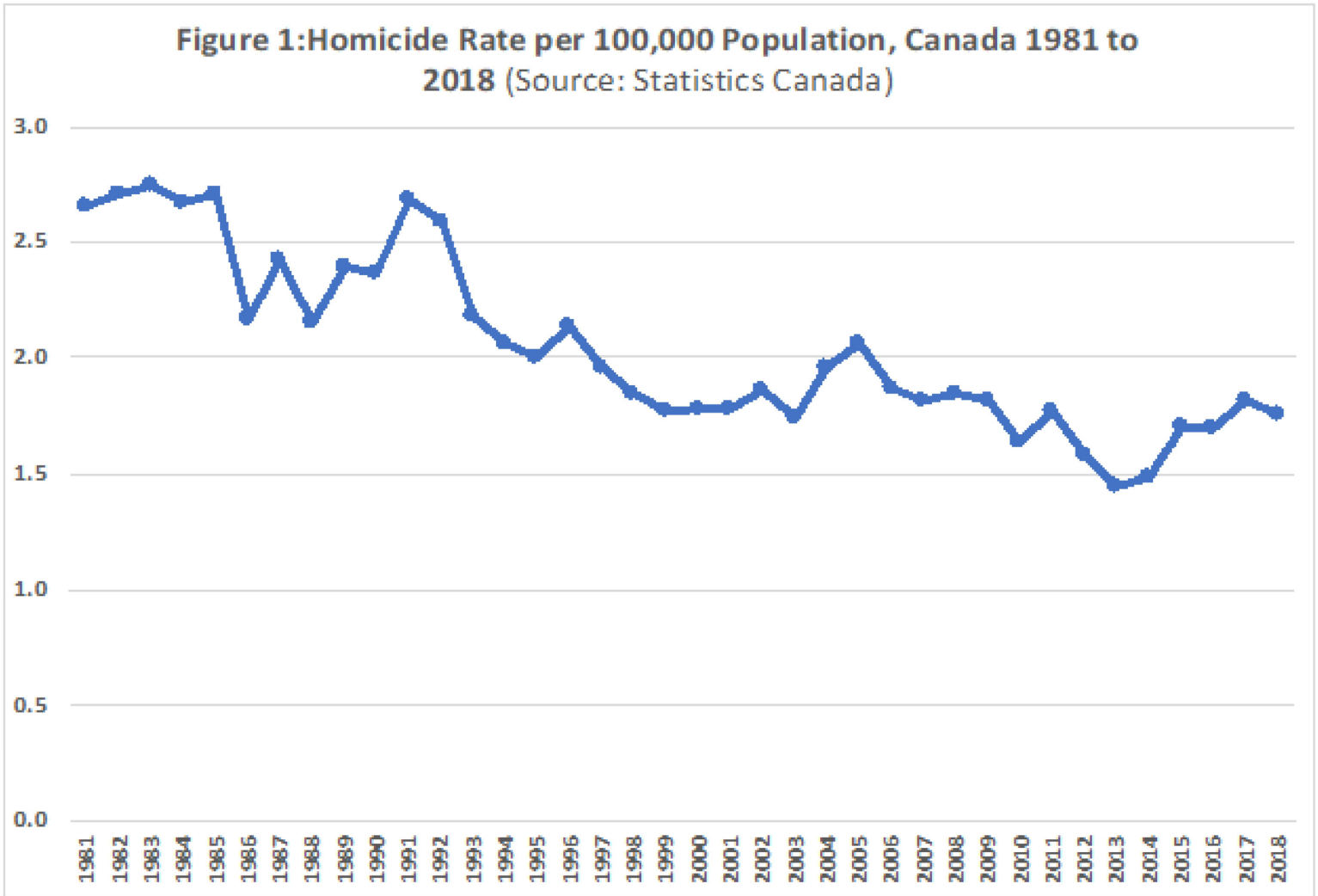
Province:

- Gini coefficient
- Ratio of median income for the top 1 percent to the median income of the bottom 50 percent

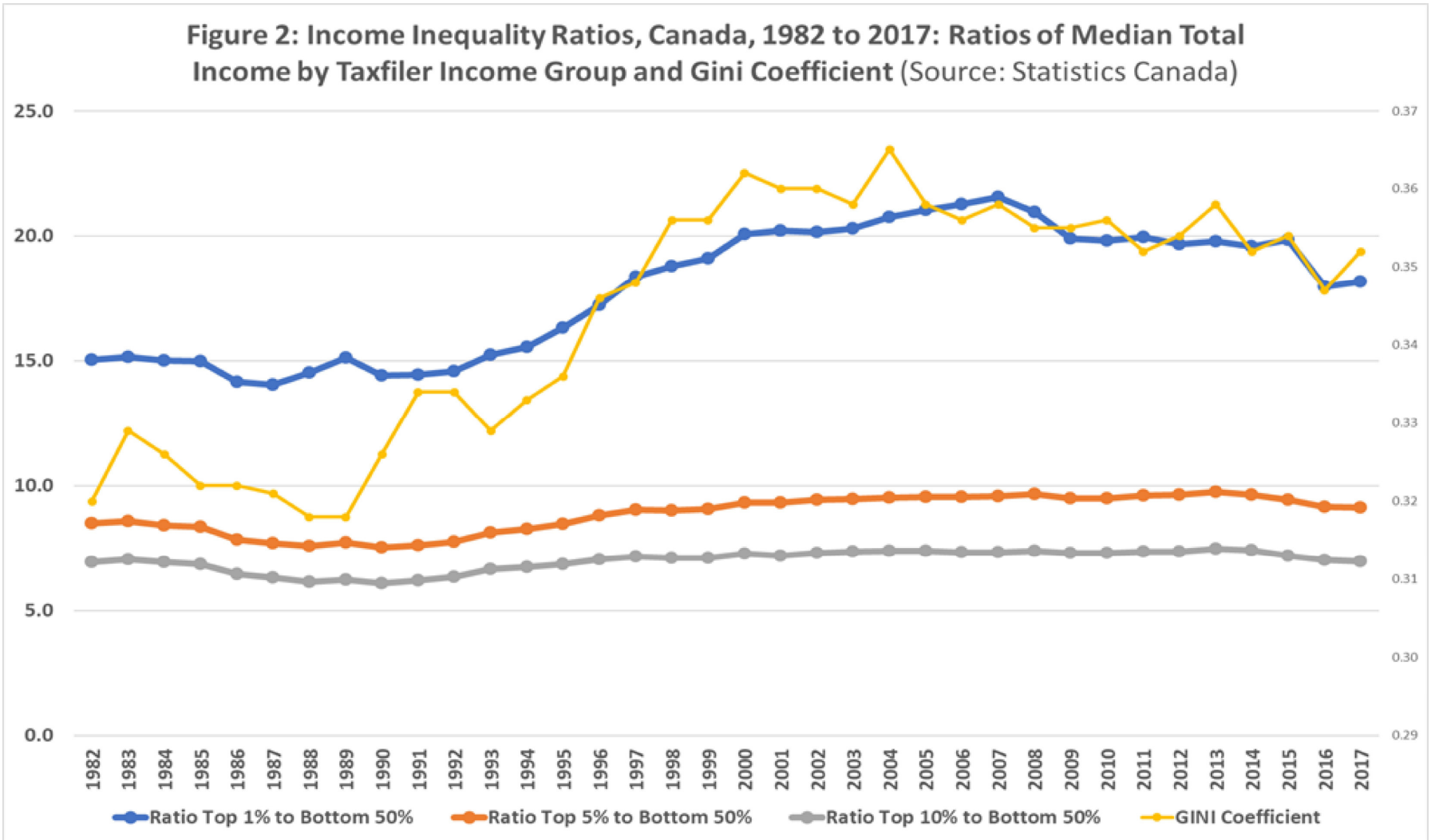
CMA:

- Gini coefficient at the CMA level unavailable
  - Use corresponding Provincial Gini coefficient
- Ratio of median income for the top 1 percent to the median income of the bottom 50 percent

Homicide Rate



Inequality Measures



National Evidence on Homicides & Inequality

Aggregate evidence suggests falling homicide rates have actually been accompanied by rising income inequality.

- Canada: From a homicide rate of 2.7 per 100,000 in 1981, it reached a rate of 1.7 by 2016 for an overall decline in the rate of 37 percent.
- The ratio of the median total income of the top 1 percent to bottom 50 percent rose from 15.1 in 1982 to 19.8 by 2015.
- For the ratio of the top 5 percent to bottom 50 percent and the top 10 percent to bottom 50 percent, the increases were from 8.5 to 9.4 and 6.9 to 7.2 respectively.
- Income share of top 1 percent in Canada rose from 8 percent in 1980 to about 12 percent by 2015.

These results do not take into account the regional differences across the country in both homicide rates and income inequality.

Province Level and CMA Regressions

Regressions reported for both Provinces and CMAs.

- The homicide rate is the dependent variable and the independent variables include:
  1. measures of income inequality;
  2. the median income;
  3. unemployment rate;
  4. the employment level;
  5. police officers per 100,000 people;
  6. demographic variables
  7. three regional dummy variables with an Ontario dummy excluded; and
  8. a time trend.
- The regressions contain two measures of income inequality:
  1. the ratio of the median income for the top one percent to the median income of the bottom 50 percent (Ratio top 1 to bottom 50); and
  2. Gini coefficient.

Econometric Issues

- Possibility that unobserved CMA or province specific factors affect both homicide rates and income inequality, which leads to a spurious correlation between the two variables.
- Potential for homicide rates to exhibit state dependence or persistence, whereby the present is highly correlated with the recent past.

To address these issues - employ a dynamic panel data model

- Accounts for unobserved heterogeneity
- Allows for persistence in dependent variable (homicide rate)

Econometric Issues

Dynamic Panel Data Model

$$y_{it} = \alpha_i + \rho y_{i,t-1} + Z_{it}\delta + X_{it}\beta + e_{it}$$

Traditional panel data estimators suffer bias in dynamic setting

- Nickell (1981) - fixed effects bias

Common Solution: Dynamic Panel Data GMM estimators

- Difference GMM: Arellano-Bond (1991)
- System GMM: Blundell-Bond (1998)
- Stata Commands: xtabond, xtdpdsys, xtabond2, xtdpdgmm

$\rightarrow$ We use System GMM estimator

Table 1: Provincial Homicide Rate Regressions

$Ln(1 + Hom\_rate_{i,t-1})$	0.220***	0.227***	0.226***	0.382***	0.393***	0.404***
	(0.068)	(0.072)	(0.073)	(0.075)	(0.071)	(0.082)
Ratio top 1 to	0.010		0.024***	-0.008		0.008
Bottom $50_{prov,t}$	(0.008)		(0.007)	(0.007)		(0.006)
$Gini_{prov,t}$	3.140**	3.930***		4.184**	3.455**	
	(1.570)	(1.338)		(1.711)	(1.454)	
Police per	0.006***	0.006***	0.006***			
$100000_{prov,t}$	(0.001)	(0.001)	(0.001)			
N	320	320	320	360	360	360
Sargan P value	0.369	0.394	0.476	0.780	0.836	0.870
AR(1) P value	0.000	0.000	0.000	0.000	0.000	0.000
AR(2) P value	0.019	0.017	0.020	0.014	0.012	0.007
AR(3) P value	0.317	0.324	0.320	0.189	0.236	0.233

Table 2: CMA Homicide Rate Regressions

$Ln(1 + Hom\_rate_{i,t-1})$	0.218***	0.236***	0.219***	0.221***	0.249***	0.222***
	(0.066)	(0.066)	(0.066)	(0.067)	(0.068)	(0.068)
Ratio top 1 to	-0.013***		-0.013***	-0.015***		-0.016***
Bottom $50_{cma,t}$	(0.005)		(0.005)	(0.005)		(0.005)
$Gini_{prov,t}$	-0.203	-0.803		-0.514	-1.526	
	(1.657)	(1.841)		(1.509)	(1.649)	
Police per	0.001	0.002	0.001			
$100000_{cma,t}$	(0.001)	(0.001)	(0.001)			
N	457	457	457	457	457	457
Sargan P value	0.585	0.643	0.598	0.635	0.717	0.647
AR(1) P value	0.001	0.001	0.001	0.001	0.001	0.001
AR(2) P value	0.264	0.243	0.264	0.245	0.219	0.244

Robustness Check Options

Potential Problems with System GMM estimator:

- Violation of "N large, T fixed and small" setup of System GMM estimator
- Choice of instruments

Alternative options:

1. Maximum Likelihood: Moral-Benito, E., Allison, P., & Williams, R. (2019) - xtdpdml
2. Bias-corrected type fixed effects estimator
   - Bruno (2005) bias-corrected least-squares dummy variable - xtlsdvc
   - Dhaene and Jochmans (2015) split-panel jackknife estimator (ML) - xtsjp
3. Norkute et al. (2021) defactored regressors and multifactored error structure - xtivdfreg

Alternative Estimators

Table 3: Provincial Homicide Rate Regressions

	Sys-GMM	FE	LSDVC	SPJ	IVD-1
$Ln(1 + Hom\_rate_{i,t-1})$	0.30***	0.08	0.12**	0.08	0.45**
	(0.06)	(0.06)	(0.06)	(0.06)	(0.67)
Ratio top 1 to	0.02***	-0.00	-0.00	-0.00	-0.02
Bottom $50_{prov,t}$	(0.00)	(0.01)	(0.01)	(0.01)	(0.07)
$Gini_{prov,t}$	4.07**	4.28***	4.20**	4.28**	0.07
	(1.70)	(1.40)	(1.63)	(1.39)	(9.05)
Police per	0.01***	0.00	0.00	0.00	0.00
$100000_{prov,t}$	(0.00)	(0.00)	(0.00)	(0.00)	(0.02)
N	320	320	320	320	320

Table 4: CMA Homicide Rate Regressions

	Sys-GMM	FE	LSDVC	SPJ	IVD-1
$Ln(1 + Hom\_rate_{i,t-1})$	0.26***	0.03	0.09*	0.02	0.32**
	(0.06)	(0.05)	(0.05)	(0.05)	(0.16)
Ratio top 1 to	-0.00	0.01	-0.01	0.00	0.05
Bottom $50_{cma,t}$	(0.00)	(0.01)	(0.01)	(0.01)	(0.05)
$Gini_{prov,t}$	-2.17	1.90	2.00	1.47	-3.64
	(1.72)	(2.14)	(2.09)	(2.11)	(4.72)
Police per	0.00**	-0.00	-0.00	-0.00	-0.01
$100000_{cma,t}$	(0.00)	(0.00)	(0.00)	(0.00)	(0.01)
N	457	457	457	457	457

Conclusions

- We find a province-level relationship between greater economic inequality and higher homicide rates
- We are unable to document a statistically significant positive relationship between income inequality and homicide rates in Canada either when all the CMAs are combined or when they are broken up into regional units.
  - Results at the CMA level suggest homicide rates and income inequality are negatively correlated after controlling for a range of confounding factors.