**APPENDIX**

## Methodology, Data, and Model

Our estimates are obtained from pooled cross-section and time-series data using generalized least squares estimates of the cross-sectionally heteroscedastic and time-wise autoregressive model discussed in Kmenta (1986, 616-25). The estimation is performed with the SHAZAM computer program.

Our data include 19 years (1974 to 1992) and 10 provinces (all of the Canadian provinces, excluding the Yukon and the Northwest Territories). The model employed may be written as:

$$Y_{it} = \beta_1 X_{it1} + \beta_2 X_{it2} + \ldots + \beta_9 X_{it9} + \varepsilon_{it} \tag{1}$$

Where

| | | |
|---|---|---|
| i | = | 1,…10 (the 10 provinces) |
| t | = | 1,…19 (the years 1974-1992) |
| $Y_{it1}$ | = | Total robbery |
| $Y_{it2}$ | = | Armed robbery |
| $Y_{it3}$ | = | Robbery involving a firearm |
| $X_{it0}$ | = | Dummy variable for the Canadian gun law (0 in years 1974 to 1977, 1 in years 1978 to 1992) |
| $X_{it1}$ | = | Registered Native Indians as a percentage of the provincial population |
| $X_{it2}$ | = | Males age 15-24 as a percentage of the population |
| $X_{it3}$ | = | Unemployment rate |
| $X_{it4}$ | = | International immigrants as a percentage of the population |
| $X_{it5}$ | = | Clearance rate |
| $X_{it6}$ | = | Provincial population per police effective |
| $X_{it7}$ | = | Weeks of UI benefits paid as a percentage of the population |
| $X_{it8}$ | = | Inter-provincial migrants as a percentage of the population |
| $X_{it9}$ | = | Non-permanent residents as a percentage of the population |
| TIMEt | = | A sequence of consecutive integers beginning with unity for the 1974 observation through 19 for the 1992 observation for each province |
| DNFLDi | = | Unity for the 19 observations for Newfoundland, and zero otherwise. DPEI, DNS, DNB, DQUE, DONT, DMAN, DSASK, DALTA are defined analagously |
| TNFLDt | = | A sequence of consecutive integers beginning with unity for the 1974 observation for Newfoundland, and ending with 19 for the 1992 observation for Newfoundland. Other provinces are defined analagously. |

Assumptions about the error term $\varepsilon_{it}$ are made to incorporate cross-sectional heteroscedasticity and time-wise autoregression in the model.

These assumptions are:

$$E\left(\varepsilon_{it}^{2}\right) = \sigma_{i}^{2} \tag{2}$$

$$E\left(\varepsilon_{it}\varepsilon_{jt}\right) = 0 \quad \text{if } i \neq j \tag{3}$$

$$\varepsilon_{it} = \rho_{i}\,\varepsilon_{it-1} + U_{it} \tag{4}$$

The $\rho_i$ are estimated from the OLS residuals $\hat{\varepsilon}_{it}$ as:

$$\hat{\rho}_{i} = \frac{\sum \hat{\varepsilon}_{it}\hat{\varepsilon}_{it-1}}{\sum \hat{\varepsilon}_{it}^{2}} \tag{5}$$

where t=2, … 190.
These estimates are used to transform the data as follows:

$$\begin{aligned} Y_{i1}^{*} &= \sqrt{1-\hat{\rho}_{i}^{2}}\; Y_{i1} \\ Y_{i1}^{*} &= Y_{it} - \hat{\rho}_{i} Y_{it-1} \\ Y_{i1k}^{*} &= \sqrt{1-\hat{\rho}_{i}^{2}}\; X_{ik1} \\ X_{itk}^{*} &= X_{itk} - \hat{\rho}_{i} X_{it-1k} \end{aligned} \tag{6}$$

where i = 1,…10
t = 2,…190
k = 1,…9.

The $U_{it}^{*}$ are obtained from:

$$Y_{it}^{*} = \beta_{i}X_{it1}^{*} + \beta_{2}X_{it2}^{*} + \ldots + \beta_{9}X_{it9}^{*} + U_{it}^{*} \tag{7}$$

The $\sigma_{ui}^{2}$ is estimated from:

$$S_{ui}^{2} = \sum U_{it}^{*} / 181 \tag{8}$$

and $\sigma_{i}^{2}$ is estimated from:

$$S_{i}^{2} = S_{ui}^{2} / \left(1 - \hat{\rho}_{i}^{2}\right) \tag{9}$$

A second transformation of the variables (for heteroscedasticity) is then done as follows:

$$
\begin{aligned}
Y_{Lt}^{**} &= Y_i^{*} / S_{ui} \\
Y_{itk}^{**} &= Y_{itk}^{*} / S_{ui}
\end{aligned}
\tag{10}
$$

This leads to the final estimation, which is:

$$Y_{it}^{**} = \beta_1 X_{it1}^{**} + \beta_2 X_{it2}^{**} + \ldots + \beta_9 X_{it9}^{**} + U_{it}^{**} \tag{11}$$

where $U_{it}^{**}$ is assymptotically independent and nonautoregressive.

Our estimated vector of regression coefficients $\bar{\beta}$ is the generalized least squares estimator.