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Crime and the Business Cycle in Mississippi

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CRIME AND THE BUSINESS CYCLE IN MISSISSIPPI

by
Taylor Thrasher

A thesis submitted to the faculty of The University of Mississippi in partial fulfillment of the requirements of the Sally McDonnell Barksdale Honors College.

Oxford
May 2018

Approved by

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Advisor: Dr. Thomas Garrett

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Reader: Dr. Joseph Holland
ABSTRACT
TAYLOR THRASHER: Crime and the Business Cycle in Mississippi
(Under the direction of Dr. Thomas Garrett)

This thesis examines the relationship between crime and the business cycle in Mississippi. Working with a theoretical model of the individual's decision to commit a crime, I show that an increase in legal income decreases an individual's propensity to commit crime. I then use regressions to estimate the long-run and short-run income elasticities of violent crime, burglary, larceny, and vehicle theft. The long-run empirical model shows how income growth effects crime growth, and the short-run empirical model shows how income variability effects crime variability. In the long run, I find that as income increases (decreases), both burglary and larceny decrease (increase). In the short run, larceny again decreases (increases) as income increases (decreases), and burglary rises during years for which there are recessions. I find no long-run or short-run relationship between violent crime or vehicle theft and the business cycle.
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Chapter I: Introduction

Each year, national, state, and local governments and individual citizens allocate a substantial proportion of their resources to crime prevention. In 2015, total state and local government spending on police and corrections totaled $181 billion in the United States, which accounted for about 6 percent of all spending by state and local governments.¹ In particular, the state of Mississippi and local governments spent $1,229,560,000 on police protection and corrections in 2015.² In addition, many crimes generate costs which governments are, at least partially, expected to cover, such as the cost of courtroom procedures. Crime also generates social costs, such as the mental and emotional costs that crime inflicts on its victims. Thus, from both financial and social perspectives, information on crime trends and research into the determinants of crime and crime prevention are of importance for governments and their constituents.

Information collected from the FBI’s Uniform Crime Reporting (UCR) database for the period of 1969-2015 indicates that national violent crime (encompassing murder, rape, robbery, and assault) per capita increased steadily until the early 1990’s (hitting an all-time high of approximately 7.6 violent crimes per 1,000 people), at which point it began declining. The rate has remained below 4

violent crimes per 1,000 people since 2011. National larceny rates also peaked around 1991 at about 32.1 larcenies per 1,000 people and decreased from then on, hitting a low of 17.8 per 1,000 in 2015. Similarly, vehicle theft per capita reached a high in 1991, amounting to about 6.6 per 1,000 people, and has generally decreased for the following two and a half decades. The rate stood at 2.2 per 1,000 people in 2015. Burglary per capita in the U.S. began declining more than a decade earlier than violent crime, larceny, and vehicle theft. The rate reached a maximum of approximately 16.7 burglaries per 1,000 people in 1980 and has, with few exceptions, decreased or remained constant since then, ultimately achieving its lowest value (about 4.9 burglaries per 1,000 people) in 2015.

The trends of per capita rates of violent crime, burglary, larceny, and vehicle theft in Mississippi from 1969 to 2015 roughly resemble those of national crime rate trends. Violent crime per capita in Mississippi reached a sharp peak (almost 5 per 1,000 people per year) in the mid-1990’s. Over the past twenty years, violent crime has fallen considerably, but it continues to hover around a rate of 2.6 violent crimes per 1,000 people per year. Vehicle theft per capita in Mississippi experienced a similar trajectory: it rose quickly to its maximum (about 4.8 per 1,000) in the 1990’s but has since declined. Burglary per capita also reached its peak in the 1990’s, although it did so at a much slower rate than did vehicle theft or violent crime. Its decline since the 1990’s has persisted at a slower rate than those of vehicle theft and violent crime as well. Larceny per capita has followed a similar pattern as burglary, but larceny exhibited a slight uptick in the past couple of years. In 2015, there were
about 1.4 vehicle thefts, 8.3 burglaries, and 18.6 larcenies per 1,000 people in Mississippi.

In typical economic models of individual behavior, individuals determine whether or not to perform an action (e.g., purchase a good, move locations, take the bus, etc.) based on their internal cost-benefit analysis. The model of an individual’s decision on whether or not to commit a crime is no different. If the benefits of committing a crime (increased income, personal enjoyment, etc.) outweigh the costs (prison time, fines, society’s disapproval, etc.), the individual will commit that crime. On the other hand, if the costs of committing a crime outweigh the benefits, the individual will not commit that crime. Potential criminals base their decision on a comparison of the utility (i.e., well-being) they would receive via legal income (no crime) with the expected utility from committing a crime, which takes into account the probabilities of success (not getting caught) and failure (getting caught). If an individual’s expected utility from committing a crime is greater than her utility from not committing a crime, then that individual will break the law. This simple economic model of criminal behavior suggests there are several ways to deter crime, such as increasing the utility that people receive from not engaging in criminal activity (e.g., increasing legal income), or decreasing the expected utility that crime would generate (e.g., increasing the cost of crime). Several academic papers have studied the determinants of crime.

Becker (1968) explains that three main determinants of crime that can be observed and influenced via policy are the probability of arrest, the severity of punishment, and an amalgamation of other social and economic indicators, the most
important being legal income. An increase in any of these is expected to reduce the number of crimes that an individual commits; the first two decrease the expected utility of crime and the latter increases the utility gained through legal activity. Howsen and Jarrell (1987) reach slightly different conclusions in their empirical study. They show that property crime is influenced by the probability of arrest and the unemployment rate, but not by the severity of punishment. Kelly (2000) finds that property crime is linked to poverty and police activity, and that violent crime is linked to levels of income inequality. It is important to note, however, that deterrence, while reducing the social costs of crime, generates significant social costs of its own. For example, increasing the probability of arrest generates higher costs through more police training, an increase in the number of officers (and thus salaries to be paid), or an improvement in police technology. Likewise, increasing the severity of arrest often generates higher costs as a result of lengthier prison or probation sentences that both require labor and resources (Becker, 1968). Hence, the aim of policy-makers and law enforcement ought not to be to eradicate crime, but to reach an optimal social level of crime, where the marginal cost of victimization equals the marginal cost of crime prevention.

The aforementioned studies have empirically shown that (legal) income is an important determinant of an individual’s crime decision. This study examines the relationship between the growth and variability of income (termed the “business cycle”) and the growth and variability of various crime rates using aggregate time series data on income and crime rates for Mississippi. The use of aggregate income and crime data rather than individual-level data will provide evidence on how
crimes respond to the business cycle in Mississippi. The predictions from my aggregate analysis are similar to those from the model of the individual’s crime decision under the assumption that all individuals have similar preferences (utility). However, since there is a significant amount of variation among the cities and towns within Mississippi in terms of income, the number of police, social customs, etc., an aggregated unit of analysis may generate results different than those that have been found to exist on an individual level. This thesis thus also demonstrates how well aggregate data can replicate the results from studies using less-aggregated data.

My empirical analysis uses annual state-level data on real per capita personal income and seven different crime rates (murder, rape, robbery, assault, burglary, larceny, and vehicle theft) for the state of Mississippi over the years 1969-2015 (due to data availability). I analyze the behavior of four crime variables over the business cycle – burglary, larceny, vehicle theft, and violent crimes (which is the sum of murder, rape, robbery, and assault) – by performing regression analyses to estimate long-run income elasticities (to capture crime growth) and short-run income elasticities (to capture year-to-year variability in crime). My results indicate, that in the short run, the relationship between income and each of the crime rates is only statistically significant for larceny, and is negative in this case. This implies that year-to-year changes in income have no effect on year-to-year changes in crime rates other than larceny. The relationship between non-income recession characteristics and burglary is also statistically significant and positive in the short run. In the long run, the only statistically significant relationships found are between
larceny and income and burglary and income, signifying that burglary and larceny have a negative relationship with income over time.

The thesis proceeds in four additional chapters. Chapter II reviews the academic literature on crime and the business cycle and discusses the economic model of crime. Chapter III proposes my research question and details the data sources and empirical methodology used. Chapter IV presents the results obtained from the empirical analysis outlined in Chapter III. This chapter also includes a discussion surrounding these results in the context of the predictions made in Chapter III. Finally, Chapter V concludes with a review of the research objective, methodology, and results, while also discussing policy implications and potential opportunities for further research.
Chapter II: Literature Review and Conceptual Framework

Literature Review

This section focuses on the previous academic literature that examines the relationship between the business cycle and crime rates. The findings of these studies serve as the basis for my conceptual model and empirical methodology presented later. These previous studies have identified four theoretical channels through which changes in the business cycle may influence violent crime and property crime rates.

First, a recession may lead to increases in both violent crime and property crime by decreasing the availability of legal means to earn income and the opportunity cost of punishment resulting from failed crimes (Cook and Zarkin, 1985). Higher rates of unemployment will cause many to receive a lower real income, leading each affected individual to experience a lower utility of legal wealth. A lower real income also implies that an individual’s opportunity cost of time is lower. Hence, an individual with a lower income will not have to forego as much in order to allocate time to crime rather than legal work. This should result in a higher expected utility of crime, all else equal. As a result, each individual’s utility of wealth may decrease relative to her expected utility of crime, making individuals on the margin more likely to commit a crime. Paternoster and Bushway (2001) refer to this linkage as the “motivational effect”.

11
Second, the decreased allocation of available resources toward police and corrections activities that occurs during a recession may also increase both property and violent crimes rates (Bushway, et al., 2012). Any existing deterrent effect on crime from police or court activities may be diminished when funding and resources decrease. However, there is evidence that during periods of decreased funding police may adjust by placing a greater priority on the prevention of felonies rather than on the prevention of misdemeanors (Corman, et al., 2001), meaning less costly crimes (such as petty theft) may increase more than more costly crimes (such as murder).

Third, the decrease in the availability of legal work opportunities may be accompanied by a decrease in the availability of illegal means of increasing one’s wealth. This hypothesized shortage of opportunities for crime is generally believed to exert downward pressure on property crime rates, and, furthermore, Paternoster and Bushway (2001) theorize that this could also have a negative influence on violent crime rates. Regardless of whether or not there is a greater desire to commit crimes (both property and violent), the onset of a recession may decrease the availability of opportunities to actually do so (Cook and Zarkin, 1985). Paternoster and Bushway (2001) refer to this linkage as the “guardianship effect”, since the overall lower employment rate that is characteristic of recessions implies that a greater percentage of people will be at home, rather than at work and in public, thus making themselves less available to be victimized and their property less likely to be stolen.
Finally, the decreased level of drug and alcohol consumption that has been shown to occur during recessions could exacerbate this downward pressure, since potential crimes (either property or violent) motivated by the perpetrator’s intoxication could be prevented (Bushway, et al., 2012).

Clearly, many of the various influences of the business cycle on crime rates exert conflicting pressures. As such, researchers have performed several empirical tests in order to determine which influence dominates.

Two such tests were performed by Cook and Zarkin (1985). Their first test involves comparing the average annual growth rate of each crime (burglary, robbery, auto theft, and criminal homicide) during each expansion period with the growth rate of that crime in the following year. Their analysis is predicated on the idea that, should a particular crime have no relationship with the business cycle, the number of post-expansion years with higher growth rates for that crime should be roughly equal to the number of post-expansion years with lower growth rates, compared to the average growth rate during the expansion period. Moreover, if a particular crime and the business cycle possess an inverse relationship, the number of post-expansion years with higher growth rates should be greater than the

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3To illustrate the conflicting effects of these various forces, imagine an individual, Sally, who is considering supplementing her legal income by pickpocketing tourists. A recession may lead Sally to be more inclined to such an undertaking, as her real income may decrease. However, her ability to pickpocket may be severely hindered by, for example, the lowered numbers of tourists or the fewer valuable objects that any tourists would carry with them during the recession. She may also be aware that the recently constrained resources of the local police department has led to decreased patrolling in the area, lowering her chances of being caught and, thus, increasing her expected utility of wealth. Finally, since Sally has less disposable income, she has been consuming less alcohol, largely negating any chance that Sally will pickpocket as a result of a spur of the moment decision brought on by intoxication. Likewise, all of the existing tourists in her town will be consuming less alcohol overall as well, making them more aware of their surroundings and more difficult from whom to steal.
number of post-expansion years with lower growth rates, and vice versa for a positive relationship. For each crime, the authors view each business cycle as an independent trial in an experiment and use the binomial hypothesis test to determine the nature of the relationship between each crime and the business cycle. The authors find that the business cycle has an inverse relationship with both burglary and robbery. They find no statistically significant relationship between the business cycle and either murder or vehicle theft.

Bushway, et al. (2012) use the same non-parametric test as Cook and Zarkin (1985), but are able to extend the analysis and bolster the previous results with the added benefit of 26 more years of data, including four additional business cycles. Their findings are in line with those of Cook and Zarkin (1985); they find that the business cycle has an inverse relationship with robbery and burglary and no relationship with murder and vehicle theft.

While the analyses described above lend support to the idea that property crime rates other than vehicle theft rise during recessions and that violent crime rates other than robbery are unaffected, they are not able to provide indications of the size of any detected effects. Furthermore, contrary to the assertion of Bushway, et al. (2012), it is not universally agreed that the non-parametric tests provide sufficient evidence for causality. In order to address these shortcomings, Cook and Zarkin (1985) supplement the non-parametric analysis with an econometric analysis. They use the unemployment rate and the employment-population ratio as measures of the business cycle, and they separately regress each measure on burglary, robbery, auto theft, and criminal homicide using a log-level model. Their
results show that as the unemployment rate increases (decreases), burglary and larceny increase (decrease). Additionally, as the employment-population ratio increases (decreases), burglary and larceny decrease (increase). The authors again find no statistically significant relationship between criminal homicide and either dependent variable.

By examining vehicle theft, Paternoster and Bushway (2001) aim to shed light on the effect that disentangling the motivational and guardianship effects can have on our understanding of the relationship between the business cycle and crime rates. Although vehicle theft is a property crime and, in that respect, is expected to be countercyclical with the business cycle, many tests indicate that its rates are either unrelated to or procyclical with the business cycle.

They point out, however, that these studies make no distinction between vehicle theft for the purposes of making a profit and for joyriding (which is presumably less influenced, if at all, by economic considerations). They perform the nonparametric analysis of vehicle theft initially used by Cook and Zarkin (1985), this time distinguishing between the two types of vehicle theft. They find that joyriding vehicle theft rates are countercyclical with the business cycle. The result for profit-motivated vehicle theft could indicate that either there is no relationship between its rates and the business cycle, or that the opposing forces of both the motivational and the guardianship effects are at work.

Corman, et al. (1987) use a vector autoregressive (VAR) technique to analyze the interrelated dynamics of crime rates for felony property crimes (grand larceny,
robbery, burglary, and auto theft) and the unemployment rate. Their study adds to the literature by observing crime rates only for New York City between 1970 and 1984, rather than for the entire U.S. By regressing the crime rate in New York City on four lags of the city’s unemployment rate, the authors are not able to detect a joint statistically significant relationship between unemployment and crime. By analyzing the impulse response functions of each of the variables to a shock in unemployment by one standard deviation, however, they show that shocks in the unemployment rate are generally followed by a spike in felony property crime rates that is quite short in nature (about 1 month) due to a following sustained jump in the arrest rate.

Corman and Joyce (1990) also use similar methods to examine the interrelationships between crime and various deterrent and economic variables in New York City. They are not able to detect a statistically significant relationship between the unemployment rate and any of the four violent crimes under consideration – murder, rape, robbery, and assault – in the short run over the period 1970-1986.

**Conceptual Framework: The Economic Model of Crime**

The empirical studies described in the previous section provide compelling evidence in support of a countercyclical relationship between the business cycle and property crime (disregarding vehicle theft). There is, therefore, a general consensus on the effect of increased legal income on the decision to commit burglary or

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4 Unlike the other papers discussed in this literature review, this study categorizes robbery as a property crime, highlighting the fact that robbery has motivations rooted in both financial and violent desires.
larceny. Missing from the existing literature, however, is a mathematical model and proof to provide theoretical foundations to the established empirical finding that higher legal income reduces individuals’ propensities to commit crime. This section rigorously demonstrates that an increase in legal income will reduce propensity to commit crime.

Consider an individual who is initially indifferent between committing a crime and not committing a crime. In this case, the individual’s utility of legal wealth is equal to her expected utility of wealth from crime.

Let the individual’s utility of legal wealth \(w\) be represented by the following function:

\[
U(w) = \ln(w).
\]

This utility function assumes that the individual displays diminishing marginal utility of wealth. That is, her utility increases with respect to income, but each subsequent unit increase in income generates a smaller increase in utility. The individual’s expected utility of wealth from committing a crime is represented as:

\[
E[U(w)] = p_s \cdot \ln(w + w_s) + p_f \cdot \ln(w - \alpha w) - A,
\]

where \(0 < p_s < 1\) denotes the probability of success, \(0 < p_f < 1\) denotes the probability of failure, and \(w_s\) represents the gains in wealth from a successful crime. Clearly, \(p_s + p_f = 1\). The individual’s non-negative anguish cost \(A\), represents the moral or social costs that one incurs upon committing a crime. An individual who is more sensitive to how her actions are perceived by society would have a higher anguish cost, as would an individual who has strong moral objections to crime. The resultant loss in utility from getting caught committing a crime is \(\ln(w - \alpha w)\). The
decrease in wealth from a failed crime ($\alpha w$) is dependent on initial, legal wealth to capture the increasing opportunity cost of a crime as one's wealth increases. That is, for some constant $0 < \alpha < 1$, an individual will lose a greater amount of wealth due to a failed crime as her legal wealth increases.

The general model represented above serves as the basis for the following proposition:

**Proposition:** An increase in legal wealth will increase an individual's utility of legal wealth more than it will increase her expected utility of wealth of committing a crime. As a result, an initially indifferent individual will not commit a crime if her legal wealth increases. Thus, if the above model is generalized for all individuals, crime should fall as legal wealth increases.

**Proof of Proposition:** In order to prove the proposition, I must show that the change in an individual's utility resulting from a change in legal wealth is greater than the change in that individual's expected utility of wealth resulting from the same change in legal wealth.

The individual's utility function for legal wealth is

$$U(w) = ln(w).$$

The change in utility of legal wealth with respect to a change in legal wealth is

$$\frac{\partial U(w)}{\partial w} = \frac{1}{w} > 0, \text{for } w > 0. \quad (1)$$

The individual's expected utility function is

$$E[U(w)] = p_s \cdot ln(w + w_s) + p_f \cdot ln(w - \alpha w) - A,$$

or, by noting that $p_f = 1 - p_s$, ...
\[ E[U(w)] = p_s \cdot \ln(w + w_s) + (1 - p_s) \cdot \ln(w - \alpha w) - A. \quad (2) \]

The change in expected utility with respect to a change in legal wealth is found by differentiating equation (2) with respect to \( w \):

\[
\frac{\partial E[U(w)]}{\partial w} = \frac{p_s}{w + w_s} + \frac{1 - p_s}{w - \alpha w} \cdot (1 - \alpha)
\]

\[
= \frac{p_s}{w + w_s} + \frac{1 - p_s}{w}
\]

\[
= \frac{w \cdot p_s}{w \cdot (w + w_s)} + \frac{(1 - p_s) \cdot (w + w_s)}{w \cdot (w + w_s)}
\]

\[
= \frac{w \cdot p_s + w \cdot (1 - p_s) + w_s \cdot (1 - p_s)}{w \cdot (w + w_s)}
\]

\[
= \frac{1}{w} \left[ \frac{w + w_s \cdot (1 - p_s)}{w + w_s} \right]. \quad (3)
\]

Substituting equation (1) into equation (3) yields

\[
\frac{\partial E[U(w)]}{\partial w} = \frac{\partial U(w)}{\partial w} \cdot \left[ \frac{w + w_s \cdot (1 - p_s)}{w + w_s} \right]. \quad (4)
\]

Rearranging equation (4) gives

\[
\frac{\partial E[U(w)]}{\partial w} = \frac{w + w_s \cdot (1 - p_s)}{w + w_s} \cdot \frac{\partial U(w)}{\partial w}.
\]

Since \( 0 < p_s < 1 \), it must be that \( w + w_s \cdot (1 - p_s) < w + w_s \). So,

\[
\frac{\partial E[U(w)]}{\partial w} = \frac{w + w_s \cdot (1 - p_s)}{w + w_s} < 1, \quad (5)
\]

which implies that

\[
\frac{\partial E[U(w)]}{\partial w} < \frac{\partial U(w)}{\partial w},
\]
which is the desired result that an increase in legal wealth will generate a greater change in utility of legal wealth than in expected utility of wealth.

Both the previous academic literature and the mathematical model presented above suggest an individual facing increased legal income will be less likely to commit a crime that is motivated by financial concerns. Several tests have shown that the business cycle has no influence on violent crime rates but a negative effect on property crime rates other than vehicle theft. The next section will present tests used to determine whether this relationship is also observable at the state level for Mississippi.
Chapter III: Empirical Methodology and Data

This chapter presents the data and the empirical methodology I use to examine the effect of the business cycle on the crime rates in Mississippi over the time period 1969-2015. As the business cycle consists of both the growth of income and the variability of income, my methodology is divided into two main sections: 1) the long-run empirical model (to capture the relationship between income growth and crime growth), and 2) the short-run empirical model (to capture the relationship between income variability and crime rate variability). I also discuss the data that I use and my expectations for the results.

To estimate the empirical models, I use Mississippi-level data on crime rates and real per capita personal income for the period of 1969 to 2015.\(^5\) I consider four crimes – violent crime (murder, rape, robbery, and assault), larceny, burglary, and auto theft. The numbers for each crime were obtained from the FBI’s Unified Crime Report. I converted these data into crimes per capita by dividing each crime by Mississippi population.\(^6\) I calculated real income per capita using the Consumer Price Index (CPI) and income and population data.\(^7\) To account for non-income economic factors that might influence crime (e.g., unemployment), I obtained recession/expansion classifications for each year in my sample period provided by

\(^{5}\) 1969 is the earliest year for which the crime data I use is available.
\(^{6}\) Population data are from the Bureau of Economic Analysis (BEA).
\(^{7}\) These population data are also from the BEA.
the National Bureau of Economic Research. Figure 1 presents the Mississippi crime rates over the period 1969 to 2015.

**Figure 1: Mississippi Crime Rates, 1969-2015**

![Graph showing Mississippi crime rates from 1969 to 2015.]

**Long-Run Empirical Model**

To analyze the effect of income growth on the growth in each crime rate, I estimate the following model:

\[
\ln(\text{Crime}_t) = \alpha_0 + \alpha_1 \cdot \ln(\text{Income}_t) + \alpha_2 \cdot \text{Recession}_t + \alpha_3 \cdot \text{Trend}_t + \varepsilon_t. \tag{6}
\]

I estimate this model for each type of crime, denoted as \(\text{Crime}_t\). \(\text{Income}_t\) is real per capita income, and \(\text{Recession}_t\) is a dummy variable that has a value of ‘1’ for years in which six or more months of that year were classified as a recession, and ‘0’ otherwise. \(\text{Trend}_t\) is a time index and takes the value of 1 for year 1969, 2 for 1970,
3 for 1971, and so on, and is included to capture the average annual growth in crime that is not due to changes in income or recessions.9

The estimate of $\alpha_1$ is the long-run income-elasticity of each crime (i.e., the percent change in crime for a percent change in income over the sample period).10 Given the previous academic literature and the theoretical model discussed in Chapter II, I expect $\alpha_1$ to be zero for violent crime and less than zero for burglary and larceny. The expected sign of the coefficient for vehicle theft is less clear due to the contradictory conclusions concerning the relationship between the business cycle and vehicle theft given by theoretical models and empirical results. The dummy variable coefficient, $\alpha_2$, captures the non-income effect of a recession on crime rates.11 I expect the estimate of $\alpha_2$ to be zero for violent crime and greater than zero for burglary and larceny.

*Short-Run Empirical Model*

To analyze the effect of year-to-year variability of income on year-to-year variability of crime rates, I estimate the following model for each crime:

$$\Delta \ln (\text{Crime}_t) = \beta_0 + \beta_1 \cdot \Delta \ln (\text{Income}_t) + \beta_2 \cdot \text{Recession} + \upsilon_t,$$

where $\Delta$ represents the first difference of the respective variable.12 All variables in the model above use the same data as in the previous section.

9 Dickey-Fuller tests for stationarity were run for income and each crime variable. Violent crime, burglary, and larceny were found to be stationary, while vehicle theft and income were found to be nonstationary. The trend variable is included because income is nonstationary. Because both income and vehicle theft are nonstationary, long-run results pertaining to their relationship with each other are likely spurious.
10 For example, an estimate of $\alpha_1 = 0.5$ would imply that a 1% increase in income would lead to a 0.5% increase in the crime rate.
11 The existence of a recession will result in an estimated change in the crime rate of $e^{\alpha_2 - 1}$.
12 All short-run models also control for autocorrelation using the Cochrane-Orcutt procedure when necessary.
The coefficient $\beta_1$ is the short-run income-elasticity and represents the sensitivity of year-to-year changes in the crime rate resulting from year-to-year changes in income. I expect $\beta_1$ to be zero for violent crime and negative for burglary, larceny, and (possibly) vehicle theft. The recession dummy variable reflects the average yearly change in crime resulting from non-income related characteristics of recessions.\(^\text{13}\) I have similar expectations for the sign of these estimates as for the estimates of $\alpha_2$.

\(^{13}\)The coefficient on the recession dummy retains the same interpretation as in the long-run empirical model: $e^{\beta_2-1}$.
Chapter IV: Empirical Results and Discussion

This chapter presents the empirical results from the regression models presented in the previous chapter. I provide further context for these results by comparing them to the predictions given in chapter III and by discussing possible explanations for any discrepancies.

Table 1 shows the results for the long-run empirical model (6), estimated once for each crime.

Table1: Long-Run Effect of Income Growth on Crime

<table>
<thead>
<tr>
<th>Variable</th>
<th>Dependent Var.</th>
<th>Dependent Var.</th>
<th>Dependent Var.</th>
<th>Dependent Var.</th>
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<tr>
<td></td>
<td>ln(ViolentCrime)</td>
<td>ln(Burglary)</td>
<td>ln(Larceny)</td>
<td>ln(VehicleTheft)</td>
</tr>
<tr>
<td></td>
<td>(1)</td>
<td>(2)</td>
<td>(3)</td>
<td>(4)</td>
</tr>
<tr>
<td>Constant ($\alpha_0$)</td>
<td>-9.752</td>
<td>6.119</td>
<td>7.823**</td>
<td>-7.764</td>
</tr>
<tr>
<td></td>
<td>(6.082)</td>
<td>(5.346)</td>
<td>(3.818)</td>
<td>(11.42)</td>
</tr>
<tr>
<td>ln(Income)($\alpha_1$)</td>
<td>0.443</td>
<td>-1.032*</td>
<td>-1.09***</td>
<td>0.276</td>
</tr>
<tr>
<td></td>
<td>(0.62)</td>
<td>(0.542)</td>
<td>(0.382)</td>
<td>(1.144)</td>
</tr>
<tr>
<td>Recession Dummy ($\alpha_2$)</td>
<td>-0.007</td>
<td>0.023</td>
<td>0.014</td>
<td>-0.004</td>
</tr>
<tr>
<td></td>
<td>(0.027)</td>
<td>(0.023)</td>
<td>(0.016)</td>
<td>(0.048)</td>
</tr>
<tr>
<td>Trend ($\alpha_3$)</td>
<td>-0.017</td>
<td>-0.001</td>
<td>-0.007</td>
<td>-0.031</td>
</tr>
<tr>
<td></td>
<td>(0.010)</td>
<td>(0.01)</td>
<td>(0.009)</td>
<td>(0.027)</td>
</tr>
<tr>
<td>Adj. $R^2$</td>
<td>0.042</td>
<td>0.146</td>
<td>0.213</td>
<td>-0.035</td>
</tr>
<tr>
<td>Number of Observations</td>
<td>46</td>
<td>46</td>
<td>46</td>
<td>46</td>
</tr>
</tbody>
</table>

Note: * = significant at 10%, **=significant at 5%, ***=significant at 1%. Autocorrelation is corrected for when needed. Standard errors in parentheses.
The results in Table 1 reveal that the income elasticity estimates for burglary and larceny are negative and statistically significant, having values of -1.032 and -1.09, respectively. In both cases, crime growth decreases (increases) more than an increase (decrease) in income. This finding is in accordance with my theoretical predictions and with the results from the research performed by Cook and Zarkin and Bushway, et al. All other long-run estimates of interest are statistically insignificant, suggesting that vehicle theft and violent crime do not grow with respect to income growth, and that non-income recession features have no effect on crime growth.

Table 2 shows the results from the short-run empirical model (7), which was also estimated for each crime.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Dependent Var.</th>
<th>Dependent Var.</th>
<th>Dependent Var.</th>
<th>Dependent Var.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$\Delta \ln$ (Violent Crime)</td>
<td>$\Delta \ln$ (Burglary)</td>
<td>$\Delta \ln$ (Larceny)</td>
<td>$\Delta \ln$ (VehicleTheft)</td>
</tr>
<tr>
<td>$Constant$ ($\beta_0$)</td>
<td>0.021</td>
<td>0.011</td>
<td>0.031</td>
<td>-0.013</td>
</tr>
<tr>
<td></td>
<td>(0.028)</td>
<td>(0.024)</td>
<td>(0.019)</td>
<td>(0.034)</td>
</tr>
<tr>
<td>$\Delta \ln$ (Income) ($\beta_1$)</td>
<td>-0.622</td>
<td>-0.286</td>
<td>-0.811*</td>
<td>1.341</td>
</tr>
<tr>
<td></td>
<td>(0.666)</td>
<td>(0.684)</td>
<td>(0.453)</td>
<td>(1.195)</td>
</tr>
<tr>
<td>$Recession$ ($\beta_2$)</td>
<td>-0.034</td>
<td>0.077*</td>
<td>0.002</td>
<td>0.025</td>
</tr>
<tr>
<td></td>
<td>(0.038)</td>
<td>(0.039)</td>
<td>(0.026)</td>
<td>(0.069)</td>
</tr>
<tr>
<td>Adj. $R^2$</td>
<td>-0.019</td>
<td>0.083</td>
<td>0.045</td>
<td>-0.015</td>
</tr>
<tr>
<td>Number of Observations</td>
<td>45</td>
<td>45</td>
<td>45</td>
<td>45</td>
</tr>
</tbody>
</table>

Note: * = significant at 10%, **=significant at 5%, ***=significant at 1%. Autocorrelation is corrected for when needed. Standard errors in parentheses.
The statistically significant estimate of the income elasticity of larceny is inelastic and, as predicted, negative. The estimate of -0.81 suggests that year-to-year increases (decreases) in income result in smaller year-to-year decreases (increases) in larceny rates. The estimate of the coefficient on Recession for burglary is also statistically significant and is, as expected, positive, suggesting that the occurrence of recessions causes higher rates of burglary due to non-income factors. All other short-run estimates are statistically insignificant.

Several reasons may explain why so few estimates are statistically significant. First, the use of state-level data to examine a phenomenon that occurs on the individual level is a primary factor. Furthermore, Mississippi’s population is not homogenous across the state. Some areas are rural, while others are urban. Areas like the Delta region experience endemic poverty, while other areas like the Gulf Coast and Jackson suburbs are comparatively wealthy. The crime data for Mississippi aggregates and gives equal weight to the crime rates from all of these areas. Hence, the variation in Mississippi could generate dissonance between aggregate-level and individual-level estimates of the relationship between income (the business cycle) and crime. As mentioned in the literature review of Chapter II, another source of this dissonance may be conflicting influences of guardianship and the motivational effects.¹⁴ In their examination of vehicle theft and business cycle, Paternoster and Bushway (2001) demonstrate one example of a method of

¹⁴ Recall that the motivational effect is the theoretical increase in an individual's propensity to commit a crime resulting from the fewer opportunities to increase legal wealth during a recession. The guardianship effect is the theoretical decrease in an individual's propensity to commit a crime resulting from the higher proportion of people remaining at home (and thus "guarding" their possessions) rather than in public or at work.
disentangling these two effects. Repeating my study using less-aggregated data and finding ways to isolate the influences of the guardianship and motivational forces on all crime rates may produce results more aligned with predictions informed by the theoretical literature on the economics of crime.
Chapter V: Conclusion

This study added to the body of theoretical and empirical research that examines the relationship between the business cycle and crime by determining the nature of the relationship between the growth and variability of income and the growth and variability of crime rates in Mississippi over the period 1969 to 2015. Previous empirical research has shown that property crime rates tend to increase during recessions and that violent crime rates tend to be unaffected by changes in the business cycle. Results regarding the relationship between vehicle theft and the business cycle are less clear, potentially due to the grouping together of vehicle thefts motivated by both financial and non-financial tendencies.

Because a large portion of the effect of the business cycle on crime is thought to be generated by the changes in real income levels that occur throughout the course of the business cycle, I estimate long-run and short-run income elasticities for violent crime, burglary, larceny, and vehicle theft. The long-run income elasticity estimates capture the effect of income growth on the growth of crime rates. The short-run income elasticity estimates capture the effect of income variability on the variability of crime rates. I also estimate the effect of non-income factors of recessions on each of these crime rates. My results indicate that the long-run income elasticities of burglary and larceny are both negative and near unit elastic. In the short run, the income elasticity of larceny is also negative, and there is a small,
positive effect of non-income recession characteristics on burglary in the short run. Besides the long-run coefficient on larceny, no other estimate is statistically significant. I discuss possible explanations for this.

While the non-income effect of recessions on crime rates is not fully clear, in general my results support the theory that income and property crimes rates other than vehicle theft are countercyclical in Mississippi. I motivated these conclusions using a model of utility and expected utility of wealth to demonstrate that an increase in an individual’s wealth will decrease her propensity to commit a crime. To do so, I have shown that an increase in income will lead to a greater increase in her utility of wealth than it will her expected utility of wealth. If this model can be generalized for all individuals, then aggregate increases in wealth should result in lower aggregate crime rates.

Whether this individual model can be generalized to a more aggregate level, however, is not clear. Only some of my results mimic the results expected based on the individual model. To gain a clearer understanding of the effect of the business cycle on the individual's decision to commit a crime, my long-run and short-run tests should be repeated using less-aggregated data (ideally, data on an individual level). Since such data may not be available, my conclusions could also be strengthened through the use of data on a unit that is still aggregated but more uniform than Mississippi, such as West Virginia. Methodological innovations that isolate the individual effects of the two key forces at play (the “motivational” and “guardianship” effects) may also clarify the relationship between the business cycle and crime.
As crime is such a relevant issue, it is important to discuss any policy implications my research may have. One issue to note is the need for greater awareness of the relationship between each crime and the business cycle. Since this and other empirical studies show that recessions tend to generate higher rates of larceny in the short run, more resources should be dedicated to inhibiting this effect. This, of course, may be difficult since recessions tend to also cause fewer resources to be available to law enforcement. Additionally, it is important for policy-makers to be aware that recessions do not necessarily generate changes in crime rates via lowered income alone. Other factors, such as unemployment, may play a part. In particular, my short-run results show that the relationship between burglary and non-income recession characteristics is positive. Efforts to address increases in the burglary rate during recessions should be crafted with this in mind.

Although this study can be improved with better data and more precise methodology, it is able to supplement the existing literature by showing that the long-run income elasticities of both burglary and larceny are slightly less than -1, which shows that these two crime rates decrease almost proportionally to increases in income. This study also presented a mathematical proof showing that an individual’s propensity to commit crime decreases as wealth increases. There is still more to say on this issue, and those interested in expanding on this line of research may want to do so by making the data adjustments mentioned previously. Researchers could also examine how unemployment itself, rather than the catch-all variable of Recession, affects crime. Additionally, as is noted in the literature review, not all researchers exclusively categorize robbery as a violent crime. Thus, one
option may be treat robbery as separate dependent variable, rather than as a part of violent crime.
REFERENCES


