Re-evaluating the Cantor and Land (1985) model of Unemployment and Crime: A multilevel analysis of multiple economic measures

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Abstract

The complex relationship between crime and economic change has had a long pedigree in criminological research. Much of the recent research is premised on, or critical of the Cantor and Land (1985) model of unemployment and crime, which considers the unemployment rate as representative of the state of the economy. The theoretical assumption behind the model rests on the notion that to accurately assess the unemployment-crime relationship, the impact of criminal motivation and criminal opportunity need be considered in a common framework. Accordingly, Cantor and Land (1985) developed a structural approach that synthesized the counteracting effects of motivation and opportunity into a single working model, finding that opportunity dominates motivation. Although the theory behind the empirical model is not often questioned, both methodological and empirical concerns have arisen with regard to the procedures employed by Cantor and Land (1985) and subsequent studies that rely on the Cantor and Land approach. Methodologically, researchers have questioned whether the model has been accurately specified and, if, flaws in statistical specification have contributed to mixed and inconsistent results. Empirically, testing the model using unemployment as the sole indicator of economic performance has been widely contested in the literature. This paper considers both issues as the Cantor and Land (1985) model will be evaluated using distinguished measures of unemployment and a multilevel methodological approach, with the Canadian provinces from 1981-2013 as the units of analysis. The inclusion of multiple economic measures, in addition to the comparative utility allows for a more comprehensive representation of economic performance. Canadian panel data contributes to the small number of panel analysis in the literature and extends the literature beyond prominently US based investigations. Furthermore, employing a multilevel technique enables greater precision in the estimates, allowing researchers to accurately analyze hierarchical data such, as, panel data at two distinct levels. Overall, by extending the seminal work of Cantor and Land (1985) the intent is to bridge the empirical gaps in the crime-economy literature and, in doing so, provide an instructive example for the operationalization of the model in future studies. In examining the effect of multiple economic measures on eight separate crime types, support was found for the Cantor and Land (1985) model in both property and violent crimes. The results are robust to the inclusion of time as a random effect, controls for simultaneity using contextual, deterrent and variables controlling for inequality and demographics along with multiple measures of the economy.

Keywords: Cantor and Land; unemployment; crime; panel data; multilevel modeling

Dedication

My humble efforts I dedicate to my mother, who is the essence of strength, courage and perseverance. Throughout my life, she has been a source of measureless support and, this, would not have been possible without her ongoing encouragement.

Thank you, Mom.

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Chapter 1.

Introduction

Understanding crime trends, including factors that drive fluctuations, is fundamental in the study of crime, having both substantive and practical implications. Because crime trends are dynamic, gaining insight into mechanisms that contribute to variance in crime patterns is an important area of development for crime scholars. Accordingly, an array of factors have been invoked to explain changes in crime trends, including economic-based determinants. Even though the relationship between crime and economic change has had a long history of investigative interest in criminological research, economic factors remain relatively underdeveloped when compared to areas that adhere more closely to criminological concepts. Presumably, criminologists are hesitant to incorporate economic concepts into criminological research due to the perceived complexities inherent to the study of economics. Nonetheless, the economy is a social structure of unequivocal importance, as economic changes can implicate shifts in the behavioral patterns of individuals and, thus, is applicable to the assessment of crime trends.

For decades, investigative efforts into the relationship between crime and the economy focused almost exclusively on criminal motivation and, therefore, individual-based theories dominated in the literature (Lynch & Cantor, 1992). Criminologists and economists alike have attempted to explain crime rates by examining how the propensity to commit crime responds to the expected costs and benefits of illegal activity (Becker, 1968; Ehrlich, 1973; Levitt, 1997). More recently, criminologists have shifted their focus to understanding why criminal events occur, placing emphasis on the identification of factors that facilitate the opportunity for criminal acts and, thereby, moving toward structural-based explanations. Investigations into the crime-economy relationship resulted in the emergence of a huge literature spanning a range of academic disciplines

and drawing upon a variety of theories, most of which relate either to the motivational, opportunity or rational choice perspectives (Cook & Watson, 2014). Early in the theoretical literature, scholars generally agreed that the unemployment-crime relationship was positive: an increase in unemployment leads to increases in crime (Cook & Watson, 2014). However, a review of the empirical research portrays an inconsistency in the results obtained (Chiricos, 1987; Cook & Watson, 2014). Limitations in earlier studies may have been attributed to the fact that researchers did not consider theoretically similar mechanisms within a common framework, further contributing to mixed findings.

Cantor and Land (1985) recognized the constraints of having disjointed theoretical components and sought to remedy this limitation. In doing so they formulated a model of unemployment and crime that effectively integrated previously fragmented theoretical approaches. The result was a model that synthesized two distinct and counterbalancing structural effects of unemployment rates on crime rates: the motivation effect and the opportunity effect. Such a model effectively conjoins criminal motivation theories that relate unemployment to the prevalence of motivated offenders in the population with criminal opportunity theories that relate unemployment to the victim proneness of potential crime targets. The hypothesized relationship between unemployment and crime is not direct but instead mediated through two distinct and counteracting structures: an increase in unemployment has a lagged positive effect on crime through increased motivation and a contemporaneous negative effect on crime because of increased guardianship and reduced opportunity. Currently, the bulk of crime-economy literature is either critical of, or premised on, the Cantor and Land (1985) model of unemployment and crime.

As such, two primary issues have been identified within the literature with regard to flaws in the current state of research. The first issue is empirical; researchers have challenged whether it is appropriate to use the unemployment rate as a sole measure of economic performance (Arvanites & DeFina, 2006). Second, from a methodological perspective, disagreements have arisen over the empirical validation of the Cantor and Land model (1985). To be more precise, researchers have questioned whether the statistical models employed accurately identify the relative effects of motivation and

opportunity on crime. Although current research has provided valuable insight into the crime-economy relationship, primarily through the evaluation of the Cantor and Land (1985) model, I have identified additional points of weakness that have yet to be acknowledged in the current literature. Provided the aim is to assess the impact of economic change on crime trends, logic would dictate that the relationship ought to be estimated using longitudinal data. That is, data sets containing observations at multiple time points provide information on trends that cannot be obtained from cross-sectional data, in which observations are available for just one occasion (Phillips & Greenberg, 2007, p. 51). This aspect is of particular relevance when assessing the crime-economy relationship. Being that the economy is cyclical, the use of longitudinal data allows the researcher to cover periods containing stable and unstable labour market conditions. Strategically, employing data that covers an extended period allows for emphasis of the low-frequency (long-term) variation in the crime and economic variables, thereby facilitating the identification of long-run trends (Raphael & Winter-Ebmer, 2001). Further to this, longitudinal data enables the researcher to disentangle the temporal ordering of variables, and is, thus, capable of shedding light on the causal relationships among them (Phillips & Greenberg, 2007, p. 51). In the social sciences, the panel design is most commonly used to address questions of variation or change over time (Phillips & Greenberg, 2007; Stoel, Wittenboer, & Hox, 2013). However, there is a notable lack of research in this literature with respect to the analysis of panel data, as the statistical models within the current literature often do not account for the hierarchical structure of the data. In an attempt to resolve this gap, the current study utilizes a panel design. Moreover, contextual factors, though important, are rarely accounted for in crime and economic research. Thus, estimates from existing research do not account for the contextual differences between the groups in which the data were drawn (Albright & Marinova, 2010).

To address the limitations of existing research the current analysis will consider the methodological and empirical issues previously mentioned using data from the 10 Canadian provinces from the years 1981-2013. Moving beyond previous inquiries, the Cantor and Land (1985) model of unemployment and crime will be extended through the use of a multilevel technique, a statistical method that has not been applied in this line of research. Frequently, ordinary least squares or fixed effects modeling are utilized within

the existing body of literature. The aim in adopting a multilevel approach to specifying the Cantor and Land (1985) model is to provide an instructive example of how a relatively novel approach can be used to unravel the complications of previous empirical analyses (particularly pertaining to the temporal alignment of opportunity and motivation). To achieve this end, the hierarchical structure of the panel data set will be accounted for as both cross-sectional and temporal components can be analyzed using fixed and random effects estimators. Hence, employing a multilevel technique will complement and extend previous research that has focused on explaining the economic-crime relationship using single-level measures to explain cross-level impact of economic changes on crime (Rountree & Land, 1996).

Empirically, multiple economic variables that measure the state of the economy on different scales will be included to mediate concerns related to the use of unemployment as the single measure of economic performance. To create robustness in representation of the state of the economy, gross provincial product (GPP), low income, unemployment, and unemployment of 53 weeks+ are incorporated into the analyses. As well, with the multilevel models, each economic variable will interact with time, creating a measure of the impact of the state of the economy, on crime over time. In this way, the temporal effects of the explanatory variables on crime can be identified and separated. In addition, contextual differences within the provinces in which the data were drawn will be accounted for in the analysis through the use of contextual variables. Even supposing that the contextual effects are not of primary interest, per se, it is still important to account for the possible implications or effect of those differences. For the most part, researchers are only interested in the exact categories of the factors that appear in the experiment (Albright & Marinova, 2010). Nonetheless, when data are drawn from distinguished groups, the environments in which they were obtained are not equal, the economic and social landscapes of each province differ and, therefore, the ecological context of a province can promote or reduce crime. In such a case, terms can be added to account for these differences and provide greater precision in the analysis.

The contributions of this paper, therefore, are methodological and theoretical. In terms of method, the use of multiple measures of the economy allow us to identify and focus on different areas of the economy that, in turn, estimate differences in the

corresponding effect on motivational and opportunity. As well, the inclusion of multiple economic variables safeguards against omitted variable bias, thus contributing to accurate model specification and the minimization of potential biases in our estimated parameters. Because the provincial observations are nested within ten different provinces, including the relevant random effect protects against the risk of making false inferences about the fixed effects. In terms of theory, further insight into the crime-economy relationship can be gained through the use of varying measures of the economy. Methodologically, the statistical method employed in the current study is able to specify the Cantor and Land (1985) model in an empirical context that considers temporal change. Therefore, with adequate specification the results ought to conform to the relationship hypothesized by Cantor and Land (1985): the contemporaneous effect of unemployment on crime would be negative (opportunity-based) and the lagged effect of unemployment on crime would be positive (motivation-based).

Chapter 2.

Review of Literature

Empirical interest in the crime-economy relationship was revived upon the introduction of the Cantor and Land (1985) model of unemployment and crime. Earlier research on the phenomena generally occupied one of two theoretical camps: motivation or opportunity, both of which were premised on the conceptual framework of routine activity theory but nonetheless never incorporated into a single working model (Britt, 1997; Cantor & Land, 1985; Chiricos, 1987; Cohen & Felson, 1979). By the 1980s, long standing disagreement among scholars regarding the theoretical framework with which to evaluate the crime-economy relationship along with discord on the operationalization of the relationship brought any attempt at gainful progress to a stalemate (Chiricos, 1987). All this changed in 1985, when Cantor and Land (1985), in recognizing the shortfall of having disjointed theoretical components, formulated a model that would effectively remedy this limitation (Andresen, 2013). The researchers believed that the inherent complexities of the crime-economy relationship could not be explained in terms of either motivation or opportunity and, therefore, developed a model that included both by synthesizing all the major structural pillars of routine activity theory into a single working model.

In their model of unemployment and crime, Cantor and Land (1985) posited that by altering the conditions of social strain and social control, economic change measured by the national unemployment rate (a conventional indicator of macroeconomic activity) would positively impact criminal motivation (Phillips & Land, 2012; Andresen, 2014). Secondly, economic changes influence the availability of vulnerable targets and, hence, the number of available criminal targets (Phillips & Land, 2012, p. 682). It is important to note that the unemployment-crime relationship set forth by Cantor and Land (1985) is not direct in the sense that unemployment directly impacts crime. Rather, as shown in

figure 1. changes in the unemployment rate will have an impact on criminal motivation and criminal opportunities (Cantor & Land, 1985; Andresen, 2014). Cantor and Land (1985) hypothesized that these two distinct structural effects would be counterbalancing: a downturn in aggregate economic activity would increase motivation but decrease opportunity. Criminal motivation was theorized as having a lagged effect, taking time to develop as individuals do not immediately turn to illegitimate activity in the face of economic hardship. The lagged effect (motivation) of unemployment on crime was attributed to the cushion period where newly unemployed individuals, primarily in Western industrialized nations such as Canada and the United States, receive financial assistance in the form of unemployment benefits for a period of time after becoming unemployed (Cantor & Land, 1985). For this reason, Cantor and Land (1985) reject the commonly held notion that individuals are immediately motivated to commit crimes out of financial stresses related to periods of economic slowdown. Although Cantor and Land (1985) argued that the exact lag period is expected to be ambiguous, the unemployment rate lagged by one year was used to capture the motivational effect (Paternoster & Bushway, 2001).

Conversely, the opportunity effect occurs immediately because unemployment instantly alters the duration and frequency that individuals are away from the home: being unemployed leads to a shift in routine activities toward the home that allows people to guard person and property making them less susceptible to victimization (Cantor & Land, 1985). Further to this point, unemployment produces financial strain and, thus, individuals have less to spend on non-essential goods and services. In short, unemployment has a contemporaneous effect on crime by decreasing the circulation of suitable targets that should lead to a decrease in criminal opportunities. Finally, Cantor and Land (1985) found that both motivation and opportunity matter, particularly for property crime but operated at different time frames. Motivation matters in the long run, due to the lagged effect and opportunity matters in the short run, as the effect is immediate (Cantor & Land, 1985). Concluding, based on their empirical assessment of the model, the opportunity effect was deemed to be dominant over the motivational effect.

Since inception, researchers have argued over the empirical validation of the Cantor and Land (1985) model, more specifically whether opportunity actually dominates motivation even so, the theory behind the model is not often questioned (Andresen, 2013). In general, the empirical disputes most often arise over the unit of analysis and statistical method used to evaluate the model and also whether it is appropriate to use the unemployment rate as a standalone indicator of the entire economic state (Andresen, 2013). Through the construction of a model that effectively challenges the conventional notion that unemployment and crime are most often positively related, Cantor and Land (1985) have provided great instructive value for researchers in the crime-economy sphere. Despite having a framework that incorporates the structural impact of both motivation and opportunity into a single working model, mixed and inconsistent results still persist; and empirical evaluations of the model have further resulted in conflicting findings. These mixed results are most present in a review of 63 empirical studies, by Chiricos (1987). Chiricos (1987) found that whether the relationship between unemployment and crime was positive, negative or null largely depended on the statistical method and variables used in the analysis. Chiricos (1987) therefore indicated the importance of statistical specification and the unit of analysis used to represent the economy in evaluating the Cantor and Land (1985) model.

Subsequently, two major issues have been raised concerning to the current state of empirical inquiry on unemployment and crime: the first pertains to disagreements on the empirical methods, primarily the statistical models used to test the Cantor and Land (1985) model; and second are issues relating to the appropriateness of using unemployment as an isolated measure to test economic performance (Andresen, 2013; Arvanites & DeFina, 2006). As mentioned previously, one of the most prominent issues in the current literature relates to the narrow interpretation of economic activity, as the majority of the existing literature has utilized the unemployment rate to measure the entire state of the economy. The convoluted nature of the economy makes it so that different aspects of the economy implicate structural changes in varying ways. And, thus, to properly identify and separate specific mechanisms of economic change that impact different forms of structural change, leading to fluctuations in different types of crime, the nuances behind economic activity must be adequately unpack (Farrell, Tilley, Tseloni, & Mailley, 2010). Clearly, proper specification of the Cantor and Land (1985)

model will assist in bridging inconsistencies in the results due to discrepancies in method selection. Likewise, because the empirical testing of a model is sensitive to both the variables chosen and the statistical method employed, in order to make conclusive statements on the model being tested and the theoretical relationships it represents, proper specification is crucial (Andresen, 2014). In the analysis below, a review of the most recent studies that have supported and incorporated the mechanisms put forth by Cantor and Land (1985) will be presented. The methodological and empirical divergences within the literature are illustrated throughout.

The issue of whether the opportunity effect dominates the motivation effect has been one of the most contentious within the literature. Hale and Sabbagh (1991) argue that Cantor and Land's (1985) results were likely invalid as the methodological approach adopted by these researchers had fundamental flaws. Accordingly, Hale and Sabbagh (1991) focused their analysis on determining opportunity and motivation effects using time series data from England and Wales. Results indicated the presence of a motivational effect that was positively associated with crime but did not find evidence for an opportunity effect. Hale and Sabbagh (1991) contended that in addition to the statistical misspecification of the equations estimated by Cantor and Land (1985), a failure to incorporate exogenous variables into their analysis greatly limited the generalizability of their results. Similarly, Field (1990) demonstrated the importance of incorporating other economic factors when evaluating the unemployment-crime relationship as concentrating on unemployment alone may lead to model misspecification. For instance, Field (1990) found that for property crime, personal consumption better captures the economic-crime relationships than unemployment. Field (1990) concluded that in times when growth in personal consumption is on the decline, property offenses will decrease.

Cantor and Land (1991) provided a prompt rebuttal to Hale and Sabbagh (1991) in which they agree that advantages may be found in estimating the unemployment-crime relationship within the context of a full structural model, a model that considers possible exogenous factors but disagree that the results from their seminal study were invalid. In support of their claim, Cantor and Land (1991) asserted that along with other researchers (Cohen, Felson & Land, 1980; Cohen & Land, 1987; Devine, Sheley &

Smith, 1988) they have re-examined the model with the addition of mediating variables, the findings were broadly consistent with those published in Cantor and Land (1985). With regard to critiques on using the unemployment rate as a lone indicator of economic activity, Cantor and Land (1991) agreed that if introducing additional economic measures into future inquiries will provide greater insight into the relationship, it should be pursued. However, their aim in developing the model was to provide a framework capable of correcting the inconsistent and mixed findings prior, the model was never advocated as the be-all and end-all model of unemployment and crime. Finally, Cantor and Land (1991) believed Hale and Sabbagh (1991) were misguided in their criticisms as the most important point to be taken from their 1985 article should relate to the structural components and basic assumptions of the model proposed not the specific way in which it was tested or conceived, per se. Elaborating further, Cantor and Land stated that no one method of analysis is fundamentally correct, each has its own advantages and disadvantages that need to be discussed and considered during hypothesis testing (Cantor & Land, 1991, p.423). Hence, the purpose of the article was not to argue for the 'correct' functional relationship with which to estimate the unemployment-crime relationship but instead to provide a functional model in which to appraise the relationship. Therefore, Cantor and Land affirm that the models tested in their seminal publication were neither 'fundamentally flawed' nor 'misspecified' but instead a plausible specification of the US unemployment rate series (Cantor & Land, 1991, p. 424).

Shortly thereafter Smith, Dwayne, Devine and Sheley (1992) conducted a time series analysis to determine relationships among race and gender specific rates of unemployment and corresponding rates of arrest using the Cantor and Land (1985) model. Specifically, Smith et al. (1992) sought to determine whether the unemployment-crime relationship differed in directionality and/or intensity when distinguished in terms of age and race from findings for the general population. Overall, initial findings closely resembled those of Cantor and Land (1985), and support was found for both the motivation and opportunity effect. With respect to age and race, an increase in unemployment had a positive motivational effect for property crimes among all groups, including older and majority status groups (Smith et al. 1992). In particular, whites were

more susceptible than African Americans to the motivational impact of fluctuations in the unemployment rate (Smith et al., 1992).

Using time series data, Britt extended the work of Smith et al. (1992) and re-evaluated the unemployment-crime relationship by testing for variations by age group and through consideration of changes over time. Britt (1997) was one of only a few early researchers to distinguish between different forms of unemployment. By incorporating age structures into this analysis Britt (1997) found that homicide, robbery, and burglary had positive relationships with unemployment rates for adults, but unemployment rates for youth were negatively related to homicide and aggravated assault. Support for a temporally inclined variable for the unemployment and crime relationship was established, however no support was found for an increasing motivational effect of unemployment over time. Britt's (1997) re-evaluation of the unemployment-crime relationship resulted in two primary considerations for subsequent researchers: the first pertains to the assumption in macro-level research that the unemployment-crime relationship is time constant. Secondly, the results prompt further investigation into the age specific effects of macroeconomic and macro-social on criminal behavior—as most macro-level criminological research assume constant effects for social and economic conditions across persons of all ages though it has been shown that general economic and social conditions have age-graded effects on criminal behavior (Britt, 1997, p. 424)

Within a decade of the publication of Hale and Sabbagh's (1991) critiques, a number of methodological concerns had emerged in relation to the operationalization of the Cantor and Land (1985) model. Greenberg (2001) raised concerns on the procedures employed by Cantor and Land (1985) and successive studies that relied on the Cantor and Land approach (Greenberg, 2001). According to Greenberg (2001) concerns with the unemployment and crime literature were plentiful, ranging from statistical misspecification to the operationalization of independent variables to units of analysis to statistical/econometric methods. Greenberg (2001) went as far to say that "many—perhaps most—sociological analyses of crime rate time series…suffer from serious methodological deficiencies" (Greenberg, 2001, p.323). In sum, the issues cited exemplify that even long after its introduction, the fundamental issues relating to the identification of the Cantor and Land (1985) model had yet to be resolved.

Levitt (2001) expanded on the issues raised by Greenberg (2001) and gave special attention to the flaws of using nationally aggregated data to distinguish between two alternative behavioral explanations for a link between unemployment and crime. According to Levitt (2001) national time series data are better suited for long-run patterns that are inherently national in character, such as patterns of economic growth but a crude tool for answering criminological questions. His suggestion for a more fruitful approach to the question at hand would be to utilize a menagerie of different methodological approaches such as cross-section or panel data analysis of less geographically aggregated areas (Levitt, 2001, p. 377). For those reasons, Levitt (2001) used a state level panel data set and estimated the data using a fixed effects panel data model that allowed for the measure of short versus long run effects in the unemployment and crime model. The analysis revealed a different pattern of coefficients. Levitt (2001) found a negative or statistically insignificant parameter for the relationship between unemployment and crime, supporting the opportunity effect of the Cantor and Land (1985) model. The results pertained specifically to opportunity effects because fixed effects panel data models specify short-run relationships that correspond to opportunity/contemporaneous effects. Therefore, the study does not deny the motivational effect but employs a technique that appropriately isolates and identifies the opportunity effect. Levitt (2001) exemplified the importance of statistical methodology in testing the Cantor and Land (1985) model. Because Cantor and Land (1985) posited the motivational (long-run) and opportunity (short-run) effects to be separate and distinguished structures, in testing the model it is critical to employ a statistical method that is capable of unraveling the two mechanisms.

More recently, Phillips and Land (2012) conducted what is probably the most comprehensive research on the relationship between unemployment and crime to date. In their empirical evaluation the researchers considered counties, states, and the United States as a whole, and later examined the effect of aggregation on the results. Essentially, Phillips and Land (2012) incorporated Levitt's (2001) recommendation that disaggregated data should be used when evaluating the relationship between crime and economic change on the state and international levels. Strong support was found for the Cantor and Land (1985) model, the expected parameter sign was estimated in 78 of 84

cases. In addition, Phillips and Land (2012) found that the effects of motivation are stronger for property crimes than violent crimes.

Most recent are the empirical contributions of Andresen (2012, 2013, 2014). Andresen (2012) was the first to use a panel of census tracts to evaluate the Cantor and Land (1985) model, the smallest unit of analysis used to analyze the model thus far. Andresen's (2012) approach was a departure from previous studies, in that his primary interest was not with the effects of motivation versus opportunity, per se, but rather his study centered on long run versus short run effects of economic changes on crime. In his analysis, Andresen (2012) found unemployment to be positively associated with crime in the long run and negatively associated with crime in the short run.

Andresen (2013) continued his explorative efforts and developed a study where he addressed methodological and empirical issues that have plagued researchers in the Cantor and Land (1985) literature. Supplementary to the work of Arvanites and DeFina (2006), who emphasized the importance of considering different measures of the economy, Andresen (2013) addressed measurement concerns related to the use of a single measure, unemployment, to represent the entire state of the economy and included four economic measures into his analysis. The introduction of multiple economic measures enabled Andresen (2013) to better identify the impact of the state of the economy on crime. In order to resolve inconsistencies attributed to improper statistical specification of the Cantor and Land (1985) model, Andresen (2013) applied a methodological approach that allows for the separation of motivation from opportunity through the use of short and long run effects of the relationship between economic performance and crime (Andresen, 2013, p. 220). The end result was that all four economy related variables matter for property and violent crime, but the sign and magnitude of the estimated parameters were vastly dependent on context (Andresen, 2013). Andresen (2014) extended his assessment using multiple economic measures and demonstrated the importance of having multiple explanatory variables when testing the Cantor and Land (1985) model. A hybrid modeling approach was used to analyze the relationship between crime and economic performance in Canada. Andresen (2014) included two measures of economic activity, unemployment and gross domestic product, and found that both measures matter for crime. However, the opportunity effect was

found to matter more often than the motivational effect though the strength of either effect depends on the type of crime under assessment.

In a similar context, Cook and Watson (2014) conducted an analysis that moved beyond unemployment as a measure of economic activity. Although extensions beyond unemployment exist in the literature—Arvanites and DeFina (2006), Rosenfeld and Fornago (2007) and Andresen (2013; 2014) consider gross state product, consumer sentiment, low income and gross provincial product respectively—direct consideration of cyclical components have yet to be measured. Henceforth, Cook and Watson (2014) analyzed the opportunity and motivational effects of the Cantor and Land (1985) model using cyclical components of alternative socio-economic indicators. Appropriately, national aggregated data were analyzed for unemployment along with per capita measures of real personal disposable income, real GDP and real consumers in their model. The intent in using nationally aggregated data was to replicate the level of analysis employed by Cantor and Land (1985). Clear support was found for the presence of opportunity and motivational effects of the form predicted by Cantor and Land (1985) (Cook & Watson, 2014). However, distinguished from Cantor and Land (1985), the most supportive results did not come from unemployment but instead from the socio-economic indicators with the use of consumption (Cook & Watson, 2014). Additionally, Cook and Watson (2014) found notable distinctions in the results for violent and property crime. New to the literature, was a significant finding for an opportunity effect for violent crime, something that should be further evaluated in future research.

In sum, our review of the recent Cantor and Land (1985) literature has revealed two primary issues in the research. The first is statistically inclined, because different statistical methods are built to address different questions, the choice of statistical method will impact the results. Secondly, the variables chosen to represent the economy have implications for the Cantor and Land (1985) model. To accurately assess the model both the opportunity and the motivation effect must be accounted for. In the current study, both of these issues will be addressed in later sections. However, in order to frame how this is done, the conceptual framework of the Cantor and Land (1985) model must be clearly articulated.

Chapter 3.

Conceptual and Modeling Frameworks

A nuanced portrait of the Cantor and Land (1985) model has been established above, therefore only a brief discussion of the mechanisms that are relevant to the hypotheses will be reviewed hereafter. As already articulated, the Cantor and Land (1985) model of unemployment and crime separates the impact of an economic downturn (measured by the unemployment rate) into two counteracting effects: the lagged motivational effect and the contemporaneous opportunity effect. The motivational and opportunity effects were assumed to operate at different time frames: an increase in unemployment would have a contemporaneous impact on opportunity structures while the motivational effect is lagged.

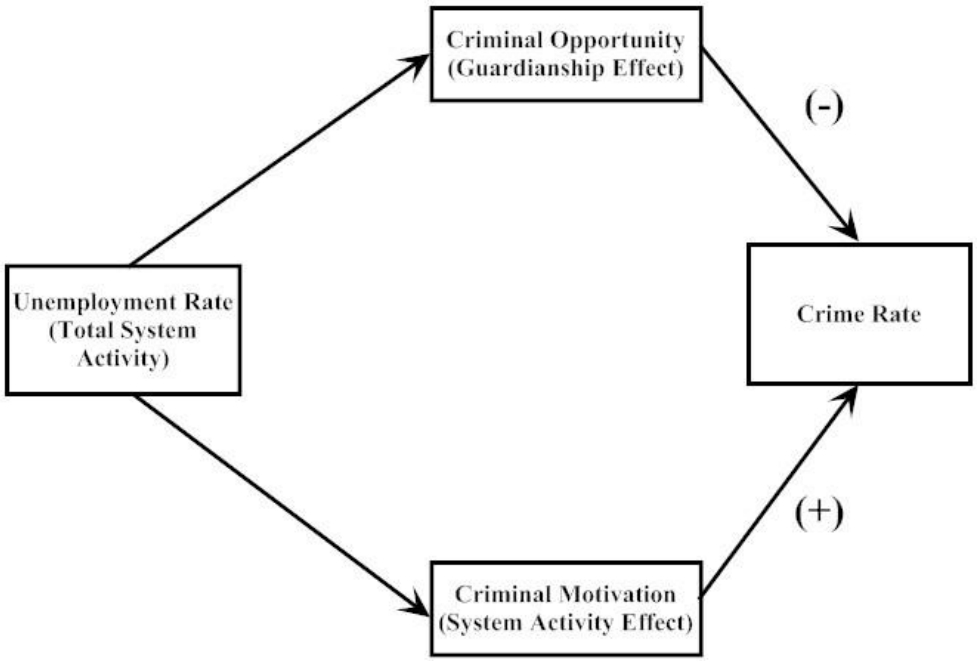

Figure 1.

Cantor and Land (1985) found that the opportunity effect prevailed over the motivational effect. The testable hypotheses of the theoretical model set forth by Cantor and Land (1985) are as follows:

Hypothesis 1 (H1): The motivational distribution of the population toward crime is impacted by economic conditions, as economic conditions deteriorate as indicated by an increase in the unemployment rate, the distribution shifts toward the higher end of criminal motivation. Accordingly as the unemployment rate increases, crime is expected to increase.

Hypothesis 2 (H2): Economic conditions impact the routine activities of individuals, the frequency and duration that individuals are at home or away from their homes. As economic conditions worsen as indicated by an increase in the unemployment rate the routine activities of individuals shift toward the protective environment of the home, thereby decreasing the circulation of suitable targets. Therefore as the unemployment rate increases crime is expected to decrease.

Theoretically speaking, H1 corresponds to a long-run, or lagged effect as the impact of unemployment on criminal motivation takes time to develop. Cantor and Land (1985) captured this effect using the unemployment rate lagged by one time period. The underlying rationale of using a lagged measure for criminal motivation is rooted in the assumption that individuals do not immediately turn to crime whether in a direct sense or indirectly, by creating demand for crime through the purchase of illegitimate goods immediately after becoming unemployed (Andresen, 2014). It is only after, depleting all legitimate resources (such as institutional support) that individuals are expected to turn to illegitimate means. As follows, because the effect of criminal motivation involves a temporal element (unemployment duration), it is perhaps important to distinguish between short term/regular unemployment and long term/structural unemployment. H2, pertains to an immediate/contemporaneous effect as unemployment promptly shifts the routine activities of individuals toward the home thereby criminal opportunities are immediately decreased through increased guardianship. Furthermore, unemployment will lead to a decrease in household income and less consumption. As a result, criminal opportunities will decrease will fewer available targets in circulation. Correspondingly, as

the economy contracts, individuals who are still employed may spend less time outside the home as threats of unemployment may deter individuals from spending on non-essential goods and services.

The following are the proposed hypotheses for the current study that are extensions of Cantor and Land's (1985) hypotheses. In particular, the motivational branch of the model is further expanded by testing for variation in the economy-crime relationship with the inclusion of an unemployment variable that includes an explicit measure of duration (Unemployment for 53+ weeks). The intent of including a duration variable is to test the effect of long term structural unemployment, the literature currently lacks a measure that directly quantifies the lagged effect. In fact, the method of analyses allows for the temporal ordering of observations that will foster an empirical determination of whether the motivational and opportunity effects do, in fact, operate at different temporal levels.

Hypothesis 1' (H1'): Economic conditions impact the routine activities of individuals. As economic conditions worsen individuals shift their activities toward the home, protecting their person and property. As economic conditions worsen, individuals have less to spend on non-essential goods, decreasing the circulation of suitable targets thereby decreasing criminal opportunities. Unemployment, in the short-run will have a negative impact on property and violent crime.

Hypothesis 2' (H2'): Economic conditions impact the distribution of motivated offenders toward crime; on average individuals who are structurally unemployed are faced with the poorest economic conditions when compared to those who are unemployed but still receiving Employment Insurance. These individuals are expected to be furthest along the continuum of criminal motivation. In the long-run, an increase in the rate of unemployed individuals, is expected to lead to higher levels of property crime.

Initially, H1' corresponds to the contemporaneous opportunity effect: economic downturn leads to an increase in unemployment, that then decreases the availability of suitable targets through increasing changes in guardianship and decreased spending on non-essential goods and services (fewer vacant homes and fewer people outside the home). The unemployment rate is a good indicator for the purposes of capturing the

opportunity effect, because it represents a proportion of individuals, on average, who are frequently at home due to unemployment. Therefore, it is expected that an increase in the unemployment rate will lead to a decrease in both property and violent crime, in the contemporaneous time frame. Furthermore, because the multilevel technique allows for a temporal measure (32 time units each ordered to correspond to observations taken over 32 years) to be accounted for in the analysis, it is possible to elaborate on H1 and accordingly test the hypothesis in varying ways. Unique to the multilevel model is the ability to allow variables to interact with time, both implied (random) and direct (fixed). Therefore, in allowing unemployment to interact with time, it was possible to test the lagged motivational effect that relates to the motivated offender. As time persists, the relationship between unemployment and crime should become positive, as long-term unemployment is expected to have a positive impact on criminal motivation and thereafter property and violent crime. The aim of testing H1' is to reveal the counteracting effects of opportunity and motivation, but more importantly demonstrate the temporal ordering of the effects as indicated by Cantor and Land (1985).

H2' corresponds to the motivated offender. With reference to Cantor and Land's (1985) seminal publication and a majority of the literature that tests the model, it is assumed that the impact of unemployment on crime is mediated through a group of individuals who move in and out of criminal activity as the economy contracts and expands. Collectively, the group of unemployed individuals who are motivated toward illegitimate activities must engage in criminal acts significantly enough to impact crime rates at an aggregate level. However, as discussed above, the impact of unemployment on criminal motivation can be distinguished by way of duration. Hence, H2' separates regular from long term/ structural unemployment and, thus, allows the impact of structural unemployment on criminal motivation to be tested using a direct measure. Because the impact of economic decline and unemployment do not impact individuals equally, it is important to create a more direct measure for the population of individuals who are most susceptible to the hardships of poor economic conditions. To that end, structural unemployment is captured using the unemployment rate of 53 weeks or greater—in Canada regular Employment Insurance benefits typically range from 14 to 45 weeks, but only to a maximum of 52 weeks. Thus, individuals who are represented in our measure of unemployment for 53+ weeks face higher levels of structural

unemployment and, as a result, poorer economic conditions. Consequently, including this population will allow for an empirical inquiry into whether those who are further along the continuum of unemployment have greater motivation toward illicit activities; and if so, an increase in the unemployment rate of 53 weeks or more should have a positive impact on crime, particularly property crime. With specific regard to the multilevel model, as time persists the expectation is that the relationship between unemployment of 53+ weeks will remain positive.

Chapter 4.

Data and Methods

As stated above, the operationalization of the Cantor and Land (1985) model has elicited an abundance of critique in the literature; the most prevalent methodological issues pertain to measurement and statistical methods. More specifically, various researchers (Andresen, 2012, 2013, 2014; Arvanites & DeFina, 2006; Britt, 1997; Greenberg, 2001) have questioned whether it is appropriate to operationalize the economy using a single aggregated unit of measure. Similarly, the issue of suitability also applies to statistical specification, by way of determining which statistical method is best suited to test and accurately conceive the Cantor and Land (1985) model. For example, Chiricos (1987) found that the determination of which effect mattered most (motivation or opportunity) was contingent on the statistical method employed. Further, Phillips and Greenberg (2008) emphasized that in selecting a statistical method one must first consider the question being asked and then select a method that is appropriate for the analysis of that question. For instance, if a study is concerned with questions specific to the motivational arm of the Cantor & Land (1985) model then it would be most appropriate to use a statistical method that identifies long run relationships, such as the single-year ecological cross-section (Kennedy, 2008). Conversely, if the primary interest is in identifying the short-run opportunity effect then a statistical method such as the fixed effect panel method that identifies short-run relationships may render most effective (Andresen, 2013). However, in the current context, the single-year ecological cross-section method would be impractical as our data set does not include a large number of ecological units. Furthermore, the fixed effect panel method only allows for a single-level estimation of the data, because our data consists of distinguishable elements (cross sectional and temporal in addition to group and individual level measures) employing this method would be at the risk of omitting valuable information. As such, this paper will address both methodological and

empirical issues by employing a statistical method that is well-suited to test the questions at hand. In addition, including multiple measures of the economy will facilitate a more robust interpretation of economic performance. Together, these methodological and empirical extensions are aimed at providing greater insight into the distinctions of the Cantor and Land (1985) model and more broadly on the relationship between crime and the economy. An elaboration of the measures and statistical methods will follow the introduction and explanation of the data.

4.1. Data

The panel data used that contains 10 Canadian provinces for the years 1981-2013 were obtained from Statistics Canada's Canadian Socio-economic Information Management (CANSIM) database. Many of the problems, hypotheses, and theories underlying social sciences research, have at their core, an implicit or explicit interest in the notions of timing and change (Box-Steffensmeir & Jones, 2004). Being that, a bulk of interesting problems in the social sciences have observable implications that are longitudinal, panel data analysis is perhaps one of the most efficient and beneficial ways to evaluate trends (Box-Steffensmeir & Jones, 2004; Arvanites & DeFina, 2006). That is, longitudinal data sets, such as panel data contain observations for a particular subject at multiple time points and, thus, are able to provide information that cannot be obtained from cross-sectional data, in which observations are available for just one time frame, most often a single year (Yaffee, 2003). Elaborating further, when looking to address questions of variation or change over time, panel data prove ideal because the data are comprised of two distinct dimensions: a spatial and a temporal unit (Yaffee, 2003). The combination of time series and cross sectional elements enables the researcher to disentangle the temporal ordering of variables and, thus, shed light on the causal relationships among them—something that would be difficult to achieve using only one of these two dimensions (Phillips & Greenberg, 2007; Gujarati, 1999). The spatial dimension pertains to a set of cross-sectional units: these units could be countries, states, counties, firms, groups of people, or even individuals (Yaffee, 2003). In the current analysis our cross-sectional units are taken from the 10 Canadian provinces over a span of 32 years (1981-2013), producing 32 units of observation for each of the 10

provinces, totaling in 320 observations for each variable. The temporal dimension pertains to periodic observations of a set of variables characterizing these cross-sectional units over a particular time span (Yaffee, 2003). Because the observations are taken annually, the temporal component is related to the number of periodic samples that were taken from the provinces, 32 years of observations taken once per year. In the current context, panel data analysis is fitting as both the space and time dimensions of the data permit the evaluation of the Cantor and Land (1985) model in an empirical context that considers temporal change. Once properly specified in a temporal context, it will assess whether the impact of contemporaneous unemployment (opportunity) on crime is in fact negative and, whether, the lagged impact of unemployment on crime is positive. Furthermore, because the data set covers a comprehensive period, stable and unstable markets conditions are represented within the data. More precisely, the nature of the data allows for the extent of variation in both crime and economic conditions to be studied over an extended period, thereby, low-frequency or long term variation in the measures can be identified within the current study (Gould, Weinberg & Mustard, 2002). This strategy in relation to the Cantor and Land (1985) model specifically facilitates the testing of long-run or motivational effects. As unemployment is often short-lived and highly cyclical, the analysis of short term unemployment cycles may not accurately capture the long-run effects of economic changes on crime rates (Gould et al. 2002). Crime should be more responsive to long term changes in labor market conditions than to short-term fluctuations, given the potentially long-lasting effects of incarceration and investment in human capital specific to the criminal sector. Therefore, assessing a comprehensive data set allows time variants in crime development to be considered, an element that is pertinent to the evaluation of the Cantor and Land (1985) model (Gould et al. 2002). Even though the advantages of using disaggregated data, such as panel data, to test the Cantor and Land (1985) model have been extensively outlined (Andresen, 2012, 2013, 2014; Arvanites & DeFina, 2006; Britt, 2007; Levitt, 2001; Phillips & Land, 2012), the literature contains relatively few analyses of panel data. Therefore, this paper will contribute to the small number of panel data analysis in this sphere.

An extent of the crime-economy literature has included both property and violent crime; as such, both categories of crime will be represented in this study. To account for

property crime, shoplifting, theft, burglary, theft of vehicle, and theft from vehicle were selected for analyses. All property crimes, with the exception of shoplifting are expected to demonstrate negative contemporaneous effects (opportunity) and positive lagged effects (motivational) with unemployment. In essence, unemployment places individuals at home, increasing guardianship that decreases the opportunity for motivated offenders, thereby protecting individuals from potential victimization (Clarke & Mayhew, 1994). On the other hand, shoplifting presents a unique opportunity to isolate and test the motivational structure of the Cantor and Land (1985) model. The impact of unemployment on criminal opportunity does not operate in the same way on shoplifting as it may on other property crimes, the placement of individuals at home protecting their person and property does not increase guardianship in retail spaces. Furthermore, because an increase in criminal motivation could lead to engagement in illegitimate activity both directly, such as shoplifting, and indirectly through the purchase of stolen goods, the analysis of shoplifting allows us to capture both categories. Consequently, in testing this crime type is it possible to assess whether structural unemployment does in fact lead to an expected positive relationship with shoplifting, indicating a positive motivational effect and a negative or null contemporaneous opportunity effect.

Violent crime was captured with the inclusion of sexual assault, homicide, assault and robbery. To be consistent with previous research, including the original work of Cantor and Land (1985), these crimes will be analyzed separately. All crimes are measured as the natural logarithm of the crime rate per 100,000 inhabitants. Taking the natural logarithm of a rate or raw count, per 100,000 inhabitants in this case, allows for comparisons to be made in terms of percent change, independent of population size. Further, taking the natural logarithm of the dependent and independent variables allows for ease of interpretation, as the results can be interpreted as elasticities, allowing for direct comparisons (between magnitudes) in the results (Wooldridge, 2010). As a note, because some of the Canadian provinces are rather small in populace, there were fourteen instances of zero homicides, thirteen of these instances are in Prince Edward Island and one in Newfoundland. Given that the natural logarithm is not defined for zero values, to facilitate the natural logarithm, the zero values were changed to one. Concerns of imposing bias from modifying the data were mediated through two separate analyses; one where the values were included, and one in which the values were

removed. There was no qualitative change in the results. The descriptive statistics for the crime rates per 100,000 are taken from yearly provincial values and shown in Table 4.1.

Table 4.1 Descriptive Statistics, Natural Logarithms of Crime Rates per 100,000 Canadian Provinces, 1981 – 2013

Crime Type	Minimum	Maximum	Mean	Standard Deviation
Sexual Assault	3.26	5.43	4.47	0.41
Homicide	-1.75	1.63	0.56	0.59
Assault	5.26	7.43	6.55	0.37
Robbery	1.58	5.34	4.03	0.89
Shoplifting	4.13	6.48	5.71	0.41
Theft	6.87	8.63	7.76	0.39
Break and Enter	5.74	7.52	6.78	0.39
Theft of Vehicle	4.40	7.22	5.73	0.66
Theft from Vehicle	5.48	7.95	6.68	0.54

The primary variables of interest consist of multiple economic measures: unemployment, gross provincial product (GPP), unemployment for 53+ weeks, and low income, all of which were obtained through CANSIM. Unemployment is measured as a rate of the percentage of unemployed persons relative to the 15-64 year old work force in each province; GPP is measured as the natural logarithm of millions of 2002 constant dollars and represents the average income in the economy. The natural logarithm was taken for GPP in order to provide some form of normalization and account for the variation in economic activity between each province. Unemployment for 53+ weeks[1] is measured as the natural logarithm of the rate of persons 15-64 years old who have been unemployed and currently looking for work, for a period of 53 weeks or greater; finally low income is measured as the natural logarithm of the rate of families spending 20

[1] The variable for Unemployment for 53+ weeks had missing data (<6%) for the provinces of Saskatchewan, Alberta and Prince Edward Island. With Little's Test, the data were determined to be missing at random (MAR). GPP closely relates to employment cycles. As such, the measure was charted for each of the three provinces to allow for triangulation; a pattern emerged that aligned with the unemployment data. It was determined thereafter, that linear interpolation would be an appropriate and straightforward method to address the missingness. Accordingly, the data were interpolated using this method.

percent or more after-tax income than average on essential needs such as food, clothing, and shelter these individuals capture the motivated offender. Again, taking the natural logarithm of both our dependent and independent measures allow for direct comparisons to be made in the magnitudes: as the resulting sets of estimated parameters are elasticities (Andresen, 2014). The descriptive statistics for the economic variables are shown in Table 4.2 either as natural logarithms or rates.

Table 4.2. Descriptive Statistics, Explanatory Variables, Canadian Provinces, 1981 – 2013

Explanatory Variable	Minimum	Maximum	Mean	Standard Deviation
GPP, millions 1992 dollars (logged)	21.51	26.84	24.37	1.31
Unemployment, rate	3.40	20.20	9.76	3.73
Unemployment 53+ weeks (logged)	5.30	11.49	8.24	1.49
Low income, percent (logged)	8.52	14.24	11.96	1.40

Cantor and Land (1985) hypothesized that a downturn in aggregate economic activity would increase motivation but decrease opportunity. However, it may be difficult if not unrealistic to accurately capture the entire phenomena of economic change with a single economic variable. Consequently, by using a single measure to test their hypothesis it is possible that Cantor and Land (1985) did not fully conceptualize the intended logic of their model. A further examination into the definitions of the economic measures will exemplify the importance of using multiple measures of the economy when testing the relationship between crime and economic change.

The unemployment rate which has been a common measure of macro-economic activity in the crime and economy literature, only includes those who are currently looking for work therefore individuals who are not currently seeking employment but are nonetheless unemployed along with those who are underemployed because of economic conditions would not be represented in this measure (Andresen, 2012; Arvanites & DeFina, 2006; Chiricos, 1987; Greenberg, 2001). The relationship between unemployment and crime is therefore, based on changes in the rate of individuals who are actually looking for employment not the actual proportion of individuals who are out of work; an increase in unemployed individuals will impact both motivation and opportunity structures (Andresen, 2013, p. 222).

GPP is an income-based measure of provincial level economic activity, measuring the total income and production of a province within a given calendar year; this is the smallest unit of aggregated economic activity available. Therefore including GPP as an economic measure better indicates the state of the economy at a relatively disaggregated level, when compared to Gross domestic product (GDP) and the national unemployment rate (Arvanites & DeFina, 2006). Cantor and Land (1985) stated that the use of macro level aggregated data greatly limited their study because the effects of being unemployed on criminal motivation is best tested when individual data are available for both offending and unemployment. Because GPP is the smallest unit of data available for aggregated economic activity it may be feasible to get a better indication of the crime-economy relationship by using this smaller unit of measure. In this instance, the relationship between GPP and crime is based on actual changes in economic activity (Andresen, 2013). A decrease in GPP indicates a contraction in economic activity that could also be an indication of the proportion of individuals who are out of the labor force as well as the underemployed (Andresen, 2013).

The low income variable, measures the percentage of families within the population who spend a disproportionate amount of their income on needs that are essential for living: food, shelter and clothing. Thus, low income is a direct representation of the proportion of the individuals and families within the population who actually experience economic hardship. This variable best details the motivational, long run effect of the Cantor and Land (1985) model because it measures those who have the greatest incentives to commit economically motivated crimes, such as property crime (Andresen, 2013).

Lastly, the variable of unemployment for 53+ weeks allows for the analysis of the motivational effects of long term- structural unemployment that is distinguished and differs from regular or short term unemployment. As mentioned above, Cantor and Land (1985) recognized that unemployment had a lagged effect on criminal motivation, individuals are not instantaneously motivated nor pushed towards crime as a result of economic hardship, the process takes time to develop. Cantor and Land (1985) attributed this lagged motivation effect to the cushion period in which newly unemployed individuals in modern industrialized societies, receive financial assistance in the form of

unemployment benefits for a period of time after becoming unemployed. For this reason, Cantor and Land (1985) dismissed the assumption that financial stresses related to periods of economic slowdown are likely to serve as an immediate motivation for persons to commit crimes. It is only after individuals have exhausted their stock of post-employment resources that the strain of financial stress will set in and though Cantor and Land (1985) argued that the exact lag period is expected to be ambiguous, they used the lag unemployment rate of one year to capture the lag motivational effect (Paternoster & Bushway, 2001, p. 393). Cantor and Land (1986) did not create a direct measure for the empirical evaluation of lagged motivation and neither have subsequent studies. As a consequence, there is paucity in the crime and economy literature on the impact of unemployment duration and how it affects the dynamics of the crime-economy relationship.

If a continuum of low to high motivation to commit offenses is considered, and all members of the population are arranged along this continuum, previous theories would lead to an assertion that all other things being equal a downturn in economic conditions would produce a shift towards the higher end (Cantor & Land, 1985, p. 319). Despite the intuitive appeal of this argument, this is not the case as demonstrated by Cohen and Felson (1979) through their example of the sociological paradox in the United States during the 1950-1960s. For this reason, a more concise assertion could be that individuals who face higher levels of long term, structural unemployment and/or poorer economic conditions have greater motivation towards illegitimate activities, such as property crime (Andresen, 2012). Including a measure that captures the percent of unemployed persons within the population who have effectively run out of a primary form of legitimate income that is, employment insurance will enable us to test and distinguish the effects of structural unemployment from regular unemployment. The intent of including a direct measure for structural unemployment is to fill the gap of ambiguity regarding the lag period of motivation.

Unemployment duration of 53+ weeks was selected for this analysis because in Canada regular Employment Insurance benefits can typically range anywhere from 14 to 45 weeks but only for a maximum of 52 weeks. Therefore, electing to go beyond the higher bound of this range allows us to consider only individuals who are no longer

receiving unemployment benefits and, therefore, have exhausted all major sources of finance. These are individuals who are facing higher levels of structural unemployment and as a result poorer economic conditions, so including this population will allow for empirically inquiry into whether those who are further along the continuum of unemployment actually have greater instances of criminal motivation; and if so an increase in the unemployment rate of 53 weeks or more should have a positive impact on crime, particularly property crime.

The statistical method employed in the current context, multilevel regression, allows for the consideration of contextual factors: differences in provincial level characteristics that may have an impact on the overall effect of the explanatory variables on the crime types (Bickel, 2007). Simply put, because the data set consists of group-level measures (provinces), between group differences that could account for changes in crime beyond the individual level characteristic of time must be accounted for (Stoel et al. 2013).

Commonly, aggregated measures of the economy such as the national unemployment rate have been used to evaluate the Cantor and Land (1985) model. However these type of data place limitations on the findings as little is known about the economic and crime differences within provinces, states or even countries in which the data were drawn. Although, not necessarily interested in those differences per se, for the sake of precision the possible implications or effects of those differences should be addressed in the analysis. As outlined by Giffen (1965, 1976), Kennedy et al. (1991) and Andresen (2009) a well-known and distinctive regional pattern exists with regard to Canadian crime rates, increasing from east to west; yet relatively little is known about why this pattern exists. As such, it is important to investigate provincial level characteristics that may contribute to this regional pattern. Given that not all provinces are equal in economic and social conditions it is important to investigate and account for the ecological context of a province that can promote or reduce crime. Accordingly, the models are robust to the inclusion of contextual factors that were selected in accordance with routine activity theory. All contextual variables were obtained through CANSIM: incidents per officer, correctional expenditures as a percentage of the GDP and officers per capita. Incidents per officer is measured as the natural logarithm of the count and is

expected to have positive lagged and contemporaneous relationships with crime. Because this variable captures a work-load issue, increases in the measure not only demonstrate higher criminal incidents in an area but also exhibits a relative underrepresentation of the police, a lack of formal guardianship (Andresen, 2013, p. 223). Correspondingly, incidents per officer reveal regional differences in crime, provinces with higher incidents indicate greater instances of crime and vice versa. The interaction between correctional spending as a percentage of the GDP and officers per capita demonstrate a deterrent effect that could lead to differences in crime rates between provinces. Increased funding for corrections and greater numbers of officers per capita is expected to create a deterrent effect by decreasing the circulation of motivated offenders and increasing guardianship.

Motivated offenders, suitable targets and capable guardianship or lack thereof are the three main pillars of routine activity theory. Therefore it is important to control and account for the presence of these factors in the study. The presence of motivated offenders is another element that could lead to regional differences in crime. Accordingly so, the Gini index and young males were included to capture the presence of motivated offenders. Young males are measured as the natural logarithm of the count of young males in the population aged 15-29. While the Gini index is commonly used to measure inequality, an index of zero would represent perfect equality and as the index increases so does the perceived level of inequality. Taken together, these variables are expected to have a positive relationship with crime. Because young males are deemed to be the most crime prone sub population (Hirschi & Gottfredson, 1983; Kennedy & Forde, 1990; Miethe, Stafford & Long, 1987) and the Gini coefficient represents the relative economic hardship that could increase criminal motivation, jointly these variables could lead to increases in illegitimate economic activity (Andresen, 2012). Table 4.3 summarizes the contextual variables.

Table 4.3 Descriptive Statistics, Natural Logarithms of Contextual Variables, Canadian Provinces, 1981 – 2013

Explanatory Variable	Minimum	Maximum	Mean	Standard Deviation
Police officers per capita	4.92	5.61	5.19	0.12
Corrections spending, percent of GDP	15.01	20.28	17.90	1.28
Criminal incidents per officer	2.94	4.43	3.80	0.30
Gini coefficient	34.70	45.10	39.86	2.19
Young Males (Percent of population)	9.50	14.15	12.03	1.26

Finally, because the data are from the years 1981-2013 two trend variables were included in the analyses, Trend and Trend^2 to account for the sharp increase in all crime rates during the 1980s and the subsequent crime drop in the 1990s—see Farrell et al (2015) for a discussion of the crime drop and its implications for criminological research. Trend ranges from 1-32, taking on sequential values for each year and each province, Trend^2 is the square of Trend. This approach was taken in order to demonstrate the general tendency of the pattern in the data, without the addition of Trend and Trend^2 the error residuals would not be independently distributed. The time measure in our multilevel model was created by taking a sequential measure of the number of observations taken from each province (1-32). Thus, the time variable consists of ten sequential sets of 1-32, one for each of the ten provinces. The descriptive statistics for the trend and time variables are presented in Table 4.4

Table 4.4 Descriptive Statistics, Time and Trend Variables, Canadian Provinces, 1981 – 2013

Explanatory Variable	Minimum	Maximum	Mean	Standard Deviation
Trend	1.00	33.00	17.00	9.54
Trend^2	1.00	1089	379.67	334.23
Time	1.00	33.00	17.00	9.54

4.2. Empirical Approach

The two separate and counteracting pathways of the Cantor and Land (1985) model, motivation and opportunity, pertain to lagged and contemporaneous relationships, respectively, and require a statistical method that is capable of identifying the temporal ordering of these effects. Accordingly, a hierarchical linear modeling approach, multilevel regression, was employed to test the Cantor and Land (1985) model. Results obtained from OLS (ordinary least squares) estimates are commonly found in the Cantor and Land (1985) literature and more generally in studies on unemployment and crime. However various biases have been noted concerning OLS estimations, resulting in the underestimation of the unemployment and crime relationship (Lin, 2008). In general, Lin (2008) identified three factors that potentially explain the bias in OLS results. The first being the problem of omitted variables, for example omitting a procyclical crime-related consumption variable would lead the OLS method to underestimate the true effects of unemployment on crime. Cook and Zarkin (1985) have suggested that legitimate employment opportunities, criminal opportunities, crime-related commodities, and the responses by the criminal justice system are all important variables in the crime supply function. In this paper measures related to the factors identified by Cook and Zarkin (1985) are accounted for with the inclusion of unemployment, GPP, low income as independent variables that represent the economic incentive factors. Criminal opportunities and criminal motivation are captured with the contextual variables. Secondly, biases in OLS estimates could be attributed to the problem of simultaneity, leading to concerns pertaining to the direction of causation between unemployment and crime (Lin, 2008; Raphael & Winter-Ebmer, 2001). That is, the overall effect of unemployment may be underestimated under OLS if criminal activity reduces employability of offenders, through either a scarring effect of incarceration or a greater reluctance among the criminally initiated to accept legitimate employment, thus, criminal activity in turn may contribute to unemployment (Raphael & Winter-Ebmer, 2001). To the extent that criminal activity discourages employers from operating in the area or perpetuates employer flight, the direction of causation with regard to the unemployment crime relationship could be reversed (Cullen and Levitt, 1999). Lastly, the OLS method would underestimate the effect of economic activity on crime as a result of random measurement errors in unemployment or other economic measures (Lin, 2008).

Apart from the biases imposed specifically on the unemployment and crime relationship, from a general methodological perspective OLS presents special limitations analyzing longitudinal data and is, therefore, not ideal. Because traditional regression based approaches treat all covariates as though they are time invariant, methods such as OLS are unable to account for covariates having values that change over time, that is, covariates that are time varying (Box-Steffensmeir & Jones, 2004). Furthermore, when analyzing data that contain duration components, such a panel or other longitudinal data, standard OLS applications could lead to considerable asymmetry in the response variable. Given that, OLS will model the mean response as a function of the covariates and, hence, having positive duration data will often lead to asymmetry, particularly if some observations have exceptionally long duration times (Box-Steffensmeir & Jones, 2004). To address the potential biases of OLS estimations, the current study includes multiple measures of the economy and employs a statistical method that appropriately reduces the biases of OLS particularly in estimates of panel data. Taken together, new forms of statistical specification and a greater range of economic variables have the potential to remedy the limitations of OLS and in doing so contribute to the Cantor and Land (1985) literature. The multilevel technique will be discussed in the following section.

4.3. Multilevel Modeling

The multilevel modeling approach enables the researcher to place emphasis on the complimentary nature of macrosocial and micro level factors in the explanation of variation in crime and delinquency (Rountree, Land & Miethe, 1994, p. 387). A primary factor that differentiates multilevel models from that of conventional linear or logistic regression is that focus that is placed on the distinct effects of both aggregate and individual-level factors (Rountree et al. 1994). The implicit hierarchy involved between individual level or within group characteristics (time in the current context) and that of aggregate or between group factors (provincial level variables), are usually ignored in standard statistical approaches (Rountree et al. 1994). Measures from both levels are usually entered into the same analysis without consideration for the impact nesting, thereby threating to violate the assumption of independence in which these traditional

contextual analyses are based (Rountree et al. 1994). Multilevel models provide a solution for violations of independence by explicitly accounting for the hierarchical structure of the data. In doing so, submodels and nested error terms are employed to account for effects and sources of variation at different levels of analysis (Rountree et al. 1994, p. 388). To that end, hierarchical linear models account for the idea that observations drawn from the same group are often likely to be more similar regarding certain characteristics than are observations taken from different groups. In brief, multilevel analyses are beneficial to criminological research as it provides the potential for progress towards the goal of theoretical integration in criminology as causal significance is placed on both large-scale social forces and individual-level adaptations that result in criminal events (Rountree et al. 1994, p. 388). The application of the multilevel technique as it specifically applies to the current study will receive further elaboration in the sections below.

The units of analysis identified within the current data set consists of two distinct levels, the individual level: (1) time, the total number of years of annual data for a province, 32 consecutive years; and the group level: (2) provincial level data, the data that were obtained from each of the ten Canadian provinces (explanatory and contextual variables). Because, the multilevel approach allows for both random and fixed effects estimations, this technique is fitting for the analysis of our data, as the data include group/provincial level variables as well as temporal/time level measures which require distinction in the estimates. The fixed effects model is only capable of testing the effects of the explanatory variable (X) on the dependent variable (Y) (Albright & Marinova, 2010). These factors are said to be fixed because the same fixed levels are included in replications of the study and the researcher is interested only in the exact categories of the factor that appear in the experiment (Albright & Marinova, 2010). The underlying assumption for a fixed effects model is no difference in the means of each group (provinces), such that all provincial measures are pooled and considered to be equal (Bell & Jones, 2013). Moreover, fixed effects estimation assumes no effect for time, the impact of temporal change is zero (Bell & Jones, 2013). Because the fixed effects model does not account for the hierarchical nature of the data, within and between group measures are processed as a single homogenous effect, thereby our level 1 measure (time) and our level 2 measures (provincial measures) are considered one in the same

(Albright & Marinova, 2010). As such the standard fixed effects equation for panel data would be as follows:

$Y_{it} = \beta_1 X_{it} + \alpha_i + u_{it}$	(1)

where α_i is the unknown intercept for each entity, Y_{it} is the dependent variable where i = entity and t = time, X_{it} represents one independent variable, β1 is the coefficient for that independent variable, and u_{it} is the error term (Torres-Reyna, 2007). Because, fixed effects modeling assumes that the errors are independent and normally distributed with constant variance, this method is poorly suited when dealing with nested data, such as panel data that consists of group level measures, because within group observations are likely homogeneous and, thus, violate the assumption of independence.

Random effects modeling, unlike the fixed effects model, assumes that the variation across entities is random and uncorrelated with the independent variables included in the model (Torres-Reyna, 2007). As there is reason to believe that differences across provinces have some influence on the dependent variable, random effects modeling should be included in the analysis. The underlying assumption in utilizing this method is that contextual differences between provinces have an impact on the dependent variable and that change over time is not the single contributing factor to changes in crime rates. Arguably, random effects modeling allows for greater flexibility and generalizability, as it permits accounts of context, including variables that are only measured at the higher level (provincial level measures) (Bell & Jones, 2013).

Additionally, modeling random effects allows for recognition of differences between group level measures, something that is particularly evident with temporal hierarchies that are often characterized by marked dependence over time. Therefore, the assumption that all higher level entities are identical and can be completely 'pooled' into a single population cannot be made for data with temporal hierarchies as responses for measurement occasions within a given higher-level entity are often related to each other (Bell & Jones, 2013, p. 7). Accordingly, standard errors will be incorrect if this dependence is not taken into account (Moulton, 1986). To that end, the random effect model provides a solution to the dependency issue by partitioning the unexplained residual variance into two: higher-level variance between higher-level entities and lower-

level variance within these entities, between occasions (Bell & Jones, 2013, p. 8). To achieve this, a residual term is included for each level, with the higher-level residual being the so-called random effect (Bell & Jones, 2013). An example of the standard random effects model would be:

$$Y_{it} = \beta X_{it} + \alpha + u_{it} + \varepsilon_{it} \quad (2)$$

where u_{it} accounts for the between group error and ε_{it} represents the within group error.

The multilevel technique utilized in the current analysis combines both fixed and random effect estimations. A standard multilevel equation that combines fixed and random effects is as follows:

$$Yij = \gamma_{00} + \gamma_{10}X_{ij} + \gamma_{01}Z_j + \gamma_{11}X_{ij}Z_j + u_{1j}X_{ij} + u_{0j} + e_{ij} \quad (3)$$

Simply put, the first part of the equation ($\gamma_{00} + \gamma_{10}X_{ij} + \gamma_{01}Z_j$) corresponds to fixed effects, where the effect of X on Y is considered regardless of the impact of Z (group variable). The second part of the equation ($\gamma_{11}X_{ij}Z_j + u_{1j}X_{ij} + u_{0j} + e_{ij}$) demonstrates the random component where the intercept represents between group differences and the effect of X is conditioned on Z (group variable). With the addition of a time component, as evident in our data set, the equation can be expanded as such:

$$Yij = \boldsymbol{\gamma_{00}} + \gamma_{10}TIME1_{ij} + \gamma_{01}Z_j + \gamma_{11}TIME1_{ij}Z_j + u_{0j} + u_{1j}TIME1_{ij} + e_{ij} \quad (4)$$

The fixed effects component of the equation ($\boldsymbol{\gamma_{00}} + \gamma_{10}TIME1_{ij} + \gamma_{01}Z_j$) indicates that the time variable is at level 1 (note the 'i' subscript after TIME). The interaction term ($\gamma_{11}TIME1_{ij}Z_j$) allows for the interaction between the level two and level one (Time) variables. The statistical interaction between the aggregate and individual-level measures account for the non-uniformity of the relationships of individual-level variables to the impact on crime rates across provinces (Rountree et al. 1994). The random effect component ($u_{1j}TIME1_{ij} + e_{ij}$) indicates that the level one variable is included as a random component, and in including a random effect, the potential heterogeneity across provinces can be assessed accordingly. If the random component (time) is found to be insignificant, this would indicate that heterogeneity across groups (provinces) does not

significantly affect the prediction. Specifically, in allowing time to be random, the impact of changes in crime rates due to time variations will vary across provinces, thus creating an implied interaction with the level two covariates (provincial level variables). That is, the assumption in allowing time to vary is that a temporal effect exists and that the effect of changes over time varies by province and, hence, account for this variation.

Cantor and Land (1985) operationalize the distinction between opportunity and motivation by arguing that the former occurs within a restricted period, while the latter operates with a lag or delay (Cook & Watson, 2014, p. 462). In the current context, in order to create variables that measure the temporal lagged effect of criminal motivation, interaction terms were included at the fixed effects level between all the economic variables and time. Resulting were variables that measured the impact of unemployment, unemployment 53+ weeks, low income, and GPP on our various crime types over time, and these variables were able to capture the lagged motivational effect. The contemporaneous effect of criminal opportunity was captured using the economic variables in the original form at the fixed effects level (no variance over time). The intent in creating distinguished variables using temporal units is to separate and test the effects of motivation and opportunity in the respective temporal ordering, as outlined by Cantor and Land (1985). Additionally, because the random component model allows the intercept and slope of the time measure to vary by province, implied interaction terms were created between all variables and time.

Before testing the models, the intraclass correlation coefficient (ICC) was calculated for each of the crime types. The ICC illustrates whether there is enough unexplained between group variation at level two to warrant the use of a random coefficient modeling approach, if not, fixed effects modeling can be used without violating the assumption of independence of observations. The standard threshold is set at five percent, in that ICC calculations of five percent or greater indicate that the variability in the response is attributed to group level differences indicating a misspecification issue (Bickel, 2007). Therefore, these differences should be modeled, with the inclusion of group level variables, and failing to do so would result in omitted variable bias. Theoretically, the ICC could be reduced to zero with proper specification, a substantial reduction in the coefficient would mean that the variables included sufficiently

reduced between group variations. To calculate the ICC, a separate intercept model was created for each crime type. The intercept model provides a baseline in which model fit can be assessed, model fit statistics from the conditional models are compared to the baseline. The ICC is calculated using the formula presented here:

$INTERCEPT_1 / (INTERCEPT_1 + residual)$	(5)

The ICC calculations are shown in Table 4.5. All dependent variables have an ICC of greater than five percent, thus justifying the use of multilevel modeling. It should be noted that three separate analyses were conducted for each crime type: the intercept model, the fixed effects model with interactions terms but without random components and, finally, a random effect model where our time variable is the random component.

Table 4.5 Intraclass Correlation Coefficients (ICC), Percentage of Variance in Crime Types, Canadian Provinces, 1981 – 2013

Intraclass Correlation Coefficients	Between Group Variance	Within Group Variance
Sexual Assault	31.40%	68.60%
Homicide	72.20%	27.80%
Assault	68.30%	31.70%
Robbery	91.00%	9.00%
Shoplifting	59.40%	40.60%
Theft	81.10%	18.90%
Break and Enter	70.50%	29.50%
Theft of Vehicle	77.90%	22.10%
Theft from Vehicle	83.30%	16.70%

Chapter 5.

Empirical Results

In this section the main results are presented, where the contemporaneous opportunity and lagged motivational effects on property and violent crime types were estimated using multilevel regression analysis. The results from the empirical analyses can be considered to contain two general components. First, they can be perceived in terms of the extent to which theoretically predicted signs for the relationships are observed in practice. Second, the results can be viewed in terms of the information provided on statistically significant[2] opportunity and motivation effects. Each of the nine crime types (shoplifting, theft, burglary, theft of vehicle, theft from vehicle, sexual assault, homicide, assault and robbery) were considered in separate models, three separate models were used to analyze each crime type for a total of twenty-seven models.

5.1. Shoplifting

The results from the analysis for shoplifting are presented in Table 5.1 Notably, the intercept model indicates that a statistically significant difference exists between provinces for logged rates of shoplifting; and a significant residual reveals differences in shoplifting rates within each province. The time factor is also significant, thus indicating, that time has an effect on the outcome variable.

[2] Statistical significance is measured at the ** 0.05 and ***0 .01 levels

Table 5.1 Estimated Multilevel Effects, Natural Logarithms Shoplifting Rates, Canadian Provinces, 1981 – 2013

Contemporaneous effect	Baseline Model	Fixed Effects Model	Random Effect Model
Intercept	6.02***	-46.03**	-28.27
Time	-.018***	-.190	-.188
Unemployment		-.014	.000
Unemployment 53+		-.006	-.021
Low Income		.359**	.417**
GPP		-.904**	-.780**
Lagged effect, Interaction w/ Time			
Unemployment *time		.002**	.000
Unemployment 53+ *time		.005	.007**
Low Income *time		-.022**	-.024**
GPP *time		.016	.017
Contextual Variables			
Officers per capita		11.38**	7.90
Corrections spending		3.50**	2.34
Officers per capita * Corrections spending		-.656**	-.413
Incidents per officer		.401**	.404**
Gini coefficient		-.039**	-.040**
Young Males		.739**	.305
Covariance Parameters			
Residual		.047***	.034***
Intercept		.086	-
Intercept+ Time Random Effect			
UN (1,1)			.086
UN (2,1)			-.003
UN (2,2)			.000

Note: Models are based on 320 observations. Estimated parameters are elasticities. ** 5 percent significance; *** 1 percent significance

An ICC of 59.40 % specifies that the between group variability is significant enough that addition provincial level variables are required to explain the variability in the dependent variable. Without the inclusion of provincial level, or contextual measures, the

variability in the dependent variable is accounted for simply by virtue of the time measure. Accordingly, unemployment, unemployment 53+ weeks, low income, and GPP are included in the second model as explanatory variables. The contextual variables incorporated are as follows: correctional expenditures as percentage of the GDP, officers per capita (an interaction between the two measures, the conceptualization of deterrence), incidents per officer, young males and the Gini index. The underlying rationale for including shoplifting in the current analysis was to test the lagged motivational effect of the Cantor and Land (1985) model. Because the impact of an economic downturn on criminal opportunity should not impact shoplifting in the same way as it would other property crimes; testing this crime type, enables the motivational effect to be isolated, allowing for greater insight to be gained into the lagged effect. The time variable was found to have a significant and negative relationship with shoplifting, suggesting that rates of shoplifting decrease as the years pass. Conforming to expectations, both unemployment variables were insignificant in the contemporaneous form, illustrating the absence of an opportunity effect for unemployment and structural unemployment in the short-run. Of the four state of the economy variables, GPP, in the contemporaneous form was found to have a statistically significant and negative parameter estimate, thereby demonstrating a negative opportunity effect, a finding in line with expectations. Most compelling are the results for the interaction terms between the economic variables and the time component. Of the economic variables tested, two of the four revealed significant relationships with shoplifting: unemployment and low income indicating the presence of a motivational effect. In allowing unemployment to interact with time, essentially transforming the variable into a measure of long-term unemployment, the estimated parameter became positive. This finding corresponds to expectations of the temporal effect of criminal motivation as hypothesized by Cantor and Land (1985).

The interaction between low income and time showed a negative relationship. Unemployment of 53+ weeks, the variable representing structural unemployment yielded an insignificant relationship, presumably because the lagged effect was already evident in the variable. The contextual variables reveal some interesting results; all were statistically significant, though the signs and magnitude differ. Young males, incidents per officer, correctional spending as percent of the GDP along with officers per capita

were found to have positive relationships with shoplifting. While the Gini index and the interaction between correctional spending as percent of the GDP and officers per capita produced negative parameter estimates. The residual (level 1) for our estimated covariance structure was statistically significant and decreased from 0.066 in the intercept model to 0.046 when explanatory variables were added to the conditional fixed effects model (model 2). Although there is a reduction in the residual, the fact that it is still significant illustrates that there is more to explain concerning the variance at level 1. The intercept (between group differences) is no longer statistically significant meaning that our second model with the addition of provincial level variables was able to sufficiently explain all the between group variation.

The third and final model is the random effects model in which the time component was made the random effect. In allowing the effect of time to vary by province, and thereby create an implied interactional effect, distinct changes were noted in the results. First, the impact of unemployment over time (lagged effect) on shoplifting became insignificant. The unemployment variables in the contemporaneous forms remained insignificant, further establishing the absence of an opportunity effect. The parameter signs and statistical significance were not altered for low income and GPP with the introduction of a random component. The results demonstrate that the impact of heterogeneity of time across provinces, impacts the economic variables in differing ways.

What's more, allowing time to vary successfully accounted for all the variation in the intercepts as indicated by the insignificant parameter estimate for UN (1,1). Similarly, the current model successfully accounted for all the variance in the slopes, as UN (2,2) became insignificant with the addition of time as the random component. In sum, the variables included in the model were able to account for all the between and within group variation and are, thus, fitting predictors for shoplifting. The model fit statistics when viewed in terms of the information criteria alone whereby, a smaller value indicates that the balance between model fit and parsimony is achieved show that the fixed effects model is a better fit than the intercept model. However, upon calculating the deviance difference statistic, the fixed effects model was not shown to be significantly better than the intercept model. However, in using the same criteria for model fit, the random

component model was shown to be a significantly better model than the fixed effects model. Results can be found in Table. 5.2

Table 5.2 Model Fit statistics for Natural Logarithms of Shoplifting Rates

Model Fit Statistics	Baseline Model	Fixed Effects Model	Random Effect Model
Deviance Statistic	-	20.04	86.36***
-2 Restricted Log Likelihood	88.88	59.84	-26.52
Akaike's Information Criterion (AIC)	92.88	63.84	-18.52
Schwarz's Bayesian Criterion (BIC)	100.47	71.33	-3.54

Note: Information criteria, follow a smaller-is-better interpretation, thus a reduction in value indicates a better model fit. For the deviance difference calculations, levels of significance are indicated as follows: ** 5 percent significance; *** 1 percent significance. Values are calculated using information from the -2 Restricted Log Likelihood statistic.

5.2. Theft from Vehicle

The intercept model establishes a statistically significant difference exists between provinces with regard to logged rates of theft from vehicles and a significant residual parameter conveys within province differences. The results for theft from vehicle are displayed in Table 5.3

The ICC for theft from vehicle (83.30%) warranted a multilevel approach, as it far exceeds the 5.0% threshold. Again, the time coefficient was significant with a negative parameter. Moving onto the second model, the explanatory economic variables (both as individual factors and as interaction terms with time) and contextual variables were included and estimated as fixed effects. In assessing the relationship between the economic variables and theft from vehicles it is expected that both the contemporaneous opportunity effect and the lagged motivation effect be present and consistent with the predictions of Cantor and Land (1985). Three of the four economic variables (unemployment, low income, and GPP) and the time variable reveal significant contemporaneous effects; the measure of unemployment for 53+ weeks was insignificant. That is, taken in the original form, each of the three significant economic variables verifies the presence of a contemporaneous opportunity effect, though the

signs and magnitude differ. Low income revealed a positive relationship: an increase in the rate of low income families leads to an increase in criminal opportunities, hence an increase in theft from vehicles. Conversely, the parameter estimates for unemployment and GPP are negative, with theoretically expected signs. Compelling are the results that emerged when the economic variables interacted with time, and most prominent being the results for unemployment. The interactional effect between unemployment and time transformed unemployment in its contemporaneous form into structural or long term unemployment capturing the lagged effect of criminal motivation. Unemployment over time had a significant and positive relationship, exemplifying an increase in criminal motivation in the long run and appropriately an increase in theft from vehicles in the long run.

Table 5.3 Estimated Multilevel Effects, Natural Logarithms Theft from Vehicle Rates, Canadian Provinces, 1981 - 2013

Contemporaneous effect	Baseline Model	Fixed Effects Model	Random Effect Model
Intercept	7.09***	-33.93**	-3.99
Time	-.024***	-.625***	-.525***
Unemployment		-.061***	-.039**
Unemployment 53+		.045	.054
Low Income		.843***	.497***
GPP		-.785***	-.592***
Lagged effect, Interaction w/ Time			
Unemployment *time		.004***	.002**
Unemployment 53+ *time		-.003	-.001
Low Income *time		-.034***	-.028***
GPP *time		.041***	.033***
Contextual Variables			
Officers per capita		8.45**	2.29
Corrections spending		2.67***	.835
Officers per capita * Corrections spending		-.484**	-.131
Incidents per officer		1.05**	1.43***
Gini coefficient		-.024**	-.007
Young Males		.026	-.029
Covariance Parameters			
Residual		.020***	.015***
Intercept		.119	-
Intercept+ Time Random Effect			
UN (1,1)			.018
UN (2,1)			-.001
UN (2,2)			.000

Note: Models are based on 320 observations. Estimated parameters are elasticities. **5 percent significance; *** 1 percent significance

The results for unemployment conform to the temporal ordering for both the opportunity and motivational effects as hypothesized by Cantor and Land (1985). Low

income was significant with a negative parameter estimate when allowed to interact with time, thus increases in provincial levels of low income families over time leads to a decrease in criminal motivation at the provincial level and, hence, a decrease in theft from vehicles. GPP showed a significant positive relationship with theft from vehicle when measured over time. Unemployment for 53+ weeks was the only economic variable to remain insignificant throughout the analysis. Five of the six contextual variables (including the interaction between correctional expenditures and officers per capita) were significant with varying signs. The residual retained significance and, therefore, variance at the individual level requires further explanation. A decrease from the intercept model (0.044 to 0.020) indicates that the variables included in the current model are significantly better than the intercept model. And because the intercept is no longer significant, all the between group variability has been explained with the current model.

Results for the third model, the random component model does not show a great departure from the previous model with regard to statistical significance and parameter signs. The parameter signs and statistical significance for the economic variables in both the contemporaneous and lagged forms did not change with the addition of time as a random effect. However, the same cannot be said for the contextual variables, as all but one variable (incidents per officer) became insignificant. The parameter estimates for the variance around the intercepts UN (1,1) and the slopes UN (2,2) were insignificant and, therefore, it can be concluded that the third model was effective in accounting for all between group variation in the slopes and intercepts. The model fit statistics for the current model can be viewed in Table 5.4.

Table 5.4 Model Fit statistics for Natural Logarithms of Theft from Vehicles

Model Fit Statistics	Baseline Model	Fixed Effects Model	Random Effect Model
Deviance Statistic	-	-170.11	-75.79
-2 Restricted Log Likelihood	-31.02	-201.13	-276.92
Akaike's Information Criterion (AIC)	-27.02	-197.13	-268.92
Schwarz's Bayesian Criterion (BIC)	-19.43	-189.64	-253.94

Note: Information criteria, follow a smaller-is-better interpretation, thus a reduction in value indicates a better model fit. For the deviance difference calculations, levels of significance are indicated as follows: ** 5 percent significance; *** 1 percent significance. Values are calculated using information from the -2 Restricted Log Likelihood statistic.

5.3. Theft of Vehicle

A pattern has begun to emerge with regard to provincial differences in rates of crime, in that a considerable amount of variance exists between the provinces and thus provincial level variables are required to account for the variation. Theft of vehicle does not diverge from this pattern, as an ICC of 77.90% suggest that provincial level differences account for a substantial amount of variation in our dependent variable and, therefore, it is necessary to account for these differences in the modeling approach. To that end, a multilevel technique can be utilized. It should be mentioned that time was insignificant in this instance, suggesting that time (level 1 measure) is not a relevant factor in predicting theft of vehicles. Results can be found in Table 5.5.

Table 5.5 Estimated Multilevel Effects, Natural Logarithms Theft of Vehicle Rates, Canadian Provinces, 1981 - 2013

Contemporaneous effect	Baseline Model	Fixed Effects Model	Random Effect Model
Intercept	5.75***	-33.61	-55.80**
Time	-.001	.028	-.074
Unemployment		-.025	-.021
Unemployment 53+		-.062	-.120
Low Income		.204	.356**
GPP		-.368	-.640
Lagged effect, Interaction w/ Time			
Unemployment *time		-.002**	-.001
Unemployment 53+ *time		.002	.004
Low Income *time		.005	-.007
GPP *time		-.002	.008
Contextual Variables			
Officers per capita		7.13	12.18**
Corrections spending		1.79	2.91**
Officers per capita * Corrections spending		-.333	-.626**
Incidents per officer		1.58***	1.65***
Gini coefficient		.037**	.031**
Young Males		.075	.739**
Covariance Parameters			
Residual		.035***	.031***
Intercept		.140	-
Intercept+ Time Random Effect			
UN (1,1)			.156
UN (2,1)			-.002
UN (2,2)			.000

Note: Models are based on 320 observations. Estimated parameters are elasticities. ** 5 percent significance; *** 1 percent significance

The fixed effects model demonstrates that the results for theft of vehicle are vastly different from the results found for theft from vehicle, though the expectation was

that both crime types should produce theoretically similar findings. Be that as it may, the current analysis only produced one statistically significant finding; unemployment over time with a negative parameter estimate. The relationship was not as expected; long term unemployment should lead to an increase in criminal motivation in the long-run. The only other variables to reach significance were the contextual measures: incidents per officer and Gini, both with positive parameters. The present analysis does not provide great inference into the nuances of the Cantor and Land (1985) model, as having only one significant parameter estimate does not lend strong support to the model. In a similar fashion, the significant residual signifies that there is still variance to be explained at the individual level and thus further modeling is necessary.

Accordingly, the third model includes a random component, in which the effect of time is allowed to vary by province. Because there is still variance to be explained at the individual level, it is fitting to include time as a random component, as it is the only individual level variable in the model. It follows that the pattern of coefficients for the economic variables in the random component model does not differ greatly from the results of the fixed effects model. The only difference being that all economic measures are now insignificant, unemployment over time was significant in the previous model. Noteworthy, are the changes in the contextual variables, the inclusion of a random component resulted in statistical significance for all six contextual measures. The interaction term between officers per capita and correctional expenditures estimate, a finding that is in line with expectations. Considering the deterrent effect that is produced by an increase in officers per capita and correctional spending, the interaction term is intended to reduce crime through increase guardianship and hence a decrease in criminal opportunities. Albeit, a majority of the variables did not reach statistical significance, the covariance parameters indicate that the measures included in the model were able to fully account for the between group variance, as demonstrated by the insignificant parameter estimates for the variance around the intercepts UN (1,1) and the slopes UN (2,2). The deviance statistics for theft of vehicle demonstrate that the fixed effects model is a significantly better fit when compared to the intercept model; and the random component model proves to be a better fit than the fixed effects model. The model fit statistics can be found in Table 11.

Table 5.6 Model Fit statistics for Natural Logarithms of Theft of Vehicles

Model Fit Statistics	Baseline Model	Fixed Effects Model	Random Effect Model
Deviance Statistic	-	273.57***	21.87***
-2 Restricted Log Likelihood	248.68	-276.92	-24.89
Akaike's Information Criterion (AIC)	252.68	-268.92	-38.76
Schwarz's Bayesian Criterion (BIC)	260.27	-253.94	-23.78

Note: Information criteria, follow a smaller-is-better interpretation, thus a reduction in value indicates a better model fit. For the deviance difference calculations, levels of significance are indicated as follows: ** 5 percent significance; *** 1 percent significance. Values are calculated using information from the -2 Restricted Log Likelihood statistic.

5.4. Break and Enter

The ICC for logged rates of break and enter (BNE) is 70.50%, meaning that a significant difference exists between provinces concerning rates of BNE. Having an ICC that far exceeds the 5.0% threshold, is an indication that the between group variability is vast enough that provincial level variables ought to be modeled to explain or decrease between group variability in the dependent variable. Henceforth, a multilevel technique is appropriate in this case. As exemplified in previous models, the time component remains significant with a negative parameter estimate, conforming to the general trend of declining crime (Farrell et al., 2010).The results for BNE are displayed in Table 5.7.

Table 5.7 Estimated Multilevel Effects, Natural Logarithms Break and Enter Rates, Canadian Provinces, 1981-2013

Contemporaneous effect	Baseline Model	Fixed Effects Model	Random Effect Model
Intercept	7.11***	-10.31	-2.12
Time	-.019***	.039	.088
Unemployment		-.017**	-.008
Unemployment 53+		.050	.010
Low Income		-.006	.090
GPP		.137	-.104
Lagged effect, Interaction w/ Time			
Unemployment *time		.002***	.001
Unemployment 53+ *time		-.003**	-.001
Low Income *time		.006**	.002
GPP *time		-.005	-.104
Contextual Variables			
Officers per capita		2.31	1.03
Corrections spending		.454	.045
Officers per capita * Corrections spending		-.096	-.031
Incidents per officer		.999***	1.05***
Gini coefficient		.017***	.011**
Young Males		-.148	.231
Covariance Parameters			
Residual		.006***	.006
Intercept		.060	-
Intercept+ Time Random Effect			
UN (1,1)			.048
UN (2,1)			-.000
UN (2,2)			4.00

Note: Models are based on 320 observations. Estimated parameters are elasticities. ** 5 percent significance; *** 1 percent significance

Following the intercept model is the fixed effects model, included in the analysis are the economic and contextual variables, without a random component. Theoretically, because the variable of interest falls into the category of property crime, it is expected that the results demonstrate a short-run contemporaneous opportunity effect and a long-run or lagged motivational effect, consistent with the predictions of Cantor and Land (1985). The pattern of coefficients show strong support for a motivational effect, as three of the four long-run measures reached significance, compared to only one short-run variable. A negative and statistically significant estimated parameter for unemployment supports the argument of a contemporaneous opportunity effect in the context of the state of the economy and crime. What's more, a positive motivational effect is reinforced in the current analysis, as unemployment over time, a direct measure of structural unemployment produced a significant and positive parameter estimate. Correspondingly, low income over time, indicated a significant and positive parameter and, as follows, further substantiates a motivational effect in the long-run. Unemployment for 53+ weeks when measured as an interaction term with time returned a significant but negative parameter. The case could be that because this specific unemployment measure is already a direct measure of long term structural unemployment that in allowing it to further interact with time, the redundancy of the duration component produced a negative estimate. Turning to the contextual factors, of the six included in the model, only two (Gini and incidents per officer) reached significance, both with positive parameter signs. The results from the fixed effects model largely demonstrate the correct temporal ordering of the Cantor and Land (1985) model. In particular, the unemployment variables revealed the strongest support for the model, and clearly exhibited both the contemporaneous opportunity and lagged motivational effects of unemployment on property crime. Nonetheless, a statistically significant residual illustrates that the variance at level 1 has yet to be fully explained and hence further modeling is required. A decrease was noted in the residual for model two (0.006) when compared to the intercept model (0.038), signifying that the conditional model is a better predictor of BNE when compared to the intercept model.

Turning to the random component model, in allowing the effect of time to vary across provinces the results changed drastically from those observed in the fixed effects model. The addition of time as a random factor, made all the economic variables, both

contemporaneous and lagged, and all but one contextual variable (incidents per officer) insignificant. The findings demonstrate the relevance of accounting for random effects, or an effect that is present beyond the fixed effects being investigated. Although the random effect may not be of theoretical interest per se, accounting or controlling for it is important, as failing to do so, may lead the researcher to make false inferences about the fixed effects. In the current context, it is clear that in accounting for differences in the effect of time between provinces the results were a stark contrast to those in the fixed effects model. As such, without the inclusion of a random component, I could have run the risk of making inaccurate or false inferences regarding the relationship between our explanatory variables and break and enter. The parameter estimates for the variance around the intercepts UN (1,1) and the slopes UN (2,2) were insignificant and, therefore, it can be concluded that the third model was effective in accounting for all between group variation in slopes and intercepts. Turning to the goodness-of-fit measures, the deviance difference calculations and the information criteria do not provide an indication that the fixed and random component models are significantly better than the intercept model; nor is the fixed effects model a better fit than the random component model. However, when determining model fit it is important to consider both the theoretical and empirical interpretation of the models, as oppose to the model-fit statistics alone. Information on model fit can be obtained in Table 5.8.

Table 5.8 Model Fit statistics for Natural Logarithms of Break and Enter

Model Fit Statistics	Baseline Model	Fixed Effects Model	Random Effect Model
Deviance Statistic	-	-479.99	-19.18
-2 Restricted Log Likelihood	-82.34	-562.33	-581.51
Akaike's Information Criterion (AIC)	-78.34	-558.33	-573.51
Schwarz's Bayesian Criterion (BIC)	-70.75	-550.84	-558.53

Note: Information criteria, follow a smaller-is-better interpretation, thus a reduction in value indicates a better model fit. For the deviance difference calculations, levels of significance are indicated as follows: ** 5 percent significance; *** 1 percent significance. Values are calculated with information from the -2 Restricted Log Likelihood statistic.

5.5. Theft

Shifting attention to the intercept model for theft, an ICC of 81.10% indicates that macro-level measures, in this case provincial level variables account for a substantial amount of between group variance in relation to the variable of interest. As an individual level measure, time alone can only account for 18.90% of the variance in logged rates of theft; the time measure is significant with a negative parameter. To provide a more concise explanation of the variability in rates of theft, provincial level measures will be modeled accordingly. The expectation moving forward is that the opportunity effect should be present in the short-run, and in the long-run a motivational effect is anticipated, principally for the unemployment measures. Included in the fixed effects model are variables representing varying states of the economy, and contextual variables to account for the potential differences in contextual landscape between provinces. The results for theft can be found in Table 5.9. They are comparable to those found for break and enter, especially unemployment in the long and short-run.

Table 5.9 Estimated Multilevel Effects, Natural Logarithms Theft Rates, Canadian Provinces, 1981 - 2013

Contemporaneous effect	Baseline Model	Fixed Effects Model	Random Effect Model
Intercept	8.14***	-39.13***	-2.23
Time	-.023***	-.150**	-.038
Unemployment		-.022**	-.004
Unemployment 53+		-.008	-.004
Low Income		.298***	.208***
GPP		-.213	-.184
Lagged effect, Interaction w/ Time			
Unemployment *time		.002***	.000
Unemployment 53+ *time		-.001	.000
Low Income *time		-.009**	-.008***
GPP *time		.009**	.004
Contextual Variables			
Officers per capita		8.83***	1.42
Corrections spending		2.44***	.343
Officers per capita * Corrections spending		-.478***	-.057
Incidents per officer		.691***	1.03***
Gini coefficient		-.020***	-.010**
Young Males		.179	.057
Covariance Parameters			
Residual		.005***	.003***
Intercept		.058	-
Intercept+ Time Random Effect			
UN (1,1)			.020
UN (2,1)			-.001
UN (2,2)			.000

Note: Models are based on 320 observations. Estimated parameters are elasticities. ** 5 percent significance; *** 1 percent significance

Of the four contemporaneous economic measures, only unemployment and low income reached statistical significance. Unemployment showed a negative parameter, a finding that corresponds to the predictions of Cantor and Land (1985), in which they

predicted a short-run negative opportunity effect for unemployment. On the other hand, low income was positively related to theft in the short-run, a finding that could be expected given those who qualify as low income may be motivated toward theft no matter the time frame. The lagged motivation effect was found in three of the four economic variables: unemployment, GPP and low income. Closely aligning with the hypothesized relationships of the Cantor and Land (1985) model, unemployment over time, an indication of structural unemployment, produced a positive sign thus signifying a motivational effect. The long-run effect of GPP was positive, generally increases in GPP are assumed to represent an increase in wealth and, therefore, a decrease in criminal motivation, hence the relationship is not as expected (Andresen, 2014). Lastly, the lagged measure for low income produced a negative parameter estimate, it is expected that individuals in low income families should be motivated toward property crime, such as theft. However, the current data places constraints on inferences concerning the low income variable, as it is too aggregated to grant insight into the employment status and, hence, daily routines of these particular individuals. Five of the six contextual factors reached significance with varying parameter signs, the only insignificant measure being young males. The residual estimate remained significant, though a decrease is noted when compared to the intercept model (0.021 to 0.005). For that reason, further modeling is required to better account for the variance in the level 1, time variable. The third model, a random component model, will account for provincial differences in the effect of temporal changes on crime rates. Because the residual in the fixed effects model is still significant, it can be inferred that the effect of time is not homogeneous across provinces. Instead, it can be assumed that the effect of time on rates of theft vary between provinces, as crime may increase or decrease at different rates over time, depending on provincial context.

Findings from the third model demonstrate the importance of testing for random effects. As exemplified in the current analysis, doing so can safeguard against making false inferences. Accounting for the random effect of time wiped out most of the significant findings from the previous model. Low income, both contemporaneous, and lagged was the only economic measure in the random component model to reach significance and, also, retain the same signs as found in the fixed effects model . Moreover, the only contextual measures to return significant parameter estimates in the

present model were: incidents per officer and Gini. The covariance parameter estimates show that the variance component for the random intercept UN (1,1) and for the random slopes UN (2,2) are no longer significant; suggesting that all the variance in theft has been accounted for by the variables in the model. Turning to the model fit statistics for theft, most notable is the deviance statistic for the random component model. The statistic indicates that the final model is a significantly better fit than the fixed effects model. Results can be found in Table 5.10.

Table 5.10 Model Fit statistics for Natural Logarithms of Theft

Model Fit Statistics	Baseline Model	Fixed Effects Model	Random Effect Model
Deviance Statistic	-	-324.09	195.62***
-2 Restricted Log Likelihood	-276.31	-600.40	-796.02
Akaike's Information Criterion (AIC)	-272.31	-596.40	-788.02
Schwarz's Bayesian Criterion (BIC)	-264.73	-588.91	-773.03

Note: Information criteria, follow a smaller-is-better interpretation, thus a reduction in value indicates a better model fit. For the deviance difference calculations, levels of significance are indicated as follows: ** 5 percent significance; *** 1 percent significance. Values are calculated with information from the -2 Restricted Log Likelihood statistic.

5.6. Assault

The results for logged rates of assault show a different pattern of coefficients from those found for property crimes. Results are displayed in Table 5.11

Similar to previous analyses, the intercept model signifies a significant difference in rates of assault between provinces, and within provincial differences are evident as exemplified by the significant residual coefficient. Between group variation is 68.30% as indicated by the ICC. The rather large coefficient signifies that a hierarchical model is required to adequately explain the between group variance. The second model consists of contextual and economic variables both in the contemporaneous form and as interactional terms with time. All the economic variables with the exception of unemployment indicate significant and negative contemporaneous opportunity effects with assault. It should also be noted that the significant time variable gave a positive

parameter estimate, indicating an increase in assault over time (years). Unemployment for 53+ weeks low income and GPP were negatively related to assault rates in the short-run. However, void of further disaggregated data, inferences cannot be made as to whether these relationships are in the expected direction. Interestingly, the findings demonstrate that the opportunity structure of the Cantor and Land (1985) model operates in a similar fashion for assault (violent crime) as it did for property crime, something that has yet to be distinguished in the existing literature. Moreover, in testing the motivational effect, the interaction between unemployment and unemployment for 53+ weeks, with time, produced statistically significant results, though the signs and magnitude differ. Unemployment for 53+ weeks when measured over time is the only economic measure to show a positive motivational effect. Alternately, unemployment over time yielded a negative parameter estimate for assault. Thereby, an increase in unemployment and GPP over time produces a decrease in criminal motivation toward assault. Taken from the results, it could be concluded that whether in the contemporaneous or lagged form, unemployment has a negative impact on assault. Unemployment for 53+ weeks on the other hand, was found to have a negative opportunity effect and, a, positive motivational effect, a finding that is precisely in line with the predictions of Cantor and Land (1985). Accordingly, the results display evidence of significant opportunity effects, a finding that corresponds to a new discovery by Cook and Watson (2014) of an opportunity effect for violent crime. With regard to the contextual factors, of the six measures tested only two were found to be significant: Gini with a negative parameter and incidents per officer with a positive parameter. The residual (level 1) for the estimated covariance structure was statistically significant and decreased from 0.039 in the intercept model to 0.007 when explanatory variables were modeled. The intercept was insignificant in the second model and, therefore, the current model was able to explain all the provincial, level 2 variance.

Table 5.11 Estimated Multilevel Effects, Natural Logarithms Assault Rates, Canadian Provinces, 1981 - 2013

Contemporaneous effect	Baseline Model	Fixed Effects Model	Random Effect Model
Intercept	6.24***	17.26	7.87
Time	.019***	.173**	.006
Unemployment		.003	-.030***
Unemployment 53+		-.078**	.020
Low Income		-.218**	-.080
GPP		-.748***	-.237**
Lagged effect, Interaction w/ Time			
Unemployment *time		-.001***	.001
Unemployment 53+ *time		.006***	6.68
Low Income *time		-.007	.005
GPP *time		.003	-.000
Contextual Variables			
Officers per capita		1.11	.127
Corrections spending		.135	-.252
Officers per capita * Corrections spending		-.007	.069
Incidents per officer		.760***	.680***
Gini coefficient		-.016**	-.007
Young Males		.007	.001
Covariance Parameters			
Residual		.007***	.004***
Intercept		1.43	-
Intercept+ Time Random Effect			
UN (1,1)			.094
UN (2,1)			-.003
UN (2,2)			.000

Note: Models are based on 320 observations. Estimated parameters are elasticities. ** 5 percent significance; *** 1 percent significance

Time was made a random component in the final analysis, creating an implied interactional effect with each of the variables in the model. Unemployment in the contemporaneous form became statistically significant in the current model, indicating

the presence of a negative opportunity effect, a finding that is in line with theoretical expectations. Cantor and Land (1985) postulated a negative contemporaneous relationship between unemployment and criminal opportunity, and the results correspond to the negative opportunity effect. GPP retained statistical significance with the same negative parameter sign as was found in the fixed effects model. Interestingly, adding time as a random component pushed all the previously significant relationships between the temporal interaction terms (economic variables and time) to insignificance, a contrast to the findings for property crime. Incidents per officer was the only contextual variable that was consistently significant in both fixed and random effects models. Both covariance parameter estimates became insignificant with the addition of a random component suggesting that the model has explained all the variance in intercepts and slopes. Overall, in the fixed effects model a significant motivational effect was established in two of four economic variables. The relationships could make sense in terms of violent crime. However, in the random effects model, the contemporaneous opportunity effect dominated, as the inclusion of a random component pushed a majority of the economic variables into insignificance. The findings demonstrate the importance in utilizing a multilevel approach when evaluating a model that consists of temporal units such as the Cantor and Land (1985) model, because the results changed dramatically with the addition of a random time component. The model fit statistics for the current model can be found in Table 5.12.

Table 5.12 Model Fit statistics for Natural Logarithms of Assault

Model Fit Statistics	Baseline Model	Fixed Effects Model	Random Effect Model
Deviance Statistic	-	-418.10	-152.19
-2 Restricted Log Likelihood	-81.20	-499.30	-651.49
Akaike's Information Criterion (AIC)	-77.20	-495.30	-643.42
Schwarz's Bayesian Criterion (BIC)	-69.62	-487.81	-628.43

Note: Information criteria, follow a smaller-is-better interpretation, thus a reduction in value indicates a better model fit. For the deviance difference calculations, levels of significance are indicated as follows: ** 5 percent significance; *** 1 percent significance. Values are calculated with information from the -2 Restricted Log Likelihood statistic.

5.7. Sexual Assault

The results for logged rates of sexual assault show an interesting pattern of coefficients. Results are displayed in Table 5.13

Table 5.13 Estimated Multilevel Effects, Natural Logarithms Sexual Assault Rates, Canadian Provinces, 1981 - 2013

Contemporaneous effect	Baseline Model	Fixed Effects Model	Random Effect Model
Intercept	4.37***	-5.47	2.45
Time	.005**	.510***	.505***
Unemployment		.068***	.033
Unemployment 53+		-.135	-.053
Low Income		-.604***	-.614***
GPP		.562	.277
Lagged effect, Interaction w/ Time			
Unemployment *time		-.002**	-.001
Unemployment 53+ *time		.015***	.010**
Low Income *time		.017**	.026**
GPP *time		-.030***	-.033***
Contextual Variables			
Officers per capita		.195	-.825
Corrections spending		.062	.127
Officers per capita * Corrections spending		.049	.109
Incidents per officer		.445	.238
Gini coefficient		-.083***	-.080***
Young Males		-.148	-.306
Covariance Parameters			
Residual		.041***	.035***
Intercept		.064	-
Intercept+ Time Random Effect			
UN (1,1)			.103
UN (2,1)			-.002
UN (2,2)			.000

Note: Models are based on 320 observations. Estimated parameters are elasticities. ** 5 percent significance; *** 1 percent significance

Findings for the intercept model are comparable to those found in previous analyses. Rates of sexual assault are distinguished between provinces as indicated by a significant intercept coefficient. Similarly, within provincial differences in rates of sexual assault are evident given the significant residual estimate. Reference to the ICC allows further elaboration on the extent of the between and within provincial differences for rates of sexual assault. The ICC suggests that 31.40% of the variance is attributed to between group differences; while 68.60% is due to differences within each province. Even though, the ICC surpasses the 5.0% threshold required to justify the use of multilevel technique, rates of sexual assault when compared to other crime types tested, has shown the least amount of variation between provinces. Akin to the findings for assault, time in the current analysis revealed a positive and significant parameter—of the crimes tested, only assault and sexual assault have been found to increase over time. To sufficiently explain the between group variance, a fixed effects model will be employed hereafter and include contextual and economic variables at the provincial level.

Of the contemporaneous economic variables, two of the four tested revealed significant relationships: unemployment with a positive sign and low income with a negative sign. Contemporaneously, unemployment is not expected to have a positive relationship with sexual assault: as unemployment places individuals at home, limiting their risk of victimization. Low income, on the other hand, produced a negative sign, a relationship that could be theoretically understood, in terms of routine activity theory. If being low income increases the likelihood that individuals stay at home and accordingly reduces the propensity in which individuals converge in public spaces, this should reduce the likelihood of victimization through decreased opportunity. With regard to the lagged variables that measure the motivational structure of the Cantor and Land (1985) model, all four economic measures returned significant parameters, a finding that has not been achieved with any other crime type. Unemployment and GPP when measured over time showed negative signs. Conversely, unemployment for 53+ weeks and low income, measures that are conceptually similar returned positive parameter estimates, confirming the presence of a motivational effect for sexual assault. Of the six contextual variables only one reached significance: the Gini coefficient with a negative sign. Although the residual decreased from 0.122 in the intercept model to 0.041 with the

addition of provincial level predictors, because the parameter is still statistically significant, further modeling is required to account for the remaining variance in the time variable. All the explanatory measures included in the current model were successful in explaining the between group, provincial level variance, as indicated by the insignificant intercept.

In striving to fully account for the variance in the time measure, a random effect was included in the third model. Considering that time is the only individual level variable, it is appropriate for time to be the random component. In doing so, the results from the fixed effects model were transformed, though in a relatively subtle way when compared to previous findings. The inclusion of a random effect, wiped out the previously significant effects of unemployment (opportunity effect) and unemployment* time (motivational effect). However, all the other economic variables that showed significance in the fixed effects model remained significant with the same signs when the random effect was included. For instance, unemployment for 53+ weeks measured over time (motivational effect) remained statistically significant with a positive parameter in the random component model. This finding indicates that individuals who have remained unemployment for at least a year after the 53+ week period demonstrate a motivational effect toward sexual assault. In a similar manner, the relationship between sexual assault and low income (in both the contemporaneous and lagged forms) did not change from the fixed effects model. Low income in the short-run continued to show a negative opportunity effect with sexual assault. In the long-run, low income (measured over time) remained positively associated to rates of sexual assault, thus verifying the presence of a motivational effect. The motivational effect was also persistent for GPP*time, as the relationship remained negative and significant in the current model. The Gini coefficient was the only statistically significant contextual variable with a stable negative sign. As the case with all previous analyses, the predictors included in the current model adequately accounted for all between group variation in slopes UN (1,1) and intercepts UN (2,2), as indicated by the insignificant parameters. It is clear that the motivational effect, particularly for low income and unemployment for 53 weeks or greater, dominated over the opportunity effect for this specific crime type. It should be noted that the model fit statistics for sexual assault showed consistent and substantial decreases as the models progressed. As shown by the information criteria and deviance

statistics in Table 5.14, the fixed effects model was a significantly better fit than the intercept model; and the random component model a significantly better fit when compared to the fixed effects model. The information criteria, that is interoperated in the smaller-is-better form also indicates an improvement in model fit, as the values decreased from the first to third model.

Table 5.14 Model Fit statistics for Natural Logarithms of Sexual Assault

Model Fit Statistics	Baseline Model	Fixed Effects Model	Random Effect Model
Deviance Statistic	-	265.98***	27.04***
-2 Restricted Log Likelihood	281.85	15.87	-11.17
Akaike's Information Criterion (AIC)	285.85	19.87	-3.17
Schwarz's Bayesian Criterion (BIC)	293.44	27.36	11.81

Note: Information criteria, follow a smaller-is-better interpretation, thus a reduction in value indicates a better model fit. For the deviance difference calculations, levels of significance are indicated as follows: ** 5 percent significance; *** 1 percent significance. Values are calculated with information from the -2 Restricted Log Likelihood statistic.

5.8. Homicide

The ICC derived from the intercept model 72.20% marks a substantial difference between provinces concerning logged rates of homicide. On that account, it is evident that provincial level measures are required to reduce the variation between provinces. Further indicated in this preliminary model is that time is a significant predictor of homicide, having a negative parameter suggests that rates of homicide are decreasing over time. Results are displayed in Table 5.15.

Table 5.15 Estimated Multilevel Effects, Natural Logarithms Homicide Rates, Canadian Provinces, 1981 - 2013

Contemporaneous effect	Baseline Model	Fixed Effects Model	Random Effect Model
Intercept	.749***	9.03	16.01
Time	-.011***	-.085	.075
Unemployment		-.010	.001
Unemployment 53+		.094	.030
Low Income		.038	.025
GPP		-1.02**	-.917
Lagged effect, Interaction w/ Time			
Unemployment *time		-.001	-.002
Unemployment 53+ *time		-.002	.002
Low Income *time		-.007	-.004
GPP *time		.009	-.000
Contextual Variables			
Officers per capita		-.529	-2.18
Corrections spending		-.565	-1.03
Officers per capita * Corrections spending		.128	.213
Incidents per officer		.858***	.869***
Gini coefficient		.043**	.031
Young Males		.909**	.949**
Covariance Parameters			
Residual		.087***	.084***
Intercept		.048	-
Intercept+ Time Random Effect			
UN (1,1)			.094
UN (2,1)			-.002
UN (2,2)			7.38

Note: Models are based on 320 observations. Estimated parameters are elasticities. ** 5 percent significance; *** 1 percent significance

Appropriately a modeling technique that accounts for the hierarchical nature of the data, is employed hereafter. A set of variables are tested that capture the contemporaneous opportunity effect and lagged motivational effect of the Cantor and

Land (1985) model in a fixed effects framework. Of the economic variables included, only GPP reached statistical significance with a negative sign, demonstrating a negative opportunity effect with homicide. An interesting finding was noted with the contextual factors, in that young males showed a positive relationship with homicide. An interesting finding was noted with the contextual factors, in that, young males showed a positive relationship with homicide. The current finding is appealing, as this measure has rarely reached significance for other crime types, both property and violent. Criminological research has emphasized a strong relationship between age and crime (Hirschi & Gottfredson, 1983; Kennedy & Forde, 1990; Miethe et al., 1987; Sampson & Laub, 1992). The accepted wisdom in criminology is that crime is committed disproportionately by adolescents and more specifically by young males (Sampson & Laub, 1992). Thus, having found a positive relationship between young males and homicide provides greater depth into inferences on the relationship between young males and violent crime. In addition, the Gini coefficient was also positively related to homicide, taken together, these measures demonstrate that young males who are placed in situations of relative economic hardship may be motivated toward the most serious of violent crimes, homicide. Incidents per officer also returned a significant and positive parameter with homicide rates. Despite a reduction from the intercept model (0.100), the estimated residual for the current model (0.087) is still statistically significant, thus additional modeling is required to better account for the variance in the level 1 (Time) variable- accordingly a random time component will be included in the successive model.

The implied interaction between time and the explanatory variables rendered all but two measures insignificant. As with the previous model, only the contextual variables reached significance: young males and incidents per officer showed positive signs. Young males and incidents per officer remained significant with positive parameters when the random effect of time was accounted for. Hence, because the relationship has remained stable and consistent throughout it is possible to make generalized inferences beyond the fixed effects. After accounting for differences in the effect of time between provinces, the relationship between young males, incidents per officer with homicide did not change. The parameter estimates for the variance around the intercepts UN (1,1) and the slopes UN (2,2) were insignificant and, therefore, it can be concluded that the third model was effective in accounting for all between group variation in slopes and

intercepts. The model fit statistics found in Table 21 reveal through calculations of the deviance statistic that the random component model is a significantly better fit than the fixed effects model.

Table 5.16 Model Fit statistics for Natural Logarithms of Homicide

Model Fit Statistics	Baseline Model	Fixed Effect Models	Random Effect Model
Deviance Statistic	-	-11.53	6.4**
-2 Restricted Log Likelihood	232.36	243.89	237.49
Akaike's Information Criterion (AIC)	236.36	247.89	245.49
Schwarz's Bayesian Criterion (BIC)	243.95	255.38	260.47

Note: Information criteria, follow a smaller-is-better interpretation, thus a reduction in value indicates a better model fit. For the deviance difference calculations, levels of significance are indicated as follows: ** 5 percent significance; *** 1 percent significance. Values are calculated with information from the -2 Restricted Log Likelihood statistic.

Generally, the results are a preliminary indication of the varying impact that different measures of the economy along with the statistical method used to test the variables can have on the opportunity and motivational structures for property and violent crimes. It should be noted that robbery has not been included in our discussion of the results. Although an attempt was made to analyze this crime type using the multilevel technique, convergence was not achieved and, thus, a decision was made to exclude robbery from the analyses.

Chapter 6. Discussion

In this paper I have investigated the long drawn and unassumingly complex relationship between the economy and crime. The literature in this area is abundant with a lengthy history of exploration in the social sciences. Although a legion of scholarly attempts have been made to provide clarity into the economy-crime relationship, the results were largely mixed with inconsistent findings. It was not until 1985, that a complete structural model of unemployment and crime was introduced by David Cantor and Kenneth Land. The Cantor and Land (1985) model of unemployment and crime was innovative in that it was structurally inclined and incorporated all the major tenants of routine activity theory into a single working model. Emerging was a model that considered two distinct pathways: opportunity and motivational in which the counteracting forces from unemployment could impact crime.

Cantor and Land (1985) found that both motivation and opportunity matter for crime, but operated at different time frames; they concluded that the opportunity effect dominated the motivation effect. Since the introduction of the Cantor and Land (1985) model, the issue of whether the effect of opportunity does indeed dominate the motivational effect has elicited a great deal of academic discussion and empirical inquiry. Furthermore, disputes on the empirical validity of the Cantor and Land (1985) model also center on the variable used to measure the economy and the statistical method employed to evaluate the model. This study addresses these overarching issues by including multiple measures of the economy to determine which variables are best suited for capturing the structural effects of the Cantor and Land (1985) model. As well, the use of a multilevel modeling technique enabled the hierarchical estimation of both cross-sectional and temporal elements, all the while distinguishing between individual and group level measures of a comprehensive panel data set from the years 1981-2013. Additionally, issues regarding the prevailing effect of the Cantor and Land (1985) model (opportunity or motivation) were addressed through the use of a statistical technique that

accounted for, and tested, each effect in their respective temporal orders. Employing a multilevel modeling approach enabled the contemporaneous and lagged variables to be directly implemented and, thus, tested in a single model.

From inspection of the signs of the correlation coefficients, clear support was found for the theoretical predictions of Cantor and Land (1985). The results though not as extensive, are comparable to the strong support found by Phillips and Land (2012) for the directional effects hypothesized by Cantor and Land (1985). The findings demonstrated in the Phillips and Land (2012) article were remarkable in that 78 out of 84 estimated relationships were consistent with the contemporaneous opportunity and lagged motivation effects of unemployment on crime rates. Although the current study extends support for the theoretical model articulated by Cantor and Land (1985) and, also, for related works such as that of Phillips and Land (2012), it is nonetheless important to recognize that the results are distinguishable by way of two general components. First, the findings can be perceived in terms of the extent to which the theoretically predicted signs for the relationships, as outlined by Cantor and Land (1985) are observed in practice. Second, the results can be viewed in terms of the information provided on statistically significant opportunity and motivation effects. Correspondingly, an effective assessment of the findings should adequately reference the two general components that are contained within the results. Therefore, interpretation of the results with respect to the temporal relationships hypothesized by Cantor and Land (1985) as well as the significant structural effects of opportunity and motivation will be assessed in turn.

With respect to measures that display the correct temporal order as predicted by Cantor and Land (1985) that is, a negative contemporaneous opportunity effect and a positive lagged motivation effect, the coefficients show a clear partition between property and violent crime. Furthermore, the dominating structural effect of the Cantor and Land (1985) model, whether opportunity or motivation, is also distinguished according to crime classification. Thus, the extent to which the results of this study adhere to the hypothesized relationships predicted by Cantor and Land (1985) are largely dependent on the crime type under investigation. Notably, Phillips and Land (2012) also found opportunity and motivation effects to be distinguishable by crime type. Specifically,

motivation effects were found to be stronger and more prevalent for property crimes than for violent crimes. Respectively, the parameter estimates for burglary, larceny, and motor vehicle theft displayed algebraic patterns in the form predicted by Cantor and Land (1985) and, were, statistically significant across all three levels (county, state and national) of analysis (Phillips & Land, 2012). Conversely, the researchers (see Phillips and Land, 2012) found the opportunity effect to dominate for violent crime types, especially homicide; the effects of crime opportunity reached significance at all three levels of analysis for homicide (Phillips & Land, 2012). Results from the current analysis correspond to the findings of Phillips and Land (2012) regarding the divide in crime classification as relates to differences in the significance of opportunity and motivation effects. This point will be further advanced in the following sections. As such, the findings for property crime will be discussed and, thereafter, an assessment of the outcomes that related to violent crime. A summary of the findings for property crimes are displayed in Table 6.

Table 6. Summary of Results: Property Crime

Property Crimes	Opportunity Effects		Motivation Effects	
	Fixed	*Random*	*Fixed*	*Random*
Shoplifting				
Unemployment	-.014	.000	.002**	.000
Unemployment 53+	-.006	-.021	.005	.007**
Low income	.359**	.417**	-.022**	-.024**
GPP	-.904**	-.780**	.016	.017
Theft fr Vehicle				
Unemployment	-.061***	-.039**	.004***	.002**
Unemployment 53+	.045	.054	-.003	-.001
Low income	.843***	.497***	-.034***	-.028***
GPP	-.785***	-.592***	.041***	.033***
Theft of Vehicle				
Unemployment	-.025	-.021	-.002**	-.001
Unemployment 53+	-.062	-.120	.002	.004
Low income	.204	.356**	.005	-.007
GPP	-.368	-.640	-.002	.008
Break and Enter				
Unemployment	-.017**	-.008	.002***	.001
Unemployment 53+	.050	.010	-.003**	-.001
Low income	-.006	.090	.006**	.002
GPP	.137	-.104	-.005	-.104
Theft				
Unemployment	-.022**	-.004	.002***	.000
Unemployment 53+	-.008	-.004	-.001	.000
Low income	.298***	.208***	-.009**	-.008***
GPP	-.213	-.184	.009**	.004

Note: Note: Models are based on 320 observations. Estimated parameters are elasticities. **5 percent significance; *** 1 percent significance.

On the whole, the results obtained for various types of property crime provide strong support for the presence of both opportunity and motivational effects, many of which were found to be in the correct temporal order and, thus, in the form predicted by Cantor and Land (1985). To that extent, the findings for property crime reveal that differing types of theft: shoplifting, theft from vehicle, break and enter and theft provide the strongest support for the theoretical expectations of Cantor and Land (1985), and align closely to the hypotheses of the current study. However, disparate from the findings outline by Cantor and Land (1985) in which the opportunity effect dominated, the current study revealed a dominating motivational effect for property crime; as the long-run motivational effect was predicted in the correct form more often than the short-run opportunity effect. The results derived from models in which varying types of property crime were tested established dominance of the motivational effect. The evidence suggests that the lagged motivational effect has a greater impact than the contemporaneous opportunity effect when considering the relationship between economic fluctuations and property crime. Specific, to the multiple economic variables that were included in this study, it was found that unemployment and GPP were the most consistent in predicting the effects of opportunity and motivation in the correct temporal form. A demonstration of the information provided by the unemployment and GPP measures as they relate to the structural effects of the Cantor and Land (1985) model can be further elaborated upon, with reference to disaggregated types of property crime, specifically shoplifting, theft, theft from vehicle, and break and enter.

Turning to shoplifting, the intent in selecting this crime type was to isolate and test the lagged motivational effect of the Cantor and Land (1985) model. Therefore, including shoplifting in the analyses placed focus on the motivational branch of the model, allowing for the temporal ordering of criminal motivation to be tested in both the fixed and random component models. Comparisons between theoretical expectations and results were most notable for the unemployment variable when analyzed in the fixed effects model. The relationship between unemployment and shoplifting was insignificant (though the negative sign is in the expected direction) when analyzed in the contemporaneous form, implying that the opportunity effect is absent in the short-run. Taken as a measure over time, the relationship became positive and statistically significant, indicating a long-run motivational effect. Correspondingly, the analysis of

theft revealed both opportunity and motivational effects in the correct temporal order for the unemployment measure—the relationship between unemployment and theft was negative in the contemporaneous form and positive when considered over time. However, it should be mentioned that the results for shoplifting and theft were derived from the fixed effects model, the addition of a random component resulted in insignificant findings for all measures that previously demonstrated the correct temporal order, with the exception of GPP in the contemporaneous form for shoplifting. With that being said, theft from vehicle was the only property crime under analysis to demonstrate consistent results throughout. The findings for unemployment and GPP, that precisely correspond to the opportunity and motivational effects hypothesized by Cantor and Land (1985) remained stable with the addition of time as a random component. The analyses for break and enter revealed a negative opportunity effect and positive motivational effect for unemployment, but only when considered in the fixed effects model; the addition of a random component rendered all the economic measures insignificant.

Collectively, the results exemplify that unemployment is a good indicator of opportunity and motivational effects for property crime. The impact of unemployment should not have a contemporaneous opportunity effect on shoplifting, but is expected to show a negative parameter estimate for theft from vehicle, theft of vehicle, break and enter and theft. The results formally illustrate this relationship, as the majority of property crimes tested show negative opportunity effects in the short-run. Unemployment is expected to lead to a short-run decrease in criminal opportunity and, thus, a contemporaneous decrease in property crime due to a shift in the routine activities of unemployment individuals toward the home, where they are able to protect their persons and property. Criminal motivation is highly pertinent to all property crime types, and the long-run results in the fixed effects panel for unemployment demonstrate strong support for a long-run motivational effect. Importantly, the results for unemployment exemplify the correct temporal ordering for both opportunity and motivational effects. Cantor and Land (1985) postulated a positive motivational relationship between unemployment and property crime, the findings support their hypothesis. An increase in the unemployment rate indicates a decrease in employed individuals within the population, meaning an increase in individuals without legitimate means to make ends meet. Therefore, without

legitimate means it is believed that individuals are more inclined toward illegitimate means, hence an increase in criminal motivation.

Additionally, the results for GPP revealed relationships that correspond to the hypothesized relationships postulated in the current study and also those outlined by Cantor and Land (1985). In particular GPP revealed a negative contemporaneous opportunity effect and a positive lagged motivational effect for theft from vehicle in both the fixed and random effect models. The contemporaneous opportunity effect was found for shoplifting and a lagged motivational effect was found for theft, both in the fixed effects model. An increase in GPP indicates an improvement in the overall economic state of the province. Arvanites and DeFina (2006) believed that the use of state level economic data is a good measure for motivation because it grants easy interpretation of when there will be greater opportunities for crime, both in terms of the volume of goods to steal and in the number of people away from the protective environment of the home (Andresen, 2014, p. 30). Therefore, growth in GPP indicates an improving or favorable economic environment, marked by increases in employment and, in turn, more disposable income that can be spent on non-essential goods and services. Appropriately, businesses will introduce new products to meet increasing demand (Arvanites & DeFina, 2006). The sum of these structural factors will lead to an increase in motivated offenders within the population due to an increase in the circulation of suitable targets, both in terms of person and property. This is precisely in line with the predictions of routine activity theory (Cohen & Felson, 1979). An increase in GPP could lead to a decrease in criminal opportunities in the short-run as people have greater incentives and funds to spend on securing their persons and property. Moreover, the opportunity effect could initially be negative because there is a lagged effect between economic growth and consumption patterns.

Finally, of all the economic variables under analysis for property crime, low income was the most consistent measure, and the only variable to withstand significance with the same sign in both the fixed and the random component models- as was found in the analyses for shoplifting, theft from vehicle and theft. Interestingly, the low income measure returned results in all three models that were opposite of expectations, a positive opportunity effect and negative motivation effect. Low income was included as

an economic measure because it is an ideal indicator of motivation as the unemployment rate will only capture some of this motivation but would not include those who have given up on their job search or those who are underemployed and still have significant motivation for criminal opportunities (Andresen, 2014). Because good economic times are unequally distributed even when the economy is doing well there may still be a significant portion of the population who are motivated toward criminal activities independent of opportunities (Andresen, 2014). For the reasons mentioned, low income is expected to return a positive parameter in the lagged form, an indication of increased motivation toward property crime. Although, the pattern of coefficients for the low income measure did not return results in the expected direction it is, nonetheless, important to consider the findings in terms of the information provided on the significant opportunity and motivation effects. The current findings strongly suggest that the relationship between an individual in the low income bracket and various types of property crime is inverse of the directional relationship hypothesized by Cantor & Land (1985). The consistency in the findings encourage further delineation of this relationship and, to that end, the relationship between low income and property crime is deserving of greater analytical inference.

Turning to violent crime, as previously mentioned, the results for property and violent crime are distinguishable in terms of the extent to which economic measures under analysis are able to predict the relationships estimated by Cantor and Land (1985). Furthermore, the results for property and violent crime are distinctive by way of the state of the economy variables that are most relevant in predicting significant opportunity and motivation effects. Comparable to the findings published in Cantor and Land (1985), our analyses found the opportunity effect to dominate in varying types of violent crime (in particular assault and homicide) when tested in both the fixed and random component models. Property and violent crimes are opposite with regard to the dominating effect in both fixed and random component models. This suggest that motivational effects are of greater relevance for property crime when the results are derived from the fixed effects panel, while opportunity effects dominated in violent crimes (in both fixed and random component models). A summary of the results for violent crimes are provided in Table 6.1

Table 6.1 Summary of Results: Violent Crime

Violent crimes	Opportunity Effects		Motivation Effects	
	Fixed	*Random*	*Fixed*	*Random*
Assault				
Unemployment	.003	-.030***	-.001***	.001
Unemployment 53+	-.078**	.020	.006***	6.68
Low income	-.218**	-.080	-.007	.005
GPP	-.748***	-.237**	.003	-.000
Sexual Assault				
Unemployment	.068***	.033	-.002**	-.001
Unemployment 53+	-.135	-.053	.015***	.010**
Low income	-.604***	-.614***	.017**	.026**
GPP	.562	.277	-.030***	-.033***
Homicide				
Unemployment	-.010	.001	-.001	-.002
Unemployment 53+	.094	.030	-.002	.002
Low income	.038	.025	-.007	-.004
GPP	-1.02**	-.917	.009	-.000

Note: Note: Models are based on 320 observations. Estimated parameters are elasticities. **5 percent significance; *** 1 percent significance.

Findings from the current study reveal an interesting aspect, with regard to the dominating effect, whether opportunity or motivation, in that the relevance of a particular structural effect is highly contingent on the category of crime under evaluation. The results demonstrate that theoretical expectations are not monolithic, rather different crime types encompass different aspects of the Cantor and Land (1985) model (Andresen, 2013). As such, my findings reiterate the point made by Cantor and Land (1991), in which they elaborated that the most important point to be taken from their 1985 article should relate to the structural components and basic assumptions of the model proposed. Cantor and Land (1991) encouraged subsequent researchers to appraise the unemployment-crime relationship using the functional model created in their seminal publication but, never suggested that the way in which the model ought to be tested or conceived was invariable. It could perhaps be inferred that Cantor and Land

(1985) did not intent for the opportunity effect to be indisputably dominant over the motivational effect, as is often referenced within the literature. In fact, Cantor and Land (1991) explicitly encouraged researchers to test their model using different methods and measures, as no one method is fundamentally correct, and the advantages and disadvantageous of various methodological approaches should be considered during hypothesis testing.

Another discrepant factor between the results for violent and property crime relates to the significance of the state of the economy variables. Where the unemployment rate and GPP were most consistent with expectations for property crimes, unemployment for 53+ weeks and low income are the most consistent of the economic variables for violent crime. Given the results, it is clear that a divide exists among the four variables representing the state of the economy, indicating that the relevance of these variables are highly context dependent. Each of the variables included account for different aspects of the economy: business cycles, average income, unemployment, structural unemployment and those whose incomes are significantly below average (Andresen, 2013). Therefore, the current findings demonstrate the importance of context within the Cantor and Land (1985), or any other, theoretical framework: theoretical expectations are not concrete, rather they vary (at the very least) by crime type, property versus violent crime (Andresen, 2013, p. 226). The results for violent crime exemplify that structural unemployment and low income, both of which are conceptually similar measures and excellent indicators of motivation are the most important predictors of criminal opportunity and criminal motivation for violent crime types. Importantly, the theoretical expectations as set forth by Cantor and Land (1985) were established in the correct temporal order in two of the three violent crime types under assessment: sexual assault and assault.

Further elaborating on the results for violent crime, low income and unemployment for 53+ weeks were, in fact, the most stable measures, demonstrating that they complement one another, and work together in measuring relatively similar aspects of economic activity. Unemployment of 53+ weeks, a new variable for this literature, is a direct measure of structural unemployment. As stated earlier this new variable considers a population of individuals who have been unemployed for a period

that exceeds their eligibility for Employment Insurance. Individuals in this category suffer from the poorest economic conditions when compared to their unemployed counterparts still receiving Employment Insurance. It was hypothesized that these individuals are furthest along the continuum of criminal motivation and, accordingly, this variable should be positively correlated with property crime both in the long and short-run. Interestingly, the current study found this particular measure to be highly correlated with violent as opposed to property crime in the long-run. Further to this, unemployment for 53+ weeks was adopted as an attempt to bridge the gap of ambiguity regarding the time frame required for the motivational effect of unemployment to develop. Conceptually, including a variable that directly measures long term unemployment makes sense when the aim is to test the impact of structural unemployment on criminal motivation. Criminal motivation toward property crime should have been captured with the low income measure. The underlying rationale for including low income as a measure of the economy is encompassed in the notion that individuals who occupy this category may be underemployed, unemployed but have given up the job search or working illegally and thus not included in the unemployment data. Therefore, by including the low income measure, it may be possible to narrow the gap in the conceptualization of criminal motivation. The relative impact of unemployment for 53+ weeks and low income on the structural components of the Cantor and Land (1985) model will be further expanded upon below.

In relation to sexual assault, the contemporaneous opportunity effects were found to be negative at the onset, however, when measured over time the relationship became positive, suggesting the development of a lagged motivational effect for both low income and unemployment for 53+ weeks. Although, the aggregated nature of the data impedes our ability to make conclusive statements on the directionality of the relationships, it is still possible to infer from the results that long term economic hardship does in fact correspond to criminal motivation for violent crime. The findings are striking because the Cantor and Land (1985) model is, for the most part, intended to explain property-related crime with underlying economic motivation. Consequently, the literature has not established a direct link between unemployment and motivation toward violent crime. Cantor and Land (1985) acknowledged that violent crimes, in the context of the unemployment-crime relationship, are different from property crimes. The impact of

unemployment on violent crime depends on the situations in which potential crime victims find themselves, as there is an exact correspondence between victim and offender in violent crimes (Cantor & Land, 1985, p. 320). Further, from a routine activity perspective, high unemployment places individuals at home or in areas close to home and, this may lead to lower rates of violent crimes because a substantial fraction of violent crimes involve acquaintances or strangers outside the home (Cohen & Felson, 1979). Moreover, Cantor and Land (1985) explained that many violent crimes, especially homicide, are committed during the course of a property crime and, therefore, an increase in the unemployment rate may have an indirect negative impact on violent crimes through lower property crime rates in the short run.

The current study extends the Cantor and Land (1985) literature by demonstrating that measures capturing the presence of motivated offenders produce significant parameter estimates for the motivational effect in violent crime, thus commissioning explanations beyond those exclusive to property crime. Initially, structural unemployment and being in the low income category may indeed place individuals at home, likely due to financial hardship, thereby minimizing the risk of victimization, an assumption that conforms to routine activity perspective. The current findings correspond to the assertion that measures indicating financial hardship reveal a negative opportunity effect for sexual assault and assault. However, with regard to the positive motivational effect found for low income and structural unemployment over time, the findings could be explained in terms of financial stress, as opposed to routine activity. Individuals who face extended periods of stress that are perpetuated by on-going financial hardship, may experience greater levels of aggravation. Therefore, stress brought on by relative deprivation could lead to increased motivation for violent crimes such as assault, though the explanation is not as fitting for sexual assault. Further exploration into these findings is clearly an avenue of future research.

Conversely, an increase in GPP produced negative short-run opportunity effects for assault and homicide, but no significant motivational effects. These result run counter to the expectations of routine activity theory: an increase in employment and disposable income places people outside of the home and at risk of victimization as they converge in time and space with motivated offenders, in the absence of capable guardianship

(Cohen & Felson, 1979). However, upon further contemplation the relationship can be understood; improved economic conditions decrease violent crime by decreasing financial stress that is often a major source of individual strain and motivation for violence appears to be less in these times—this is, however, speculative as the data required to test this hypothesis are currently unavailable. In sum, opportunity effects were found to be more prevalent for violent crime than were motivational effects; five of the short-run parameters were as expected compared to three long-run parameters. Simply put, in testing the Cantor and Land (1985) model using multiple economic measures it was found that different variables appear to encompass different aspects of the model, motivation and/or opportunity, not necessarily both. Furthermore, the current study clearly demonstrates the importance of context when evaluating the Cantor and Land (1985) framework, as we found the outcome to be highly contingent on the crime type under evaluation.

Chapter 7. Conclusion

The primary goal of this study was to move beyond verifying the existence of a relationship between the economy and crime. Because the Cantor and Land (1985) model of unemployment and crime, is widely utilized in most of the recent crime-economy literature, the aim was to disentangle the mechanisms behind the model and, in that way, contribute to the existing literature. The analyses are based on the expectations of Cantor and Land (1985) that a downturn in the economy would increase criminal motivation and, thus, increase crime rates in the long run; and conversely decrease criminal opportunity, leading to a decrease in crime rates in the short run. For the purposes of this study, the Cantor and Land (1985) model of unemployment and crime was extended both methodologically and empirically. The hypotheses tested include direct temporal elements that expanded upon the assumptions proposed by Cantor and Land (1985). Specifically, the aim was to provide greater insight into the temporal ordering of the effect of opportunity and motivation as they relate to various economic measures and crime. This was achieved by way of statistical specification, as a multilevel modeling approach was used to identify the temporal effects of opportunity and motivation and thereafter test the impact of these mechanisms on property and violent crime types. Because multilevel analyses enable the investigation of the effects of the covariates on the overall level of the responses and on the changes of the responses over time, it is a fitting technique for the identification of the relative effects of motivation and opportunity on crime. Once properly specified, in an empirical context that considered temporal change, the contemporaneous effect of unemployment on crime would be negative (opportunity-based) and the lagged effect of unemployment on crime would be positive (motivation-based). However, inconsistencies in the empirical evaluation of the Cantor and Land (1985) model continue to persist in the literature. Results are conflicting and mixed, an indication that researchers have yet to identify a method that allows for the proper specification of the model in a temporal context. In short, the statistical technique employed in the current study enabled the relative effects

of motivation and opportunity to be explicitly modeled though the direct incorporation of time into the models tested.

Empirically, various economic measures were included in the analysis: unemployment, GPP, low income and unemployment for 53+ weeks each representing different aspects of economic activity and, therefore, accounting for the different interpretive states of the economy. Testing multiple economic indicators using a statistical method capable of identifying the relative effects of motivation and opportunity produced some interesting inferences into the nuances of the Cantor and Land (1985) model. For instance, in the analyses of property crimes, unemployment and GPP were found to be the most important determinants for the effect of criminal opportunity and motivational. Conversely, a different pattern was found in the results for violent crime, as the economic measures that represent relative deprivation, low income and unemployment of 53+ weeks were most relevant for violent crime types. Despite the alternative classifications of crime, both opportunity and motivational effects were found in their respective temporal orders for various economic measures. As elaborated earlier, the statistical technique employed allowed for the economic variables to be measured and tested in both the contemporaneous and lagged forms. Accordingly, the opportunity mechanism was found to exist contemporaneously, while the motivational effect was established in the lagged form and, thus, confirming the temporal ordering of each effect as hypothesized by Cantor and Land (1985). Deserving of greater attention are the results for violent crime, as they are interesting in two ways. First of all, previous studies have presented findings for either a motivational or an opportunity effect in violent crime. However the establishment of both mechanisms that comprise the Cantor and Land (1985) model have not been demonstrated in disaggregated violent crime types. Therefore, the findings of the current study concerning both opportunity and motivational effects for assault and sexual assault are new to the literature. Secondly, the results place emphasis on the relationship between prolonged economic deprivation and violent crime within the framework of Cantor and Land (1985). That is, being structurally unemployed and spending a disproportionate amount of income on essential needs in the short-run could decrease criminal opportunities, a finding that is in line with routine activity theory. However, in the long-run, being in a state of relative deprivation

for extended periods is related to increases in criminal motivation toward violent crime, a finding that is perhaps, in line with strain perspectives.

The results from the current study lend support to the assertion that multiple measures of the economy ought to be used in assessments of the crime-economy relationship or more specifically in testing the Cantor and Land (1985) model. Furthermore, by refitting Cantor and Land's (1985) model to address the context of the current study, and more broadly to address concepts that are central to the original model, we arrived at findings that show strong support for the model. This suggests that the applicability of the Cantor and Land (1985) model could be expanded, and that future research may benefit from making appropriate modifications when re-evaluating the model.

Although support was found for the Cantor and Land (1985) model the study was limited by the aggregated nature of the crime and economic data. Today, economists and criminologists would likely agree that microeconomic data sets containing information about the criminal record and other background variables of individuals offer a better way of identifying behavioral responses than aggregate data (Oster & Agell, 2007). Yet, because of the paucity of such micro-level data, most crime studies, have resorted to the use of aggregate data, where identification is achieved from observing the regional correlation between crime and various economic indicators (Oster & Agell, 2007). As an example of this, the aggregated data used in the current analysis prevented in-depth inferences into the nature of the relationships, most particularly regarding the low income variable, which was the most stable and the most relevant variable for assault. However, the findings do present explorative value, in that future research could probe further into the structural characteristics of the Cantor and Land (1985) model by utilizing disaggregated crime data. For example when considering the impact of low income on assault or sexual assault, having disaggregated data would give researchers the ability to identify the employment status of these individuals and, thereafter, be able to make inferences on the routine activities of individuals in the low income category. Therefore, insight can be gained into why low income showed a negative opportunity effect and positive motivational effect. Perhaps being low income over an extended period may produce frustration out of economic deprivation leading to

an increase in motivation toward assault and sexual assault or this may not be the case entirely. Given the findings, it may be appropriate to consider whether low income should be distinguished in terms of duration: structural vs. short term and correspondingly whether duration alters the impact of opportunity and motivational effects. Therefore, future studies are encouraged to utilize finer scales of resolution when evaluating the Cantor and Land (1985) model, so that further inferences can be made on the nature and directionality of the relationships found.

On a related note, using Employment Insurance as a standard to capture the population of individuals who are unemployed but no longer receiving unemployment benefits may not the most accurate representation of this sub-population. The stringent requirements for Employment Insurance as set out by the Canadian government may disqualify many unemployed individuals from receiving assistance, hence these individuals will not benefit from the cushion period after initial unemployment. Consequently, the time frame for the motivational effect to develop may be shorter for those ineligible when compared to individuals who are eligible for governmental assistance. Because individuals who do not qualify for Employment Insurance are unrepresented in the sample, it could be implied that this void in the data threatens the generalizability of the results.

In relation to context, social disorganization measures are commonly included in the ecology of crime literature (Andresen, 2012). Theoretically, social disorganization theory has been central in much of the research on contextual effects (Stewart, 2003). Shaw and McKay (1942), in their early work on crime and delinquency, argued that three major structural factors: low economic status, ethnic heterogeneity, and high residential mobility lead to the disruption of community cohesion and organization, that, in turn, increases the rate of delinquency (Stewart, 2003). As such, it is important to account for the contextual effects of social disorganization because factors that contribute to a state of disorganization may unduly impact property and violent crime rates. Thus, findings on the effect of motivation and opportunity may be attributed to the socially disorganized character of a community and not changes in the economy. Furthermore, because social disorganization theory closely links low social economic status to social disorganization it is important to account for other factors that contribute to social disorganization to

ensure that a downturn in the economy is not impacting crime rates by adding to disorganized structure of a community (Sampson & Groves, 1989). Likewise, as elaborated by Raphael and Winter-Ember (2001), the failure to control for crime related commodity variables such as alcohol and drugs, each of which demonstrate procyclical pressure, can lead to the underestimation of the true effects of unemployment or unemployment related measures and crime (Lin, 2008). To the same extend, Levitt (2004) also argued that because most crime-related commodities, such as alcohol and cocaine, qualify as normal goods, improvements in economic conditions could have a negative impact on crime (Lin, 2008). The current analyses did not include a measure to account for the potential impacts of crime related commodities on rates of property and violent crime. Therefore, this could have contributed to the lack of statistical significance for the effect of unemployment on violent crime: as alcohol has been found to have profound effects on violent crime. The current study is limited by not accounting for contextual factors relating to social disorganization and crime related commodities, the latter is due to data availability at the provincial level over time, and the former (alcohol sales as a percentage of the GDP) was excluded due to collinearity issues. Consequently, differences between provinces concerning structural factors that relate to social disorganization and the sale of alcohol, a crime-related commodity are unaccounted for. To fit this gap, future studies should include contextual factors that are selected in accordance with social disorganization theory and include measures for commodities that have a known relationship with crime.

The partialling fallacy problem presents another potential limitation of the current study. In 1990, Land, McCall and Cohen published the first article to ever systematically identify the methodological sources that contributed to the inconsistent and mixed findings in studies examining the relationship between structural characteristics of areal units (such as states, metropolitan areas, cities, neighborhoods) to homicide and other crime rates. To gain insight into why results lacked consistency within this ecological of crime literature Land et al. (1990) re-examined the partialling fallacy, first identified by Gordon (1968) in an earlier ecology of crime study. Accordingly, a comprehensive evaluation of 21 extant ecological studies of homicide identified three methodological commonalties that Land et al. (1990) attributed to the inconsistent findings. First, the majority of studies were based on relatively small samples of cities, metropolitan areas,

or states—Usually less than 200 cities were sampled with even smaller numbers of metropolitan areas and states (McCall, Land, & Parker, 2010). Second, most studies employed data from a single cross section or time period—usually a decennial census year such as 1960 or 1970 (McCall et al, 2010). Lastly, almost all of the studies specified their models using multiple regression techniques with various state, metropolitan area, or city-level structural (demographic, ecological, and socioeconomic) covariates used as regressors to explain interunit variation in crime rates. Taken together, Land et al. (1990) believed that statistical or methodological artifacts were responsible for the pattern of inconsistent results. Amongst a great number of methodological contributions, the Land et al. (1990) article drew special attention to the effects of collinearity and the partialling fallacy among structural covariates in homicide studies and more broadly, within the ecology of crime literature.

Even though, criminologists prior to the Land et al. (1990) article identified the problem of collinearity as it relates to structural covariates, the issue largely went unaddressed and, hence, never considered as a contributing factor to the variance in findings. Therefore, the related, yet separate problem presented by the partialling fallacy had never been suggested prior to the contributions of Land (1990) and colleagues. In simple form, the partialling fallacy can be due to modest levels of collinearity (McCall et al. 2010). Such as case would occur when a regressor/covariate denoted X_1, is more highly correlated (at, say, 0.6) with another regressor, X_2, than either is with the outcome variable (say, 0.45 and 0.5) (Land et al. 1990; McCall et al. 2010; Land, 2015). In this instance, regression estimation algorithms commonly assign all explained variance to the one of the two regressors that is (possibly very slightly) more highly correlated with the outcome variable, X_1, and no explained variance to the other regressor, X_2, even if both regressors are measuring attributes that share more variance than either has in common with the outcome variable of the regression (Land et al. 1990; McCall et al. 2010; Land, 2015). The problem with this typical method of assignment is that, it could lead to the erroneous inference that one of the regressors is not contributing to the explained variance in the crime rates under analysis when in fact it is a substantively important covariate (Land et al. 1990; McCall et al. 2010; Land, 2015). Because the current study includes structural covariates at the aggregate-level, it is likely that the partialling fallacy as left unattended, could threaten the substantive inferences of the

present analysis. Furthermore, statistical estimation and inferential problems associated with collinearity when left unaddressed could magnify standard errors and, result in uncertain parameter estimates, thereby threatening the generalizability of the results.

Land et al. (1990) proposed the use of principal components analysis and index construction to correct for the partialling fallacy in studies of structural features of ecological units. As demonstrated in the 1990 paper (see Land et al. 1990), the application of principal components analysis reduced the shared variance in the regressor space as to simplify the space and thus providing a solution to collinearity (Land et al. 1990; McCall et al. 2010; Land, 2015). The effectiveness in applying principal components analysis was demonstrated in findings that were consistent across three levels of areal units (cities, metropolitan areas, and states) and time periods (1960, 1970, and 1990) (Land et al. 1990; McCall et al. 2010; Land, 2015). Accordingly, to correct for collinearity and partialling fallacies future studies need consider the recommendations and instructive examples provided in Land et al. (1990); McCall et al.(2010) and; McCall, Land, and Parker (2011).

Despite the fact that this study contributes to the small number of empirical studies that use Canadian data to test the Cantor and Land (1985) model, the use of Canadian data is also limiting. For comprehensive purposes, most known works on Cantor and Land (1985) are American, for that reason the current results do not offer a direct comparison to established works in the existing literature. For example, the social safety nets in Canada function differently and some have claimed are to an extent, better (see, for example, Bezruchka, 2009) when compared to those available in the United States, where relatively few government benefits accrue to the less well off. Therefore, if the results are to be generalizable, future research should focus on testing the Cantor and Land (1985) model in different context. Granted that future studies are able to effectively demonstrate these result in differing contexts, then the variables selected in this study are generally effective in measuring the effects of opportunity and motivation in the appropriate time frame in ways consistent with the Cantor and Land (1985) model

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