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# Youth Gangs as Pseudo-Governments: Implications for Violent Crime

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We hypothesize that the failure of government to protect the rights of individuals from violence committed by youths has led to the formation of youth gangs as protective agencies. Our theory predicts an opposite direction of causality between gang activity and violent crime from what is widely accepted. While areas with more gang activity also have more violence, our results suggest that gangs form as protection agencies precisely in areas with high violent crime rates. While gangs, like governments, use violence to enforce rules, the net impact of gangs is likely to lower violent crime. We test this hypothesis and offer policy implications.

**JEL Classification: D74, H11, K42**

## 1. Introduction

In the early 1970s, fewer than 300 cities cited having problems with youth gangs.[1] Since then, gangs have been identified in all 50 states, with over 2500 cities reporting problems by the late 1990s.[2] Anecdotal evidence, along with casual empiricism, has led many people to hold a strong belief that youth gangs are a serious problem because areas with more gang activity also tend to have higher rates of violent crime committed by youths. Simply put, the commonly accepted wisdom is that gangs cause violence.

In this paper, we propose and test a hypothesis suggesting that the causal relationship between youth violence and gang activity might flow in the exact opposite direction of what is commonly accepted. We propose that the failure of government to protect the rights of individuals from violence *committed by* youths has led to the formation of gangs as protective agencies among those populations who are most victimized by unpunished juvenile offenders in areas with high preexisting rates of violent crime. By banding together under the threat of mutual retaliation, potential victims of youth violence can secure increased safety. This same phenomenon also explains the widespread prevalence of gangs within prisons, where the rights

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[1] Curry, Ball, and Decker (1996) provide a methodology for estimating data on gangs, gang membership, and gang-related criminal activity.

[2] Miller (2001) reports that smaller cities, especially those with populations below 10,000, have seen much more growth in gang-related activity than their larger counterparts between the 1970s and the 1990s.

of individuals are largely unenforced. While gangs, like governments, use coercion and violence to enforce their rules through retaliation, the net impact of gangs (like governments) is likely to lower the overall amount of violence.[3] Generally, for an equilibrium to exist in which gang-type agencies prevail, the deterrence effect must reduce violence by more than the amount of violence used by the enforcement agency.[4]

Our analysis is solidly founded in the economic literature on the formation and evolution of "governments" from a situation of anarchy developed by Nozick (1974) and Buchanan (1975).[5] These authors, particularly Nozick, explain how and why infant governments evolve as protection firms in the anarchistic "Hobbesian jungle,"[6] characterized by violence and theft. Assuming that protection firms already exist, Sutter (1995) uses a game-theoretic model to address the behavior of and relations between individual protection firms and their respective clients when there are varying levels of symmetry between the former and the latter. While other authors, such as Bandiera (2003), have previously applied this theoretical framework to the evolution of specific protection firms, like the Sicilian mafia, very little has been done on applying this model to youth gangs, with the exception of a purely theoretical model by Skaperdas and Syropoulos (1995). Our analysis of youth gangs also relies on several recent theories developed in the literature on anarchy and whether it is welfare improving relative to a predatory state (for example, Moselle and Polak 2001; Leeson 2006).

In this paper, we develop this youth gang application of government evolution and anarchy theory to a much greater extent than has previously been done in the literature, and then conduct empirical testing. Our hypothesis—that gangs form in areas where there is a high rate of preexisting violence as a protection agency substituting for the lack of government enforcement of rights—is an alternative explanation for the well-documented cross-sectional correlation between gang activity and violent crime. In particular we show that our model predicts an exactly opposite direction of causality between youth gang activity and the rate of violent crime from what is commonly accepted. Because our hypothesis relies on the causality flowing from crime to gang membership rather than vice versa, we use empirical causality models to test our hypothesis. We indeed find a one-way causal relationship that violent crime causes gang membership, and we can reject the hypothesis that gang membership causes violent crime.

Our results have significant implications for government policy directed toward youth gangs. Just as the overthrowing or dissolving of a government in a geographic area might result in more violence because of a lack of rights enforcement in the resulting anarchy, government policy aimed at dissolving youth gangs will not be successful in reducing violent crime, and may in fact increase it.[7] By failing to adequately punish youth offenders when they violate the rights of other individuals, the current government legal system has created an environment where

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[3] One exception to this would be the case of an extremely predatory government, which might be welfare reducing relative to pure anarchy; see Moselle and Polak (2001).

[4] For the representative individual it would not be Pareto improving to join (as the probability of being violated would be higher for a member of the gang).

[5] For a good summary and review of this literature, see Gordon (1976).

[6] Hobbes (1651) argued that prior to government there was a state of nature characterized by an absence of rules governing ownership and interaction. Absent rules, Hobbes posited that life would be "nasty, brutish, and short." For a more recent discussion of this concept, with an analysis of when such situations are likely to evolve into cooperative outcomes, see Leeson, Coyne, and Boettke (2006).

[7] A current-day example of this is postwar Iraq, where private security firms are being hired to compensate for the lack of protection by U.S. and Iraqi government sources.

there is a significant demand for these private protective agencies (youth gangs). While gangs do use violence to enforce their rules and protect the rights of their members, the net result of gangs, according to our results, is to reduce the amount of violent crime because of mutual deterrence. Because there will always be a market for private protection when government fails to protect individual rights, the implications are clear for how public policy reform can reduce gang activity: more effective enforcement of laws that protect the rights of individuals from violent crimes committed by youthful offenders. Breaking up and destabilizing gangs within our model is violence increasing, rather than violence reducing.

Our findings suggest policy implications that are sometimes contrary to the existing deterrence literature. The older theoretical literature on the deterrence effect indicates that stricter law enforcement is less effective than better detection (Davis 1988; Leung 1995). These models, however, deal with single offenders and not gangs. Garoupa (2007), on the other hand, actually addresses punishment as it relates to gangs. The author finds that government may actually increase the criminal effectiveness of gangs by using stricter enforcement measures. Also, Garoupa (2000) stipulates that government should impose less severe punishment on relatively nonviolent gangs because those gangs are likely more efficient in controlling criminal activity than is government. Government should instead focus its efforts on controlling violent gangs that use "costly extortion." The results of this paper suggest that Garoupa's (2000) solution is indeed the appropriate policy response to gang activity.

This does not mean to say that all gang activity is explained by these differentials in enforcement. Sociological explanations and other factors surely play a major role. We also note that in some other countries with softer juvenile punishments, gangs are less prevalent. However, the fact that many gang members report joining a gang for protection, both among prison and youth gangs, suggests that the effect we examine is important nonetheless. What is important for deterring crime is whether the individual *committing* the crime is punished. When offenders go unpunished by the formal legal system, informal gangs help to fill this role, providing protection for those who would be potential victims of the unpunished offenders.

## 2. The Traditional View of Gangs

Sociologists and criminologists have weighed in most heavily on the debates regarding gang formation. Spergel et al. (1996a) theorize that youth gang problems are brought about by several community-level factors, including a lack of both social opportunities and social organization, institutional racism, and failures of social policy. They claim that, especially in black neighborhoods, the street gang provides control and employment opportunities that are not provided by legally recognized institutions. The popular perception is that gangs, like the infamous Bloods and Crips, seek out new markets in which to franchise their names. However, the empirical literature has found results that reject this hypothesis. For example, Spergel et al. (1996b) note that most new gangs are not franchises. This is later reaffirmed by Maxson (1998).

Other authors have hypothesized that gangs are little more than organized drug-dealing firms, and that the main reason for gang existence is the fact that drugs are illegal. This claim is widely made by law enforcement officials. While it is true that some gangs use the drug trade to help finance their activities, the empirical literature has uniformly provided results that reject the view that drug activity is the main reason for gang formation and existence. Maxson (1995)

tests the connection between street gangs, illicit drug sales, and violence and finds that street gangs are far less likely to be involved in the illegal drug trade and the associated violence than the law enforcement literature suggests. The author finds that only a few gangs seemed to specialize in drug sales. Levitt and Venkatesh (2000) describe the inner workings of a gang that, in fact, does sell drugs. However, the gang charges an additional membership fee for those who wish to sell drugs.

One reason to be very skeptical of these claims by law enforcement officials of the gang relationship with the drug trade is because if law enforcement exaggerates the extent to which gangs are involved in drug trade, they are more likely to get bigger budgets. The fact that budgetary considerations play a major role in the decisions and actions of police departments is now widely demonstrated in the literature by authors such as Rasmussen and Benson (1994).

That gang activity is present to a greater extent in areas with higher rates of violent crime has been well demonstrated *in the cross section*. Based on this strong correlation, it is widely accepted that the way to reduce violent crime is to reduce gang activity. Inherent in this statement is an underlying assumption about the direction of causation between violent crime and gang activity. An intervention that reduces gang activity will only reduce violent crime if gangs cause violent crime. All protection firms and organizations, from the mafia to private security to traditional governments, use coercion, retaliatory violence, and predatory violence to enforce certain rules of conduct and to enforce and protect the rights of their members. However, saying that gangs cause violence based on this observed behavior is identical to claiming that governments that use coercion and violence as a means to provide protection services are causing more total violence than would exist without any government in place. The gang's use of retaliatory violence against someone who aggresses against a gang member actually results in a lower level of total violence as it creates a strong incentive for individuals not to initiate violence to begin with because of the fear of retaliation by the gang. Within the economic model of protection services, an intervention that resulted in weakened gangs (or weakened governments) would result in more violence, not less.

Any theory of gangs should be accepted or rejected based on its ability to explain real-world empirical observations. As we have already discussed, the real-world evidence rejects the hypothesis that gangs franchise and that they primarily form to participate in the drug trade (although it may be a secondary function performed by the gang once it is organized). Perhaps the most useful empirical observation that must be explained by a good theory of gang formation is why these gangs are primarily present among youths and not adults.[8] The most widely accepted reason within law enforcement and in sociology is that gangs *employ* and recruit youth members because these members can commit crimes virtually without punishment because of their age. In this framework, youths are employed to coerce other individuals and commit violent acts to obtain resources for the gang leaders. Data on the age distribution of gang members, however, is notably inconsistent with this view.

Figure 1 presents the age distribution of gang members from the 1998 National Youth Gang Survey (Office of Juvenile Justice and Delinquency Prevention 2000). If gang members are employed based upon their ability to commit illegal acts without punishment from law enforcement, there should be a large, discrete decline in gang membership beginning at age 18.

[8] Interestingly, gang activity among adults is most prevalent in prisons, a place where the enforcement and protection of individual rights is almost nonexistent. This is an observation that would also reject the commonly accepted wisdom in favor of our theory.

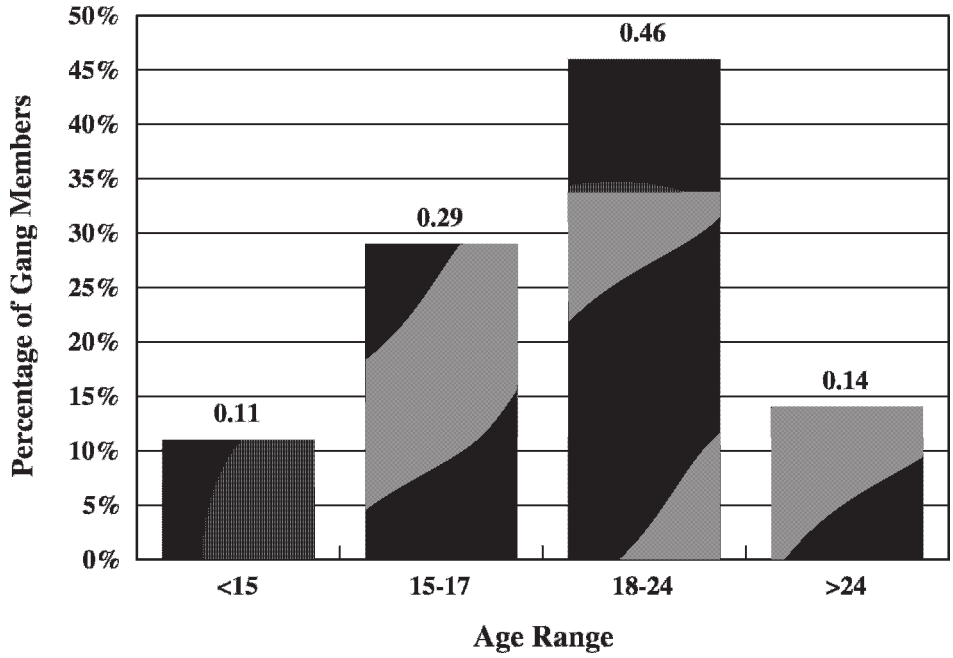


**Figure 1.** Age Distribution of U.S. Gang Members, 1998

The age distribution of youth gang membership, however, does not show a significant drop at exactly age 18, but rather tapers off through the mid-twenties. This is a widely recognized puzzle in the standard theory.

Our hypothesis—that repeated violence committed by youths who then go unpunished causes gangs to subsequently form among the potential *victims* of this violence—does a better job of explaining the true age profile of gang membership. Because social groups and interactions do tend to be stratified by age, our theory also predicts that gangs would form among youths more than adults. However, within our model the age distribution of gang membership should begin to smoothly decline after age 18 as individuals move into new social groups as they age. The fact that both a 16-year-old and an 18-year-old are just as likely to be the victim of a 17-year-old criminal explains why our model fits this data better than the existing, and more commonly accepted, view of youth gangs. Both our later finding, that gangs lower net violence, and the fact that there is a gradual erosion of gang membership with age also provide some empirical support for the model by Sutter (1995). In that model, when exit is easier for members, the gang will tend to be more protective rather than predatory.

## 3. The Economic Model of Gang Formation

Much of the economic literature on gang formation developed from earlier works on government formation. Lane (1958) describes how government, in its role as a "protection firm," became a monopolist over the protection industry and then the entire market. Carneiro (1970) confirms that coercive force, not enlightened self-interest, led to the formation of states throughout history. Despite these two early contributions, the modern economic literature on

the formation and evolution of protection firms from a situation of anarchy is generally attributed to the influential works of Nozick (1974) and Buchanan (1975). Holcombe (2004), extending this literature, argues that in the absence of government, people will organize protection firms, which will grow into mafias and eventually gain monopoly power and establish themselves as governments. Skaperdas and Syropoulos (1995) describe how, in a state of anarchy, those with a comparative advantage in violence grab and maintain power through coercion of those who have a comparative advantage in production.

The economic model of gang formation also can be derived from literature on weak governments. For example, Konrad (1999) explains how, even in the presence of a legitimate modern government, gangs can develop in situations where there is a regional power vacuum. Mehlum, Moene, and Torvik (2002) develop a theoretical model to show how violent gangs may become monopoly producers of violence and protection. This occurs when legitimate government fails to protect rights. The gangs may extort protection fees both from individuals that operate in the underground economy and from others that lack legal protections. Bandiera (2003) shows that the Sicilian mafia emerged due to a lack of strong governmental protection of property rights. Similarly, according to Anderson (1995), certain conditions encourage the formation of a mafia: a loss of legitimate state power and the presence of illegal markets. Although a street gang is not a mafia, the two criteria are typically present in poor inner cities, potentially aiding in gang formation, just as they do in mafia formation. Meanwhile, Skaperdas (2001) lists certain contributing factors for the birth and growth of gangs and organized crime, again including illegal markets along with ethnic and/or social distance from mainstream society.

Most of the literature on the evolution of private protection firms focuses on a situation of anarchy within a certain geographical area, where there is little or no government provision of rights protection.[9] However, Hirshleifer (1995) notes that some degree of anarchy is present in every social order. As government law enforcement cannot completely keep violence and theft from occurring, markets for specialized private protection firms may develop. Even within one specific society, the extent of rights protection can differ dramatically among subsets of the population. This is a particularly realistic description for the case of youths. As anyone who has attended a public school knows, individual rights are generally not enforced except in situations of extreme violence. Bullying, theft of lunch money, physical coercion, and other types of violence or threats of violence are not only commonplace but widely accepted and tolerated even by school administrators. The same is true in adult prisons. Our hypothesis is that it is precisely these areas in which the failure of the government to protect the rights of individuals results in the formation of gangs as substitute protective agencies. So, we postulate that, in areas where there is less government rights protection, individuals will be more prone to become members of gangs. By being part of the gang, one obtains the protection and "law enforcement" services of the gang within one's own community. If violence is inflicted upon a gang member, the gang will retaliate against the perpetrator. In neighborhoods with little violence, there is much less need for these protective services, and thus the likelihood of gang formation is reduced.

There is a common misperception in society that *only* government can provide peace and order. In fact, according to Reuter (1983), conflicts in an organized crime setting are usually

[9] For an examination of the role of private protection in the presence of government as well, see Benson and Mast (2001). On the private provision of dispute resolution, also in the presence of government, see Benson (1995).

settled peacefully. Leeson (2007) shows that even under anarchy, private trading arrangements can (and will) evolve to prevent or minimize violence. Dowd (1997) reminds us that the "Wild West" was usually more peaceful and orderly than generally perceived, due to the occasional creation of citizen vigilante groups that enforced the legal attitudes of the day. According to Sutter (1995), the level of violence (and degree of protection of private property vs. predation) will depend on how the firms interact with each other. In a world of quasi-anarchy and competing protection firms, the potential for violence will depend on the returns to scale in violence and whether firms are near the minimum efficient scale to protect their members. Sutter (1995) also concludes that the ability of individuals to exit from a gang (either to join another gang or to withdraw from gang membership altogether) will affect whether gangs would be overly predatory or primarily provide protection services to members. Our paper provides evidence to show that, in the inner city, where government protection of rights is limited at best, gangs form to provide *more* safety and order than would otherwise be available.

## 4. The Economic Model of Gang Operation

It is important to understand not only how gangs *form*, but also how they operate once formed. Spergel et al. (1996b) describe the symbiotic nature of street and prison gangs, with both organizations acting to maintain control and order in their respective geographic areas. Interestingly, the relatively high degree of gang activity within prisons also supports our hypothesis. Like inner cities and public schools, prisons are well known for being places where the rights of individuals are not very well protected. Prison inmates can expect to get more protection of their rights from belonging to a prison gang than from the prison security guards.[10] The limited and incomplete protection of rights in prisons, like in inner cities, leads to an unmet demand for rights protection that private organizations fulfill.

Skaperdas (2001) argues that organized crime is more like a state than a firm. However, it more closely resembles predatory states. Skaperdas and Syropoulos (1995) show how those ruled by the gangs will tend to devote fewer resources toward production, resulting in a lower level of economic activity and growth. This is especially true in the impoverished inner cities, where the gangs already compete for increasingly scarce resources. However, gangs may still be better for the overall social and economic performance of an area than anarchy without gangs. Moselle and Polak (2001) show that both organized banditry and anarchy can be welfare enhancing relative to government, if government is predatory enough.[11] Their argument could be applied to gangs to suggest that gangs might also be welfare enhancing relative to a highly corrupt and predatory government.

According to Baumol (1990), governments throughout history have for the most part behaved like gangs, being tyrannical and self-serving. However, he proposes that gangs are less like governments and more like firms serving clients. Gambetta (1993) also disagrees that the mafia is another form of a state. He argues that mafias neither are centralized nor maintain undisputed control over a certain geographic region. They are also not accountable and not

[10] Holcombe (1994) presents an economic model of how individuals secure others' observance of their rights. Those who will secure the largest degree of observance are those who either have a larger ability to threaten coercion or violence, or those who are the most productive and can trade their output in exchange for observance.

[11] For an application of this to stateless Somalia, see Leeson (2006).

universal. Instead, Gambetta (1993) indicates that the mafia is probably closer to a business firm that provides protection services to paying clients only, and not to all citizens in their region.[12] For example, as Anderson (1995) points out, existing businesses that are victims of extortion may actually support the gangs because they exhibit some control on the entry of rival firms. Like firms, gangs develop and display the gang's logos, which are then worn by gang members. This is consistent with our hypothesis that gangs form primarily as protective firms. Identifying oneself visibly as belonging to a gang communicates the threat of gang retaliation to anyone looking to commit violent aggression, regardless of whether they personally know the individual.

Actually, some theoretical papers do show that violence decreases with fewer competing coercive organizations. Buchanan (1973) explains that a monopoly on violence is better than a more competitive market in the protection industry because monopolists tend to underproduce. So, society should experience a lower output of violence when one gang has monopoly power over a certain geographical area. In this case, as Buchanan indicates, by following its own self-interested goals, a monopoly producer of an "economic bad" makes society better off by underproducing violence. Similarly, in the models presented in Skaperdas (2001) and Cothren (2002), increased competition (or instability) in the violence industry results in decreased social welfare.

## 5. Data and Empirical Analysis

While there is a strong theoretical literature on anarchy, gangs, and organized crime, the empirical testing of these theories is almost nonexistent. In the case of gangs, this lack of empirics is primarily due to the lack of data on gang-related activity. Although some cross-sectional survey data on gang prevalence across cities exist, cross-sectional data cannot be used to infer the direction of causation. Previous research in criminal justice has shown a strong positive correlation between violence and gang activity in this existing cross-sectional data—areas like Los Angeles have both more violence and more gangs than areas such as rural Nebraska (with low violence and low gang activity). To test the direction of causality, time-series data are necessary. From those data, it is possible to see, on average, which series moves "first" and which moves "second." The method that allows us to conduct such an analysis is the Granger causality test. While technically a test to measure if one series forecasts another, Granger causality has been used to investigate links between oil price shocks and recessions (Hamilton 1983), exports and economic growth (Ahmad and Harnhirun 1996), and local government revenues and grants (Dahlberg and Johansson 2000). So, we are careful to use the term "Granger-cause" to describe any significant results from this model. Another caution of using this test is that it is sensitive to the lag length of the vector autoregression (VAR) (Hamilton 1994). We utilize the Akaike information criterion (AIC) to determine the lag length, since the AIC usually recommends a longer lag length than the Schwarz information criterion. Longer lag lengths coincide with the final major caution of using Granger causality: The test is

[12] The particular gang studied by Levitt and Venkatesh (2000) behaves somewhat like a business, extorting money for protection, selling drugs, paying a franchise fee, charging a membership fee, and taking over nearby territory. The gang they study also goes "out of business." However, as we indicated earlier, such drug-dealing franchise gangs are more the exception than the rule.

sensitive to omitted variables (Hamilton 1994). While utilizing more degrees of freedom, longer lag lengths are considered more conservative because a VAR with a higher number of lagged endogenous variables includes more potentially relevant variables.

To test our hypothesis, we obtained nine years of monthly gang membership data directly from the Los Angeles Police Department (LAPD) Special Operations Support Division.[13] This is the only available time series of gang membership data that is long enough to use for causality testing. In compiling the data, the LAPD employs undercover gang intelligence officers to infiltrate gangs in order to identify each gang's respective members. In addition, these officers report on whether each member is currently active in gang activities or is currently absent from the gang. The gang membership data contain information on total gang membership and membership for several individual gang categories. Again, while these data may have some limitations, they are the only data of their type currently in existence. Also, the LAPD's reliance on these data for internal decisions gives them an incentive to make the data as accurate as possible.[14]

We supplement the LAPD's gang membership data with violent crime data from the LAPD's annual *Statistical Digest*. It consists of the following Type I offenses: homicide, aggravated assault, and robbery.[15] These data are useful because they provide a long time-series of monthly data that extends for the majority of the time that the gang membership data cover. While the gang membership data span from April 1998 to July 2007, the monthly crime data span from January 1997 to December 2004.[16] Because the time periods differ, we use only the overlapping 81 months of data, from April 1998 to December 2004.[17]

To test the robustness of our model, we conduct our tests not only for total gang membership but also individually for membership in the three largest individual gang classes reported by the LAPD: Hispanic gangs, Crips, and Bloods. Because of the well-documented seasonal nature of criminal activity, we employ a 12-month seasonal difference of all variables and use the indication $\Delta_{12}$.

Because we are interested in employing the Granger causality test to determine the direction of causality, we need to first ensure that our series are stationary. Otherwise, results from nonstationary data series will lead to spurious causality results. To test for unit roots, we employ the augmented Dickey-Fuller (ADF) test.

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[13] These data were prepared by the LAPD Bureau Special Enforcement Units and Community Resources Against Street Hoodlums units and compiled by the Special Operations Support Division. The authors appreciate the data assistance provided by Detective Chuck Zeglin of the LAPD.

[14] Los Angeles County has approximately 500 Hispanic gangs, 200 Crip gangs, and 75 Blood gangs. Within the city limits of Los Angeles, there are approximately 143 Hispanic gangs, 100 Crip gangs, and 24 Blood gangs (Alonso 2007d). Total gang membership, at 65,578 in April 1998, declined significantly to 39,119 in July 2006. Hispanic gangs lost the largest number of members (−18,734), while Asian gangs lost the largest portion of members (−61.8%).

[15] The only violent Type I offense we do not consider is rape because the Federal Bureau of Investigation only counts rapes committed on females. Gangs are dominated by males (Howell 1998); however, male-on-male rape is reported as assault according to the Uniform Crime Reporting Division of the Federal Bureau of Investigation.

[16] Gang membership data for February 2002 were not reported. For simplicity, we interpolate February using January and March 2002 membership.

[17] Note these data include all crimes, not just crimes judged by the police to be gang related. For 2006, the total number of homicides (481) in Los Angeles comprised 272 (56.5%) gang-related homicides (Los Angeles Police Department 2006). This portion has fluctuated between 50.1% and 59.1% between 2000 and 2007. Gang felony assaults in 2006 (2877) constituted 20.4% of all 14,118 aggravated assaults in Los Angeles. Gang assaults have constituted between 16.2% and 20.4% of all city assaults since 2000. Gang-related robberies also hovered between 16.0% and 19.9% of total robberies during the same time span. In 2006, of the 14,235 robberies in Los Angeles, 2515, or 17.7%, were gang related.

**Table 1.** Augmented Dickey-Fuller Unit Root Test Results

| | Variable Form: $\Delta_{12}$ | | Variable Form: $\Delta(\Delta_{12})$ | |
|---|---|---|---|---|
| Variable | ADF Test Statistic | Lags | ADF Test Statistic | Lags |
| Aggravated assault | −0.9775 | 12 | −4.6420** | 12 |
| Homicide | −4.1147** | 1 | n/a | n/a |
| Robbery | −1.5367 | 12 | −4.7995** | 12 |
| Total gang members | −2.4350 | 12 | −4.8501** | 11 |
| Hispanic gang members | −2.0500 | 12 | −4.3693** | 11 |
| Crips gang members | −3.3648* | 12 | n/a | n/a |
| Bloods gang members | −3.7834** | 12 | n/a | n/a |

The number of lags was determined using the Akaike information criterion. Asterisks indicate statistical significance at the following levels: ** = 1%, * = 5%.

Table 1 shows the ADF test results for all of our data series. Looking at the first column of results, only one of the three crime variables, homicide, is stationary (in the 12-month difference form). Both aggravated assault and robbery are nonstationary. The first difference is taken for these two series, and the ADF tests for the transformed series (shown in the second column of results) shows that they are now stationary and can be used for the causality regressions (the first difference of the 12-month seasonally differenced series). For the four gang membership variables, three are stationary in their level form, leaving only Hispanic gang membership nonstationary. Once the first difference is taken and the transformed series retested, it is now stationary.[18] We adopt the standard convention of using $\Delta_{12}$ to refer to the series that are only seasonally differenced to remove the 12-month seasonal pattern (and they were stationary in that form), and $\Delta_1(\Delta_{12})$ to refer to any series for which the first (monthly) difference was taken to make the series stationary based on the results of the ADF test.

With all of the variables of interest now in a form that is stationary, we can proceed to test our hypothesis regarding the causal direction between gang membership and our crime variables. Our initial Granger causality tests are conducted as indicated in Equations 1 and 2 below:

$$V_{t,j} = \beta_{1,j} + \sum_{i=1}^{r}\left(\beta_{1i,j}V_{t-i,j}\right) + \sum_{i=1}^{s}\left(\alpha_{1i,k}G_{t-i,k}\right) + \varepsilon_{1t,j}, \tag{1}$$

$$G_{t,k} = \alpha_{2,k} + \sum_{i=1}^{s}\left(\alpha_{2i,k}G_{t-i,k}\right) + \sum_{i=1}^{r}\left(\beta_{2i,j}V_{t-i,j}\right) + \varepsilon_{2t,k}, \tag{2}$$

where $V$ and $G$ are, respectively, violent crimes and gang membership, $j$ is an indicator for the type of violent crime, and $k$ is an indicator for the gang category. We set up the null hypotheses that (i) $\alpha_{1i,k} = 0$, (ii) $\alpha_{2i,k} = 0$, (iii) $\beta_{1i,j} = 0$, and (iv) $\beta_{2i,j} = 0$, for all $i = 1$ to $r$, $s$.[19] Again, the optimal lags ($r$ and $s$) are determined by using the AIC on the vector autoregressive equations. Using an $F$-test, we evaluate these null hypotheses for each gang ($k$) and crime ($j$) to determine if any causal relationship exists. Our Granger causality results are presented in Table 2.

[18] For consistency and robustness we also show in the second column of results in Table 1 the test statistics after taking the first difference for the four series that were already stationary in their 12-month seasonal difference form. They should remain significant (with increasing test statistics), which they all do.

[19] Of course we also test the null hypotheses that (v) $\beta_{1,j} = 0$ and (vi) $\alpha_{2,k} = 0$.

**Table 2.** Gangs and Violent Crime Causality Tests: Bivariate Models

| Homicide | | | | | |
|---|---|---|---|---|---|
| Gang | Model | Lags | $H_0$: Violence Does Not Granger-Cause Gangs ($F$-statistic) | $H_0$: Gangs Do Not Granger-Cause Violence ($F$-statistic) | Finding |
| Total gang members | $\Delta_1(\Delta_{12})$ | 4 | 3.6873** | 0.3222 | Homicide Granger-causes gangs |
| Bloods | $\Delta_{12}$ | 12 | 1.6822 | 2.0018 | No causality |
| Crips | $\Delta_{12}$ | 12 | 1.9014 | 1.0974 | No causality |
| Hispanic | $\Delta_1(\Delta_{12})$ | 4 | 3.3927* | 0.2796 | Homicide Granger-causes Hispanic gangs |
| **Aggravated Assault** | | | | | |
| Gang | Model | Lags | $H_0$: Violence Does Not Granger-Cause Gangs ($F$-statistic) | $H_0$: Gangs Do Not Granger-Cause Violence ($F$-statistic) | Finding |
| Total gang members | $\Delta_1(\Delta_{12})$ | 12 | 1.7011 | 0.9168 | No causality |
| Bloods | $\Delta_1(\Delta_{12})$ | 12 | 3.4864** | 0.7155 | Assault Granger-causes Blood gangs |
| Crips | $\Delta_1(\Delta_{12})$ | 12 | 2.5556* | 1.0319 | Assault Granger-causes Crip gangs |
| Hispanic | $\Delta_1(\Delta_{12})$ | 12 | 1.4485 | 0.9074 | No causality |
| **Robbery** | | | | | |
| Gang | Model | Lags | $H_0$: Violence Does Not Granger-Cause Gangs ($F$-statistic) | $H_0$: Gangs Do Not Granger-Cause Violence ($F$-statistic) | Finding |
| Total gang members | $\Delta_1(\Delta_{12})$ | 12 | 1.2338 | 0.9200 | No causality |
| Bloods | $\Delta_1(\Delta_{12})$ | 12 | 0.7151 | 1.1784 | No causality |
| Crips | $\Delta_1(\Delta_{12})$ | 12 | 0.9793 | 1.0621 | No causality |
| Hispanic | $\Delta_1(\Delta_{12})$ | 12 | 1.1859 | 0.8720 | No causality |

Lags for the Granger causality tests were determined using the Akaike information criterion. All variables were twelfth-differenced in order to correctly deal with the seasonality present in the crime data. Additionally, some of the twelfth-differenced series had unit roots. To correct for this situation, those series were first-differenced. All resultant series are stationary. Generalized least squares estimation was used in situations where serial correlation was present. Asterisks indicate statistical significance at the following levels: ** = 1%, * = 5%.

The first section at the top of Table 2 shows the results of the causality test for the relationship between homicide and gang membership. For all cases we cannot reject the null hypothesis that gang membership does not Granger-cause homicide; however, we can reject the null hypothesis that homicide does not Granger-cause gang membership both for total gang members and Hispanic gangs. Thus, for total gang membership and the largest gang subcategory, the causality tests show that there is a one-directional causal relationship: *Homicide causes gang membership*. In no case do we find that gang membership causes homicide. As the rate of homicide in Los Angeles increases, so does gang membership in subsequent months as a result, but not vice versa.

The middle section of Table 2 shows the results of the causality tests for the relationship between aggravated assault and gang membership. For aggravated assault, we again cannot reject the null hypothesis that gang membership does not Granger-cause aggravated assault in Los Angeles. Consistent with this paper's theory, the results show that assault does Granger-

cause membership in both Blood and Crip gangs. For Hispanic gangs and total gang membership, there is no causality in either direction. The evidence here again points to the conclusion that an increase in violence, in this case aggravated assault, causes an increase in certain gang membership levels, but not vice versa.

The bottom section of Table 2 shows the results of the causality tests for the relationship between robbery and gang membership. Here, we can reject a causal relationship in both directions. There is neither a causal relationship flowing from gang membership to robbery nor from robbery to gang membership. We believe that the results for robbery are not significant for several reasons. First, the other two crimes we examine involved the actual infliction of physical harm and are thus much more likely to be reported in the first place. As Neumayer (2003) points out, homicide is the most accurately reported crime. As is well known, sexual crimes are severely underreported due to the social stigma the victim faces. However, the underreporting of crimes such as robbery is likely strongest among youth victims, due both to their historical distrust of police and to the stigma of "tattling," which very well may earn oneself additional future violence of a more serious nature.[20] If a robbery victim joins a gang the following month after being robbed but not reporting it, gang membership will increase while the robbery will be absent from the data. Because homicide is the most accurately reported of the violent crimes, we believe our results for that variable are the most trustworthy.

Perhaps most noteworthy is that in only one case did we uncover a causal relationship showing that gang membership causes violent crime. When causality does exist, it is almost exclusively violent crime causing gang membership. Our results strongly show that an exogenous change in violent crime, particularly homicide and aggravated assault, results in a subsequent increase in gang membership as additional people seek the protective services offered by gangs. Again, in only a single case do we find evidence that an exogenous change in gang membership results in a corresponding increase in violent crime.

To ensure the robustness of our results, we conducted our Granger causality tests using an exogenous measure of the unemployment rate (both seasonally adjusted [SA] and non-seasonally adjusted [NSA]). This variable allows us to control to some degree for regional economic conditions that may impact the decisions to commit crimes or join gangs.[21] There is a significant literature that addresses the association between certain crime rates and unemployment rates.[22] While there is still substantial debate over this association, the unemployment rate is the best available control variable for our monthly crime and gang data. All unemployment rate data was obtained from the U.S. Bureau of Labor Statistics.

The results of the NSA and SA Granger causality tests are located in Tables 3 and 4, respectively. Based on our augmented models, the results show an even clearer relationship of crime leading to gang membership. Homicides Granger-cause total gang membership, along with Crip and Hispanic gang membership. This is true for both the SA unemployment rate and the NSA unemployment rate. Recall that homicide is likely the best measure of violence for this study. So, the results lend additional and strong confirmation that crime Granger-causes gangs.

When controlling for the unemployment rate, our results for aggravated assault are clear for both Blood and Hispanic gangs: Assault Granger-causes gang membership. For Crip gangs, the results are mixed. When using the NSA unemployment rate, the results show assault

[20] However, because of their low incomes, youths may also be less often the victims of significant reportable robberies.
[21] Many thanks to an anonymous referee for suggesting this control variable.
[22] Ehrlich (1996) provides a concise summary.

**Table 3.** Gangs and Violent Crime Causality Tests: Controlling for the Non-seasonally Adjusted County Unemployment Rate

| Homicide | | | | | |
|---|---|---|---|---|---|
| Gang | Model | Lags | $H_0$: Violence Does Not Granger-Cause Gangs ($F$-statistic) | $H_0$: Gangs Do Not Granger-Cause Violence ($F$-statistic) | Finding |
| Total gang members | $\Delta_1(\Delta_{12})$ | 4 | 3.6189* | 0.3193 | Homicide Granger-causes gangs |
| Bloods | $\Delta_{12}$ | 2 | 0.2391 | 1.6495 | No causality |
| Crips | $\Delta_{12}$ | 2 | 3.8996* | 2.1576 | Homicide Granger-causes Crip gangs |
| Hispanic | $\Delta_1(\Delta_{12})$ | 4 | 3.3303* | 0.2753 | Homicide Granger-causes Hispanic gangs |
| **Aggravated Assault** | | | | | |
| Gang | Model | Lags | $H_0$: Violence Does Not Granger-Cause Gangs ($F$-statistic) | $H_0$: Gangs Do Not Granger-Cause Violence ($F$-statistic) | Finding |
| Total gang members | $\Delta_{12}$ | 2 | 1.0685 | 0.8153 | No causality |
| Bloods | $\Delta_1(\Delta_{12})$ | 12 | 3.1890** | 0.8037 | Assault Granger-causes Blood gangs |
| Crips | $\Delta_1(\Delta_{12})$ | 12 | 2.3608* | 1.1254 | Assault Granger-causes Crip gangs |
| Hispanic | $\Delta_1(\Delta_{12})$ | 2 | 3.4689* | 0.7259 | Assault Granger-causes Hispanic gangs |
| **Robbery** | | | | | |
| Gang | Model | Lags | $H_0$: Violence Does Not Granger-Cause Gangs ($F$-statistic) | $H_0$: Gangs Do Not Granger-Cause Violence ($F$-statistic) | Finding |
| Total gang members | $\Delta_1(\Delta_{12})$ | 12 | 1.4387 | 0.9004 | No causality |
| Bloods | $\Delta_{12}$ | 1 | 1.0342 | 0.0871 | No causality |
| Crips | $\Delta_{12}$ | 1 | 5.6439* | 0.1246 | Robbery Granger-causes Crip gangs |
| Hispanic | $\Delta_1(\Delta_{12})$ | 1 | 0.0001 | 3.2244 | No causality |

Lags for the Granger causality tests were determined using the Akaike information criterion. All variables were twelfth-differenced in order to correctly deal with the seasonality present in the crime data. Additionally, some of the twelfth-differenced series had unit roots. To correct for this situation, those series were first-differenced. All resultant series are stationary. Generalized least squares estimation was used in situations where serial correlation was present. Asterisks indicate statistical significance at the following levels: ** = 1%, * = 5%.

Granger-causing Crip membership. With the SA unemployment rate as a control variable, we encounter bidirectional causality. This result indicates that Crip gang membership Granger-causes more assault while assault Granger-causes greater gang membership. It provides some evidence that gangs increase crime levels; however, since it occurs only in one instance, that evidence is quite weak.

In the final section of our tables, we find that, when controlling for the unemployment rate (both SA and NSA), robbery Granger-causes Crip gang membership. Again, no other causal relationship exists between robbery and the other gangs. So, there is some evidence that robbery could lead certain individuals to join the Crips. Again, since this occurs only twice across our various model specifications, the evidence for this finding is relatively weak.

**Table 4.** Gangs and Violent Crime Causality Tests: Controlling for the Seasonally Adjusted County Unemployment Rate

| Homicide | | | | | |
|---|---|---|---|---|---|
| Gang | Model | Lags | $H_0$: Violence Does Not Granger-Cause Gangs (*F*-statistic) | $H_0$: Gangs Do Not Granger-Cause Violence (*F*-statistic) | Finding |
| Total gang members | $\Delta_1(\Delta_{12})$ | 4 | 3.6197* | 0.3222 | Homicide Granger-causes gangs |
| Bloods | $\Delta_{12}$ | 2 | 0.2026 | 1.7877 | No causality |
| Crips | $\Delta_{12}$ | 2 | 3.3519* | 2.5420 | Homicide Granger-causes Crip gangs |
| Hispanic | $\Delta_1(\Delta_{12})$ | 4 | 3.3329* | 0.2767 | Homicide Granger-causes Hispanic gangs |
| **Aggravated Assault** | | | | | |
| Gang | Model | Lags | $H_0$: Violence Does Not Granger-Cause Gangs (*F*-statistic) | $H_0$: Gangs Do Not Granger-Cause Violence (*F*-statistic) | Finding |
| Total gang members | $\Delta_{12}$ | 2 | 1.3573 | 0.5697 | No causality |
| Bloods | $\Delta_1(\Delta_{12})$ | 12 | 3.0521** | 0.7637 | Assault Granger-causes Blood gangs |
| Crips | $\Delta_1(\Delta_{12})$ | 12 | 2.1418* | 3.7537** | Bi-Directional causality between Assault and Crip gangs |
| Hispanic | $\Delta_1(\Delta_{12})$ | 2 | 3.4951* | 0.7676 | Assault Granger-causes Hispanic gangs |
| **Robbery** | | | | | |
| Gang | Model | Lags | $H_0$: Violence Does Not Granger-Cause Gangs (*F*-statistic) | $H_0$: Gangs Do Not Granger-Cause Violence (*F*-statistic) | Finding |
| Total gang members | $\Delta_1(\Delta_{12})$ | 12 | 1.3142 | 0.8755 | No causality |
| Bloods | $\Delta_{12}$ | 1 | 0.7417 | 0.1229 | No causality |
| Crips | $\Delta_{12}$ | 1 | 5.5153* | 0.1032 | Robbery Granger-causes Crip gangs |
| Hispanic | $\Delta_1(\Delta_{12})$ | 12 | 1.2459 | 0.9139 | No causality |

Lags for the Granger causality tests were determined using the Akaike information criterion. All variables were twelfth-differenced in order to correctly deal with the seasonality present in the crime data. Additionally, some of the twelfth-differenced series had unit roots. To correct for this situation, those series were first-differenced. All resultant series are stationary. Generalized least squares estimation was used in situations where serial correlation was present. Asterisks indicate statistical significance at the following levels: ** = 1%, * = 5%.

The LAPD occasionally purges inactive members from the gang member databases. This results in some drops in membership that could potentially affect our results. To account for these purges, we added an exogenous binary variable to account for each purge. We then ran all three of our previous models. The results are very similar. For the original bivariate causality tests, we find that homicide Granger-causes total gang membership, along with Blood and Hispanic gang membership. In the models that adjust for unemployment, there is no longer any statistically significant causal relationship between homicide and Bloods. Aggravated assault again consistently Granger-causes Blood gang membership across all models. However, assault Granger-causes Crip and Hispanic gang membership in only one of three models. Finally, there

is no causality between robbery and gangs except in one model that controls for the SA unemployment rate. As before, robbery Granger-causes Crips. In none of the ''purge adjusted'' models is there any causation from gangs to violence.

We did try to perform a more micro-neighborhood-level analysis using rough measures from the Website www.streetgangs.com and limiting our data to only crimes that were classified by the police as gang crimes. Gangs that appeared to be most active in a given police sub-bureau were allocated all gang crimes within that sub-bureau. Then, each gang's crime and gang membership data were aggregated across all sub-bureaus. For example, Hispanic gangs were most active in several areas, including the Rampart and Van Nuys sub-bureaus. We aggregated Hispanic gang membership and total gang crime from those two areas (along with other sub-bureaus where Hispanic gangs were most active). As evidenced by the greatest number of gangs, Hispanic gangs also tend to dominate many more geographical areas within the city of Los Angeles than do Blood and Crip gangs. The Blood and Crip gangs seem to be most dominant in the South and Central sections of the city, along with neighboring cities (e.g., Compton and Inglewood) to the south. Hispanic gangs are more prevalent in the remaining areas (Alonso 2007a, b, c). Causality tests were then conducted using the same six-model variations, and the results are presented in Appendix A. These models were much more suspect in their explanatory power, with significantly lower *R*-squares due to our having to assign all crimes to a specific gang and counting only gang-related crimes. The results of these regressions did not find any causal relationships between gangs and crime.

## 6. Conclusion

The popular perception that gangs cause violent crime is based on tenuous casual observations. Although gangs and violence do seem to frequently coexist, such cross-sectional correlations do not imply causality. Our results provide strong evidence that violent crime causes an increase in gang membership, and not vice versa. Thus, areas with higher rates of violent crime will also experience higher rates of gang membership *as a result* of the increased violence.

We extend the models of government formation out of anarchy developed by Nozick (1974) and Buchanan (1975) and apply them to the relative anarchy faced by inner-city youths both at school and in their neighborhoods. Our analysis is based on the observation that government does not adequately protect the rights of individuals from violent crime committed by youths. Based on past violence or perceived future violence, these youths seek protection by forming organizations to provide safety where government public safety agencies have failed.

Our results are important because they uncover a situation where public policy, implemented with the best possible intentions, may in fact be harming those it was intended to help. As we have shown in all but one instance, violent crime leads to an increase in gang membership, not vice versa. If policies are enacted to break up gangs, the resulting increased anarchy should in fact lead to more violence among youths. This is because the gangs serve as a net deterrent of violence. In addition, as theorized by Buchanan (1973) and later by Konrad (1999) and Skaperdas (2001), increased competition between gangs will lead to additional violence. Unless the already existing violence is mitigated, youths from the previous gangs will again form gangs. However, as these new gangs are smaller and more fragmented, more violence will occur.

Our main policy implication is that governments should try harder to protect the rights of individuals who are the victims of violence or coercion by juvenile offenders. Youths form and join gangs to secure protection primarily because of the inability or unwillingness of police and school administrators to protect their rights by punishing those juveniles who commit or threaten violence. When schools and inner cities are Hobbesian jungles, with little rights protection, it is only natural for individuals to seek protection in the private sector by forming gangs. While law enforcement likely is active in many of these city neighborhoods, the emphasis may be too heavily focused on prosecuting those participating in the illicit drug trade, in lieu of more directly protecting public safety and individual rights. These same implications apply to prison gangs in that they exist due to the lack of formal enforcement of the rights of inmates against aggression and violent acts committed by other inmates. Unless government improves on the protection it provides to individuals who are the potential victims of crimes, others will continue to join gangs to purchase these missing protective services currently underprovided by the government sector.

We do, however, want to provide a caveat that while our data are the only time-series data available that allow us to directly examine our hypothesis regarding causality, they are aggregated to the city level. An analysis at a more detailed sub-city level complemented with individual survey data might afford a more detailed estimate of some of the factors we were unable to directly uncover, such as why some areas have higher preexisting crime rates to begin with and whether there are significant differences among sub-areas within a specific city.

**Appendix**

**Table A1.** Gangs and Violent Crime Causality Tests: Bivariate Models with Exogenous Binary "Purge Adjustment" Variable

| Homicide | | | | | |
|---|---|---|---|---|---|
| Gang | Model | Lags | $H_0$: Violence Does Not Granger-Cause Gangs (*F*-statistic) | $H_0$: Gangs Do Not Granger-Cause Violence (*F*-statistic) | Finding |
| Total gang members | $\Delta_1(\Delta_{12})$ | 4 | 3.7373** | 0.2979 | Homicide Granger-causes gangs |
| Bloods | $\Delta_{12}$ | 6 | 4.3942** | 0.8793 | Homicide Granger-causes Blood gangs |
| Crips | $\Delta_{12}$ | 7 | 1.9646 | 1.3718 | No causality |
| Hispanic | $\Delta_1(\Delta_{12})$ | 4 | 3.5195* | 0.2962 | Homicide Granger-causes Hispanic gangs |
| Aggravated Assault | | | | | |
| Gang | Model | Lags | $H_0$: Violence Does Not Granger-Cause Gangs (*F*-statistic) | $H_0$: Gangs Do Not Granger-Cause Violence (*F*-statistic) | Finding |
| Total gang members | $\Delta_1(\Delta_{12})$ | 12 | 1.5024 | 0.8954 | No causality |
| Bloods | $\Delta_1(\Delta_{12})$ | 12 | 2.8272** | 0.6931 | Assault Granger-causes Blood gangs |
| Crips | $\Delta_1(\Delta_{12})$ | 12 | 2.1251* | 1.0143 | Assault Granger-causes Crip gangs |
| Hispanic | $\Delta_1(\Delta_{12})$ | 12 | 1.3675 | 0.8900 | No causality |
| Robbery | | | | | |
| Gang | Model | Lags | $H_0$: Violence Does Not Granger-Cause Gangs (*F*-statistic) | $H_0$: Gangs Do Not Granger-Cause Violence (*F*-statistic) | Finding |
| Total gang members | $\Delta_1(\Delta_{12})$ | 12 | 1.0729 | 0.8845 | No causality |
| Bloods | $\Delta_{12}$ | 1 | 0.6998 | 0.3198 | No causality |
| Crips | $\Delta_{12}$ | 1 | 1.7498 | 0.0105 | No causality |
| Hispanic | $\Delta_1(\Delta_{12})$ | 1 | 0.0048 | 3.6179 | No causality |

Lags for the Granger causality tests were determined using the Akaike information criterion. All variables were twelfth-differenced in order to correctly deal with the seasonality present in the crime data. Additionally, some of the twelfth-differenced series had unit roots. To correct for this situation, those series were first-differenced. All resultant series are stationary. A binary variable, to control for the presence of structural breaks within the gang membership data, was added to the vector autoregressions as an exogenous variable. The structural breaks were the result of periodic purging of inactive members from the gang membership database. Generalized least squares estimation was used in situations where serial correlation was present. Asterisks indicate statistical significance at the following levels: ** = 1%, * = 5%.

**Table A2.** Gangs and Violent Crime Causality Tests: Non-Seasonally Adjusted County Unemployment Rate and Binary "Purge Adjustment" Variable

| Homicide | | | | | |
|---|---|---|---|---|---|
| Gang | Model | Lags | $H_0$: Violence Does Not Granger-Cause Gangs ($F$-statistic) | $H_0$: Gangs Do Not Granger-Cause Violence ($F$-statistic) | Finding |
| Total gang members | $\Delta_1(\Delta_{12})$ | 4 | 3.6698* | 0.2980 | Homicide Granger-causes gangs |
| Bloods | $\Delta_{12}$ | 6 | 2.2145 | 0.9385 | No causality |
| Crips | $\Delta_{12}$ | 7 | 1.9050 | 1.5045 | No causality |
| Hispanic | $\Delta_1(\Delta_{12})$ | 4 | 3.4579* | 0.2932 | Homicide Granger-causes Hispanic gangs |
| **Aggravated Assault** | | | | | |
| Gang | Model | Lags | $H_0$: Violence Does Not Granger-Cause Gangs ($F$-statistic) | $H_0$: Gangs Do Not Granger-Cause Violence ($F$-statistic) | Finding |
| Total gang members | $\Delta_1(\Delta_{12})$ | 12 | 1.4160 | 0.9786 | No causality |
| Bloods | $\Delta_1(\Delta_{12})$ | 12 | 2.6315* | 0.7775 | Assault Granger-causes Blood gangs |
| Crips | $\Delta_1(\Delta_{12})$ | 12 | 2.0297 | 1.1083 | No causality |
| Hispanic | $\Delta_1(\Delta_{12})$ | 2 | 1.1602 | 0.9000 | No causality |
| **Robbery** | | | | | |
| Gang | Model | Lags | $H_0$: Violence Does Not Granger-Cause Gangs ($F$-statistic) | $H_0$: Gangs Do Not Granger-Cause Violence ($F$-statistic) | Finding |
| Total gang members | $\Delta_1(\Delta_{12})$ | 3 | 0.2472 | 1.2562 | No causality |
| Bloods | $\Delta_1(\Delta_{12})$ | 12 | 0.8155 | 1.8281 | No causality |
| Crips | $\Delta_1(\Delta_{12})$ | 3 | 0.5594 | 1.2064 | No causality |
| Hispanic | $\Delta_1(\Delta_{12})$ | 1 | 0.0056 | 3.6451 | No causality |

Lags for the Granger causality tests were determined using the Akaike information criterion. All variables were twelfth-differenced in order to correctly deal with the seasonality present in the crime data. Additionally, some of the twelfth-differenced series had unit roots. To correct for this situation, those series were first-differenced. All resultant series are stationary. A binary variable, to control for the presence of structural breaks within the gang membership data, was added to the vector autoregressions as an exogenous variable. The structural breaks were the result of periodic purging of inactive members from the gang membership database. Generalized least squares estimation was used in situations where serial correlation was present. Asterisks indicate statistical significance at the following levels: ** = 1%, * = 5%.

**Table A3.** Gangs and Violent Crime Causality Tests: Seasonally Adjusted County Unemployment Rate and Binary "Purge Adjustment" Variable

| Homicide | | | | | |
|---|---|---|---|---|---|
| Gang | Model | Lags | $H_0$: Violence Does Not Granger-Cause Gangs ($F$-statistic) | $H_0$: Gangs Do Not Granger-Cause Violence ($F$-statistic) | Finding |
| Total gang members | $\Delta_1(\Delta_{12})$ | 4 | 3.6683* | 0.2938 | Homicide Granger-causes gangs |
| Bloods | $\Delta_{12}$ | 6 | 2.2489 | 0.9335 | No causality |
| Crips | $\Delta_{12}$ | 7 | 1.8700 | 1.5473 | No causality |
| Hispanic | $\Delta_1(\Delta_{12})$ | 4 | 3.4554* | 0.2907 | Homicide Granger-causes Hispanic gangs |
| **Aggravated Assault** | | | | | |
| Gang | Model | Lags | $H_0$: Violence Does Not Granger-Cause Gangs ($F$-statistic) | $H_0$: Gangs Do Not Granger-Cause Violence ($F$-statistic) | Finding |
| Total gang members | $\Delta_1(\Delta_{12})$ | 12 | 1.3099 | 0.9221 | No causality |
| Bloods | $\Delta_1(\Delta_{12})$ | 12 | 2.5993* | 0.7384 | Assault Granger-causes Blood gangs |
| Crips | $\Delta_1(\Delta_{12})$ | 12 | 1.8873 | 1.0536 | No causality |
| Hispanic | $\Delta_1(\Delta_{12})$ | 2 | 3.6996* | 0.8758 | Assault Granger-causes Hispanic gangs |
| **Robbery** | | | | | |
| Gang | Model | Lags | $H_0$: Violence Does Not Granger-Cause Gangs ($F$-statistic) | $H_0$: Gangs Do Not Granger-Cause Violence ($F$-statistic) | Finding |
| Total gang members | $\Delta_1(\Delta_{12})$ | 12 | 1.2338 | 0.8735 | No causality |
| Bloods | $\Delta_1(\Delta_{12})$ | 1 | 0.2272 | 2.8868 | No causality |
| Crips | $\Delta_{12}$ | 1 | 5.8606* | 0.6069 | Robbery Granger-causes Crip gangs |
| Hispanic | $\Delta_1(\Delta_{12})$ | 12 | 1.2920 | 0.9462 | No causality |

Lags for the Granger causality tests were determined using the Akaike information criterion. All variables were twelfth-differenced in order to correctly deal with the seasonality present in the crime data. Additionally, some of the twelfth-differenced series had unit roots. To correct for this situation, those series were first-differenced. All resultant series are stationary. A binary variable, to control for the presence of structural breaks within the gang membership data, was added to the vector autoregressions as an exogenous variable. The structural breaks were the result of periodic purging of inactive members from the gang membership database. Generalized least squares estimation was used in situations where serial correlation was present. Asterisks indicate statistical significance at the following levels: ** = 1%, * = 5%.

**Table A4.** Police Sub-Bureau Imputed Data Results

| Bivariate Models | | | | | |
|---|---|---|---|---|---|
| Gang | Model | Lags | $H_0$: Gang Crime Does Not Granger-Cause Gangs (*F*-statistic) | $H_0$: Gangs Do Not Granger-Cause Gang Crime (*F*-statistic) | Finding |
| Bloods | $\Delta_1(\Delta_{12})$ | 12 | 0.8776 | 1.4212 | No causality |
| Crips | $\Delta_1(\Delta_{12})$ | 1 | 0.3542 | 0.1165 | No causality |
| Hispanic | $\Delta_1(\Delta_{12})$ | 12 | 3.3340 | 1.7325 | No causality |
| Controlling for the Non-Seasonally Adjusted County Unemployment Rate | | | | | |
| Gang | Model | Lags | $H_0$: Gang Crime Does Not Granger-Cause Gangs (*F*-statistic) | $H_0$: Gangs Do Not Granger-Cause Gang Crime (*F*-statistic) | Finding |
| Bloods | $\Delta_1(\Delta_{12})$ | 12 | 0.7666 | 1.0017 | No causality |
| Crips | $\Delta_1(\Delta_{12})$ | 1 | 0.0677 | 0.2661 | No causality |
| Hispanic | $\Delta_1(\Delta_{12})$ | 12 | 2.5940 | 1.4841 | No causality |
| Controlling for the Seasonally Adjusted County Unemployment Rate | | | | | |
| Gang | Model | Lags | $H_0$: Gang Crime Does Not Granger-Cause Gangs (*F*-statistic) | $H_0$: Gangs Do Not Granger-Cause Gang Crime (*F*-statistic) | Finding |
| Bloods | $\Delta_1(\Delta_{12})$ | 12 | 0.8834 | 1.2580 | No causality |
| Crips | $\Delta_1(\Delta_{12})$ | 1 | 0.3779 | 0.0592 | No causality |
| Hispanic | $\Delta_1(\Delta_{12})$ | 12 | 2.8591 | 1.4985 | No causality |

Lags for the Granger causality tests were determined using the Akaike information criterion. All variables were twelfth-differenced in order to correctly deal with the seasonality present in the crime data. The twelfth-differenced series are all nonstationary. To correct for this situation, those series were first-differenced. Except for the Crips gang membership series, all other resultant series are stationary. The geographically imputed Crips gang membership series was persistently nonstationary at the 5% significance level; however, the series was stationary using the 10% significance level.

**Table A5.** Police Sub-Bureau Imputed Data Results (with Exogenous Binary "Purge Adjustment" Variable)

| Bivariate Models | | | | | |
|---|---|---|---|---|---|
| Gang | Model | Lags | $H_0$: Gang Crime Does Not Granger-Cause Gangs (*F*-statistic) | $H_0$: Gangs Do Not Granger-Cause Gang Crime (*F*-statistic) | Finding |
| Bloods | $\Delta_1(\Delta_{12})$ | 12 | 0.9104 | 1.5190 | No causality |
| Crips | $\Delta_1(\Delta_{12})$ | 1 | 0.3090 | 0.0019 | No causality |
| Hispanic | $\Delta_1(\Delta_{12})$ | 12 | 3.3635 | 1.1881 | No causality |
| Controlling for the Non-Seasonally Adjusted County Unemployment Rate | | | | | |
| Gang | Model | Lags | $H_0$: Gang Crime Does Not Granger-Cause Gangs (*F*-statistic) | $H_0$: Gangs Do Not Granger-Cause Gang Crime (*F*-statistic) | Finding |
| Bloods | $\Delta_1(\Delta_{12})$ | 12 | 1.0120 | 1.5360 | No causality |
| Crips | $\Delta_1(\Delta_{12})$ | 1 | 0.0363 | 1.6023 | No causality |
| Hispanic | $\Delta_1(\Delta_{12})$ | 12 | 3.0384 | 1.1603 | No causality |
| Controlling for the Seasonally Adjusted County Unemployment Rate | | | | | |
| Gang | Model | Lags | $H_0$: Gang Crime Does Not Granger-Cause Gangs (*F*-statistic) | $H_0$: Gang Crime Do Not Granger-Cause Gang Crime (*F*-statistic) | Finding |
| Bloods | $\Delta_1(\Delta_{12})$ | 12 | 0.8277 | 1.2161 | No causality |
| Crips | $\Delta_1(\Delta_{12})$ | 1 | 0.3335 | 0.0116 | No causality |
| Hispanic | $\Delta_1(\Delta_{12})$ | 12 | 2.9793 | 1.1593 | No causality |

Lags for the Granger causality tests were determined using the Akaike information criterion. All variables were twelfth-differenced in order to correctly deal with the seasonality present in the crime data. The twelfth-differenced series are all nonstationary. To correct for this situation, those series were first-differenced. Except for the Crips gang membership series, all other resultant series are stationary. The geographically imputed Crips gang membership series was persistently nonstationary at the 5% significance level; however, the series was stationary using the 10% significance level. A binary variable, to control for the presence of structural breaks within the gang membership data, was added to the vector autoregressions as an exogenous variable. The structural breaks were the result of periodic purging of inactive members from the gang membership database.

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