New Approaches to Understanding and Regulating Primary and Secondary Illegal Firearms

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Executive Summary
&
Final Technical Report

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Abstract

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The major objective of this study is to enhance understanding of the characteristics and regulation of primary and secondary illegal firearms markets. The study has two major components: 1) a national study of illegal firearm markets based on ATF firearm trace data for all firearms recovered by law enforcement between 2003 and 2006, and 2) a California focused study based ATF traced firearms recovered in California between 2003 and 2006 that were crossed referenced with California Dealer Record of Sale (DROS) data to yield information on the last-known purchaser of a firearm.

The national study was designed to:

- Develop an enhanced understanding of illegal firearms markets using ATF trace data
- Assess the potential impact of State firearm laws on firearms trafficking using ATF trace data

The California analysis was designed to:

- Enhance the tactical and strategic value of firearms trace data by tracing crime-related guns to last-known dealers/purchasers
- Improve our overall understanding of illegal secondary markets

The national study found that the stringency of state level firearms laws and regulations on time-to-crime and, in the case of California, the regular enforcement of state regulations lead to consistently longer time-to-crime for firearms recovered within their jurisdictions. These patterns persist for whether firearms were purchased within the recovery jurisdiction or in another state. With the addition, of other potential indicators of time-to-crime into the analysis, the effect of firearm laws is mediated in a manner that conforms to the expectations of how firearms regulations can operate to control the illegal distribution guns. Specifically, when dealer related variables are entered into the overall model of time-to-crime the effects of states with more stringent laws and regulations are reduced more than states without such laws, as would be expected given that state firearms laws and regulations should work through their regulation on dealers. In addition, a number of other potential determinants of time-to-crime have effects on time-to-crime that indicate they are potentially useful indicators of illegal firearms trafficking.

The California analysis compared illegal firearm market characteristics using information from ATF trace data (based primarily on first-time, retail-sourced information) with illegal firearms market characteristics based on ATF trace data updated with California DROS information. This comparison revealed that including information on the last known purchaser of

a firearm significantly reduced the median time-to-crime of California-sourced crime guns relative to time-to-crime calculations based on standard ATF trace data. This finding indicates that guns sometimes move very rapidly from subsequent market transactions to use in crime. These finding suggest that enhanced firearm trace data can be very useful in guiding law enforcement actions against gun traffickers and criminals directly acquiring firearms through secondary market sources.

Executive Summary

This study is designed to enhance our understanding of primary and secondary illegal firearms markets. The project develops methods to better assess, identify, and control various types of illegal channels through which firearms are acquired for use by criminal offenders, juveniles and other restricted persons. The project is also intended to provide a more complete picture of secondary illegal firearms markets than has been possible in the past, as the focus of illegal firearms research has been on primary retail markets in part due to the limits imposed by standard Bureau of Alcohol, Tobacco, Firearms and Explosives (ATF) tracing methods.

The study has two major components: 1) a national study of illegal firearm markets using ATF firearm trace data for all firearms recovered by law enforcement between 2003 and 2006, and 2) a California focused study on ATF traced firearms recovered in California between 2003 and 2006 that were crossed referenced with California DROS data to yield information on the last-known purchaser of a firearm. The national study based on ATF trace data analysis is designed to:

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Methodologically, the project extends our ability to trace firearms beyond a first-time retail purchase of guns recovered by law enforcement agencies to potential secondary market sales and purchases. This is achieved by the cross-referencing of firearms trace requests by law enforcement agencies in California with firearms records of sale and purchase data maintained

by California. For all legally recorded firearm purchases and sales in California, the cross-referencing process provides data on the last-known firearms dealer and purchaser associated with a gun recovered by a law enforcement agency, and allows us to extend the standard tracing process beyond first-time retail sale.

Finally, a key indicator of illegal firearm markets is employed throughout this analysis is time-to-crime.[1] ATF notes, "[i]nvestigating crime guns with short time-to-crime allows law enforcement to seek out sources of crime guns and disrupt the flow of illegal firearms trafficking" (ATF 2002, p. 30). This is not surprising, because the investigative value of information on the first retail sale of a gun depreciates rapidly. Thus, for investigative purposes, the newer guns are better. Records are likely to be more complete and more available; individuals listed on paperwork are easier to find; guns are less likely to have been resold, given away, or stolen; and the chain of transfers to illicit consumers is likely to be shorter (Kennedy et al. 1996, p. 174).

Research Findings

The national study based on ATF trace data analysis found that the stringency of state level firearms laws and regulations on time-to-crime and, in the case of California, the regular enforcement of state regulations lead to consistently longer time-to-crime for firearms recovered within their jurisdictions. These patterns persist for whether firearms were purchased within the recovery jurisdiction or in another state. These patterns do not arise because states with more stringent firearms laws are more rigorous in tracing firearms. To the contrary states with more stringent legal context actually have slightly higher proportions of older recovered firearms that

[1]Time-to-crime measures the time from when a crime-related firearm was purchased from a dealer and when it was recovered by a law enforcement agency, and distance from recovery to dealer measures the distance from the firearms dealer that sold a crime-firearm to the location where the firearm was recovered by a law enforcement agency.

could not be traced to a purchaser, and if such firearms were traced to a purchaser, this would produce slightly longer time-to-crimes for firearms recovered within their boundaries.

With the addition, of other potential indicators of time-to-crime into the analysis, the effect of legal context is mediated in a manner that conforms to the expectations of how firearms regulations can operate to control the illegal distribution guns. Specifically, when dealer related variables are entered into the overall model of time-to-crime the effects of states with more stringent laws and regulations are reduced more than states without such laws, as would be expected given that state firearms laws and regulations should work through their regulation on dealers. In addition, a number of other potential determinants of time-to-crime have effects on time-to-crime that indicate they are potential indicators of illegal firearms trafficking.

The results of the analysis hold when the effect of legal context is also examined in combination with place of purchase. In this case, the stringency of state firearms laws and regulations consistently holds for recovered firearms purchased in recovery states and those purchased outside of recovery state boundaries. Once again the effect of legal context is mediated in a manner that conforms to the expectations of how firearms regulations can operate to control the illegal distribution guns. Specifically, when dealer related variables are entered into the overall model of time-to-crime the effects of states with more stringent laws and regulations are reduced more than states without such laws for both in-state and out-of-state purchases. Also, when purchaser-possessor relationship variables enter the model the effects of out-of-state purchase legal context variables are mediated in an expected manner.

The nationwide analysis was also conducted for only firearms purchased after 1995 to take into account a possible interaction between changes in firearms purchasing patterns and the stringency of legal context. This could arise if more stringent contexts began to restrict the

purchase of firearms within their boundaries simply by applying their laws and regulations more rigorously. If this is the case, it is most likely to have occurred during the mid-1990s with the introduction of the Brady Handgun Violence Prevention Act of 1993 (Brady Law), the Violent Crime Control and Law Enforcement Act of 1994, and the associated significant decrease in FFL dealers during that period. If this occurred then we might observe a decrease in time-to-crime in states with more stringent laws because they decreased the pool of newer guns (i.e., firearms purchased after 1994) potentially transferrable to illegal channels relative to their more stringent counterparts. However, the analysis conducted with the truncated nationwide sample of firearms purchased only after 1994, show that the legal context variables continued to have positive effect on time-to-crime.

Finally, the effect of legal context does not appear to arise because of geographic mobility among states. Specifically, states with more stringent firearms laws and regulations appear less likely to accumulate an older pool of firearms through immigration because their rate of immigration from other states is about half that of states with no firearms purchase and registration laws.

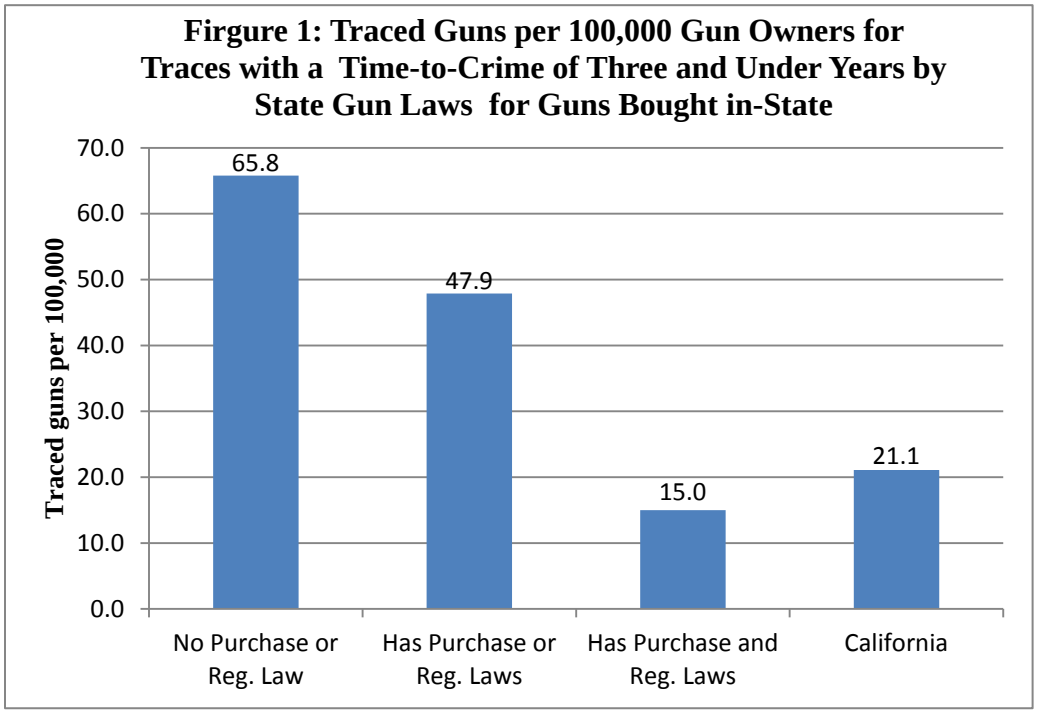
The research carried out in this report suggests that state-level laws backed up by a strong commitment to regulate firearms dealers can reduce the ease through which criminals illegally divert firearms from legal commerce. The stringency of state-level firearms laws and regulations on primary and secondary firearms sales and, in the case of California, the regular enforcement of state regulations leads to consistently longer time-to-crime for firearms from gun dealers located within their jurisdictions. Our analyses also suggested that crime guns originating from

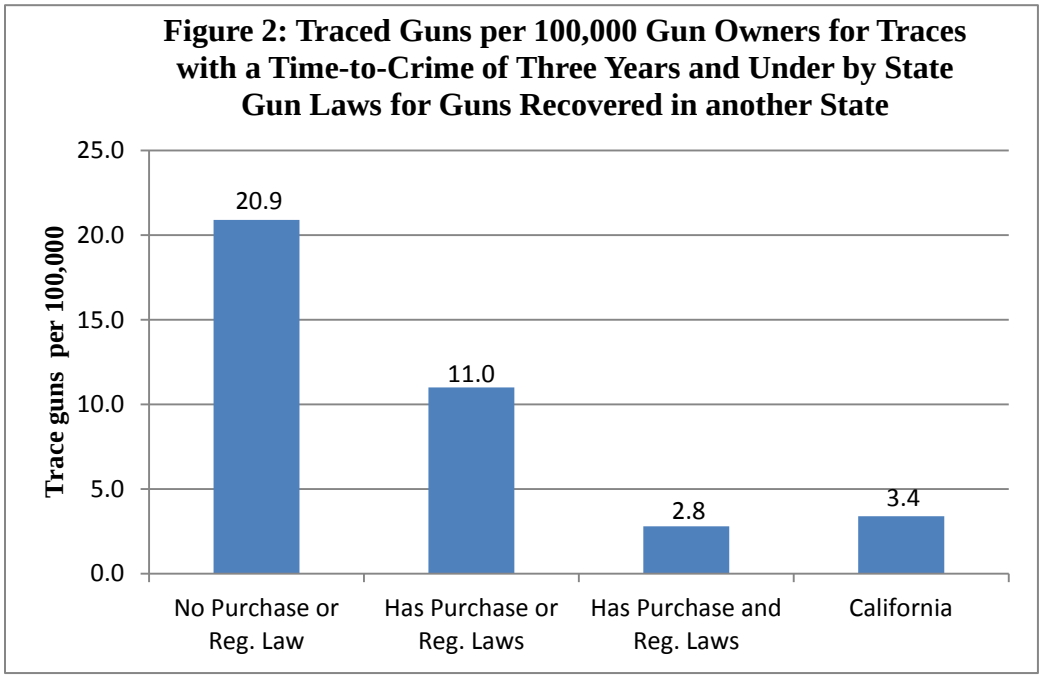
states with both purchase and registration laws were associated[2] with larger reductions in time-to-crime when compared to crime guns originating from states that had one of these types of laws but not both. Furthermore, the analyses suggests that California enforcement of state laws and regulations through routine dealer inspections and the ongoing analysis of automated records on firearm transactions for suspicious sales and purchase patterns further reduced time-to-crime of recovered crime guns originating from in-state dealers.

To assess the impact of state laws and regulations on volume of traced crime firearms diverted from legal commerce the study examine the rate of gun traces per 100,000 gun owners in a state by the stringency of state firearms law and the place of sale (i.e., guns originally sold in the recovery state versus guns sold outside of the recovery state)and time-to-crime divided into four different levels (i.e., one to three years, four to six years, seven to ten years and eleven or more years). As shown in Figures 1 and 2, for short time-to-crime guns, the rate of gun traces per 100,000 gun owners varies significantly by the stringency of state firearms laws. For firearms purchased and recovered in the same state, and for traces with a time-to-crime of one to three years, the rate of gun traces 100,000 gun owners is: 65.8 for states with *no* purchase or registration laws; 47.9 for states with purchase *or* registration laws; 15.0 for states with purchase *and* registration laws, and 21.1 for California. Likewise, for firearms originally purchased outside of the recovery and for traces with a time-to-crime of one to three years, the rate of gun traces per 100,000 gun owners is: 20.9 for states with *no* purchase or registration laws, 11.0 for states with purchase *or* registration laws, 2.8 for states with purchase *and* registration laws, and 3.4 for California. These same patterns hold for traced guns with a relatively shorter time-to-crime of four to six years for both in-state and out-of state traced firearms. The pattern of gun

[2] It should be noted that an empirically observed association is a necessary but not sufficient basis for causality (Tufte, 2006). As an additional test of causality, the study incorporated attributes into the analysis that were intended to mediate the effects of state laws and these demonstrated expected effects.

trace rates for out-of-state short time-to-crime traces is important because it is a potential indicator of the active diversion of firearms from legal commerce to other states.





These same patterns also hold, but to a lesser degree for traced guns with longer time-to-crimes (seven to ten years, and eleven plus years). However, there is one major exception to

these patterns. For traced firearms with a time-to-crime of eleven or more years California shows a higher rate of gun traces per 100,000 gun owners than any other firearms legal context. The likely reason for this anomaly is that California appears to have tightened the regulation of firearms approximately a decade before the time frame for traced firearms used in this study (i.e., firearms recovered by law enforcement between 2003 and 2006) leading to a pattern of relatively lower rates of traces guns for shorter time-to-crimes traces.

Our research also compared illegal firearm market characteristics using information from ATF trace data (based primarily on first-time, retail-sourced information) relative to illegal firearms market characteristics using enhanced trace data that was updated with information from matched California DROS data. This latter data source provides information on the last known purchaser of a firearm recovered by law enforcement. Our comparison revealed that including information on the last known purchaser of a firearm significantly reduced the median time-to-crime of California-sourced crime guns relative to time-to-crime calculations based on standard ATF trace data. This finding reveals that guns sometimes move very rapidly from subsequent market transactions to use in crime. These enhanced firearm trace data can be very useful in guiding law enforcement actions against gun traffickers and criminals directly acquiring firearms through secondary market sources.

Discussion and Policy Implications

Criminal misuse of guns kills or injures tens of thousands of Americans every year. The threat of such violence imposes a heavy burden on our standard of living, not only on groups that have the highest victimization rates, but on the entire community. Using a contingency valuation approach, Cook and Ludwig have estimated the societal cost of gun violence at $100 billion annually (Cook and Ludwig, 2000).Guns are frequently used in crime in the United States partly

because they are so easy to acquire. This ease of access, in turn, is attributable in part to the fact that there are two systems of retail gun commerce in this country, one involving licensed gun retailers and the other based on private-party gun sellers, and only the first of these systems is regulated. Some 85% of all guns used in crimes and then recovered by law-enforcement agencies have been sold at least once by private parties (Wintemute, Braga, and Kennedy, 2010).

The secondary gun market, sometimes called the private-party or informal gun market, has long been recognized as a leading source of guns used in crimes (Wintemute, Braga, and Kennedy, 2010). Although secondary market sales are primarily a convenience for the law-abiding(no paperwork, no background check, no waiting period), such sales are also the principal option when the prospective purchaser is a felon, domestic violence offender, or other person prohibited by law from owning a gun. Secondary market sales facilitate the diversion of guns from legal commerce into criminals' hands: although it is always illegal for prohibited persons to buy a gun, it is only illegal to sell a gun to such people if the seller knows or has reasonable cause to believe that he or she is doing so. Unscrupulous private sellers may simply avoid asking questions that would lead to such revelations (Wintemute, 2009).

As regulations on primary market sources increase, secondary market sources will become even more attractive to criminals seeking guns (Cook et al., 1995).For instance, implemented in February 1994, the Brady Handgun Violence Prevention Act required licensed dealers to conduct a background check on all handgun buyers and mandated a one-week waiting period before transferring the gun to the purchaser. In November 1998, waiting periods for background checks were eliminated for a National Instant Check System (NICS). Over a five-year period (1994-1999), 13 million Brady criminal background checks were conducted of prospective handgun purchasers (BJS, 1999). Nearly 320,000 requests were denied, of which

220,000 were due to prior felony convictions or pending indictments (BJS, 1999). Nevertheless, it seems easy enough for criminals to circumvent the provisions of the Brady Act by acquiring guns through the unregulated secondary market (Jacobs and Potter, 1995). An evaluation of the Brady Act found no discernible impact on homicide trends and suggested that criminals acquiring firearms from the unregulated secondary market may have undermined the effectiveness of the Brady Act in preventing homicide (Ludwig and Cook, 2000).

A comprehensive gun violence reduction portfolio requires a concerted effort directed in part at separating guns and violence. In our judgment, that effort should include a variety of efforts to reduce the availability of guns to youths and dangerous adults from primary and secondary market sources. However, the will to pursue this approach may not be available at the federal level. While some modest innovations were put in place during the Clinton Administration (Braga et al., 2002), there appears to be little appetite for doing more now. For instance, concerns about private-party gun sales and gun shows' importance as a source of guns used in crimes have led to repeated calls for "closing the 'gun show loophole'" — by which advocates usually mean requiring that private-party sales at gun shows be routed through a licensed retailer who will do a background check and keep a record of the purchase. President Barack Obama endorsed such a measure during his 2008 presidential campaign, as did President George W. Bush in 2000 and 2004. "Loophole" legislation has been introduced in both the Senate and the House of Representatives, but no hearings have been scheduled.

In fact, there is no "gun show loophole" as such (Braga and Kennedy, 2000; Wintemute et al., 2010). Federal law is silent on gun shows and permits private-party gun sales to occur anywhere. As a result, such a limited measure might well have no detectable effect on the rates of firearm-related violent crime.

The existing federal legal framework on firearms commerce actually impedes effective action. In particular, prosecuting gun traffickers is remarkably difficult (Braga, 2001). Since the telltale paperwork is not available for unregulated transactions in the secondary market, unlicensed dealers illegally engaged in the business of selling firearms can avoid prosecution by claiming that they were selling only a handful of firearms from their private collection. Corrupt FFLs who illegally divert firearms face very small penalties. The McClure-Volkmer Firearms Owners Protection Act reduced most of these record-keeping violations from felonies to misdemeanors in 1986. Straw purchasers are also difficult to prosecute, given various legal loopholes. As a result, US attorneys typically prosecute gun traffickers on charges unrelated to trafficking such as "felon in possession" or drug trafficking (ATF, 2000a).

The enforcement of laws against gun trafficking is also hindered by the rather cumbersome procedure ATF is forced to use to trace firearms (Braga, 2001). The limits of current record-keeping procedures thwart routine firearms tracing of secondhand firearms sold by licensed dealers and prevent ATF from identifying straw purchasers and scofflaw dealers who divert secondhand firearms. Trace data also provide ATF investigators with little support in examining the robust trade in secondhand firearms on the secondary market. Modest statutory changes in the system for tracking firearm purchases and sales could make a big difference in developing an effective supply-side strategy (Travis and Smarrito, 1992). For example, a requirement for licensed dealers to report serial numbers for all sales to ATF would greatly facilitate the tracing process without creating a central registry of gun owners.[3] A requirement

[3] Under such a program the serial number, manufacturer, type firearms and model of purchased firearms would be submitted to the ATF's National Tracing Center (NTC) by all FFL dealers. The NTC would store information on the serial number, date of purchase, type of gun and dealer that sold the weapon. No information on the purchaser would be sent to the NTC. Under this arrangement, the NTC could only request purchaser information on the firearm from the dealer that last sold the weapon if that weapon was recovered by a law enforcement agency. As a result, there would be no centralized system that contained the names or addresses of firearm owners and such information could only be requested from a dealer if a weapon was recovered by a law enforcement agency.

that all secondary market transaction pass through federally licensed dealers—with the same screening and paperwork provisions as if the gun were being sold by the dealer—would be useful in a variety of ways, including in detecting gun traffickers. However, both proposals would likely be vigorously challenged as infringing on the rights of lawful gun owners and as violating FOPA, which prohibits ATF from establishing any national system of gun registration (Braga, 2001).

More promising, politically speaking, is the possibility of action at the state and local level. Fortunately, there is much that can be done at those levels. States could assume some of the responsibility for tracing crime guns and investigating dealers. As described earlier, local police departments can quite possibly be effective at disrupting local gun markets, but only if they concern themselves with gathering the necessary intelligence and acting on it. Most police departments have been focused on getting guns off the street instead of focusing on where the guns are coming from (Moore, 1980; Moore, 1983). In recent years, however, local police practices have changed in many major cities due in part to efforts by ATF and the U.S. Department of Justice to form partnerships to reduce the availability of guns to youth and criminals (see, e.g. ATF 2000a; ATF 2000b).

The research carried out in this report suggests that state-level laws backed up by a strong commitment to regulate firearms dealers can reduce the ease through which criminals illegally divert firearms from legal commerce. The stringency of state-level firearms laws and regulations on primary and secondary firearms sales and, in the case of California, the regular enforcement of state regulations leads to consistently longer time-to-crime for firearms from gun dealers located within their jurisdictions. Our analyses also suggested that crime guns originating from states with both purchase and registration laws were associated with larger reductions in time-to-

crime when compared to crime guns originating from states that had one of these types of laws but not both. Furthermore, the analyses suggests that California enforcement of state laws and regulations through routine dealer inspections and the ongoing analysis of automated records on firearm transactions for suspicious sales and purchase patterns further reduced time-to-crime of recovered crime guns originating from in-state dealers.[4]

The report's findings indicate that States with lax gun laws and high rates of gun violence could impact the flow of recently purchased firearms to criminals by enacting more stringent purchase and sales laws, tracking all primary and secondary firearms transactions, and more closely regulating licensed firearms dealers. Increasing the number of states with more stringent gun controls would also have the desirable effect of reducing the export of newer guns to criminals in tighter gun control states. Of course, criminals in states with newly adopted gun controls can find ways to substitute other sources of guns such as theft from residences or making connections to gun traffickers operating in nearby lax-gun-law states. These types of gun market actions are not intended to eliminate all potential sources of guns. Rather, this approach would seek to diminish the ease by which criminals acquire guns through illegal diversions from what were once unregulated local secondary market sources, which would hopefully translate into reduced violent gun offending.

Our research also found that including information on the last known purchaser of a firearm significantly reduced the median time-to-crime of California-sourced crime guns relative to time-to-crime calculations based on standard ATF trace data. This finding reveals that guns sometimes move very rapidly from subsequent market transactions to use in crime. These

[4] These results are similar to those observed in other industries, such a manufacturing, where researchers have found that productivity is typically higher when complementary processes and practices are adopted together as a system rather than when they are adopted separately (Brynojolfsson and Saunders, 2010 review this work).

enhanced firearm trace data can be very useful in guiding law enforcement actions against gun traffickers and criminals directly acquiring firearms through secondary market sources.[5]

[5] The utility of law enforcement data that can aid investigators and guide law enforcement was highlighted in the Project Safe Neighborhoods - A National Program to Reduce Gun Crime: Final Project Report (McGarrell et. al., 2009). McGarrel et. al., found that a key to success of PSN programs was the ability to focus LE resources on specific high gun crime places and contexts. Data that can provide crime specific information can very important in helping LE in this process.

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New Approaches to Identifying Secondary Market Sources of Illegal Firearms

I. Project purpose, goals and objectives

This project is designed to enhance our understanding of primary and secondary illegal firearms markets. The project develops methods to better assess, identify, and control various types of illegal channels through which firearms are acquired for use by criminal offenders, juveniles and other restricted persons. The project is also intended to provide a more complete picture of secondary illegal firearms markets than has been possible in the past, as the focus of illegal firearms research has been on primary retail markets in part due to the limits imposed by standard Bureau of Alcohol, Tobacco, Firearms and Explosives (ATF) tracing methods.

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- Identify indicators of illegal firearms markets based in ATF trace data
- Develop an enhanced understanding of illegal firearms markets using ATF trace data
- Assess the potential impact of State firearm laws on firearms trafficking

The California focused analysis is designed to :

- Enhance the strategic value of firearms trace data by tracing crime-related guns to last-known dealers/purchasers and improve our capacity to measure characteristics of first-time and of illegal firearm markets.
- Enhance the tactical value of firearms trace data by tracing crime-related guns to last-known dealers/purchasers and improve our ability to develop more accurate indicators of trafficking and generate more accurate investigative leads.

- Improve our overall understanding of illegal secondary markets

Methodologically, the project will extend our ability to trace firearms beyond a first-time retail purchase of guns recovered by law enforcement agencies to potential secondary market sales and purchases. This is achieved by the cross-referencing of firearms trace requests by law enforcement agencies in California with firearms records of sale and purchase data maintained by California. For all legally recorded firearm purchases and sales in California, the cross-referencing process provides data on the last-known firearms dealer and purchaser associated with a gun recovered by a law enforcement agency. For those instances where a crime-related firearm has been resold and/or transferred one or more times after its initial retail sale (either through retail outlets or by private citizens), this approach allows us to extend the standard tracing process beyond first-time retail sale. This approach also enables us to trace a recovered firearm to the point of the last recorded secondhand gun sale/purchase by a retail dealer or a private citizen (if such a transaction has taken place and been recorded). These cross-referencing methods also enable us to identify first-time retail dealers and/or purchasers that may have been missed in the standard ATF tracing process because a firearm manufacturer's, wholesaler's and/or retail dealer's records are inaccurate or incomplete and thereby prevent an ATF firearm trace from identifying the first-time retail sale and purchase transaction point.

Finally, a key indicator of illegal firearm markets is employed throughout this analysis is time-to-crime.[1] ATF notes, "[i]nvestigating crime guns with short time-to-crime allows law enforcement to seek out sources of crime guns and disrupt the flow of illegal firearms trafficking" (ATF 2002, p. 30). This is not surprising, because the investigative value of

[1]Time-to-crime measures the time from when a crime-related firearm was purchased from a dealer and when it was recovered by a law enforcement agency, and distance from recovery to dealer measures the distance from the firearms dealer that sold a crime-firearm to the location where the firearm was recovered by a law enforcement agency.

information on the first retail sale of a gun depreciates rapidly. The dealers for guns first sold, for example, 5 or more years ago may no longer be in business, and the purchasers, even if they were at one time engaged in straw purchases, have quite likely moved on to other things. Newer guns, in contrast, are likely to have passed through fewer hands and this makes it much easier for law enforcement to investigate its diversion and diverters and to mount prosecutions. As Kennedy and his colleagues (1996) observe, this is one important way illegal gun markets differ from illegal drug markets: there is paperwork, sometimes at a considerable temporal remove, on guns. ATF investigators can figure out where a gun was manufactured or imported, where it was first purchased at retail, and who bought it. Thus, for investigative purposes, the newer guns are better. Records are likely to be more complete and more available; individuals listed on paperwork are easier to find; guns are less likely to have been resold, given away, or stolen; and the chain of transfers to illicit consumers is likely to be shorter (Kennedy et al. 1996, p. 174). For these reasons, as ATF's experience indicates, we would expect that law enforcement would find data on the first retail sale of older guns to be of much use in identifying currently active scofflaw dealers or traffickers.

Franklin Zimring (1976) first documented the disproportionate representation of new guns among those recovered by the police. More recently, Kennedy, Piehl, and Braga (1996) analyzed comprehensive trace data for firearms recovered from Boston youth ages 21 and under between 1991 and 1995. They documented that 26% of traced firearms were recovered in crime within two years of their first retail sale and none of these new guns were recovered in the possession of the first retail buyer. Cook and Braga (2001) analyzed comprehensive trace data on handguns recovered in 32 U.S. cities participating in ATF's YCGII program in 1999. They found that 32% of traced handguns were recovered within three years of their first retail purchase

and only 18% of these new guns were recovered in the possession of the first retail buyer. A California study of crime guns recovered from adolescents and young adults in 1999 emphasized the link between time to crime and policies regulating the purchase of firearms (Wintemute et al., 2004). A time to crime of less than 3 years was observed for 17.3% of guns recovered from persons younger than 18 years, who cannot purchase guns themselves, but 34.6% of guns recovered from persons ages 21-24.

Some critics, such as Kleck and Wang (2009), suggest that a short average time-to-crime among traced crime guns in a given area may serve more as an indirect indicator of property crime, especially burglary, in that area rather than of widespread firearms trafficking. While theft is an important source of crime guns, there is also considerable evidence that illegal diversions from legal firearms commerce supply a notable share of guns to criminals (Braga et al., 2002; Cook and Braga, 2001). In a recent analysis, Braga and his colleagues (2012) find that the age distribution of recovered crime guns is significantly different from both the age distribution of guns held by private owners and the age distribution of guns manufactured and imported in the United States. The disproportionate share of new guns recovered in crime suggests that a short time-to-crime is a valid indicator, though not conclusive evidence, of a close-to-retail illegal diversion from retail outlets that supplies criminals with guns.

II. Review of relevant literature[2]

A. Legal and Illegal Firearms Markets

Legal firearms commerce is comprised of transactions made in the *primary* firearms market and in the largely unregulated *secondary* firearms market. Transactions of new and secondhand firearms conducted through Federal Firearms Licensees (FFLs) form the primary market for firearms (Cook et al., 1995). Many retail gun stores sell both new and secondhand firearms. Once a gun is in private hands, it can be transferred in a wide variety of ways, including sales through classified ads in newspapers and gun magazines and at gun shows (which include both licensed and unlicensed dealers). Transfers of secondhand firearms by unlicensed individuals form the secondary market, where no records are kept and criminal background checks are not required (Cook et al., 1995). About 30 to 40% of all gun transactions occur on the secondary market (Cook and Ludwig, 1996). Primary and secondary firearms markets are closely linked because many buyers move from one to the other depending on relative prices and other terms of the transaction (Cook and Leitzel, 1996). As regulations tighten in the primary market, Cook and his colleagues (1995) suggested the unregulated secondary market becomes increasingly attractive.

Survey research suggests that theft from private citizens is an important source of firearms for criminals (Bureau of Justice Statistics, 1993; Wright and Rossi, 1994; Sheley and Wright, 1995). However, analyses of ATF firearms trace data and ATF firearms trafficking investigation data reveal that illegal diversions of firearms from retail businesses are also important sources of crime guns (see e.g., Braga and Kennedy, 2001; Kennedy et al., 1996; Moore, 1981; Pierce et al., 1995;Wachtel, 1998). Through crime gun tracing, trace analysis,

[2]This literature review draws upon material previously published in Braga et al. (2002), Pierce et al. (2004), and Braga and Pierce (2005).

investigative work, and the help of outside researchers, ATF has developed a more refined picture of the complex illegal firearms market. The components of the market include trafficking in *new* firearms, interstate and intrastate, by licensed firearms dealers (FFLs including pawnbrokers), large-scale straw purchasers or straw purchasing rings, and small-scale straw purchasers (i.e., legally-entitled purchasers buying one or a few guns for prohibited persons); trafficking in *secondhand* firearms, interstate and intrastate, by licensed firearms dealers (including pawnbrokers), large-scale straw purchasers or straw purchasing rings, small-scale straw purchasers (i.e., buying one or a few guns), unregulated private sellers (operating at gun shows and flea markets, through want ads, the Internet, and personal associations), and bartering and trading within criminal networks; and trafficking in new and used *stolen* firearms involving theft from licensed dealers and pawnbrokers, organized fencing of stolen guns, common carrier (such as United Parcel Service) theft, manufacturer theft, and household theft (ATF, 2000a; ATF, 2000b).

Survey estimates based on inmate surveys suggest that, as an upper bound, almost half of all crime guns may be diverted to offenders through theft (see, e.g. Wright and Rossi, 1994). Conversely, this suggests that at least half of crime guns make their way to offenders through one or a series of non-theft primary and/or secondary market transactions. Judging the importance of illegal diversions from the primary and secondary markets relative to one another is a difficult task with available data. Analyses of firearms trace data indicate that new firearms are more likely to be used as crime guns than are older firearms (see, e.g. Cook and Braga, 2001; Kennedy et al. 1996). A third of Wright and Rossi's (1994) male prison inmates reported that their most recently acquired handgun was new rather than used, and 21% purchased their most recently acquired handgun from a retail outlet. Firearm acquisitions from licensed dealers could

have occurred in a variety of ways, including buys from corrupt FFLs, theft from FFLs (3% of Wright and Rossi's (1994) respondents stole their most recent gun from a gun store), buys from FFLs through fraudulent means, including straw purchases, the use of fake identification, or the provision of false information about buyer eligibility, or legal buys from FFLs (some respondents may have had clean records at the time of their most recent purchase). Thus, existing research indicates that illegal diversions from both the primary and secondary market are important sources of guns for prohibited users.

B. The Prospects of Supply-side Enforcement

In their review of the various sources of data on the illegal supply of firearms, Braga and his colleagues (2002, p. 337) suggested that, in the parlance of environmental regulation, illegal gun markets consist of both "point sources" (ongoing diversions through scofflaw dealers and trafficking rings) and "diffuse sources" (acquisitions through theft and informal voluntary sales). A reasonable conclusion is that, as in the case of pollution, both point sources and diffuse sources are important channels through which criminal offenders obtain firearms (see also Cook and Braga, 2001). Braga and his colleagues (2002) also speculated that the mix of point and diffuse sources differs across jurisdictions depending on the density of gun ownership and the strictness of gun controls within the jurisdiction. For example, systematic gun trafficking from retail point sources may be more difficult in jurisdictions with stricter controls on the purchase and sale of firearms, such as Boston and New York, than in jurisdictions with looser control, such as Atlanta and Dallas. Given that there is a mix of concentrated and diffuse sources, the potential effectiveness of supply-side enforcement may also vary across jurisdictions.

Effective supply-side efforts could help increase the price of guns sold to prohibited persons and increase the "effective price" of acquiring guns, which refers to the time and hassle

required to make a "connection" to buy guns (see Moore, 1973; Moore, 1976). The benefit of supply-side enforcement would be an increased incentive for criminals and youth to economize on gun possession and use. As guns become scarcer and more valuable, it takes a longer time to buy a gun but will also sell more quickly. Thus, prohibited persons would possess guns for smaller amounts of time over the course of their criminal careers (Kennedy, 1994).

Unfortunately, there is limited direct evidence that successful regulatory and enforcement actions against point and diffuse sources actually reduce availability of guns, and hence gun use, in crime. As the National Academy of Sciences Committee to Improve Research Information and Data on Firearms concluded, "it is simply not known whether it is actually possible to shut down illegal pipelines of guns to criminals nor the costs of doing so" (Wellford, Pepper, and Petrie, 2005: 8). More research on the structure of illegal gun markets and experimentation with market disruption tactics is sorely needed. The limited evaluation evidence on the use of firearms trace data to guide illegal gun market interventions is covered below in section E.

C. The Firearms Tracing Process

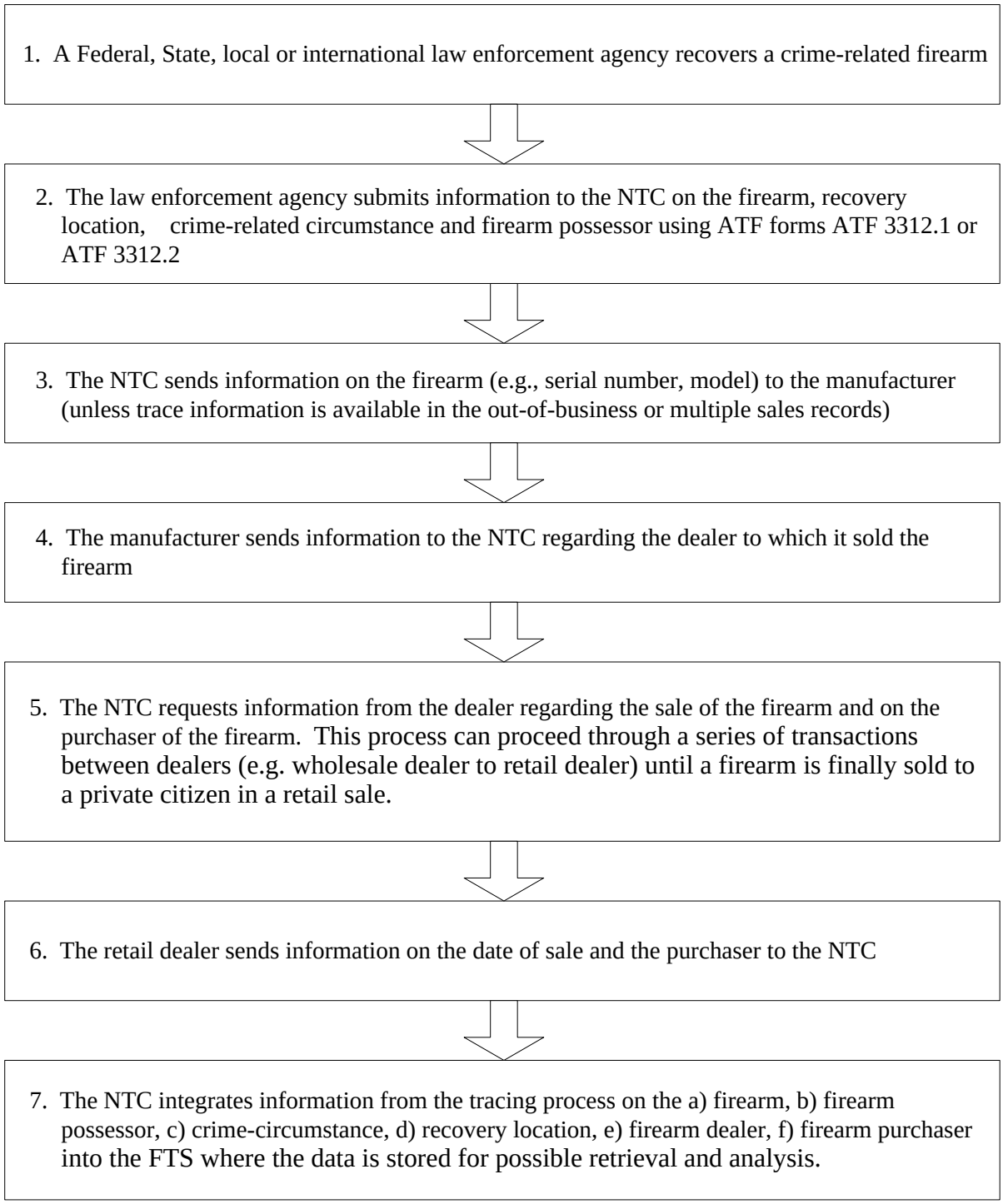
The primary legislative mandate that applies to the ATF tracing of crime firearms is the Gun Control Act of 1968 (GCA), which established a set of requirements that allows any given firearm to be traced from its manufacture or import to its first sale by a retail dealer (Zimring, 1975). The GCA mandates that each new firearm, whether manufactured in the United States or abroad, must be marked with a unique serial number. In addition, the GCA requires all federally licensed firearms dealers (FFLs), including manufacturers, importers, distributors, and retail dealers, to maintain records of all firearms transactions, including whole/retail sales and shipments received (see Figure 1). In order to respond to requests for trace information, the GCA also requires FFLs to provide information from transaction records to ATF. In essence, the GCA

established a set of record-keeping procedures that allow ATF to trace firearms to first-time retail purchases (Braga et al., 2002; Pierce and Griffith, 2005). In 1994, Congress further required firearms manufacturers and FFLs to respond to firearms trace requests within 24 hours (27 C.F.R. Part 178, Sec. 178.25a).

Congressional mandates, however, also regulate and limit how ATF manages firearms trace information. Specifically, Congress passed restrictions prohibiting ATF from consolidating or centralizing records of receipt and disposition of firearms maintained by FFLs. For example, ATF's fiscal year 1979 appropriation provided that "no funds appropriated herein shall be available for administrative expenses in connection with consolidating or centralizing …the records of receipt and disposition of firearms maintained by Federal firearms licensees" (*Federal Register,* volume 43, number 55, of March 21, 1978). These mandates make it difficult to trace firearms beyond the first-time retail purchaser of a firearm because the restriction against the centralized storage of information on firearms (e.g., serial numbers of firearms sold, FFLs making the sales) means that ATF typically has no record of the sale of secondhand guns. Although it is still possible to trace a crime gun past the point of a first-time retail sale through a process of ATF agent interviews of subsequent gun possessors (i.e., "investigative traces"), this is a time-consuming process that cannot be applied to most firearms trace requests.

Figure 1

Flowchart of ATF's Basic Tracing Process



In addition to restrictions on the management of firearms trace data, Congress has also recently placed limits on the type of information that can be provided to the public. Specifically, the Consolidated Appropriations Act of 2004 prohibits ATF from public disclosure of information required to be kept as a record by an FFL(as mandated by law) or FFL information reported to ATF.

D. The Use of Firearms Trace Data to Examine Illegal Gun Markets

Understandably, research studies based on analyses of firearms trace data have been greeted with a healthy dose of skepticism. Trace data analyses are subject to a number of widely recognized problems (see Blackman 1999; Congressional Research Service 1992;Kleck, 1999). All trace analyses are based on firearms recovered by police and other law enforcement agencies and such analyses may not be representative of firearms possessed and used by criminals. Trace datasets are also influenced by which guns are submitted for tracing, a decision made by law enforcement agencies. Beyond that, not all firearms can be traced. As such, the trace-based information that results is biased to an unknown degree by these factors.

Taken by themselves, trace data are "numerator only" and do not account for firearm sales volume. This leaves the possibility that retailers (point sources) associated with many gun traces attain that status simply by selling large numbers of guns. But where it has been possible to account for firearm sales volume, it has been shown that some retailers are associated disproportionately, not just frequently, with sales of traced guns (Wintemute et al, 2005; Wintemute, 2009; Wright et al, 2010).

More centrally, trace analysis cannot show directly whether a firearm has been trafficked. Trace studies typically contain information about the first retail sale of a firearm and about the circumstances associated with its recovery by law enforcement. These studies cannot directly

show what happened in between first sale and recovery - whether a firearm was legitimately purchased and subsequently stolen, sold improperly by a licensed dealer, or any other of a myriad of possibilities. As such, trace analysis cannot directly show that trafficking is occurring.

Importantly, the quality of firearms trace data has improved significantly over the past decade. From the beginning in 1993, the Clinton Administration was concerned about the apparent ease with which criminals and juveniles obtained guns. The ATF was charged with initiating a concerted effort to increase the amount of crime gun tracing, improve the quality of firearms trace data, increase the regulation of gun dealers, educate law enforcement on the benefits of tracing, and increase investigative resources devoted to gun traffickers (Cook and Braga, 2001). Comprehensive tracing of all firearms recovered by police is a key component of ATF's supply-side strategy. In 1996, ATF initiated the Youth Crime Gun Interdiction Initiative (YCGII) with commitments from 17 cities to trace all recovered crime guns (ATF 1997). This program expanded to 38 cities in 1999 (ATF 2000c). Other jurisdictions have also expanded their use of gun tracing. Six states, to our knowledge, have adopted comprehensive tracing as a matter of state policy, either by law (California, Connecticut, North Carolina, and Illinois), by executive order (Maryland), or by law enforcement initiative (New Jersey) (ATF 2000c).

Comprehensive tracing of all firearm recoveries reduces some of the bias in trace data introduced by police decision making. Jurisdictions that submit all confiscated guns for tracing can be confident that the resulting database of trace requests is representative of a well-defined 'population' of guns recovered by police during a particular period of time and a reasonable 'sample' of guns used in crime (Cook and Braga, 2001). Using recovered crime guns as a basis for estimating the characteristics of all guns used in crime is analogous to analyzing arrestee characteristics as a basis for estimating the characteristics of all criminals. Although both are

unrepresentative of the relevant populations in various ways and both are influenced heavily by police priorities and procedures, the validity of the conclusions drawn from these data depends on the application and the care that is taken to provide appropriate qualifications (Cook and Braga, 2001).Several studies based on comprehensive tracing in California have been published (Wintemute et al 2004, 2005; Wintemute 2009).

E. Firearms Trace Data and Illegal Gun Market Interventions

Strategic analyses of trace data provide more focused information on the identity of FFLs and others who are most active in diverting guns into criminal use (Pierce et al., 2004). The firearms tracing system provides ATF agents with data useful in identifying gun traffickers, straw purchasers, and scofflaw FFLs.

Additionally, ATF analyzes multiple sales data for suspicious purchasing patterns suggestive of gun trafficking. ATF defines a multiple sale as the sale of more than one handgun by an FFL to the same unlicensed individual within five business days. Retailers are required to report such transactions, including identifiers for the firearms involved, to ATF.

Nearly 30% of 1,500 ATF firearms trafficking investigations reviewed between July 1996 and December 1998 were initiated through strategic analyses of information, including analyses of trace data, multiple sales data, or both (ATF, 2000a). After initiation of investigations, tracing was used as an investigative tool to gain information on recovered crime guns in 60% of the 1,500 ATF firearms trafficking investigations.

An interesting application of strategic analyses of trace data has been the use of these data in guiding licensing and regulatory enforcement. As a result of licensing reforms in 1993 and 1994, Federal dealer's licenses are now being issued far more selectively and the number of active licensees has dropped from more than 260,000 to about 100,000 nationally. In a recent

paper, Koper (2002) questioned the effectiveness of these reforms as he found little evidence to suggest that guns sold by the 'dropout' dealers were more likely to be used in crime or moved more quickly through criminal channels when compared to guns sold by active dealers. Nevertheless, with the elimination of some 160,000 marginal dealers, ATF regulatory and enforcement resources are spread less thinly. Moreover, relatively few dealers are associated with the bulk of crime gun traces (Pierce et al., 1995), and as such, ATF has focused its investigations on this small group.

In 2000, ATF conducted focused compliance inspections of dealers who had been uncooperative in response to trace requests and of FFLs who had 10 or more crime guns (regardless of time-to-crime) traced to them in 1999 (ATF, 2000b). The inspections disclosed violations in about 75% of the 1,012 dealers inspected. Nearly half (47%) of the dealers had at least one inventory discrepancy. While the majority of the discrepancies were resolved during the inspection process, some 13,271 missing guns could not be accounted for by 2002 licensees. Sixteen FFLs each had more than 200 missing guns. More than 57% had at least one violation related to a failure to properly execute transaction paperwork, and 54 FFLs failed to maintain a complete and accurate record book. The focused compliance inspections identified sales to more than 400 potential firearms traffickers and nearly 300 potentially prohibited persons, resulting in 691 referrals sent to ATF agents for further investigation (ATF, 2000b).

Local problem-oriented policing projects hold great promise for creating a strong response to illicit firearms markets (Braga, 2008; Braga and Pierce, 2005). Problem-oriented policing works to identify *why* things are going wrong and to frame responses using a wide variety of often untraditional and creative law enforcement approaches (Goldstein, 1990). This approach provides an appropriate framework to uncover the complex mechanisms at play in

illicit firearms markets and to develop tailor-made interventions to disrupt the gun trade. A famous illustration of this approach was the Boston Gun Project, launched during the early 1990s. The Boston Gun Project included an interagency problem-solving group that sought to disrupt the illegal supply of firearms to youth. Disruption of the supply was achieved by analyzing firearms trace data and systematically:

- Expanding the focus of local, state, and federal authorities to include *intrastate* trafficking in Massachusetts sourced guns, in addition to interstate trafficking;
- Focusing enforcement attention on traffickers of those makes and calibers of guns most used by gang members, on traffickers of guns showing short time-to-crime[3], and on traffickers of guns used by the city's most violent gangs;
- Attempting restoration of obliterated serial numbers and subsequent trafficking investigations based on those restorations; and
- Supporting these enforcement priorities through analysis of crime gun traces generated by the Boston Police Department's comprehensive tracing of crime guns, and by developing leads through systematic debriefing of (especially) arrestees involved with gangs and/or involved in violent crime (Braga et al., 2001 p. 199).

The Boston supply-side approach was implemented in conjunction with a powerful deterrence-based demand-side strategy to reduce youth violence. Unfortunately, the gun-trafficking investigations and prosecutions followed the implementation of a very successful deterrence strategy, and their effects on gun violence could not be independently established (Braga et al., 2001). An NIJ-funded evaluation found that the focused enforcement efforts significantly reduced the illegal supply of new handguns to criminals (Braga and Pierce, 2005). However, the evaluation also suggested that Boston criminals may have substituted older guns

[3] Law enforcement investigators consider that a short time-to-crime suggests that a firearm may have been recently illegally diverted from retail outlets (ATF, 2002). For investigative and tactical purposes, guns with quick time-to-crime offer law enforcement a better opportunity to identify illegal gun traffickers. New guns have passed through fewer hands and this makes it much easier for law enforcement to investigate its diversion and its diverters, and to mount prosecutions (Kennedy et al. 1996).

for new guns and moved their illegal activities from primary markets to secondary markets in response to the enforcement strategy.

In 2001, with the support of a grant from DOJ, RAND initiated a research and program development effort to understand the nature of illegal gun markets operating in Los Angeles (Ridgeway, Pierce, Braga, Tita, Wintemute, and Roberts, 2008). The primary goal of this project was to determine whether a data driven, problem-oriented approach could yield new interventions aimed at disrupting the workings of local illegal gun markets serving criminals, gang members, and juveniles in the Los Angeles Police Department's 77th Street Policing District area (South Los Angeles). The analyses of illegal gun markets serving criminals in the target area revealed that many crime guns were first purchased at "local" licensed dealers (Ridgeway et al., 2008). That is, rather than the conventional wisdom that crime guns were being trafficked across state borders from places with less stringent regulations such as Arizona and Nevada, a majority of the guns used in crimes were purchased in Los Angeles County.

Based on their investigative experience, an interagency law enforcement working group suggested that the local nature of the market was driven by prohibited possessors who were having local friends or family members conduct straw purchases for them (Ridgeway et al., 2008). The working group felt strongly that, since the person conducting the straw purchase does not have a criminal history forbidding them from making legal purchases, this population could potentially be deterred from initiating this illegal activity. The working group organized a "letter campaign" intervention that attempted to dissuade legal firearm purchasers from selling or transferring their firearms to others without filing the necessary paperwork with the state. New gun buyers received a notification letter during their 10-day waiting period, before they picked up their newly-purchased firearm, that informed them of their responsibilities as a gun owner and

that the firearm can be traced back to them if used in a crime. The key idea of this new gun market disruption strategy was to deter small-scale straw purchasers from picking their firearms and from making other illegal purchases in the future.

An experimental evaluation of the letter campaign found that the intervention had no discernible effect on the legal transfer rate or on the short-term rate of guns subsequently turning up in a crime (Ridgeway, Braga, Tita, and Pierce, 2011). However, the evaluators found that the rate at which guns are reported stolen for those who received the letter is more than twice the rate for those who did not receive the letter. This suggested that simple, targeted gun law awareness campaigns can modify new gun buyers' behaviors.

III. Research Design

The project takes advantage of two major information sources: (1) information on firearms which, when cross-referenced, enables researchers to identify both first-time and secondary illegal market channels through which firearms are acquired for use in crime and violence by offenders, juveniles and other persons subject to gun related restrictions, and (2) existing research on potential indicators of firearms trafficking derived from analysis of firearms tracing data (e.g. Cook and Braga, 2001; Kennedy et al., 1996; Moore, 1981; Pierce et al., 1995;Wachtel, 1998; Braga and Pierce, 2005;Pierce et al, 2004, Pierce et al. 1995, and Wintemute et al., 2004,2005). The primary analytic approaches employed in this project are: (1) a comparison of the characteristics of primary and secondary illegal firearm markets based on data derived from first-time purchase and retail sale data only, versus data based on both first-time purchase and sale data and on subsequent and/or last known purchase and sale data (i.e., secondary market transactions), and (2) an assessment of potential improvements in the coverage and accuracy of different firearms trafficking indicators based again on data derived from first-

time purchase and sale retail data only, versus data based on both first-time purchase and sale data and on subsequent and/or last known purchase and sale data[4]. These analyses are conducted for all firearms trace requests submitted to ATF for firearms recovered by law enforcement agencies in California between 2003 through late-2006.

A. Data Sources

In the following section we provide a general outline the data resources used in this research.

1. ATF Firearms Trace Data

The firearms tracing process begins with a law enforcement agency's submission of a trace request to the National Tracing Center (NTC) for crime-related firearms recovered by their agency. The law enforcement requestor must submit one of two forms before a trace can be initiated - Form ATF F 3312.1 for standard crime gun trace requests, or form ATF F 3312.2 for crime guns with an obliterated serial number or where there has been an attempt to obliterate the serial number. These forms require information regarding the firearm type (e.g., pistol, revolver, shotgun, and rifle), the manufacturer, caliber, serial number (unless obliterated), importer (if the gun is of foreign manufacture), firearm recovery location associated with the criminal offense, and the name and date of birth of the firearm possessor.

The information is first checked against an index of manufacturers and firearms serial numbers contained in the records of out-of-business FFLs that are stored by ATF and in the records of multiple handgun purchases reported on an ongoing basis by FFLs, as well as in

[4]Research conducted by Wintemute et. al., (2004) in an NIJ funded study showed the potential substantive value of cross-referencing firearms sales data to update standard ATF trace data. This study updated a selected set of standard ATF traces by cross-referencing these data to California state firearms sales data. For the 11% of the ATF traces identified as having additional sales and purchasing histories before they were recovered by a law enforcement agency, time-to-crime (on average) was shortened from a mean of 5.5 years to 1.7 years.

records of firearms that have been reported stolen by FFLs. If the firearm does not appear in these databases, the NTC contacts the manufacturer or importer and tracks the recovered crime gun through the distribution chain (i.e., wholesaler or retailer) to the first retail sale dealer. Finally, if the tracing process is successful, the first-time dealer is asked to examine its records to determine the identity of the first retail purchaser. Data on traced firearms is entered into the Firearms Tracing System (FTS), a database system maintained by the NTC (see Pierce and Griffith, 2005 for an earlier description of the tracing process).

A very broad range of information is collected through this process on recovered firearms, including firearms possessors, criminal circumstances associated with recovered firearms, firearm recovery locations, manufacturers, first-time retail purchasers associated with recovered firearms, and first-time retail dealers associated with recovered firearms (Information is also available on the associates of firearms possessors, but this information was not incorporated into this study). Potential indicators of firearms trafficking can be computed from these attributes. Most of the information on firearms, firearms possessors, criminal circumstances associated with recovered firearms and recovery locations is obtained in the initial trace request submitted by a law enforcement agency and is not subject to ATF data restrictions. However, information and computed attributes that are generated through the tracing process (e.g., information on manufacture, first-time retail purchasers associated with recovered firearms, first-time retail dealers) are not available for public distribution and are limited in terms of what law enforcement authorities may view and how they may use these data (Consolidated Appropriations Act of 2004).

Cross-referencing firearms trace request data submitted by law enforcement agencies to ATF with state records on the purchase and sale of firearms sold in California allows us to trace

firearms recovered in each of these states to a first-time sale and purchase, and for firearms subsequently resold and purchased in California to trace the firearm to the last-known sale and purchaser recorded in each of these states firearms record of sale and purchase systems.

2. California Handgun Sales Data and Licensed Retailer data

Since 1977, the California Department of Justice (CDOJ) has computerized its Dealer's Record of Sale (DROS) data for all handgun sales made by federally-licensed firearms dealers.[5] Since 1991, firearm transfers between private parties have also been required to be routed through licensed dealers so that a background check can be conducted and a DROS record kept on file. Sales at gun shows have been identified since 1997, and sales to law enforcement agencies or personnel have been identified since 1996. The computerized record also contains the name, date of birth, address, telephone number, and unique DROS identifying number (assigned by CDOJ) for the purchaser; make, type, model, and, caliber of the firearm; and a unique identifying number for the retailer can be linked to a second file with full identifying information on the retailer.

If the purchaser has a record in the state's criminal history system, the purchaser's unique Criminal Information and Identification (CII) number is included in the DROS record. For secondary market sales, the seller's DROS identifier number is also added to the sales record and identifying information can be obtained from a separate file. One record is completed for each handgun purchased in California, regardless of the number of handguns purchased in a given transaction. All handguns purchased by an individual can be identified.

[5]A redesign of the state's Automated Firearm System, of which the DROS data are now a part, was completed in April 2010. Law enforcement agencies querying the system now retrieve records from as far back as 1900, but missing data are common for years before 1977. At the time this study was performed, complete data on handgun transactions were only available beginning in 1996.

Finally, California maintains a centralized list of all federal firearm licensees who have obtained a required state license, and whose sales are therefore recorded in the DROS data. This list contains complete dealer identifiers and can be merged with the DROS file to determine the overall characteristics of the guns sold by each retailer, as well as customer demographics and other attributes. DROS records are maintained in California Automated Firearms System (AFS).

3. Matching California Handgun Sales Data and Licensed Retailer data with ATF Trace data

To identify the guns for which trace requests have been submitted among a larger population of guns that have been sold, we followed two sets of procedures: the first from our prior studies to link records for handguns and individual persons in the respective sales and trace request data sets (Wintemute et al, 2004, 2005), and the second are a set of procedures adjusted for potential variations in manufacturing codes and some variation in caliber codes and then essentially repeats the first process. A full description of the matching procedures and the results of those procedures is provided in Appendix 1; Merger of California DROS Records with ATF Trace Data. Potential policy implications of results of the matching procedures are provided in Appendix 2: Merger of California DROS Records with ATF Trace Data: Implications for Weapon Marking Conventions, Laws, and Procedures.

4. Standard measures of illegal firearm market characteristics based on first-time retail sale data and enhanced measures of illegal secondary firearm market characteristics using last-known sale data.

More than a decade of research on ATF firearms trace data has identified methods for characterizing illegal firearms markets using standard ATF first-time retail sale tracing data. Measures that have been developed and incorporated in ATF reports and other forms of dissemination include indicators of firearms trafficking that can be classified in terms of their ability to characterize illegal firearms markets factors such as time-to-crime. Time-to-crime

measures the time from when a crime-related firearm was purchased from a dealer and when it was recovered by a law enforcement agency. Distance-related characteristics of illegal gun markets include the distance between (1) the business location of a dealer that sold a crime-related firearm and the recovery location where the firearm was recovered by law enforcement, (2) the home location of the purchaser of a firearm and the location where the firearm was recovered by law enforcement, and (3) the home location of a firearms purchaser and the business location of the dealer that sold the crime-related firearm. Each of the illegal market characteristics is examined and compared for first-time retail sources of firearms data and secondary market sources of firearms data.

5. Standard indicators (using first-time retail sale data) and enhanced secondary market indicators of firearms trafficking (using last-known sale data).

Indicators of firearms trafficking or indicators of suspicious patterns of behavior were derived from analyses of the best practices of expert law enforcement investigators, crime gun analysts, and statistical analyses of trace data, as well as from statistical analyses of firearms trace data conducted by a number of different academics (for example, Cook and Braga, 2001; Kennedy et al., 1996; Pierce et al., 1995; Pierce et al., 2004;Wachtel, 1998; Wintemute et al., 2004).Many of these collaborative research and development projects were directly supported by ATF and the National Institute of Justice. A graphical representation of the major types of known and potential relationships available in ATF-generated firearms trace data is provided in Figure 2.The goal was to improve our understanding of the types of factors affecting illegal gun markets (in particular, time-to-crime) and assess whether this information can be useful to law enforcement in developing strategies and tactics to control illegal firearms trafficking.

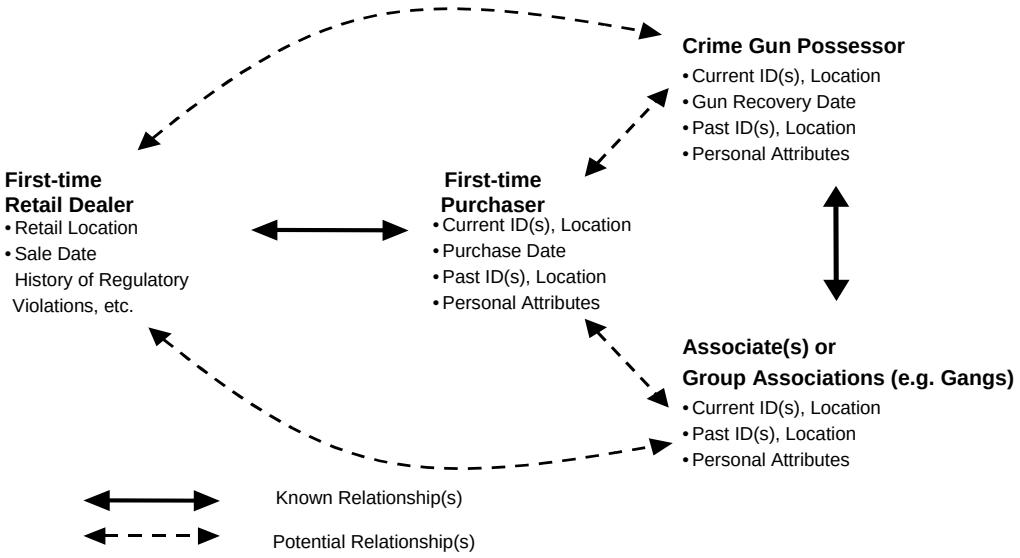
Another set of firearms indicators can be categorized in terms of the temporal position of a potential trafficking indicator in the sequence of decisions and/or actions involved in the illegal

diversion of guns from legitimate firearms commerce to the ultimate crime gun possessors. These include (1) dealer-related activities and/or conditions, (2) purchaser characteristics and behavior, (3) purchaser/possessor relationships, and (4) crime gun characteristics.

Dealer-level indicators include the number the number of traces to dealer, the volume of firearms sold to individual purchasers by a dealer, the number of multiple sale firearms sold by a dealer, and the number of firearms sold to purchasers who live in relatively distanced locations from the dealer's location.

Figure 2.

Known and Potential Relationships Available from Standard ATF Firearms Trace Data



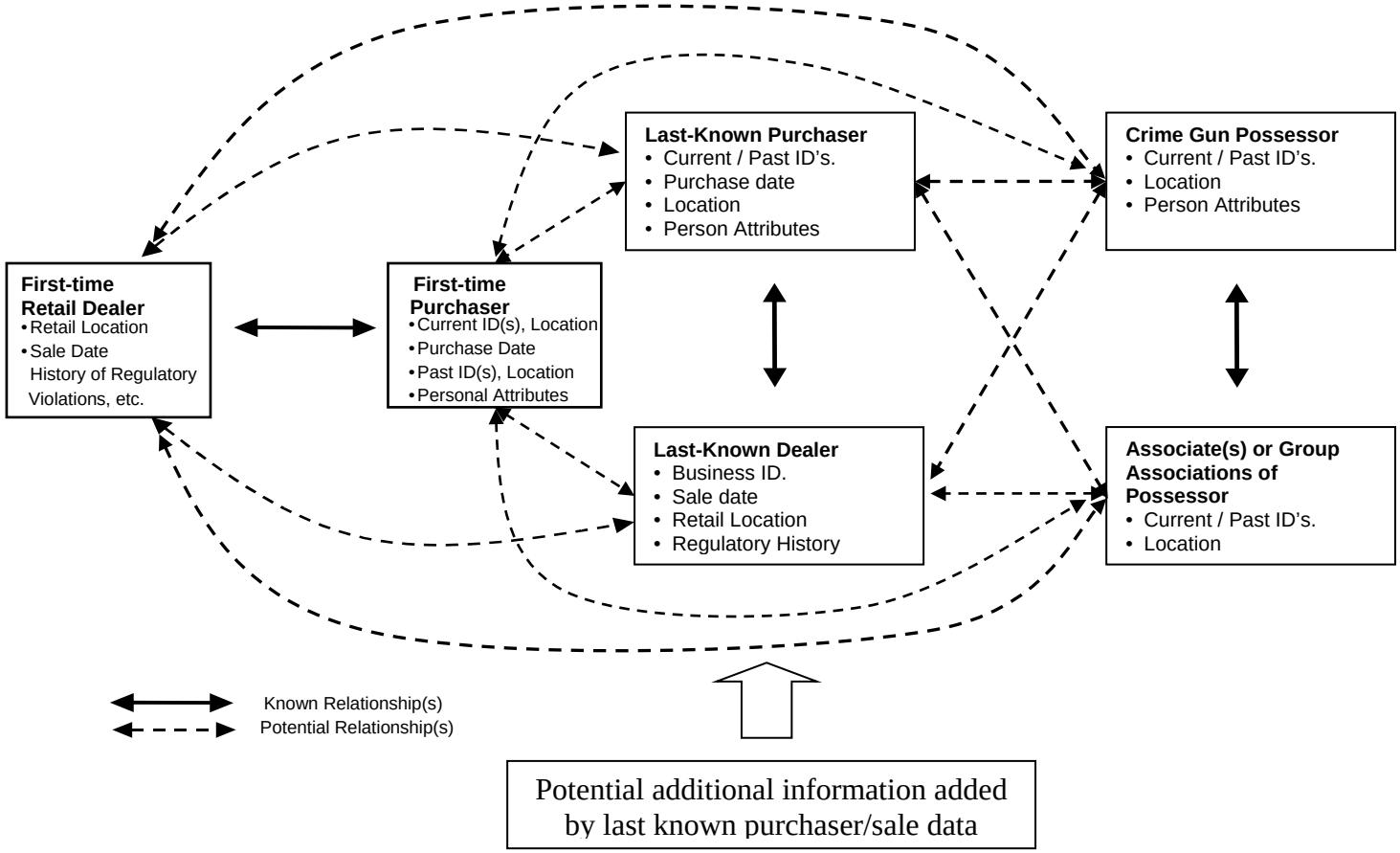
At the purchaser level, potential indicators of trafficking can include the number of traces associated with a given purchaser, the number and type of weapons purchased by a given

purchaser, and multiple sale purchases by a purchaser. For relationships between purchasers and possessors, potential indicators include the residential proximity between the purchaser and possessor (in miles), age proximity between the purchaser and possessor, and relationship indicators between the purchaser and possessor.

For each of the above types of firearms trafficking indicators two different versions of indicators were constructed. The first, which are termed *standard trace indicators,* are based on standard ATFtracing procedures. The second, which are termed *enhanced trace indicators*, are based on procedures that cross-reference with last-known dealer and purchaser data from purchase and sale data from California's firearms record of sale databases. The standard firearms trafficking indicators is based on ATF firearm trace data while the enhanced firearms trafficking indicators is based on both primary and secondary market data. A graphical representation of the major types of known and potential relationships crime related firearms available using both first-time retail sale data and last-known purchase and sale data is provided in Figure 3.

Figure 3.

Known and Potential Relationships Available from Standard ATF Firearms First-Time Retail Purchase Trace Data and Last-Known California Purchase and Sale Data



B. Analytic Approach

The overall analysis is divided into two phases. The first examines California in relation to other states in the nation and the second examines the California crime guns specifically with added information from California's firearms purchase and sale system. This first phase of the analysis is conducted to examine the somewhat unique firearms related legal context of California relative to many other states in the nation. For this analysis we are restricted to using only ATF firearms trace data because most other states do not collect information on firearms purchase and sale data in state level repositories. We are able, however, to draw on all ATF trace records for firearms recovered by law enforcement for all states in the nation. These were acquired for firearms recovered over the period 2003 through late 2006. Over this period there were 917, 548 non duplicated trace requests submitted to ATF for tracing (see Table 1). Of these 33,206 had missing information on recovery location, 36,075 were recovered outside the United States (including traces recovered in possessions of the United States such as Guam), 7,404 traces were recovered in Washington DC and 840,863 (91.6% of the total trace requests were recovered in the 50 states.

Table 1

Firearm Trace Request Recovery Locations for 2003 to 2006

	Frequency	Percent
Missing info.	33206	3.6
Outside of US	36075	3.9
DC	7404	.8
US States	840863	91.6
Total	917548	100.0

As Table 2 shows, of the 840,863 trace requests over the 2003 to 2006 period from all 50 states trace requests for firearms recovered in California amounted to 11.1% of the total (or 93,292 requests)

Table 2

Firearm Trace Request Recovery Location for California and Other States

	Frequency	Percent
Other states	747571	88.9
California	93292	11.1
Total	840863	100.0

For the comparative analysis of both the ATF standard trace based measures of illegal firearm market characteristics and the enhanced measures of illegal secondary firearm market characteristics, as well as the comparative analysis of ATF standard indicators and indicators of firearms trafficking enhanced with secondary market information, the analytic sample is restricted to the handguns recovered by law enforcement in California (representing 63,854 firearm requests of the total 93,292 firearms recovered by law enforcement in California). The subset of firearms for use in the California comparative analysis is be further reduced in terms of 1) the time frame within which guns could be purchased because the California DROS data available for this study became available starting in 1996, and 2) the restriction that a firearm was not only recovered in California but also purchased in California. The comparative sample subsets are defined in the comparative analysis section.

The comparative analysis employs two analytic strategies. First, we compare illegal firearm market characteristics using information from ATF trace based primarily on first-time,

retail-sourced data[6]versus illegal firearms market characteristics using the information on the last known purchaser of a firearm derived from ATF trace data enhanced with information from matched California DROS data on secondary market-sources of recovered crime-related firearms. Importantly, using California data we can identify a number of different types of potential secondary markets sources, including last-known retail dealer and purchaser sales, pawnshop redemptions, and private citizen transfer/sales[7]. Primary and secondary illegal gun markets are compared across a range of different market-related dimensions, including time-to-crime, the distance between the business location of a dealer who sold a crime-related firearm and where the firearm was recovered, the distance between the home location of a firearms purchaser and the recovery location, and the distance between the home location of a firearms purchaser and the dealer business location. Other such dimensions to be considered include whether a firearms dealer who last sold a firearm represented a retail store, whether a gun was last sold by a private citizen, or whether the firearm was redeemed from a pawnshop dealer.

Market characteristics are compared across the different illegal primary and secondary market sources of illegal firearms (e.g., first-time retail sales, retail secondhand sales, private citizen transfers/sales, and reported stolen firearms) using appropriate descriptive and inferential statistics. In addition, this analytic strategy also allows us to examine changes in the types of suspicious behavior and/or specific suspicious actors that are identified using standard firearms trafficking indicators based solely on primary market data (i.e. first-time retail purchase and sale data) versus those using enhanced indicators based on both primary and secondary market data (i.e., last-known purchase and sale data). For example, in terms of suspicious patterns, we will

[6] Some ATF firearms trace requests are completed using out-of-business dealer records, state firearms purchase and sale records or multiple purchase firearm sale records. Such records may sometimes represent a purchase of a firearm that is subsequent to the first retail purchase.
[7] Citizens of California are required to report private citizen transactions and firearms that are stolen from them. However the degree of compliance with these regulations is currently unknown.

look for changes in the proportion of short time-to-crime traces using standard versus enhanced indicators of firearms trafficking indicators. Another example, in terms of suspicious behavior, we will look for changes in firearms dealers or firearms purchasers that are associated with high numbers of traces using standard versus enhanced indicators of firearms trafficking. These are important questions because the use of enhanced indicators that incorporate secondary market data may enable to identify potential patterns and/or actors associated with potential firearms trafficking that are overlooked using only standard firearms trace indicators. Equally important, however, the use of standard trace indicators may actually be misleading in some instances. For instance, crime-related firearms that have been sold and purchased on the secondary market may be incorrectly associated with a particular dealer or purchaser based on first-time retail sales data.

The second major analytic strategy examines how market characteristics and indicators of suspicious behavior and/or suspicious actors may affect a key indicator of illegal firearms markets: time-to-crime. The potential impact of firearms market characteristics and indicators of suspicious behavior/persons on time-to-crime is examined, using standard ATF firearms trafficking indicators based primarily on primary trace market data (i.e. first-time retail purchase and sale data) versus those using enhanced indicators based on both primary and secondary market data which included matched DROS data (i.e., last-known purchase and sale information).

IV. The California Context in Relation to Other States

The State of California has a set of firearm-related laws and regulations that are relatively more stringent than those in many other states.[8]In terms of the purchase of firearms, California residents are limited to one handgun purchase per month starting at the time of the application.[9] (This restriction does not apply to sales by private parties that are routed through a licensed retailer.) After the purchase of a firearm, there is a 10 day waiting period before the transaction is approved (CA PC 12071(b)(3)(A), 12072(c)(1)). Transferring additional guns during the thirty day period is not permitted for those individuals who applied for a multiple purchase. Individuals are also not permitted to purchase firearms from someone else unless a licensed dealer handles the transfer (CA PC 12072(a)(5), 12072 (d)).

In terms of the firearm purchaser identification, since 2003 in California, a purchaser's right thumbprint is required on all transactions (CA PC 12077(b)(2)) and the purchaser's date of birth, name, and ID number is to be taken from the magnetic strip on the ID card (CA PC 12077(f)). Purchasers are also required to answer yes or no as to whether they are prohibited from purchasing firearms and ammunition and are required to present a Handgun Safety Certificate. These regulations are designed to reduce the potential for purchasers providing false identification to firearms dealer.

Individuals who are prohibited from firearms transactions under federal law include felons, those who have renounced their US citizenship, individuals convicted of a domestic

[8]This analysis of the California legal context draws upon material previously published in Pierce, G. L., A. Braga, M. Bjorkland, R. Griffith, T. Austin and W. Roberts. (2007) and Ridgeway, Pierce, Braga, Tita, Wintemute, and Roberts, 2008.

[9]Assembly Bill 202 (Chapter 128, Statutes of 1999). Effective January 1, 2000, the Department of Justice *(DOJ)* began screening all handgun transactions to ensure compliance with Assembly Bill 202 (Chapter 128, Statutes of 1999). This new law prohibits California firearm dealers from selling/transferring title of any handgun to any person who has already acquired a handgun within the State of California in the past thirty (30) days. This law has been incorporated into California Penal Code (PC) sections 12071 and 12072.

violence misdemeanor or subject to a domestic violence restraining order, persons "adjudicated as a mental defective," fugitives, and illegal aliens, among others. California has adopted broader exclusions, which include persons convicted of any violent misdemeanor, such as simple assault and battery. Age restrictions include the prohibition of long guns and handgun ammunition for those under the age of 18 and prohibition of handguns for those under the age of 21(CA PC 12072(a)(3)(A), 12072(b)).

California also regulates firearm retailers to a unique degree. In addition to a federal firearms license, all persons engaged in the business of selling firearms must possess a state Certificate of Eligibility and be named on the state's Centralized List of firearms retailers.(ATF, no date, p. 68, CA PC 12070(a)). They must possess a state and, if applicable, local business license. No interstate shipment of firearms may be made to a retailer who is not on the Centralized List, and each shipment must be approved separately by the state's Department of Justice.

With rare exceptions, firearm sales must be processed electronically, using software developed by the Department of Justice and in most cases on computers supplied by the department. A sale cannot be accepted for processing unless the data are complete and consistent. Purchaser identification is entered by "swiping" a California driver's license or identification card to minimize the possibility of data entry error. The telephone and address of the purchaser is required as well as their occupation, date and place of birth, sex, aliases, physical description, and signature. Firearm information must be entered using a series of drop-down lists, which in the case of handguns only contain information on firearms that have been certified for sale after passing a series of design and performance tests. The record for handgun purchases is

required (PC 12077(b)) to contain information about the gun such as the make, model, manufacturer, serial number, caliber, and any other identifying features.

Finally, the date and time of the purchase is recorded along with the name, address, dealer number, and any other identifying information about the place of purchase. Licensed dealers are responsible for maintaining records of transactions conducted at their place of business and are required to make this available upon inspection by law enforcement (CA PC 12071(b) (17).

The Bureau of Firearms maintains its own corps of 8 Field Representatives who serve as inspectors.[10] Retailers are inspected in their first year of operation and every 3 years thereafter, on average. Inspections may occur more frequently if there has been a history of rule violations in the past, and less frequently if the retailer has previously been in compliance. Scheduling of inspections also takes into account the retailer's sales volume and any referrals from law enforcement agencies or the general public. The inspections are also treated as an opportunity to educate retailers on both the basics of and recent changes to California firearms laws and regulations.

At the time of inspection, retailers must make all state and federal records and their inventories available. If violations are found, the retailer is issued a "Notification of Violations" by the inspector at the conclusion of the inspection. The retailer is also educated as to what must be done to restore compliance. The general expectation is that violations will be corrected within 30 days. The Bureau conducts a follow-up inspection to verify that the previously-identified errors are corrected and that subsequent transactions are in compliance.

[10] This paragraph and the following two paragraphs are based on information provided by Karen Milami, manager of the Training, Information & Compliance Section of the Bureau of Firearms, California Department of Justice.

Repeated and willful violations can lead to a licensee being removed from the Centralized List. Automated sales data are only accepted by the department for processing from retailers who are on the list; de-listing forces a retailer to cease firearm sales. As a practical matter, retailers that have serious criminal and/or regulatory violations will sometimes voluntarily request to be removed rather than experience possible prosecution for non-compliance. In recent years, a number of large volume dealers have ceased operations for a variety of reasons, often because they were under investigation by ATF or CDOJ. In some of these cases, violations or other findings led local licensing authorities to revoke the retailer's local business license.

Other relevant components of California State law include that 48 hours after the discovery of the theft or other loss of a firearm, a licensed dealer is responsible to report it (CA PC 12071(b)(13).

Finally, with regard to the tracing of firearms, in 2002, the California legislature enacted the nation's first statewide crime gun tracing bill, which mandated that all firearms used in a crime, suspected to have been used in a crime, illegally possessed or found, be submitted to the California Department of Justice (CA-DOJ) for the purposes of tracing through ATF (CA PC 11108(a)). The objective of this legislation is to help insure that law enforcement agencies comprehensively trace all crime-related firearms they recover.

A. Characteristics of Firearms Recovered by Law Enforcement in California and in Other States

Given California's relatively extensive set of firearms laws and regulation we first compare firearms recovered in California with those recovered by law enforcement in all other states in the US for a set of characteristics of firearms recovered, including the type of weapon recovered (see Table 3), the offense associated with the recovered weapon (Table 4), and the age

and gender of the possessors of recovered firearms (Tables 6 and 7). All comparisons in this section are based standard ATF tracing methods, which are typically to first time retail purchasers.

Table 3 - Type of Weapon Recovered

		Other States	CA	**Total**
Pistols	N	356650	40967	397617
	%	48%	44%	47%
Revolver	N	171867	22887	194754
	%	23%	25%	23%
Rifles	N	119161	17564	136725
	%	16%	19%	16%
Shotguns	N	96727	11371	108098
	%	13%	12%	13%
Other	N	3166	503	3669
	%	0%	1%	0%
Total	N	747571	93292	840863
	%	100%	100%	100%

Table 3 shows the distribution of types of firearms recovered in California is fairly comparable with that found in other states. In California, pistols represent 44% of all recovered weapons, as opposed to 48% for the rest of the country, and 25% of the revolvers recovered versus 23% for other states. Thus, overall handguns account for 69% of the firearms recovered by law enforcement in California versus 71% in other US states.

Table 4 examines the types of crimes associated with weapons recovered from law enforcement in California and other states. Both distributions are fairly similar. For instance, homicide represents 4% of crimes linked to recovered weapons in both California and all other states. When other types of crimes against the person (i.e., robbery, aggravated assault and other crimes against the person, including sex offenses) are grouped together, 12% of California's recovered firearms have crimes in that category versus 13% for other states. Overall, no specific crime category represents more than a 3% discrepancy between California and all other states with the exception of the miscellaneous category of other offense where California has a higher proportion of offenses (11%) than other states (4%). This may be largely due to the fact only 1.2% of 93,292 recovered firearms in California have missing data versus 5.1% of the 747,571 firearms recovered in other states (Table 4 only reports information on weapons with no missing information).

Table 4 - Offence Associated with Recovered Firearm

		Other states	CA	**Total**
Found firearm	N	63272	6096	69368
	%	9%	7%	9%
Under investigation	N	33426	4407	37833
	%	5%	5%	5%
Homicide	N	29483	3679	33162
	%	4%	4%	4%
Robbery	N	18224	2185	20409
	%	3%	2%	3%
Aggravated assault	N	46223	5041	51264
	%	7%	5%	6%
Other crimes against person	N	20041	4251	24292
	%	3%	5%	3%
Property crime	N	26687	3495	30182
	%	4%	4%	4%
Drug offenses	N	95299	9124	104423
	%	13%	10%	13%
Firearm offences	N	299684	37855	337539
	%	42%	41%	42%
Disorderly conduct	N	8593	326	8919
	%	1%	0%	1%
Health and safety	N	36394	5655	42049
	%	5%	6%	5%
Other offences	N	31792	10045	41837
	%	4%	11%	5%
Total	N	709118	92159	801277
	%	100%	100%	100%

Table 5 and 6 examine the age and gender of the possessors of crime guns recovered in California and other states. The proportion of traces where possessors were identified was 82.6 percent for California and 78.4 percent for all other states. The proportion of traces with demographic information on possessors (including age and gender) is somewhat lower due to missing information.

Table 5 - Possessors' Age

Possessor's age		other states	CA	**Total**
<18	N	24805	3576	28381
	%	5%	5%	5%
18-24	N	144392	17194	161586
	%	28%	25%	27%
25-34	N	136010	16913	152923
	%	26%	24%	26%
35-49	N	134169	17525	151694
	%	26%	25%	26%
50+	N	84894	14093	98987
	%	16%	20%	17%
Total	N	524270	69301	593571
	%	100%	100%	100%

Table 6 - Possessors' Sex

Possessor's gender		other states	CA	**Total**
Female	N	36799	4644	41443
	%	7%	7%	7%
Male	N	502826	66587	569413
	%	93%	93%	93%
Total	N	539625	71231	610856
	%	100%	100%	100%

The distribution of crime gun possessors by gender (Table 5) shows that the proportion of male possessors of recovered firearms is the same in California as it is in all other states (93% of crime weapons both nationally and in California are possessed by males). The age of possessors of recovered weapons (Table 5) also shows a similar distribution in California and other US states. Possessors of recovered crime guns tend to be evenly dispersed over age categories from 18-49, with each age class (18-24, 25-34 and 35-49) containing about 25% of recovered firearms

in both California and all other US states. One modest difference between California and other states is in the 50 and over age category which represent 20% of all California crime gun possessors versus 16% of all possessors in other states. Overall the age distribution of crime gun possessors if very similar in California and other US states.

Comparisons are also made in terms of selected characteristics of illegal firearms markets. Below are first examined illegal firearms markets in terms of distance between the original retail point of sale and its use in crime and subsequent recovery by law enforcement. (Table 7), and the state where a weapon was recovered versus the state where it was originally purchased(Table 8). Retail dealer-to-recovery distance provides a measure of geographic distribution of guns markets within a given region.

As Table 7 shows, of the 492,285 cases nationwide where dealer to recovery information is available[11] more than half (52%) of all firearms traced were recovered within 25 miles or less from the point of sale. Here California and other states show similar pattern with 49% of all traced crime gun in California recovered within 25 miles of the original point of sale versus 52% of all traced firearms in other states. Perhaps not surprisingly, given the geographic size of California a somewhat higher proportion of firearms were recovered at over 500 miles from the original point of sale (19% in California versus 15% in other states). Table 8 shows that for both California and all other states in the US, a substantial majority of guns were recovered within the same state where they were originally sold although the proportion is slightly higher for California where 74% of the firearms recovered in Californian where originally sold in that state

[11] Dealer to recovery distance is computed as the distance from the centroid of zip code location of the retail dealer that originally sold the firearms to the centroid of the zip code location of the where the firearm was recovered by law enforcement. Dealer zip code location is almost always available for firearms traced to a retail dealer and zip code location is generally available on firearms recovered by law enforcement. Both items of information must be available to compute this distance.

versus 69% of firearms recovered in other US states, which may, in part at least, be attributable to California's geographic size.

Table 7 - Distance from Retail Dealer to Point of Recovery in Miles

		other states	CA	**Total**
1-5	N	67759	6590	74349
	%	18%	16%	18%
6-10	N	60032	5659	65691
	%	16%	14%	16%
11-25	N	67838	7482	75320
	%	18%	19%	18%
26-50	N	30433	4259	34692
	%	8%	11%	8%
51-100	N	27830	2622	30452
	%	7%	7%	7%
101-250	N	39455	2581	42036
	%	10%	6%	10%
251-500	N	29733	3336	33069
	%	8%	8%	8%
501 plus	N	56079	7432	63511
	%	15%	19%	15%
Total	N	379159	39961	419120
	%	100%	100%	100%

Table 8 - State Where Weapon was Recovered vs. State Where It Was Purchased

Purchase State		other states	CA	**Total**
Out of State	N	139519	12357	151876
	%	31%	26%	31%
In State	N	304342	36067	340409
	%	69%	74%	69%
Total	N	443861	48424	492285
	%	100%	100%	100%

ATF notes that time-to-crime is an important measure of illegal firearm markets (ATF 2002).For investigative purposes, the newer a gun is the better. Records are likely to be more complete and more available; individuals listed on paperwork are easier to find; guns are less likely to have been resold, given away, or stolen; and the chain of transfers to illicit consumers is likely to be shorter (Kennedy et al. 1996, p. 174). For these reasons, as ATF's experience indicates, we would expect that law enforcement would find data on the first retail sale of older guns to be of much use in identifying currently active scofflaw dealers or traffickers.

Table 9 presents the distribution of time-to-crime for firearms traced to a purchaser. Here we have cases which include the time to crime for purchasers. Short time-to-crime firearms are defined by the ATF as guns recovered within three years of their original purchase[12]. As Table 9 shows more than a quarter of all guns, 26% nationwide can be classified as short time-to-crime firearms. In terms of longer time-to-crime firearms, nation-wide almost all (85%) of crime guns are recovered in less than 21 years.

However, as Table 9 shows there is a substantial difference in the time-to-crime distributions for firearms recovered in California versus other states. Short time-to-crime weapons of 1-3 years represent 16% of the firearms recovered in California versus 28% of the weapons recovered in other states. This difference, although more modest appears for somewhat older time-to-crime guns of 4-5 years with 11% of the firearms recovered in California falling into this category versus 8% for other states. For longer time-to-crime firearms (over 10 years) Table 9 shows that 56% of firearms recovered in California fall in this range versus 40% for other states. For estimates of the average difference in time-to-crime between California and other states, it is useful to examine mean and median time-to-crime measures in Table 9. Here we find the mean time-to-crime for firearms recovered in California is 12.2 years versus 9.8 years for other states (a 26% difference) and that median time-to-crime is 11.1 for California firearms versus 7.6 for other states (a 46% difference).

[12] For investigative purposes ATF considers short time-to-crime to be three years or less (ATF, 2002).

Table 9 –Time-to-Crime in Years of Traced Firearms

Years		other states	CA	Total
1-3	N	122845	7646	130491
	%	28%	16%	26%
4-5	N	47241	3945	51186
	%	11%	8%	10%
6-10	N	95494	9808	105302
	%	21%	20%	21%
11-20	N	115532	17922	133454
	%	26%	37%	27%
21 plus	N	63832	9423	73255
	%	14%	19%	15%
Total	N	444944	48744	493688
	%	100%	100%	100%
	Mean	9.770	12.212	10.011
	Median	7.644	11.168	8.049

What may account for the differences in the time-to-crime distribution of between California and other states, a difference that has been observed previously (Wintemute, 2004)? Given that California's firearm-related laws and regulations are relatively more stringent than those in many other states, it may be that California's regulatory environment is a factor that affects the distribution of time-to-crime of recovered firearms in that state.

B. The Impact of Firearms Legal Context and other Determinants of Illegal Firearm Market on Time-to-Crime

On way to examine this proposition is to examine the distribution of time-to-crime for states with different firearms regulatory environments. To do this we grouped states according to the presence or absence of firearms purchase and registration laws in the state (see Table 10). States were classified based on Vernick and Hepburn's (2003) study of State and Federal Gun Laws: Trends for 1970-1999 (Table 9-a). States were classified as having no purchase and registration laws, purchase only laws, registration only laws or both purchase and registration laws. California, which has a purchase but not registration legislation, is kept separate because it

is the focus of this research and also conveniently because it has other relevant firearms laws and regulations that provide for a more stringent regulatory context in term of the potential trafficking of firearms.

Table 10 - Time to Crime by State Purchase and Registration Laws

		State Firearm Laws					
		no purchase or registration law	purchase law only	registration law only	purchase and registration law	CA	**Total**
1-3	N	92048	17516	3777	9504	7646	130491
	%	30%	23%	23%	20%	16%	26%
4-5	N	33074	7799	1600	4768	3945	51186
	%	11%	10%	10%	10%	8%	10%
6-10	N	64429	17221	3557	10287	9808	105302
	%	21%	23%	22%	21%	20%	21%
11-20	N	75634	20449	4453	14996	17922	133454
	%	25%	27%	27%	31%	37%	27%
21 plus	N	40354	11849	2841	8788	9423	73255
	%	13%	16%	18%	18%	19%	15%
Total	N	305539	74834	16228	48343	48744	493688
	%	100%	100%	100%	100%	100%	100%
	Mean	9.255	10.497	10.961	11.502	12.212	10.011
	Median	7.000	8.501	8.926	9.833	11.168	8.049

Table 10 examines the distribution of time-to-crime across the five separate legal contexts of no purchase and registration laws, purchase only laws, registration only laws, both purchase and registration laws, and California. The proportion of short time-to-crime firearms recovered in each of these contexts appears to be lower for more stringent legal contexts. The proportion of firearms falling into the 1-3 time-to-crime category is 30% for states with no purchase and registration laws,23% for states with purchase only laws, 23% for states with registration only laws,20% for states with both purchase and registration laws, and16% for California. Similar patterns appear for the mean and median time-to-crime of firearms recovered

in these different legal contexts. Overall the time-crime-distributions in Table 10 appear vary by four general legal contexts:1) no purchase or registration states, 2) states with purchase or registration only states, 3) states with purchase and registration laws and 4) California.

A number of sets of factors are examined to see whether they help explain variation in time-to-crime across different legal contexts. First, we examine state level differences in patterns of trace completion (based on ATF's completion code determination) of firearms trace request submitted to the NTC across the different legal firearm contexts. Second we examine potential determinants of time-to-crime to examine to what extent they account for differences in time-to-crime across different legal contexts, and to what extent potential mediating effects of other potential determinants conform to expectations about how state firearms laws and regulations affect illegal firearms markets.

1. Nationwide Analysis of the Firearm Tracing Reporting Practices and the Impact of Legal on Time-to-Crime.

Table 11 presents the distribution of the completion code dispositions by the NTC for the 840,863 firearm trace requests submitted by law enforcement agencies from the 50 states over the period 2003 through late 2006. For these purposes, NTC disposition codes were grouped into five categories:1) traces made to a retail purchaser, which almost completely coincide with traces that have a time-to-crime[13], 2) guns that are too old to trace, because they were manufactured prior to 1968 or because they are past the point that dealers or manufacturers are legally required to maintain records on a gun, 3) completion codes that indicate there was not enough information to complete the trace, such as serial number, importer or manufacturer information missing, 4) dealer information unavailable, dealer out business, cannot be located or is unresponsive, and

[13] Table 11 indicates that 496,651 traces were traced to a purchaser and Table 9 reports that 493,688 traces had the purchase date information necessary to compute time-to-crime (recovery or request date information is always available). This represents about a half percent difference.

5)a general other category that includes special traces requests from law enforcement, traces still under investigation or traces that have been ended by the request of a law enforcement agency.

Table 11 –Disposition- Completion Code Status by State Purchase and Registration Laws

Disposition - Completion Code Status		State Firearm Laws: no purchase or registration law	purchase or registration only	purchase and registration	CA	**Total**
Purchase Identified	N	307529	91503	48635	48984	496651
	%	62%	56%	55%	53%	59%
Too Old to Trace	N	38243	18936	9382	10433	76994
	%	8%	12%	11%	11%	9%
Not Enough Info	N	68909	24867	16282	17887	127945
	%	14%	15%	18%	19%	15%
Dealer Info/Response	N	57378	21243	10669	11816	101106
	%	12%	13%	12%	13%	12%
Other	N	22400	7382	4213	4172	38167
	%	5%	5%	5%	4%	5%
Total	N	494459	163931	89181	93292	840863
	%	100%	100%	100%	100%	100%

Table 11 shows that trace requests recovered in states with purchaser and/or registration requirements for purchasing firearms show a lower percentage of trace requests traced to a purchaser (62% of the trace requests from states with no purchase or registration laws versus 56% from states with either purchase or registration laws, 55% from state with purchase and registration laws and 53% for California trace requests). Examination of the other completion code categories in Table 11 indicates that part of the reason for lower percentage of trace requests being traced to a purchaser in states with more stringent firearms laws is that firearms available to prohibited persons in that states may be more likely too old to trace. As Table 11 shows 8% of the trace requests for firearms recovered in states with no purchasing or registration laws were found to be too old to trace versus 12% for states with purchase or registration laws,

11% for states with purchase and registration laws and 11% for firearms recovered in California.

A similar pattern is present in Table 11 for the general completion code category that indicates a trace was not completed because there was not enough information regarding identifying information such as serial number and importer or manufacturer markings. Although this category is not explicitly tied to the age of the weapon, many of the guns in this category appear to be disproportionately older types of guns (such as 12 gauge shot guns, revolvers and calibers like 25 and 32) and, there are relatively fewer newer calibers (e.g., 9mm) in this category. Thus contrary to the proposition the states with more stringent firearms laws maybe more rigorous in tracing firearms, these patterns indicate that such states actually have slightly higher proportions of older recovered firearms that could not be traced to a purchaser. If such firearms were traced to a purchaser this would produce slightly longer time-to-crimes for firearms recovered within their boundaries.

2. Nationwide Analysis of the Impact of Legal Context and Independent Factors on Time-to-Crime.

The next question that we can examine is what is the potential effect of the stringency of state firearm laws and regulations (i.e., legal context) controlling for other potential determinants of time-to-crime. In addition, we are also interested in the effects of other potential determinants of time-to crime in their own right. The potential determinants of time-to-crime are grouped into five categories: 1) state firearms law context; 2) dealer characteristics; 3) purchaser characteristics; 4) purchaser possessor relationship; and 5) and possessor and gun characteristics.

The independent effects of individual determinants on time-to-crime are assessed in terms of the temporal stage in which they enter the illegal firearms diversion process. This also enables us to examine to what extent the effects of individual factors, in particular the impact of firearms legislation, are mediated by the addition of factors that operate at later stages in the

process of the illegal diversion of firearms. Thus, variables represented at the purchaser dynamics stage, for example, are assessed as an independent set of variables prior to the entry of variables at later stages. The overall effects of the models' potential determinants of time-to-crime were examined for the nation-wide sample of firearms traces, and for subgroups of states with different firearms legislative contexts. The latter strategy was employed to identify whether model the effects of the model determinants of time-to-crime vary across legislative contexts.

Descriptive statistics for the dependent variable, time-to-crime measured in years based on firearm purchase and recovery dates and the 21 potential explanatory determinants of time-to-crime are listed in Table 12.For those variables that represented counts of events (e.g., the number of traces from a specific dealer or purchaser), we transformed the variable by taking the natural log.[14] Dummy variables were used for dichotomous independent variables (e.g. whether the dealer was a pawnshop).

[14]Tufte (1974) suggests, taking the natural log of count data results in a smoother distribution that better represents the functional form of the data.

Table 12 – Variables for the Multivariate Analysis of Time-to-Crime for Purchasers and Possessors who are not the Same Individual

	Mean	Std. Dev.	Cases
Time to crime in years using sale date	8.463	7.0727	225392
Independent Variables			
1. Gun law one- either a purchase or registration law[1]	.1674	.37332	225392
2. Gun law two- both a purchase and registration law[1]	.0990	.29868	225392
3. Gun law CA – State of California[1]	.0731	.26023	225392
4. Active dealer – was in business at time of recovery[2]	.5350	.49877	225392
5. Firearm was purchased in the recovery state[3]	.6700	.469	225392
6. Natural log of the number of traces from a dealer	3.5343	1.85494	225392
7. Natural log of the # of multiple gun sales sold by a dealer	2.0665	2.67158	225392
8. Dealer is a pawnshop[4]	.2441	.42957	225392
9. Natural log of the # of traces to an individual purchaser	.1866	.45684	225392
10. Purchaser age 18-24[5]	.2411	.42778	225392
11. Natural log of the # traces to purchaser's home zip code	3.8172	1.30606	225392
12. Purchaser is Female[6]	.1765	.38123	225392
13. Natural log of the difference in the age of pur/ poss.	2.4215	1.06720	225392
14. Natural log of the distance between pur/ posshome zip codes	3.1819	2.28424	225392
15. Dummy variable for missing data on distance between pur/poss home zip codes[7]	.9187	.27332	225392
16. Possessor has same last name as purchaser butdifferent person[8]	.0517	.22139	225392
17. Possessor's age under 18[9]	.0529	.22379	225392
18. Possessor's age 18-24[9]	.3236	.46787	225392
19. Possessor's age 25-34[9]	.2972	.45702	225392
20. Possessor is female[10]	.0646	.24590	225392
21. Recovered firearm is a pistol[11]	.6232	0.48458	225392

Reference category is: 1)states with no purchase or registration laws, 2) inactive firearm dealers, 3) gun was purchased outside of recovery state, 4) firearms dealers that are not pawnshops, 5) firearm purchasers age 25 years of age and older. 6) male firearm purchasers, 7) firearm traces without purchaser or possessor home location zip code data, 8) firearm purchasers without the same last name or no information, 9)firearm possessor's age is 35 year of age or older, 10) firearm possessor is male, 11) any firearm that is not a pistol.

The legal context variables are the first temporal block of variables examined in the analysis, and they are constructed as dummy variables representing: 1) states with purchase or registration laws, 2) states with a purchase and registration laws and 3) California (states without both purchase and registration laws are the reference group for this set of dummy variables).

Dealer characteristics, the second temporal block, include the natural log of the number of traces to a dealer, the natural log of the number of multiple gun sales sold by a dealer, a dummy variable for whether the dealer was a pawnshop, and a dummy variable for whether the dealer was in the same state where the firearm was recovered. A dummy variable for whether a dealer was in business as of 2006 is included as a control variable (i.e., dealers who are still in business have more opportunity to have shorter time-to-crime guns traced to them, all other things being equal).[15]

Purchaser characteristics, the third temporal block, includes a dummy variable for purchasers aged 18 to 24 (which is a group with a distinctly lower time-to-crime than older age groups), the natural log of the number of traces to an individual purchaser, and the log of the number of traces from a purchaser's home residence zip code (a measure of possible networked connections between crime gun purchasers).

Purchaser possessor relationship indicators are the fourth temporal block. Variables in this block include, the natural log of the difference in age between purchaser/ possessor, the

[15]Previous research (Pierce, Braga, Hyatt, and Koper, 2004) also examined the natural log of demand letters to a dealer, the natural log of NIC check denials by a dealer, and the shelf life of weapon before it was sold. Demand letter information for dealers with 10 or more short-time-crime guns traced to them was not available in this study and since the program's inception the number of dealers sent demand letters declined by approximately 35% by April 2004 (DOJ, 2004) because the cut-off for sending letters was increased to 15 or more short time-to-crime traces. In addition, NIC denial data for dealer was not available and the transfer date to a dealer of a firearm was not available, which shelf-life variable from being computed. The effect of NIC denials on time-to-crime was modest and shelf life, although its effect was larger, the number of crime guns with a long shelf life was relatively few cases, and as such, the potential contribution of this variable to the overall variance explained of time-to-crime is correspondingly constrained.

natural log of the distance between a purchaser's and possessor's home zip codes (for cases where these data exist – about 20,000 traces were missing either purchaser or more likely possess zip code information), a dummy variable for missing data on distance between purchaser and possessor home zip codes, and a dummy variable for purchasers who have the same last name as the possessor but are identified as different persons based on different birth dates.[16]

The characteristics of possessors and gun make up the final temporal block. This includes dummy variables for possessors less than 18 years of age, 18 to 24, and 25 to 34with 35 and older as the reference category. Possessor's age was grouped into these because there is a modest curvilinear relationship between possessor age and time-to-crime. The one weapon characteristic entered into the analysis is a dummy variable for whether the gun was a pistol or some other type of firearm.

The sample for the multivariate analysis of time-to-crime was restricted to traces where the purchaser and possessor were identified as different individuals and a time-to-crime was available for the traced firearm. The sample is restricted in this manner because the situation where purchaser and possessor of crime-related guns are different persons represents a far more common pattern of diversion of firearms than the pattern where the purchaser and possessor is the same individual. Of the493,688 firearms traces with time-to-crime data there were 44,087 traces where the possessor and purchaser identified as the same person, 272,392 traces where there was insufficient information to determine purchaser/possessor relationship, and 228,305 cases where the purchaser and possessor identified as different individuals. Matches between

[16]Previous research (Pierce, Braga, Hyatt, and Koper, 2004) also examined dummy variable trafficking indicators for instances where an associate of the possessor was identified as a purchaser or an associate of the possessor lived close to the possessor. The effect of the latter variable was relatively modest, and while the effect of the dummy variable indicator for an associate of the possessor was identified as a purchaser was greater the number of crime guns with this type of possessor purchaser relationship was very same, and as such the potential contribution of this variable to the overall variance explained of time-to-crime is correspondingly constrained.

purchases and possessors were made based on an identity key that was constructed by concatenating the first three letters of an individuals' first name, the first two letters of their last name, their month and year of birth, and their state of residence. State of residence was considered important for the matching key for matching cases across the nation. Unfortunately, there is a relatively high proportion (about 30%) of possessors'whose state of residence could not be identified. This means that we would have made a higher number of matches the purchaser key if this information were available. One option in the future would be to substitute recovery state information for cases with missing possessor state of residence; another strategy would be to make matches using first name, last name and birth information only when possessor state is missing. For purchase information, state of residence information is missing rarely. The sample size we obtained with the present matching strategy (i.e., 228,305) is still quite large and also yields a lower rate of potential mismatches because only complete information was employed.

The level of missing data for the potential explanatory factors is low for most variables with the exception of the variable which measures the distance between the residence of a purchaser and possessor of a crime gun. This variable had 20,675 missing cases largely due to missing residence of possessor zip code information. To account for this relatively large number of missing cases we included a dummy variable in the analysis to control for the missing information on the variable, natural log of the distance between purchaser and possessor residence location zip codes.[17] In addition, since traces associated with out-of-business dealers in the analysis will tend to have a longer time-to-crime on average than those associated with dealers that are still in business in 2006, this could artificially increase the relationship between time-to-crime and dealer characteristics such as the number of traces to a dealer over the period

[17] (see Little and Rubin 1987 for a discussion of techniques available to researchers that deal with the problem of missing data in multivariate analyses)

2003 to 2006. To control for this potential bias we included a dummy variable that identified all dealers actively in business in 2006 (53% of the traces in the sample were associated with active dealers). The number of cases for the multivariate analysis drops slightly to 225,392 traces due to a small amount of missing information on several other explanatory variables other than the purchaser – possessor distance variable.

Because of the large sample of traces where purchaser and possessor were identified as different persons, ordinary least squares analysis was employed as one multivariate strategy for assessing the impact of state legal context variables and other potential factors on time-to-crime even though the univariate distribution time-to-crime is a skewed distribution[18]. Employing this approach also provides a convenient assessment of the overall variance explained in time-to-crime by the available explanatory variables. Tables 13a and 13b, present the OLS multivariate analysis. Table 13a presents the omnibus tests of the model coefficients and shows that each successive stage in the regression model produced a significant improvement to the model from the previous temporal block/stage. The overall variance explained by the model increases is 31.4 percent.

Table 13b presents the estimated effects of the legal context variables when they are entered into the model at the first stage. They account for 1.3% of the variance of time-to-crime when they entered into the model at this stage. Among the three legal context variables (purchase or registration states, purchase and registration states and California dummy variables) the California variable shows the greatest effect on time-to-crime with an increase of 2.845 years in time-to-crime compared to states without purchase or registration laws. States with *both* purchase and registration laws states with states with *either* purchase or registration laws show

[18]A plot of the standardized residuals from the multivariate analysis indicates the distribution of the residuals is fairly normal and an examination of a normal p-p plot of the regression analysis standardized residuals indicates this as well.

increases of time-to-crime of 1.266 and .775 years. This suggests that the stringency of state firearms laws and regulations has consistent positive effect on time-to-crime with the effect becoming stronger as the legal context becomes more stringent.[19]

Table 13a.
Model Summary for Table 13b., OLS Regression Results for Variables Predicting TTC in Years

				Change Statistics				
Model	R	R Square	Adjusted R Square	R Square Change	F Change	df1	df2	Sig. F Change
1 (Stage 1)	0.113	.013	.013	.113	967.541	3	225,388	.000
2 (Stages 1,2)	0.409	.168	.168	.155	8385.215	5	225,383	.000
3 (Stages 1,2,3)	0.441	.194	.194	.027	1855.309	4	225,379	.000
4 (Stages 1,2,3,4)	0.501	.251	.251	.057	4311.830	4	225,375	.000
5 (Stages 1,2,3,4,5)	0.561	.314	.314	.063	4137.817	5	225,370	.000

Dealer-related factors are entered into the model in the second stage. When dealer-related variables are entered the dealer related factors add an additional 15.5 % to the variance explained in time-to-crime (Table 13a) with dummy variable indicating whether a dealer was still in business in 2006 showing the greatest relative effect, *B* = -3.178 years decrease (see Table 13b) on time-to-crime among dealer related factors. All the dealer variables, however, show Beta coefficients of -.097 or greater. The *Bs* for the two other categorical dealer variables, the firearm was purchased in the recovery state, and the dealer was a pawnshop shows a decrease in time-to-crime of -1.584 and -1.638 respectively. The natural log of the number of traces to a dealer has B of -.370, which over the range of its values from 1 to the 90th percentile of its distribution (the natural log from zero to about 6) would reduce time-to crime by about -2.2 years. Correspondingly, the impact of the natural log of number of multiple sale guns sold by a dealer

[19]It should be noted that an empirically observed association is a necessary but not sufficient basis for causality (Tufte, 2006). As an additional test of causality, the study incorporates attributes into the analysis that are intended to mediate the effects of state laws in ways that would be consistent with causal expectations.

shows a -.331 effect on time-to-crime,or an effect of about -1.9 years over the range of its values from zero to the 90th percentile of its distribution.

The introduction of stage two dealer related variables, (i.e., active dealer, recovery state and dealer are the same, the natural log of the number of traces from a dealer, the natural log of the number of multiple gun sales sold by a dealer, the dealer is a pawnshop)reduces the direct effect of the state legal context dummy variables on time-to-crime. The direct effect of the states with *both* purchase and registration laws and states with *either* purchase or registration laws on time-to-crime were reduced from 1.266 and .775 years respectively to .388 and .333. The direct effect of California was reduced relatively less from 2.845 to 1.905 years. The mediating effect of the introduction of the dealer related independent variables (i.e., the reduction in the magnitude of the direct effects of the legal context variables on time-to-crime with the introduction of the dealer variables into the model) suggests that some of the influence of legal context may operate through effects on the operations of firearms dealers and the interaction between dealers and purchasers, which may make it more difficult to traffic firearms.

The purchaser-related variables that enter the model in stage 3 include the natural log of the number of traces to an individual purchaser, a dummy variable for purchasers between 18 and 24 years of age, and the natural log of the number traces to purchaser's home zip code. The addition of purchaser related variables added 2.7% to the variance explained of time-to-crime. Of these the individual level variables all show a significant effect on time-to-crime, but the neighborhood level variable, the natural log of the number traces to purchaser's home zip code does not. The effect of the legal context variables on time-to-crime remains relatively unchanged or increase slightly when dealer purchaser related variables enter the analysis, although the effect of the dummy variable for states with either purchaser *or* registration laws and the dummy

variable for states with either purchaser and registration laws show a modest increase in their effects with the introduction of the purchase characteristics block of variables..

The purchaser/possessor-relationship variables that enter the model in stage 4 include, the natural log of the difference in age between purchaser and possessor, the natural log of the distance between the home zip code of the purchaser and the home zip code of the possessor, a dummy for weapons purchased by a female purchaser, a dummy variable for traces where the possessor had the same last name as purchaser but was a different person, and a dummy variable for missing data on distance between purchaser and possessor zip codes. The addition of the stage of variable added 5.7% to the variance explained in time-to-crime. In this set of factors, the natural log of the difference in age between purchaser and possessor and thenatural log of the difference in the distance between the home zip code of the purchaser showed the greatest effect on time-to-crime (Betas = .234 and .122 respectively, and Bs of 1.571 and .369, for a ranges from zero to the 90^{th} percentile of their distributions of about 3.6 and 6.5 respectively). The dummy variable for female purchaser shows a B coefficient of -.749 years. The effect of the legal context variables on time-to-crime again remains relatively unchanged when purchaser possessor relationship related variables entered the analysis.

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Table 13b – Part 1
OLS Regression Results for Variables Predicting TTC in Years Using Sales Date for Purchasers and Possessors who are not the Same Individual

Stage (s)	1			1, 2			1, 2, 3		
Variables	B	Beta	Sig.	B	Beta	Sig.	B	Beta	Sig.
1. Gun law one- either a purchase or registration law[1]	.775	.041	.000	.388	.020	.000	.443	.023	.000
2. Gun law two- both a purchase and registration law[1]	1.266	.053	.000	.333	.014	.000	.477	.020	.000
3. Gun law CA – State of California[1]	2.845	.105	.000	1.905	.070	.000	1.832	.067	.000
4. Active dealer – was in business at time of recovery[2]				-3.178	-.224	.000	-3.110	-.219	.000
5. Firearm was purchased in the recovery state[3]				-1.584	-.105	.000	-1.507	-.100	.000
6. Natural log of the number of traces from a dealer				-.370	-.097	.000	-.298	-.078	.000
7. Natural log of the number of multiple gun sales by a dealer				-.331	-.125	.000	-.317	-.120	.000
8. Dealer is a pawnshop[4]				-1.638	-.099	.000	-1.533	-.093	.000
9. Natural log of the number of traces to an individual purchaser							-1.994	-.129	.000
10. Purchaser age 18-24[5]							-1.524	-.092	.000
11. Natural log of the number traces to purchaser's home zip code							.005	.001	.663
12. Purchaser is a female[6]							-1.047	-.056	.000
13. Natural log of the difference in age between purch/poss									
14. Natural log of the distance between purch/poss. zip code									
15. Dummy variable - missing data for purch/poss. Distance[7]									
16. Possessor same last name as purchaser –different person[8]									
17. Possessor's age under 18[9]									
18. Possessor's age 18-24[9]									
19. Possessor's age 25-34[9]									
20. Possessor is female[10]									
21. Recovered firearm isa pistol[11]									
Constant	8.001		.000	13.875		.000	13.875		.000
R^2	0.013			0.168			0.194		
F	967.54		.000	5671.07		.000	4523.57		.000

See notes 1 – 11, Table 12

Table 13b – Continued, Part 2
OLS Regression Results for Variables Predicting TTC in Years Using Sales Datefor
Purchasers and Possessors who are not the Same Individual

Stage (s)	1,2,3,4			1,2,3,4,5		
Variables	B	Beta	Sig.	B	Beta	Sig.
1. Gun law one- either a purchase or registration law[1]	.444	.023	.000	.301	.016	.000
2. Gun law two- both a purchase and registration law[1]	.357	.015	.000	.540	.023	.000
3. Gun law CA – State of California[1]	1.553	.057	.000	1.516	.056	.000
4. Active dealer – was in business at time of recovery[2]	-2.800	-.197	.000	-2.790	-.197	.000
5. Firearm was purchased in the recovery state[3]	-.390	-.026	.000	-.428	-.028	.000
6. Natural log of the number of traces from a dealer	-.238	-.062	.000	-.139	-.036	.000
7. Natural log of the number of multiple gun sales by a dealer	-.306	-.116	.000	-.232	-.088	.000
8. Dealer is a pawnshop[4]	-1.573	-.096	.000	-.966	-.059	.000
9. Natural log of the number of traces to an individual purchaser	-1.690	-.109	.000	-1.681	-.109	.000
10. Purchaser age 18-24[5]	-.237	-.014	.000	.451	.027	.000
11. Natural log of the number traces to purchaser's home zip code	.089	.017	.000	.227	.042	.000
12. Purchaser is a female[6]	-.749	-.040	.000	-.806	-.043	.000
13. Natural log of the difference in age between purch/poss	1.571	.237	.000	1.872	.283	.000
14. Natural log of the distance between purch/poss. zip code	.369	.119	.000	.397	.128	.000
15. Dummy variable - missing data for purch/poss. Distance[7]	-.707	-.027	.000	-.828	-.032	.000
16. Possessor same last name as purchaser –different person[8]	.411	.013	.000	-.217	-.007	.000
17. Possessor's age under 18[9]				-2.245	-.071	.000
18. Possessor's age 18-24[9]				-2.720	-.180	.000
19. Possessor's age 25-34[9]				-1.879	-.121	.000
20. Possessor is female[10]				.612	.021	.000
21. Recovered firearm isa pistol[11]				-2.634	-.180	.000
Constant	7.674		.000	8.849		.000
R^2	0.251			.314		
F	4530.21		.000	4919.92		.000

See notes 1 – 11, Table 12

The final stage of the model adds possessor characteristics age and gender and a dummy variable for the type of weapon recovered. This set of variables added 6.3 % to the variance explained in time-to-crime. Not unexpectedly the dummy variable for age of possessor for ages under 18, 18-24 and 25-34 showed strong negative effects (Bs = -.-2.245, -2.720 and -1.879 years reduction respectively) on time-to-crime. In addition, the type of firearm (a dummy variable for pistol versus other types of guns) showed a fairly strong negative effect (B= -2.634) on time-to-crime.

Examination of the variables for stage five of the analysis in Table 13b shows that the legal context variables, and in particular the state of California remain statistically significant predictors of time-to-crime. First, the direct effects of these variables have been somewhat reduced by the mediating effects of the subsequent stage two dealer variables, and suggests the that state legal context variables may have some of their impact on time-to-crime through their impact on dealer and purchaser. Second, the effects in the current analysis do not take into account the fact that states with more stringent firearms laws also appear to have a higher proportion of firearms that cannot be traced to a purchaser because the weapons are too old to trace, and hence have no time-to-crime information. If such information could be obtained this would probably add disproportionately to longer time to crime firearms being traced in state with more stringent firearms laws (at less more stringent purchase and registration laws). Thus, if these weapons could be included in the analysis the effects of the legal context variables would probably be greater.

3. Nationwide Analysis of the Impact of Potential Determinants of Time-to-Crime across Firearms Legal Contexts and Place of Purchase.

In addition to producing a positive impact on time-to-crime the legal context of California may also produce a different set of illegal gun market dynamics. To investigate this possibility we examine the same potential determinants of time-to-crime used in the nation-wide analysis (with the exception of the legal context variables) for firearms recovered in California and for firearms recovered in all other states. For this analysis the potential determinants of time-to-crime are grouped into four categories: 1) dealer characteristics; 2) purchaser characteristics; 3) purchaser possessor relationship; and 4) and possessor and gun characteristics.

As in the nation-wide analysis, the sample for the multivariate analysis of time-to-crime was restricted to traces where the purchaser and possessor were identified as different individuals and a time-to-crime was available for the traced firearm. The samples are divided in those firearms recovered in California versus the sample of firearms recovered in all other states. Table 14 presents the results of this analysis. The table includes the B coefficients, the standard error of the Bs, the Beta coefficients and the statistical significance are presented. However the B coefficients and standard errors will be used for comparing the effects of predictors between the sample of California recovered firearms and other state recoveries. The comparison is only made in terms the final stage of the analysis that includes all four groups'18 predictors (the 21 independent variables in Table 13 minus the three legal context variables).

The comparison of time-to-crime predictors indicates that most of the predictors show fairly similar effects on time-to-crime in the California and other state samples. The predictors showing the most similar effects on time-to-crime in both samples, include the active dealer indicator, the natural log of traces to a dealer, the natural log of multiple gun sales by a dealer, the natural log of traces to a purchaser, the natural log of traces to a purchaser's home zip code,

the natural log of the age difference between purchasers and possessors and the type of weapon recovered. Other variables that show somewhat greater differences in their effects on time-to-crime, but where the magnitude of these differences are all below a factor of two, include type of dealer, purchaser and possessor age variables, purchaser and possessor gender. Of the three remaining substantive variables, the natural log of the distance between purchasers and possessors homes and the dummy for possessor and purchaser have the same last name show some greater differences but their the direction of their effects on time-to-crime are the same in for both the California and other state samples.

Only one variable in Table 14 shows an actual difference in direction of the effect of a predictor on time-to-crime between the California sample and the other state sample is for the dummy variable indicating whether a firearm was purchased in the recovered state versus an out-of-state sale. For firearms recovered in California the effect of a gun being purchased in California increases time-to-crime by 2.532 years. For firearms recovered in other states, in-state decrease time-to-crime by -.719 years. This indicates that California context appears to inhibit the trafficking of firearms to persons legally prohibited from possessing firearms, while other state contexts on average have a less inhibitory effect on the trafficking of firearms.

Table 15 extends the comparisons presented in Table 14 to each of the four firearms legal contexts. As before, for firearms recovered in California the effect of a gun being purchased in California increases time-to-crime by 2.532 years. However, for firearms traced firearms recovered in states with *no* purchase or registration laws, in-state purchases decrease time-to-crime by -.929 years.

Table 14. OLS Regression Results for Variables Predicting TTC in Years Using Sales Date for California Recovered Guns and Firearms Recovered in All Other States for Purchasers and Possessors who are not the Same Individual

	California			Other States		
Variables	B	StdErr	Sig	B	StdErr	Sig
1. Active dealer – was in business at time of recovery[2]	-2.780	.104	.000	-2.786	.030	.000
2. Firearm was purchased in the recovery state[3]	2.532	.170	.000	-.719	.037	.000
3. Natural log of the number of traces from a dealer	-.154	.031	.000	-.156	.009	.000
4. Natural log of the number of multiple gun sales by a dealer	-.244	.027	.000	-.217	.007	.000
5. Dealer is a pawnshop[4]	-.530	.166	.001	-.970	.030	.000
6. Natural log of the number of traces to an individual purchaser	-1.460	.105	.000	-1.663	.028	.000
7. Purchaser age 18-24[5]	.600	.128	.000	.443	.032	.000
8. Natural log of the number traces to purchaser's home zip code	.264	.049	.000	.225	.011	.000
9. Purchaser is a female[6]	-.447	.140	.001	-.816	.034	.000
10. Natural log of the difference in age between purch/poss	2.192	.053	.000	1.846	.014	.000
11. Natural log of the distance between purch/poss. zip code	.552	.035	.000	.399	.009	.000
12. Dummy variable - missing data for purch/poss. Distance[7]	-1.709	.247	.000	-.785	.056	.000
13. Possessor same last name as purchaser –different person[8]	-.734	.209	.000	-.171	.060	.004
14. Possessor's age under 18[9]	-3.153	.220	.000	-2.144	.063	.000
15. Possessor's age 18-24[9]	-3.503	.134	.000	-2.645	.034	.000
16. Possessor's age 25-34[9]	-2.755	.127	.000	-1.797	.033	.000
17. Possessor is female[10]	.909	.199	.000	.574	.052	.000
18. Recovered firearm isa pistol[10]	-2.564	.101	.000	-2.644	.028	.000
Constant	8.064	.334	.000	9.162	.077	.000
R^2	.276			.313		
F	390.99		.000	5285.51		.000
Sample	16446			208926		

For note 2 – 10 see Table 12

Table 15. OLS Regression Results for Variables Predicting TTC in Years Using Sales Date for Guns Recovered in California, States with Purchase *and* Registration Laws, States with Purchase *or* Registration Laws and State *without* Either Type of Law for Purchasers and Possessors who are not the Same Individual

	State Gun Law Context							
	State with no Purchase or Reg. Laws		State with Purchase *or* Reg. Laws		State with Purchase *and*Reg. Laws		California	
Variables	B	StdErr	B	StdErr	B	StdErr	B	StdErr
1. Active dealer – was in business at time of recovery[2]	-2.813	.035	-2.722	.073	-2.688	.100	-2.780	.104
2. Firearm was purchased in the recovery state[3]	-.929	.045	-.421	.085	.649	.141	2.532	.170
3. Natural log of the number of traces from a dealer	-.161	.011	-.140	.023	-.101	.030	-.154	.031
4. Natural log of the number of multiple gun sales by a dealer	-.243	.008	-.192	.017	-.112	.022	-.244	.027
5. Dealer is a pawnshop[4]	-.760	.035	-1.272	.073	-1.482	.106	-.530	.166
6. Natural log of the number of traces to an individual purchaser	-1.654	.034	-1.662	.065	-1.561	.080	-1.460	.105
7. Purchaser age 18-24[5]	.382	.038	.575	.079	.748	.102	.600	.128
8. Natural log of the number traces to purchaser's home zip code	.313	.013	.256	.026	.001	.034	.264	.049
9. Purchaser is a female[6]	-.730	.039	-.853	.081	-1.042	.110	-.447	.140
10. Natural log of the difference in age between purch/poss	1.772	.016	1.884	.033	2.303	.045	2.192	.053
11. Natural log of the distance between purch/poss. zip code	.427	.010	.421	.021	.436	.031	.552	.035
12. Dummy variable - missing data for purch/poss. Distance[7]	-.877	.062	-.873	.143	-1.291	.227	-1.709	.247
13. Possessor same last name as purchaser –different person[8]	-.230	.069	-.109	.139	.285	.236	-.734	.209
14. Possessor's age under 18[9]	-1.927	.074	-2.504	.150	-2.991	.191	-3.153	.220
15. Possessor's age 18-24[9]	-2.494	.040	-2.914	.082	-3.138	.113	-3.503	.134
16. Possessor's age 25-34[9]	-1.637	.039	-2.118	.079	-2.317	.109	-2.755	.127
17. Possessor is female[10]	.582	.060	.580	.126	.430	.184	.909	.199
18. Recovered firearm isa pistol[10]	-2.581	.033	-2.353	.066	-3.095	.095	-2.564	.101
Constant	8.953	.090	8.900	.185	9.302	.258	8.064	.334
R^2	.323		0.287		.300		.276	
F/sig	2553.28	.000	844.95	.000	530.69	.000	348.48	.000
Sample	148883		37737		22316		16446	

For notes 2 – 10 see Table 12

The impact state firearms across the four firearms regal contexts on in combination with the location/state where a firearm was originally purchased on time-to-crime can be directly examined by inspecting how time-to-crime varies across both these dimensions. Table 16 presents the average time-to-crime of firearms by where the firearm was originally purchased (i.e., purchased in the recovery state or purchased outside the recovery state) and across the four different legal contexts (i.e., states that have no firearms purchase or registration laws, firearms recovered in states with either gun purchase *or* gun registration laws, firearms recovered in states with either gun purchase *and* gun registration laws, and California). This is an important interaction to examine because it is logical to expect that the stringency of state laws should have a similar effect on time-to-crime whether a firearm was purchased within a recovery state or outside that state. Specifically, we would expect time-to-crime to be less in jurisdictions with less constrains on the purchase and registration of firearms because such laws and regulations may make it more difficult for prohibited persons to obtain firearms from legal retail channels.

The Table 16 examines the mean time-to-crimes by legal context and dealer location place of sale/purchase and confirms the expectations of the potential effect of the stringency of states' firearms related laws on time-to-crime and also the impact of dealer place of sale (i.e., firearms purchased from dealers within a recovery state's jurisdiction versus purchased from a dealer outside a recovery state's jurisdiction). For firearms recovered within a state's boundaries but purchased from a dealer outside that recovery state, Table 16 shows that time-to-crime has a consistent positive relationship with the stringency of state firearms laws and regulations, independent of whether firearms were sold within recovery state boundaries or in states outside a recovery state. Thus, for firearms purchased from dealers outside of a recovery state's boundaries the average time-to-crime for states that have; 1) no firearms purchase or registration

laws is 9.607 years, 2) with either gun purchase *or* gun registration laws is 9.907 years, 3) with gun purchase *and* gun registration laws is 13.099 years, and 4) California is 13.291 years with an overall average time-to-crime for guns purchased outside of recovery state jurisdictions of 9.958years. Similarly, time-to-crime shows a consistent and positive relationship with the stringency of state firearms legal contexts for firearms purchased from dealers within a recovery state's boundaries. Specifically, the average time-to-crime for states that have: 1) no firearms purchase or registration laws is 7.273 years, 2) with either gun purchase *or* gun registration laws is 8.189 years, 3) with either gun purchase *and* gun registration laws is 10.058 years, and 4) California is 11.516 years - with an overall average time-to-crime for guns purchased outside of recovery state jurisdictions of 7.859 years. As Table 16 also shows, time-to-crime for firearms purchased outside of recovery states versus those purchased from dealers within recovery states is consistently greater across each respective legal contexts, which probably represents the fact that such weapons were more likely to pass through more persons before they were recovered by law enforcement (and hence accumulate longer time-to-crimes).

However, the results shown in Table 16 may not only be dependent on the place of purchase and the legal context of state firearms laws but also, on other characteristics of illegal firearms markets that were presented in Table 12 and examined in Table 13b. To address this question, we reexamine the effect of the legal context and place of purchase predictors on time-to-crime as a set interaction variables, which can then be examined in conjunction with the full complement of other determinants of time-to-crime employed in the earlier models. The set of place of purchase/legal context interaction dummy variables created were: 1) out-of-state purchases for firearms recovered in states with *no* purchase or registration laws, 2) out-of-state purchases for firearms recovered in-state with purchase *or* registrations, 3) out-of-state purchases

for firearms recovered in states with purchase *and* registration laws, 4) out-of-state purchases for California recovered firearms, 5) in-state purchases for firearms recovered in-state with purchase *or* registrations laws, 6) laws in-state purchases for firearms recovered in states with purchase *and* registration laws, and 7) in-state purchases for California recovered firearms. The reference category for this group of variables is in-state firearm purchases in states with *no* purchase or registration laws.

Table 16

Average TTC in Years Using Sales Date for Guns Purchased in-State or Out-of-State for Firearms Recovered in California, States with Purchase *and* Registration Laws, States with Purchase *or* Registration Laws and State *without* Either Type of Law for Purchasers and Possessors who are not the Same Individual

		State Gun Law Context of Where Firearms were Recovered				
State Location of Dealer Sale		Has No Purchase or Reg. Law	Has Purchase *or* Reg. Laws	Has Purchase *and* Reg. Laws	California	All States
Recovered Firearm Purchased from an out-of-State dealer	Mean	9.607	9.907	13.099	13.291	9.958
	N	(59,864)	(8,106)	(2,759)	(3,728)	(74,457)
Recovered Firearm Purchased from an in-State dealer	Mean	7.273	8.189	10.058	11.516	7.859
	N	(111,898)	(22,984)	(7,011)	(11,665)	(153,558)
Total for all Recovered Firearms[1]	Mean	8.086	8.647	10.917	11.946	8.545
	N	(171,762)	(31,090)	(9,770)	(15,393)	(228,015)

1. The overall sample N in this table are slightly larger than corresponding sample size in the previous regression analyses due a small proportion of missing data on some independent variables used in the regression analyses. This accounts for the slight discrepancy in the average time-to-crime presented in Table 12 (8.463 year) versus the average time-to-crime for the whole sample (Total for all recovered firearms, all states, 8.545) presented in this table. There are 290 cases excluded from this table due to missing dealer state information.

As in the earlier nation-wide analysis (see Table 13b) we examine the effects of the seven interactive legal context/place of purchase variables controlling the potential determinants of time-to-crime to assess whether the impact of these variables remain significant predictors of

time-to-crime controlling for the effects of the other factors. The potential determinants of time-to-crime are grouped into five categories: 1) legal context/place of purchase variables; 2) dealer characteristics; 3) purchaser characteristics; 4) purchaser possessor relationship; and 5) and possessor and gun characteristics.

In this analysis, we assess how the effects of the interactive legal context/place of purchase determinants of time-to-crime are mediated by the addition of factors that operate at later stages in the process of the illegal diversion of firearms. Table 17.a presents the omnibus tests of the model coefficients and shows that each successive stage in the regression model produced a significant improvement to the model from the previous temporal block/stage. The overall variance explained by the model increases is 31.8 % percent.

Table 17.a

Model Summary for Table 17b, OLS Regression Results for Variables Predicting TTC in Years Using Sales Date with Legal Context and State of Purchase Interactions for Purchasers and Possessors who are not the Same Individual

					Change Statistics				
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	R Square Change	F Change	df1	df2	Sig. F Change
Stage 1	.211	.045	.045	6.9132	.045	1504.710	7	225384	.000
Stage 1, 2	.419	.176	.176	6.4206	.131	8978.318	4	225380	.000
Stage 1, 2, 3	.449	.201	.201	6.3209	.025	1791.971	4	225376	.000
Stage 1, 2, 3, 4	.510	.260	.260	6.0851	.059	4453.376	4	225372	.000
Stage 1, 2, 3, 4, 5	.566	.320	.320	5.8333	.060	3976.412	5	225367	.000

The estimated effects of the independent variables on time-to-crime for each stage in the model are presented in Table 17b. This enables us to examine the total, direct and the mediated effects of these variables on time-to-crime. The seven legal context/place of purchase variables

are entered into the first stage of the model and account for 4.5% of the variance of time-to-crime. These variables are the primary focus of this part of the analysis and a summary of their direct and mediated effects is presented for each stage of the model in Table 17c.

The expectation is that the addition of dealer related determinants of time-to-crime should have the greatest effect on the legal context/place of purchase variables that represent jurisdictions with more stringent firearms laws (i.e., California and states with purchase and registration requirements). Another expectation is that the introduction of the purchaser/possessor relationship variables into the model should have their greatest impact on the out-of-state legal context/place of purchase variables because these variables attempt to measure the relational distance between purchaser and possessor and firearms purchased out-of-state (versus in-state purchases) are likely, on average, to travel through more actors in going from a legal purchase to a illegal possessor.

Table 17.b shows the impact on time-to-crime of the seven legal context/place of sale dummy variables when they enter the model at stage one. For the in-state legal context variables the stringency of state legal context shows a consistent and positive effect on time-to-crime. Specifically, the effect on time-to-crime is: 1) .925 years for in-state purchases from states with purchase *or* registrations laws, 2) 2.767 years for in-state purchases from states with purchase *and* registration laws and3) 4.148 years for in-state California purchases controlling on the other place of purchase legal context variables. The reference category for this group of variables is in-state purchases from states with no purchase or registration laws.

Table 17.b also shows that for the out-of-state purchases the legal context variables the stringency of state legal contexts again shows a consistent and positive effect on time-to-crime. Specifically, the effect on time-to-crime of: 1)out-of-state purchases from states with *no*

purchase or registration laws, 2) states with purchase *or* registration laws, 3) states with purchase *and* registration laws, and 4) California is 2.298, 2.666, 5.790, and 5.916 years respectively(The reference category is again in-state purchases from states with no purchase or registration laws).

Dealer-related factors enter into the model in the second stage. When dealer-related variables are entered the dealer related factors add an additional 13.1 % to the variance explained in time-to-crime. The dummy variable indicating whether a dealer was still in business in 2006 again shows the greatest effect (*B* = -3.179 years) on time-to-crime among dealer related factors. The *B* for the other categorical dealer variable, the dealer was a pawnshop, shows a negative effect on in time-to-crime of -1.428. The natural log of the number of traces to a dealer has B of -.382 on time-to-crime, and the natural log of the number of multiple sale guns sold by a dealer shows a -.308 effect on time-to-crime.

The introduction of the dealer related variables into the model shows a modest mediating effect on the impact of the legal context/place of purchase variables on time-to-crime, but the relative size of the mediating effects conforms to our expectations that these effects would be strongest for jurisdictions with more stringent firearms laws. As Table 17.band summary Table 17.c show, dealer related variables, when they enter the model, have their greatest mediating effect on the legal context/place of purchase variables representing more stringent jurisdictions. Specifically, the variables representing: 1)out-of-state purchases for firearms recovered in states with purchase *and* registration laws, 2) out-of-state purchases for California, 3) in-state purchases for firearms recovered in states with purchase *and* registration laws, and 4) in-state purchases for California recovered firearms show reductions in time-to-crime of -1.256, -1.497, -.659, and -1.176 years respectively (see Table 17.c, rows 3, 4, 6, 7). In contrast less restrictive jurisdictions showed considerably lower reductions in time-to-crime. Specifically, variables

representing;1) out-of-state purchases for firearms recovered in states with no purchase *or* registrations laws, 2) out-of-state purchases for firearms recovered in states with purchase *or* registrations laws, and 3) in-state purchases for firearms recovered in states with purchase *or* registrations laws show reductions in time-to-crime of -.495, -.557, and -.189years respectively (see Table 17.c, rows 1, 2, 5). The introduction of the dealer related indicators in stage two, on average[20], reduces the effect of the legal context/ place of purchase variables by -.833 years, with most of that reduction attributable to the mediating effect on states with more stringent legal contexts.

The relatively larger mediating effects of the dealer related variables on the more stringent legal context/place of purchase variables (versus those less stringent contexts) conforms to our expectations and indicates that the effect of more stringent legal contexts on time-to-crime may arise from how these states regulate their firearms dealers and monitor dealer purchaser transactions. California with its strong system of dealer inspection and its automated records systems may have implemented a particularly effective regulatory environment.

Purchaser related determinants of time-to-crime enter into the model in stage 3 and account for an additional 2.5% of the variance explained in time-to-crime. The introduction of these variables has very little mediating effect on the impact of the legal context/place of purchase variables on to time-to-crime. As Table 17.c shows the average reduction in years of time-to-crime across the seven legal context/place of purchase variables is - .086 years versus an average effect reduction of - .883 year for the dealer variables.

[20] This is the average reduction in the B coefficients for the legal context/place of purchase dummy variables with the introduction of dealer related explanatory variables in stage two.

Table 17.b– Part 1
OLS Regression Results for Variables Predicting TTC in Years Using Sales Date with Legal Context and State of Purchase Interactions for Purchasers and Possessors who are not the Same Individual

Stages	1			1,2			1,2,3		
Variables	B	Beta	sig	B	Beta	sig	B	Beta	sig
1. Out-of-state pur/ States with *no*Pur or Reg laws [1]	2.298	.143	.000	1.803	.112	.000	1.782	.111	.000
2. Out-of-state pur/ States with Pur*or* Reg laws[1]	2.666	.070	.000	2.109	.055	.000	2.038	.053	.000
3. Out-of-state pur/ States with Pur*and* Reg laws[1]	5.790	.089	.000	4.534	.070	.000	4.383	.068	.000
4. Out-of-state pur /CA place of purchase[1]	5.916	.105	.000	4.419	.079	.000	4.215	.075	.000
5. In-state-pur/States with Pur*or*Reg laws[1]	.925	.039	.000	.736	.031	.000	.763	.033	.000
6. In-state-pur / States with Pur*and* Reg laws[1]	2.767	.067	.000	2.108	.051	.000	2.079	.051	.000
7. In-state-pur /CA place of purchase[1]	4.148	.129	.000	2.972	.092	.000	2.816	.087	.000
8. Active dealer – was in business at time[2] of recovery				-3.179	-.224	.000	-3.098	-.218	.000
9. Natural log of the number of traces from a dealer				-.382	-.100	.000	-.327	-.086	.000
10. Natural log of the number of multiple gun sales by a dealer				-.308	-.116	.000	-.295	-.111	.000
11. Dealer is a pawnshop[3]				-1.428	-.087	.000	-1.357	-.082	.000
12. Natural log of the number of traces to an individual purchaser							-1.962	-.127	.000
13. Purchaser age 18-24							-1.498	-.091	.000
14. Natural log of the number traces to purchaser's home zip code							.067	.012	.000
15. Purchaser is a female[4]							-1.011	-.054	.000
16. Natural log of the difference in age between purch/poss									
17. Natural log of the distance between purch/poss. zip code[5]									
18. Dummy variable - missing data for purch/poss. Distance[6]									
19. Possessor same last name as purchaser –different person[7]									
20. Possessor's age under 18[8]									
21. Possessor's age 18-24[8]									
22. Possessor's age 25-34[8]									
23. Possessor is female[9]									
24. Recovered firearm isa pistol[10]									
Constant	7.213		.000	11.536		.000	11.924		.000
R^2	.045			.176			.201		
F	1504.71		.000	4374.95		.000	3788.13		.000

Table 17.b – Part 2
OLS Regression Results for Variables Predicting TTC in Years Using Sales Date with Legal Context and State of Purchase Interactions for Purchasers and Possessors who are not the Same Individual

Stages	1,2,3,4			1,2,3,4,5		
Variables	B	Beta	sig	B	Beta	sig
1. Out-of-state pur/ States with *no*Pur or Reg laws [1]	.577	.036	.000	.614	.038	.000
2. Out-of-state pur/ States with Pur*or*Reg laws[1]	.955	.025	.000	.809	.021	.000
3. Out-of-state pur/ States with Pur*and* Reg laws[1]	3.419	.053	.027	2.864	.044	.000
4. Out-of-state pur /CA place of purchase[1]	3.035	.054	.004	2.662	.047	.000
5. In-state-pur/States with Pur*or*Reg laws[1]	.767	.033	.000	.449	.019	.000
6. In-state-pur / States with Pur*and* Reg laws[1]	2.277	.056	.000	1.815	.044	.000
7. In-state-pur /CA place of purchase[1]	2.631	.082	.000	2.450	.076	.000
8. Active dealer – was in business at time[2] of recovery	-2.780	-.196	.000	-2.773	-.196	.000
9. Natural log of the number of traces from a dealer	-.269	-.070	.000	-.167	-.044	.000
10. Natural log of the number of multiple gun sales by a dealer	-.284	-.107	.000	-.214	-.081	.000
11. Dealer is a pawnshop[3]	-1.381	-.084	.000	-.828	-.050	.000
12. Natural log of the number of traces to an individual purchaser	-1.656	-.107	.000	-1.645	-.106	.000
13. Purchaser age 18-24	-.204	-.012	.000	.467	.028	.000
14. Natural log of the number traces to purchaser's home zip code	.161	.030	.000	.278	.051	.000
15. Purchaser is a female[4]	-.702	-.038	.000	-.764	-.041	.000
16. Natural log of the difference in age between purch/poss	1.579	.238	.000	1.874	.283	.000
17. Natural log of the distance between purch/poss. zip code[5]	.384	.124	.000	.411	.133	.000
18. Dummy variable - missing data for purch/poss. Distance[6]	-.766	-.030	.000	-.866	-.033	.000
19. Possessor same last name as purchaser – different person[7]	.370	.012	.000	-.236	-.007	.000
20. Possessor's age under 18[8]				-2.204	-.070	.000
21. Possessor's age 18-24[8]				-2.673	-.177	.000
22. Possessor's age 25-34[8]				-1.848	-.119	.000
23. Possessor is female[9]				.602	.021	.000
24. Recovered firearm isa pistol[10]				-2.568	-.176	.000
Constant	6.775		.000	8.013		.000
R^2	.260			.320		
F	416451		.000	441609		.000

1.Reference category is in state gun purchases for states with no purchase or registration laws,

The purchaser/possessor-relationship variables that enter the model in stage 4 (i.e., the natural log of the difference in age between purchaser and possessor, thenatural log of the distance between the home zip code of the purchaser and the home zip code of the possessor, a dummy for weapons purchased by a female purchaser, a dummy variable for traces where the possessor had the same last name as purchaser but was a different person, and a dummy variable for missing data on distance between purchaser and possessor zip codes) add 5.9% to the variance explained in time-to-crime.

This group of variables has strong mediating effect on the impact of the out-of-place purchases legal context variables. Specifically, when the purchaser/possessor variables enter the model in stage four (see Tables 17.b and 17.c, rows 1, 2, 3, 4) the effects of the out-of-state purchase legal context variables on time-to-crime are reduced by: 1) - 1.205 years for out-of-state purchases of firearms from states with *no* purchase or registration laws, 2) - 1.083 years for out-of-state purchases from state with purchase *or* registration laws, 3) - .964 years for out-of-state purchases from states with purchase *and* registrations laws, and 4) - 1.180 years for out-of-state purchases from California. In sharp contrast (see Tables 14e and 14f, rows 5, 6, 7), the legal context variables the introduction on purchaser/possessor variables has a much smaller impact on the effect in-state purchase legal context variables on time-to-crime.Specifically, time-to-crime changes by: 1) + .004 years for in-state purchases of firearms from states with purchase *or* registration laws, 2) + .198 years for in-state purchases from state with purchase *and* registration laws, and 3) - .185 years for in-state purchases from California. The average reduction in years of time-to-crime across the seven legal context/place of purchase variables with the introduction of purchaser/possessor relationship variables is - .631 years with the great majority of that change concentrated in the out-of-state legal context variables.

Table 17.c.

Mediating Effects on Legal Context/Place of Purchase Variables on Time to Crime of Stage 2 through 5 Determinants of Time-to-Crime for Purchasers and Possessors who are not the Same Individual

	B Coefficients forlegal context/place of purchase variables for each stage of the model estimated in Table 17.be					Change in the B Coefficients oflegal context/place of purchase variables between model stages			
Legal context/place of purchase dummies	Stage 1	Stage 2	Stage 3	Stage 4	Stage 5	Stage 2 - 1 diff	Stage 3 - 2 diff	Stage 4 - 3 diff	Stage 5 - 4 diff
1. Out-of-state pur/ States with *no*Pur or Reg laws [1]	2.298	1.803	1.782	0.577	0.614	-0.495	-0.021	-1.205	0.037
2. Out-of-state pur/ States with Pur*or* Reg laws[1]	2.666	2.109	2.038	0.955	0.809	-0.557	-0.071	-1.083	-0.146
3. Out-of-state pur/ States with Pur*and* Reg laws[1]	5.790	4.534	4.383	3.419	2.864	-1.256	-0.151	-0.964	-0.555
4. Out-of-state pur /CA place of purchase[1]	5.916	4.419	4.215	3.035	2.662	-1.497	-0.204	-1.180	-0.373
5. In-state-pur/States with Pur*or*Reg laws[1]	0.925	0.736	0.763	0.767	0.449	-0.189	0.027	0.004	-0.318
6. In-state-pur / States with Pur*and* Reg laws[1]	2.767	2.108	2.079	2.277	1.815	-0.659	-0.029	0.198	-0.462
7. In-state-pur /CA place of purchase[1]	4.148	2.972	2.816	2.631	2.45	-1.176	-0.156	-0.185	-0.181
Average of the seven legal context/ place of purchase effects and changes	3.501	2.669	2.582	1.952	1.666	-0.833*	-0.086*	-0.631*	-0.285*

***** This is the average reduction in the B coefficients for the legal context/place of purchase dummy variablesassociated with the introduction of stage of explanatory variables.

The introduction possessor related determinants of time-to crime increased the overall variance explained by the model by 6 percent. However, the mediating effect of this block of independent variables on the legal context/place of purchaser variables on time-to-crime was relatively small. The average reduction in years of time-to-crime across the seven legal context/place of purchase variables with the introduction of stage five possessor related variables was .285 years.

4. Analysis of the Impact of Potential Determinants of Time-to-Crime across Firearms Legal Contexts and Place of Purchases for Firearms Purchased after 1994

The results presented in Table 17.b and 17.c provide strong evidence that more stringent purchase and registration legal and regulatory contexts substantially reduce time-to-crime. In addition, the impact of legal context and place of purchase variables is mediated by other determinants of time-to-crime in ways that conform with expectations of how illegal gun markets may operate. Finally, we also know from Table 11that states with more stringent laws and regulatory environments do not appear to trace older firearms more rigorously than their less stringent counterparts, which might produce longer average time-to-crimes in such states. To the contrary, Table 11 shows that states with more stringent firearms laws actually are slightly more likely to have a higher proportion of older firearms not traced to a dealer among recovered guns they submitted to ATF for tracing in comparison to states with less stringent laws.

However, it is possible that an interaction between changes in firearms purchasing patterns and the stringency of legal context could help account for the observed effects of the legal context variables on time-to-crime. This could arise if more stringent contexts began to restrict the purchase of firearms within their boundaries simply by applying their laws and regulations more rigorously. If this is the case, it is most likely to have occurred during the mid-

1990s' with the introduction of the Brady Handgun Violence Prevention Act of 1993 (Brady Law), the Violent Crime Control and Law Enforcement Act of 1994, and the associated significant decrease in FFL dealers during that period.[21]

These changes could have differentially affected the sale of firearms across states, if the new regulatory environment prompted states with more stringent laws to also become stricter in the sale of firearms to their residents or in how they regulated their firearm dealers (then they were before the mid 1990's). If this occurred then we might observe a decrease in time-to-crime in states with more stringent laws because they decreased the pool of newer guns (i.e., firearms purchased after 1994) potentially transferable to illegal channels relative to their more stringent counterparts. Under this scenario, states with stricter firearms laws would have lower time-to-crimes not because of how they regulated the sale and purchase of firearms, but because they began to reduce the sale of firearms to their residents overtime, thereby differentially producing longer time-to-crimes in those states.

Fortunately this hypothesis can be examined very directly by re-estimating the multivariate analysis of time-to-crime that was conducted for all firearms recovered between 2003 and 2006 (presented in Tables 18a, 18b and 18c) but restricting the analysis to the subsample of firearms that were traced to purchases after 1994; that is after the enactment of the Brady Law in 1993 and the Violent Crime Control and Law Enforcement Act in 1994. This

[21]Two major factors appear to have contributed to this decrease in FFLs in the mid-1990s. "The Brady Handgun Violence Prevention Act of 1993, known as the 'Brady Bill,' increased the fees for federal firearms licenses from $10 per year to $200 for the first 3 years, and $90 for each 3-year renewal period. The Violent Crime Control and Law Enforcement Act of 1994, referred to as the 'Crime Bill,' enacted requirements that applicants engaging in firearms businesses notify the chief of their local law enforcement agency of their intent to apply for a license, submit their responsible persons' photographs and fingerprints with their applications, and certify that their businesses would be in compliance with state and local laws, including zoning regulations. Following enactment of the new law, many federal firearms licensees who were not in compliance with local zoning ordinances chose to voluntarily surrender or not renew their licenses." (ATF, Fact Sheet, June 2008, retrieved May 23, 2011, from http://www.atf.gov/publications/factsheets/factsheet-decline-in-ffls.html). The number of FFLs dropped fairly abruptly. Koper (2002) reports that, "in the wake of these initiatives, the number of retail gun dealers declined nearly 70% from 1993 to 1998" (p. 152).

restricts the analysis to newer recovered firearms, and analysis of recovered firearms would only include firearms purchased after the major policy initiatives of the 1990's that may have indirectly altered the regulatory behavior of states.

As in the earlier nation-wide analysis, we examine the effects of the seven interactive legal context/place of purchase variables and potential other determinants of time-to-crime (see Table 18a). As before, the potential determinants of time-to-crime are: 1) legal context/place of purchase variables; 2) dealer characteristics; 3) purchaser characteristics; 4) purchaser possessor relationship; and 5) and possessor and gun characteristics. In this analysis, however, we assess the effects of the potential determinants of time-to-crime for recovered firearms that were traced to firearms purchased after 1994 and where the purchaser and possessor is not the same person.

Descriptive statistics for the dependent variable, time-to-crime measured in years based on firearm purchase and recovery dates and the 24 potential explanatory determinants of time-to-crime, are listed in Table 18b. These are presented again because the sample is different from the earlier nation-wide analyses (see Table 12). The sample size decreases from 225,392 firearms for all recovered from 2003 to 2006 to 141,235 firearms recovered from 2003 to 2006 firearms but limited to only to firearms traced to purchases after 1994 (see Table 12 and 14g for the descriptive statistics from these two samples).

Table 18a – Variables for the Multivariate Analysis of Time-to-Crime Among Purchasers and Possessors Who Are Not the Same Individual for Purchasers and Possessors who are not the Same Individual for Firearms Purchased after 1994

	Mean	Std. Dev.	Cases
Time to crime in years using sale date	4.097	2.9964	141235
		Independent Variables	
1. Out-of-state pur/ States with *n o*Pur or Reg laws [1]	.0315	.17463	141235
2. Out-of-state pur/ States with Pur *or* Reg laws[1]	.0073	.08517	141235
3. Out-of-state pur/ States with Pur *and* Reg laws[1]	.0081	.08979	141235
4. Out-of-state pur /CA place of purchase[1]	.1057	.30749	141235
5. In-state-pur/States with Pur *or* Reg laws[1]	.0270	.16199	141235
6. In-state-pur / States with Pur *and* Reg laws[1]	.0343	.18190	141235
7. In-state-pur /CA place of purchase[1]	.6467	.47799	141235
8. Active dealer – was in business at time of recovery[2]	3.8227	1.80079	141235
9. Natural log of the number of traces from a dealer	2.6413	2.77361	141235
10. Natural log of the # of multiple gun sales sold by a dealer	.2743	.44618	141235
11. Dealer is a pawnshop[4]	.2357	.51366	141235
12. Natural log of the # of traces to an individual purchaser	.2769	.44746	141235
13. Purchaser age 18-24[5]	3.8834	1.30712	141235
14. Natural log of the # traces to purchaser's home zip code	.1929	.39454	141235
15. Purchaser is Female[6]	2.2123	1.06644	141235
16. Natural log of the difference in the age of pur/ poss.	2.9008	2.23689	141235
17. Natural log of the distance between pur/ poss home zip codes	.9122	.28301	141235
18. Dummy variable for missing data on distance between pur/poss home zip codes[7]	.0579	.23349	141235
19. Possessor has same last name as purchaser but different person[8]	.0497	.21726	141235
20. Possessor's age under 18[9]	.3504	.47709	141235
21. Possessor's age 18-24[9]	.3196	.46632	141235
22. Possessor's age 25-34[9]	.0604	.23827	141235
23. Possessor is female[10]	.6936	.46102	141235
24. Recovered firearm is a pistol[11]	4.097	2.9964	141235

As Table 18a also shows, besides the expected decrease in sample size, there are two other important differences in the descriptive statistics between the two samples; specifically, the mean for time-to-crime drops from 8.463 to 4.097 years (a 51.9 percent decrease), and the standard deviation for time-to-crime also decreases 7.0727 to 2.9964 years (a 57.6 percent decrease) when going from the full sample of recovered traced firearms to the sample restricted to only firearms purchased after 1994. These decreases are not surprising, however, given that the sample of firearms restricted to firearms purchased after 1994 systematically excludes firearms with longer time-to-crimes. This produces the observed and expected decreases in average time-to-crime and variability of time-to-crime.

For the 1995 or later purchase date analysis, Table 18b presents the omnibus tests of the model coefficients, and shows that, like the full sample model (see Table 1) each successive stage in the regression model produced a significant improvement to the model from the previous temporal block/stage. The overall variance explained by the model is 20.2 percent which is less than that explained by the full sample (31.8 % percent).

Table 18b.

Model Summary for Table 18c, OLS Regression Results for Variables Predicting TTC in Years Using Sales Date with Legal Context and State of Purchase Interactions for Purchasers and Possessors who are not the Same Individual for Firearms Purchased after 1994

					Change Statistics				
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	R Square Change	F Change	df1	df2	Sig. F Change
Stage 1	.159	.025	.025	2.9581	.025	526.574	7	141227	.000
Stage 1, 2	.330	.109	.109	2.8284	.084	3313.250	4	141223	.000
Stage 1, 2, 3	.382	.146	.146	2.7692	.037	1526.785	4	141219	.000
Stage 1, 2, 3, 4	.432	.186	.186	2.7030	.040	1750.987	4	141215	.000
Stage 1, 2, 3, 4, 5	.449	.202	.202	2.6774	.015	544.424	5	141210	.000

18c presents the estimated effects of the independent variables on time-to-crime for each stage in the model for the truncated purchase date sample. This allows us to examine the total, direct and the mediated effects of these variables on time-to-crime. The seven legal context/place of purchase variables are entered into the first stage of the model and accounts for 2.5% of the variance of time-to-crime. These variables are the primary focus of this part of the analysis and a summary of their direct and mediated effects is presented for each stage of the model in 18c.

18c shows the direct effect of the seven legal context/place of sale dummy variables on time-to-crime when they enter the model at stage one. As in the full sample analysis, the stringency of state legal context show relatively greater effect on time-to-crime than their less stringent counterparts. Specifically, the effect on time-to-crime is: 1) .586 years for in-state purchases from states with purchase *or* registrations laws, 2) .877 years for in-state purchases from states with purchase *and* registration laws and 3) 1.211 years for in-state California purchases (The reference category is in-state purchases from states with no purchase or registration laws) controlling on the other place of purchase legal context variables. Table 18c also shows that for the out-of-state purchases the legal context variables the stringency of state legal contexts again shows a consistent and positive effect on time-to-crime. Specifically, the effect on time-to-crime of: 1) out-of-state purchases from states with *no* purchase or registration laws, 2) states with purchase *or* registration laws, 3) states with purchase *and* registration laws, and 4) California is .869, 1.177, 1.679, and 2.011 years respectively (The reference category is in-state purchases from states with no purchase or registration laws).

One major difference between these results and those from the full sample analysis is that the direct effects for dummy variables representing the legal context/place of purchaser variables 40 to 70 percent lower than in the full sample analysis. This is not particularly surprising,

considering that the overall mean for the truncate 1995 or later purchase year sample is 51.9% lower than the full sample mean for time-to-crime and the standard deviation of time-to-crime is 57.6 percent lower. In this case you would expect to find smaller effects in the truncated sample.

Dealer-related factors enter into the model in the second stage. When dealer-related variables are entered the dealer related factors add an additional 10.9 % to the variance explained in time-to-crime. The dummy variable indicating whether a dealer was still in business in 2006 again shows the greatest effect (*B* = -1.219 years) on time-to-crime among dealer related factors. The *B* for the other categorical dealer variable, the dealer was a pawnshop, shows a negative effect on time-to-crime of -.364. The natural log of the number of traces to a dealer has B of -.045on time-to-crime, and the natural log of the number of multiple sale guns sold by a dealer shows a -.139 effect on time-to-crime.

As in the case of the full sample analysis, the introduction of the dealer related variables into the model show mediating effects that conform to our expectations that these effects would be strongest for jurisdictions with more stringent firearms laws. 18c and summary Table 18d show when dealer related variables enter the model, their greatest mediating effects are on the variables, specifically: 1)out-of-state purchases for firearms recovered in states with purchase *and* registration laws 2) out-of-state purchases for California, 3) in-state purchases for firearms recovered in states with purchase *and* registration laws, and 4) in-state purchases for California which showed reductions in time-to-crime of -.195, -.567, -.114, and -.496 years respectively (see Table 18d, rows 3, 4, 6, 7). In contrast less restrictive jurisdictions showed generally lower reductions in time-to-crime. Specifically, variables representing; 1) out-of-state purchases for firearms recovered in states with no purchase *or* registrations laws, 2) out-of-state purchases for firearms recovered in states with purchase *or* registrations laws, and 3) in-state purchases for

firearms recovered in states with purchase *or* registrations laws show reductions in time-to-crime of -.115, -.150, and -.056years respectively (see Table 18d, rows 1, 2, 5). The introduction of the dealer related indicators in stage two, on average[22], reduces the effect of the legal context/ place of purchase variables by -.242 years, with most of that reduction attributable to the mediating effect on states with more stringent legal contexts.

As in the case of the full sample analysis, the relatively larger mediating effects of the dealer related variables on the more stringent legal context/place of purchase variables (versus those less stringent contexts) conforms to our expectations and indicates that the effect of more stringent legal contexts on time-to-crime may arise from how these states regulate their firearms dealers and monitor dealer purchaser transactions. However, some modest differences arise with the introduction of purchaser related variables.

Purchaser related determinants of time-to-crime enter into the model in stage 3 and account for an additional 3.7% of the variance explained in time-to-crime. This is somewhat more than that added by the purchaser variable in the full sample analysis. Also somewhat in contrast to the full sample analysis the introduction of these variables has a modest mediating effect on the impact of the legal context/place of purchase variables on time-to-crime. As Table 18j show the average reduction in years of time-to-crime across the seven legal context/place of purchase variables is - .128 years and this reduction is more somewhat pronounced for states with more stringent legal firearms laws.

[22] This is the average reduction in the B coefficients for the legal context/place of purchase dummy variables with the introduction of dealer related explanatory variables in stage two.

Table 18.c – Part 1
OLS Regression Results for Variables Predicting TTC in Years Using Sales Date with Legal Context and State of Purchase Interactions for Purchasers and Possessors who are not the Same Individual for Firearms Purchased after 1994

Stages	1			1,2			1,2,3		
Variables	B	Beta	sig	B	Beta	sig	B	Beta	sig
1. Out-of-state pur/ States with *no* Pur or Reg laws [1]	.869	.123	.000	.754	.107	.000	.695	.099	.000
2. Out-of-state pur/ States with Pur*or*Reg laws[1]	1.177	.069	.000	1.027	.060	.000	.912	.053	.000
3. Out-of-state pur/ States with Pur *and* Reg laws[1]	1.679	.048	.000	1.484	.042	.000	1.230	.035	.000
4. Out-of-state pur /CA place of purchase[1]	2.011	.060	.000	1.444	.043	.000	1.263	.038	.000
5. In-state-pur/States with Pur *or* Reg laws[1]	.586	.060	.000	.530	.054	.000	.488	.050	.000
6. In-state-pur / States with Pur *and* Reg laws[1]	.877	.047	.000	.763	.041	.000	.658	.036	.000
7. In-state-pur /CA place of purchase[1]	1.280	.078	.000	.784	.048	.000	.647	.039	.000
8. Active dealer – was in business at time[2] of recovery				-1.219	-.194	.000	-1.190	-.190	.000
9. Natural log of the number of traces from a dealer				-.045	-.027	.000	.030	.018	.000
10. Natural log of the number of multiple gun sales by a dealer				-.139	-.129	.000	-.149	-.138	.000
11. Dealer is a pawnshop[3]				-.364	-.054	.000	-.274	-.041	.000
12. Natural log of the number of traces to an individual purchaser							-.513	-.088	.000
13. Purchaser age 18-24							-.957	-.143	.000
14. Natural log of the number traces to purchaser's home zip code							-.090	-.039	.000
15. Purchaser is a female[4]							-.716	-.094	.000
16. Natural log of the difference in age between purch/poss									
17. Natural log of the distance between purch/poss. zip code[5]									
18. Dummy variable - missing data for purch/poss. Distance[6]									
19. Possessor same last name as purchaser –different person[7]									
20. Possessor's age under 18[8]									
21. Possessor's age 18-24[8]									
22. Possessor's age 25-34[8]									
23. Possessor is female[9]									
24. Recovered firearm isa pistol[10]									
Constant	3.695		.000	5.185		.000	5.786		.000
R^2	.025			.109			.146		
F	526.57		.000	3313.25		.000	1526.79		.000

Table 18c – Part 2
OLS Regression Results for Variables Predicting TTC in Years Using Sales Date with Legal Context and State of Purchase Interactions for Purchasers and Possessors who are not the Same Individual for Firearms Purchased after 1994

Stages	1,2,3,4			1,2,3,4,5		
Variables	B	Beta	sig	B	Beta	sig
1. Out-of-state pur/ States with *no* Pur or Reg laws [1]	.111	.016	.000	.118	.017	.000
2. Out-of-state pur/ States with Pur *or* Reg laws[1]	.378	.022	.000	.356	.021	.000
3. Out-of-state pur/ States with Pur *and* Reg laws[1]	.779	.022	.027	.694	.020	.000
4. Out-of-state pur /CA place of purchase[1]	.697	.021	.004	.632	.019	.000
5. In-state-pur/States with Pur *or* Reg laws[1]	.498	.051	.000	.449	.046	.000
6. In-state-pur / States with Pur *and* Reg laws[1]	.777	.042	.000	.711	.038	.000
7. In-state-pur /CA place of purchase[1]	.667	.041	.000	.635	.039	.000
8. Active dealer – was in business at time[2] of recovery	-1.095	-.175	.000	-1.104	-.176	.000
9. Natural log of the number of traces from a dealer	.050	.030	.000	.071	.043	.000
10. Natural log of the number of multiple gun sales by a dealer	-.153	-.142	.000	-.146	-.135	.000
11. Dealer is a pawnshop[3]	-.310	-.046	.000	-.231	-.034	.000
12. Natural log of the number of traces to an individual purchaser	-.450	-.077	.000	-.478	-.082	.000
13. Purchaser age 18-24	-.543	-.081	.000	-.356	-.053	.000
14. Natural log of the number traces to purchaser's home zip code	-.034	-.015	.000	-.005	-.002	.415
15. Purchaser is a female[4]	-.572	-.075	.000	-.588	-.077	.000
16. Natural log of the difference in age between purch/poss	.492	.175	.000	.567	.202	.000
17. Natural log of the distance between purch/poss. zip code[5]	.197	.147	.000	.204	.152	.000
18. Dummy variable - missing data for purch/poss. Distance[6]	-.417	-.039	.000	-.431	-.041	.000
19. Possessor same last name as purchaser – different person[7]	-.144	-.011	.000	-.245	-.019	.000
20. Possessor's age under 18[8]				-.715	-.052	.000
21. Possessor's age 18-24[8]				-.846	-.135	.000
22. Possessor's age 25-34[8]				-.364	-.057	.000
23. Possessor is female[9]				.057	.005	.059
24. Recovered firearm isa pistol[10]				-.304	-.047	.000
Constant	4.184		.000	4.412		.000
R^2	.186			.202		
F	1750.99		.000	544.42		.000

The purchaser/possessor-relationship variables that enter the model in stage 4 (i.e., the natural log of the difference in age between purchaser and possessor, the natural log of the distance between the home zip code of the purchaser and the home zip code of the possessor, a dummy for weapons purchased by a female purchaser, a dummy variable for traces where the possessor had the same last name as purchaser but was a different person, and a dummy variable for missing data on distance between purchaser and possessor zip codes) add 4.0% to the variance explained in time-to-crime.

As with the full analysis, this group of variables has strong mediating effect on the impact of the out-of-place purchases legal context variables. Specifically, when the purchaser/possessor variables enter the model in stage four (see Tables 14i and 14j, rows 1, 2, 3, 4) the effects of the out-of-state purchase legal context variables on time-to-crime are reduced by: 1) -.584 years for out-of-state purchases of firearms from states with *no* purchase or registration laws, 2) -.534 years for out-of-state purchases from state with purchase *or* registration laws, 3) -.451 years for out-of-state purchases from states with purchase *and* registrations laws, and 4) -.566 years for out-of-state purchases from California. In sharp contrast (see Tables 14e and 14f, rows 5, 6, 7), the legal context variables the introduction on purchaser/possessor variables has a much smaller impact on the effect in-state purchase legal context variables on time-to-crime. Specifically, time-to-crime changes by: 1) + .009 years for in-state purchases of firearms from states with purchase *or* registration laws, 2) + .119 years for in-state purchases from state with purchase *and* registration laws, and 3) + .021 years for in-state purchases from California. The average reduction in years of time-to-crime across the seven legal context/place of purchase variables with the introduction of purchaser/possessor relationship variables is - .284 years with the great majority of that change concentrated in the out-of-state legal context variables.

Table 18d.

Mediating Effects on Legal Context/Place of Purchase Variables on Time to Crime of Stage 2 through 5 Determinants of Time-to-Crime among Purchasers and Possessors who are not the Same Individual for Firearms Purchased after 1994

	B Coefficients forlegal context/place of purchase variables for each stage of the model estimated in Table 18c					Change in the B Coefficients oflegal context/place of purchase variables between model stages			
Legal context/place of purchase dummies	Stage 1	Stage 2	Stage 3	Stage 4	Stage 5	Stage 2 - 1 diff	Stage 3 - 2 diff	Stage 4 - 3 diff	Stage 5 - 4 diff
1. Out-of-state pur/ States with *no* Pur or Reg laws [1]	.869	.754	.695	.111	.118	-0.115	-0.059	-0.584	0.008
2. Out-of-state pur/ States with Pur *or* Reg laws[1]	1.177	1.027	.912	.378	.356	-0.150	-0.115	-0.534	-0.022
3. Out-of-state pur/ States with Pur *and* Reg laws[1]	1.679	1.484	1.230	.779	.694	-0.195	-0.254	-0.451	-0.085
4. Out-of-state pur /CA place of purchase[1]	2.011	1.444	1.263	.697	.632	-0.567	-0.181	-0.566	-0.064
5. In-state-pur/States with Pur *or* Reg laws[1]	.586	.530	.488	.498	.449	-0.056	-0.042	0.009	-0.049
6. In-state-pur / States with Pur *and* Reg laws[1]	.877	.763	.658	.777	.711	-0.114	-0.106	0.119	-0.066
7. In-state-pur /CA place of purchase[1]	1.280	.784	.647	.667	.635	-0.496	-0.138	0.021	-0.032
Average of the seven legal context/ place of purchase effects and changes	1.211	0.970	0.842	0.558	0.513	-0.242	-0.128	-0.284	-0.044

The introduction possessor related determinants of time-to crime increased the overall variance explained by the model by 1.5 percent, and the mediating effect of this block of independent variables on the legal context/place of purchaser variables on time-to-crime was small. The average reduction of time-to-crime for the seven legal context/place of purchase variables with the introduction of stage five (possessor) variables was negligible (.044 years).

5. Geographic Mobility, Stringency of States Laws and Time-to-Crime

A possible interaction between geographic mobility and the stringency of state firearms laws in gun recovery states could under some circumstances, help account for the observed impact of state legal contexts on time-to-crime. This could occur if states with more stringent firearms laws experienced greater rates of persons moving into their states than is the case for states with less stringent laws. Firearms recovered that were purchased by persons who migrated across state borders to the recovery state are likely on average to be older than firearms recovered from in-state purchases. If such a pool of older weapons is greater in states with more stringent firearms laws because they also have higher levels in migration this could increase the pool of older firearms in those states and all other factors being equal lengthen the time-to-crime of firearms recovered within their boundaries.

This proposition can be investigated fairly directly simply by examining the percent of a state's population that has moved into that state from another state.[23] These immigration patterns can then be examined for firearms recovered across states with different firearms legal laws and regulations. Table 19 present these data.

[23] Movers are defined as "people who lived in a different home in 2000 than they did in 1995" (Berkner, B. and Faber, C., September 2003, p. 1). We do not examine the rate of persons migrating from other countries into particular states because very few of such individuals are likely to bring firearms with them

Table 19

Percent Immigration from another State from 1995 to 2000 for Different State Legal Contexts

State Firearms Legal Context	Mean Percent
States with *no* Pur or Reg laws	10.53
States with Pur *or* Reg laws	9.68
States with Pur *and* Reg laws	5.30
California	4.60
Total	9.43

For recovered firearms traced to purchasers who were not the same individual as the firearm possessor, Table 19 presents the percent of the population moved into a state from another state (from 1995 to 2000) across state firearm legal contexts (Berkner and Faber, September 2003 from Table 4. Geographical Mobility for the United States, Regions, and States, and for Puerto Rico for the Population 5 Years and Older: 1995 to 2000). As shown, recovered firearms the average percent of persons who moved from another state into a given recovery state is 10.5 percent for states with *no* purchase or registration laws, 9.7 percent for states with firearms purchase *or* laws, 5.3 percent for states with purchase *and* registration laws, and 4.6 percent for California. Thus, states with more stringent firearms laws and regulations are actually less likely to accumulate an older pool of firearms through migration because their immigration from other states is about half that of states with no purchase or registration laws.

6. The Impact Legal Context on the Rate and Movement of Traced Guns

Table 20 examines the effect of state firearms legal context and the place of sale of a firearm (i.e., guns originally sold in the recovery state versus guns sold outside of the recovery

state)on the distribution of time-to-crime. As expected these results conform to the patterns of mean and median time-to-crime for in and out-of-state traces presented in Table 16. The only difference is that this table allows us to examine how the lower and upper ends of the distribution vary by state firearms legal context and by place of sale. In particular we are most interested in what happens to the distribution of traced firearms with a time-to-crime of one to three years because this is the category of traced firearms most likely to be trafficked to prohibited persons.

The patterns found in Table 20 are quite strong. First we examine firearms purchased and recovered in the same state. For states with no purchase or registration laws 34.2% of the traced firearms have a time to crime less than three years, and this falls to 26.8%, 20.3% and 12.7% for states with progressively more stringent firearms laws and regulations. For out-of-state traced firearms the same pattern holds; 20.3% of the firearms traces have a time to crime less than three years for states with no purchase or registration laws, and falls to 17.4%, 9.5% and 6.5% for states with progressively more stringent firearms laws and regulations. These results are also confirmed by our multivariate analyses. Moreover, the impact of state firearms laws does not appear to be a function of mobility patterns (see Table 19) or more aggressive tracing of guns, especially older firearms, in states with more stringent firearms laws(see Table 11) .

The time-to-crime findings indicate that firearms trafficking appear to be affected by the stringency of state firearms law and regulations. A key policy question then is to what extent does the rate of firearms traces vary with the stringency of firearms law and regulations? To address this question we developed a measure of the rate of firearm traces per person by state firearms legal context, place of purchase and time-to-crime. We are particularly interested in the rate of short time-to-crime traces because these weapons are more likely to be illegally transferred to prohibited persons than firearm traces with longer times-to-crime.

Table 20
Distribution of TTC of Traced Firearms by the Legal Context where the Firearms were Sold for Purchasers and Possessors who are not the same person (Recoveries 2003 to 2006)

1. In-State Sales TTC by State of Sale Gun Laws					
Time-to-Crime	No Purchase or Reg. Law	Has Purchase or Reg. Laws	Has Purchase and Reg. Laws	California	Total
% 1 to 3 yrs	34.2	26.8	20.3	12.7	30.8
% 4 to 6 yrs	18.4	18.1	15.4	12.3	22.7
% 7 to 10 yrs	18.3	21.4	19.6	18.5	23.1
% 11 + yrs	29.2	33.7	44.7	56.5	23.4
Total %	100.0	100.0	100.0	100.0	100.0
Tot. Traces	111,898	22,984	7,011	11,665	153,558
2. Out-of-State TTC Sales by State of Sale Gun Laws					
% Time-to-Crime	No Purchase or Reg. Law	Has Purchase or Reg. Laws	Has Purchase and Reg. Laws	California	Total
% 1 to 3 yrs	20.3	17.4	9.5	6.5	18.9
% 4 to 6 yrs	17.1	17.2	11.7	9.6	21.7
% 7 to 10 yrs	20.5	22.3	17.6	16.6	26.6
% 11 + yrs	42.0	43.0	61.2	67.3	32.7
Total %	100.0	100.0	100.0	100.0	100.0
Tot. Traces	59,864	8,106	2,759	3,728	74,457

The rate of traced firearms was restricted to firearm traces where the purchaser and possessor are different persons, as in the previous analyses of time-to-crime. The numerator for the rate of traced firearms measure was providedby the number of firearms traces (where the purchaser and possessor is not the same person) for firearms recovered by law enforcement

between 2003 and 2006. These traces were aggregated by the stringency of state firearms laws, the place of sale of a firearm (i.e., guns originally sold in the recovery state versus guns sold outside of the recovery state) and time-to-crime divided into four different levels (i.e., one to three years, four to six years, seven to ten years and eleven or more years). The denominator for rate measure was the estimated number of firearm owners in a state.

The number of gun owners in a state was estimated using percent of households in a state that reported there was a gun in their household. The estimated proportion of households with a gun was obtained from the Behavioral Risk Factor Surveillance System (BRFSS) 2001 survey of 200,000 households. The number of households in a state (from the 2000 Census) was multiplied by the proportion of households reporting they that they have a firearm (from the BRFSS 2000 survey) to yield the number of households in a state with firearms. The number of households with firearms was multiplied by the average number of persons per household in each state (from the 2000 Census) to yield the number of gun owners in a state.

The estimated number of gun owners in a state, rather than a state's residential population is used to calculate the firearms traces rates, because traced rates based on states' residential populations would spuriously decrease the firearm trace rates of states with less stringent and spuriously increase the trace rates in states with more stringent laws. This occurs because a larger proportion ofthe residentsin states with less stringent firearms laws own guns than is the case for residents in states with less stringent firearms laws than in states with less stringent laws. The implications of using the estimated number of gun owners for a denominator of a gun trace rate measure versus using residential population is shown in Table 21. Clearly the denominators for a trace rate measure are larger for states with less stringent laws using Census 2000 residential population estimates than is the case using the estimated number of gun owners in states. As

Table 21 shows, using state residential population would yield *relatively* larger denominators for states with more stringent laws than in states with less stringent laws compared to denominators using estimated number of gun owners in a state.

Table 21
Resident and Gun Owner Population by State Firearm Laws

	Resident and Gun Owner Population			
State Legal Firearm Context	Resident Population	% Resident Population	Est. No. of Gun Owners	% No. of Gun Owners
No Purchase or Reg. Law	157765380	56.2	58095663	66.4
Has Purchase or Reg. Laws	40917369	14.6	12872898	14.7
Has Purchase and Reg. Laws	48295450	17.2	9472213	10.8
California	33871648	12.1	7031819	8.0
Total US (without DC)	280849847	100.0	87472593	100.0

Table 22 examines the rate of gun traces per 100,000 gun owners in a state by the stringency of state firearms law and the place of sale (i.e., guns originally sold in the recovery state versus guns sold outside of the recovery state) and time-to-crime divided into four different levels (i.e., one to three years, four to six years, seven to ten years and eleven or more years). As Table 22 shows, for short time-to-crime guns, the rate of gun traces per 100,000 gun owners varies significantly by the stringency of state firearms laws. For firearms purchased and recovered in the same state, and for traces with a time-to-crime of one to three years, the rate of gun traces 100,000 gun owners is: 65.8 for states with *no* purchase or registration laws; 47.9 for states with purchase *or* registration laws; 15.0 for states with purchase *and* registration laws, and 21.1 for California. Likewise, for firearms originally purchased outside of the recovery and for

traces with a time-to-crime of one to three years, the rate of gun traces per 100,000 gun owners is: 20.9 for states with *no* purchase or registration laws, 11.0 for states with purchase *or* registration laws, 2.8 for states with purchase *and* registration laws, and 3.4 for California. These same patterns hold for traced guns with a relatively shorter time-to-crime of four to six years for both in-state and out-of state traced firearms. The pattern of gun trace rates for out-of-state short time-to-crime traces is important because it is a potential indicator of the active diversion of firearms from legal commerce to other states.

Table 22
Gun Traces per 100,000 Gun by the Legal Context where the Firearms were Sold for Purchasers and Possessors who are not the same person (Recoveries 2003 to 2006)

1. In-State Gun Trace Rate by State of Sale Gun Laws					
Time-to-Crime	No Purchase or Reg. Law	Has Purchase or Reg. Laws	Has Purchase and Reg. Laws	California	Total
1 to 3 yrs	65.8	47.9	15.0	21.1	54.1
4 to 6 yrs	35.4	32.4	11.4	20.4	31.1
7 to 10 yrs	35.2	38.2	14.5	30.7	33.0
11 + yrs	56.2	60.1	33.1	93.7	57.3
Tot. in-state rate	192.6	178.5	74.0	165.9	175.5
2. Out-of-State Sales Gun Trace Rate by State of Sale Gun Laws					
Time-to-Crime	No Purchase or Reg. Law	Has Purchase or Reg. Laws	Has Purchase and Reg. Laws	California	Total
1 to 3 yrs	20.9	11.0	2.8	3.4	16.1
4 to 6 yrs	17.7	10.9	3.4	5.1	14.1
7 to 10 yrs	21.1	14.1	5.1	8.8	17.4
11 + yrs	43.3	27.1	17.8	35.7	37.6
Tot. out-of-state rate	103.0	63.0	29.1	53.0	85.1
Gun Owner Population	58,095,663	12,872,898	9,472,213	7,031,819	87,472,593

These same patterns also hold, but to a lesser degree for traced guns with longer time-to-crimes (seven to ten years, and eleven plus years). However, there is one major exception to these patterns. For traced firearms with a time-to-crime of eleven or more years California shows a higher rate of gun traces per 100,000 gun owners than any other firearms legal context, specifically 93.7 per 100,000 for California versus 56.1 for states with *no* purchase or registration laws, 60.1 for states with purchase *or* registration laws, 33.1 for states with purchase *and* registration laws.

The likely reason for California's divergence from its pattern is that California appears to have tightened the regulation of firearms approximately a decade before the time frame for firearms used in this study (i.e., firearms recovered and traced by law enforcement between 2003 and 2006) leading to a pattern of relatively lower rates of traces guns for shorter time-to-crimes traces. Figure 4 shows the changes in California firearms laws that affected purchase transactions and dealer licensure requirements between 1994 and 1997. The information is drawn from the Dealer's Record of Sale (DROS) Register History (Revised 2005). In 1994 California required for the first time that the purchasers of handguns obtain a basic Firearm Safety Certificate prior to taking possession of a handgun. In the following year, 1995, the DOJ Centralized List (CL) of Firearms Dealers was enacted into law. Under this law Firearms Dealers had to be established on the CL (cost $85.00 per year per store location) to be able to obtain DROS registers and/or submit them to DOJ for background check processing. Establishing centralized list of dealers and integrating that with the process of obtaining DROS registers may have helped enhance the administrative oversight firearms dealers in California. Such over sight may have been further advanced with the computerization of the California DOJ processing firearms sales and background checks.

Figure 4

Changes in California firearms laws that affected purchase transactions and dealer licensure requirements:1994 – 1997*

1994 - Purchasers of handguns are required to obtain a basic Firearm Safety Certificate prior to taking possession of a handgun.
1995 - The DOJ Centralized List (CL) of Firearms Dealers was enacted into law. Firearms Dealers had to be established on the CL (cost $85.00 per year per store location) to be able to obtain DROS registers and/or submit them to DOJ for background check processing.
1997 - The old process of dealers mailing completed DROS registers to DOJ for processing was replaced with a new electronic/telephonic firearms eligibility background check process. The waiting period for both handguns and long guns was reduced to 10 days.

*Dealer's Record of Sale (DROS) Register History (Revised 2005)

Empirical support for the proposition that California's tightening of the regulation of the purchase and sale of firearms in the mid 1990's may have reduced the number of firearms diverted from legal channels is provided by comparing relative over time changes in the number for traced firearms by year of purchase for California versus all other states.[24]Taking 1993 a base comparison year, we can compare the relative change is the number of traced firearms by the year they were purchased for all firearms recovered by law enforcement between 2003 and 2006.We selected 1993 because it was prior to the enactment of two California laws that may have tightened regulation of firearms purchases and sales. Gun sales saw a significant increase in 1993 because of the enactment of the Brady Gun law. As a result a relatively high number of traced firearms purchased were also purchased in 1993 in both California and in other states. We compare the number of traced firearms purchased in 1993 with the numbers purchased in 1996,

[24] As with previous analyses, firearms traces are restricted to traces those where the purchaser and possessor are different persons.

1997, 1998 and 2000[25] for both California and all other states. For all States other than California, 12,035 traced firearms were purchased in 1993. The number of trace firearms purchased decreased from 1993 by 18.3% in 1996, 15.3% in 1997, and 12.3% in 1998 and increased by 1.8% in 2000. For California, 1,230 traced firearms were purchased in 1993. The number of purchased firearms decreased from 1993 by 50.49% by 1996, 47.4% in 1997, 52.4% and 1998 and increased by 58.8% in 2000.[26]

The greater relative decline in traced firearms in Californian compared with other states after 1993 coincided with the enactment of more stringent firearms regulation and possibly regulatory over sight in California. In effect, this suggests that California have shifted from a less stringent firearms regulation context one that was more stringent. This shift in the may account for California's relatively high level to traced firearms per 100,000 gun owners compared with other states for longer time-to-crime traces and it's relatively much lower rates of traced firearms for shorter time-to-crime. California's move from a less stringent to a more stringent firearms regulatory context appears to have reduced the rate of traced firearms to prohibited persons in California and outside of California.

7. Summary of Impact Legal Context and Other Determinants on Time-to-Crime

The stringency of state level firearms laws and regulations and, in the case of California, the regular enforcement of state regulations leads to consistently longer time-to-crime for firearms recovered within their jurisdictions. These patterns persist for whether firearms were purchased within the recovery jurisdiction or in another state. These patterns do not arise because states with more stringent firearms laws are more rigorous in tracing firearms. To the contrary states with more stringent legal context actually have slightly higher proportions of older

[25] In 2000 California State law was amended to limited purchasers/transferees of handguns to 1-handgun per 30 day period. {12072(a) (9) PC} (b).
[26]These same patterns hold only are somewhat greater if 1992 is chosen as a base comparison year.

recovered firearms that could not be traced to a purchaser, and if such firearms were traced to a purchaser, this would produce slightly longer time-to-crimes for firearms recovered within their boundaries.

With the addition, of other potential determinants of time-to-crime into the analysis, the effect of legal context is mediated in a manner that conforms to the expectations of how firearms regulations can operate to control the illegal distribution guns. Specifically, when dealer related variables are entered into the overall model of time-to-crime the effects of states with more stringent laws and regulations are reduced more than states without such laws, as would be expected given that state firearms laws and regulations should work through their regulation on dealers. In addition, a number of other potential determinants of time-to-crime have effects on time-to-crime that indicate they are potential indicators of illegal firearms trafficking.

The results of the analysis hold when the effect of legal context is also examined in combination with place of purchase. In this case, the stringency of state firearms laws and regulations consistently holds for recovered firearms purchased in recovery states and those purchased outside of recovery state boundaries. Once again the effect of legal context is mediated in a manner that conforms to the expectations of how firearms regulations can operate to control the illegal distribution guns. Specifically, when dealer related variables are entered into the overall model of time-to-crime the effects of states with more stringent laws and regulations are reduced more than states without such laws for both in-state and out-of-state purchases. Also, when purchaser-possessor relationship variables enter the model the effects of out-of-state purchase legal context variables are mediated in an expected manner.

The nationwide analysis was also conducted for only firearms purchased after 1995 to take into account a possible interaction between changes in firearms purchasing patterns and the

stringency of legal context. This could arise if more stringent contexts began to restrict the purchase of firearms within their boundaries simply by applying their laws and regulations more rigorously. If this is the case, it is most likely to have occurred during the mid-1990s with the introduction of the Brady Handgun Violence Prevention Act of 1993 (Brady Law), the Violent Crime Control and Law Enforcement Act of 1994, and the associated significant decrease in FFL dealers during that period. If this occurred then we might observe a decrease in time-to-crime in states with more stringent laws because they decreased the pool of newer guns (i.e., firearms purchased after 1994) potentially transferrable to illegal channels relative to their more stringent counterparts. However, the analysis conducted with the truncated nationwide sample of firearms purchased only after 1994, show that the legal context variables continued to have positive effect on time-to-crime.

Finally, the effect of legal context does not arise because of geographic mobility patterns among states. Analysis of state migration statistics indicates that the effects of state legal context do not arise from the migration of firearms owners from less states with more stringent laws to states with less stringent laws thereby creating a larger relative pool of firearms to be stolen from owners and producing relatively longer time-to-crimes in such states. Indeed, quite the opposite appears to be the case, in that states that have more stringent firearms laws and regulations appear less likely to accumulate an older pool of firearms through migration because their immigration from other states is about half that of states with no purchase or registration laws.

V. California Comparative Analysis of Illegal Firearms Markets: Standard ATF Trace Data versus Trace Data Enhanced with Matched DROS Information

The comparative analysis of illegal firearms markets using standard ATF trace based data versus illegal firearm markets measured using trace data enhanced with matched DROS information employs two analytic strategies. First, we compare illegal firearm market characteristics using information from ATF trace (based primarily on first-time, retail-sourced information) versus illegal firearms market characteristics using enhanced trace data that is updated with information matched California DROS data. This latter data source provides information on the last known purchaser of a firearm recovered by law enforcement. As indicated earlier in Table 17, of the 10,273 firearms where ATF and CA DROS data was matched, there were 1978 cases (19.3 percent) where DROS sale data was matched to a later transaction.

The second major analytic strategy examines how market characteristics and indicators of suspicious behavior and/or suspicious actors may affect a key indicator of illegal firearms markets, the time-to-crime for firearms recovered in California between 2003 and 2006. The potential impact of firearms market characteristics and indicators of suspicious behavior/persons on time-to-crime is examined using indicators based on ATF trace data only (i.e., primarily on first-time retail purchase and sale data) versus an analysis using enhanced trace data with updated with California DROS information. These indicators are grouped into four categories: 1) dealer characteristics; 2) purchaser characteristics; 3) purchaser possessor relationship; 4) and possessor and gun characteristics. This ordering of the factors loosely corresponds to the sequence of actors and transactions associated with firearms trafficking.

A. Analysis of Changes in Illegal Firearms Markets Characteristics Using Enhanced Trace Data Updated with California DROS Information.

The comparative analysis first examines potential differences in the temporal and geographic dimensions of illegal firearm markets, that is time-to-crime and the dealer-to-recovery distance (that is the distance from the recovery of a firearm in a crime to the dealer associated with the firearm's sale). We also examine changes in the distribution of purchasers of firearms who were also identified as possessors of the weapon when it was recovered by law enforcement. The purchaser-possessor relationship is important, because the subgroup of recovered firearms where the purchaser and possessor are different persons are the most likely to be trafficked firearms.

Table 23 presents a comparison of time-to-crime based on ATF trace data only versus enhanced trace data updated with California DROS information. For the 10,273 recovered firearms that where ATF trace data and California DROS data were matched, time-to-crime the mean number of years of time-to-crime decreased from 5.09 years using ATF trace data only to 3.84 years based on enhanced trace data that incorporates information on the last known purchaser from DROS data (a statistically significant difference at $p<.001$). In addition, the median time-to-crime dropped from 4.33 to 3.54 years (a decrease of 18.2%) and the percent of firearms with a time-to-crime of three years or under increased from 37.8 to 44.0 percent (a relative increase of 16.4.9%) for enhanced trace data compared with ATF only trace information. This indicates that adding information on last known purchasers using California DROS data not only help provide a more accurate overall assessment of gun markets (e.g., the distribution of time-to-crime), but also improves our ability to elevate some "cold" cases to be candidates for investigation.

Table 23

Comparison of Time-to-Crime for ATF Trace Only Data and for Enhanced Trace Data Updated with California DROS Data

Time-to-crime		Only ATF Trace Data	Enhanced Trace Data
0 to one year	N	1784	2092
	%	17.4	20.4
Two to three years	N	2093	2427
	%	20.4	23.6
Four to five years	N	1902	2162
	%	18.5	21.0
Six or more years	N	4494	3592
	%	43.7	35.0
Total	N	10273	10273
	%	100.0	100.0
	Mean	5.09	3.84
	Median	4.33	3.54
Paired sample t-test for distance to dealer		t= -2.770, p<.001, df = 10272	

The comparison of the distance from firearm recovery location to the location of the dealer identified as selling the weapon (referred to as distance-to-dealer) for ATF trace only data versus enhanced trace data updated with California DROS information is presented in Table 24. For the 10,273 recovered firearms where ATF trace data and California DROS data were matched, the distance-to-dealer for recovered firearms showed a statistically significant decrease (i.e., $p < .001$) in the average distance-to-dealer of 81.25 miles for ATF trace data to only 34.21 miles for the enhanced trace data incorporating last known purchaser DROS information.

Table 24

Comparison of The Distance from a Firearm Recovery Location to the Sale Dealer Location for ATF Trace Only Data and for Enhanced Trace Data Updated with California DROS Data

Distance to Dealer		Only ATF Trace Data	Enhanced Trace Data
0 - 5	N	2015	2192
	%	24.2	26.2
6 - 10	N	1856	1968
	%	22.3	23.5
11 - 25	N	2094	2100
	%	25.1	25.1
26 - 50	N	970	942
	%	11.6	11.3
51 - 100	N	609	585
	%	7.3	7.0
101 - 250	N	312	302
	%	3.7	3.6
251 +	N	484	278
	%	5.8	3.3
Total	N	8340	8367
	%	100.0	100.0
Mean		81.25	34.21
Median		12.0	11.0
Paired sample t-test for mean distance to dealer		t= 13.239, p<.001, df = 8339	

However, in contrast to the decrease in average distance for dealer-to-recovery (i.e., 81.25 to 34.21), the median distance only dropped from 12 to 11 miles, and the percent of firearms that were recovered within 10 or less miles the dealer associated with the sale of the gun showed a modest increase from 46.5 percent to 49.7 miles for the enhanced trace data. The difference between the decrease in average distance versus median distance arises from the fact that some recovered firearms were first purchased out of California and were subsequently

matched to a later purchase in California DROS data. This would result in fairly substantial decrease in average distance but not necessarily median distance from recovery-to-dealer when are comparing ATF trace only data (with traces data from some dealers outside of California) to enhanced trace data which by definition is only traced to California dealers. Dealers associated with out-of-state purchases would tend to be purchased farther from firearm recovery locations then firearms purchased within California. This would also help explain why the dealer-to-recovery distance for traces matched to California DROS in state purchases is also smaller that the dealer-to-recovery distances found in the national data presented in Table 7 (which is based on ATF trace information on firearms recovered throughout the United States)

Table 25 examines the purchaser-possessor affiliation for firearms recovered by law enforcement for ATF trace only data versus enhanced trace data. For the 10,273 recovered firearms where ATF trace data and California DROS data were matched, the proportion of recovered firearms where the purchaser was the same person as the possessor of the recovered firearm showed a statistically significant increase (i.e., $p < .001$) from 23.8 percent for ATF trace only data to 31.3 percent based on enhanced trace data. In addition, the percent of recovered firearms where the purchaser and possessor were not the same person decreased from 49.1 percent to 46.8 percent, and the proportion of recovered firearms where there was insufficient information to identify whether the purchaser and possessor were or were not the same person decreased from 27.1 percent to 21.9 percent.

Table 25

Comparison of Purchaser Possessor Affiliation for ATF Trace Only Data and for Enhanced Trace Data Updated with California DROS Data

Purchaser/Possessor Affiliation		Only ATF Trace Data	Enhanced Trace Data
Insufficient Information	N	2778	2254
	%	27.0	21.9
Pur/poss Not Same Person	N	5046	4805
	%	49.1	46.8
Pur/Poss Same Person	N	2449	3214
	%	23.8	31.3
Total	N	10273	10273
	%	100.0	100.0
Z-test for proportion for pur/poss same person		Z= 11.934, p<.001	

Next we will consider factors that are potential determinants of time-to-crime. Most of these factors represent possible indicators or firearms trafficking as well as characteristics of firearms markets. These factors are grouped into four categories: 1) dealer characteristics; 2) purchaser characteristics; and 3) purchaser-possessor relationship indicators. A fourth category of potential determinants of time-to-crime, possessor and gun characteristics, remain the same for both ATF only data and enhanced trace data with updated California DROS information. Since they do not change we will not examine them in this section but they will be included in the analysis of time-to-crime. The ordering of these variables loosely corresponds to the sequence of actors and transactions associated with firearms trafficking.

Table 26compares the distribution of recovered firearm traces by the number of traces to a dealer for ATF trace only data versus enhanced trace data updated with California DROS data. When the distribution of the 10,255 recovered firearms where ATF trace data aggregated the dealer of sale is compared with the 10,209 cases where enhanced trace data were aggregated to

the dealer of sale we find there is a small but statistically significant decrease in the mean number of traces associated with the dealer of sale from 108.7 mean traces per dealer to 107.88 traces per dealer. The median number of traces fell from 48 to 47 traces per dealer and the percentage of dealers with only one firearm traced to them fell from 7.4 to 3.2 percent of the dealers.

Table 26

Distribution of Traces by the Number of Traces to a Dealer for ATF Trace Only Data and for Enhanced Trace Data Updated with California DROS Data

Traces to a Dealer		Only ATF Trace Data	Enhanced Trace Data
1 trace	N	759	322
	%	7.4	3.2
2 -5 traces	N	1028	895
	%	10.0	8.8
6 - 10 traces	N	871	1046
	%	8.5	10.2
11 - 25 traces	N	1219	1502
	%	12.6	14.7
26 - 50 traces	N	1328	1602
	%	12.9	15.7
51 - 100 traces	N	1737	1628
	%	16.9	15.9
101 plus traces	N	3259	3214
	%	31.7	31.5
Total	N	10255	10209
	%	100.0	100.0
Mean		108.78	107.88
Median		48.0	47.0
Paired sample t-test for distance to dealer		t= 34.30, p<.001, df = 10208	

Next, we examine purchaser characteristics. Table 27 presents a comparison of purchaser gender based on ATF trace data only versus enhanced trace data updated with California DROS data. For the 10,273 recovered firearms that where ATF trace data and California DROS data were matched, the proportion of purchases that were male showed virtually no change for cases based on ATF trace data only (88.6 percent) compared to cases using enhanced trace data (88.6 percent). Thus, the addition of last known purchaser data with enhanced trace data did not change the gender distribution of crime firearm purchasers.

Table 27

Comparison of the Purchaser's Gender for ATF Trace Only Data and for Enhanced Trace Data Updated with California DROS Data

Purchaser Gender		Only ATF Trace Data	Enhanced Trace Data
Male	N	8553	8767
	%	88.6	88.6
Female	N	1098	1127
	%	11.4	11.4
Total	N	9651	9894
	%	100.0	100.0
Chi-Square test		Chi-square = 0.000514, p=.982, df = 1	

Table 28 examines purchaser age of recovered firearms for ATF trace data only versus enhanced trace data. As we found for the gender of purchasers, the age of purchasers also shows show virtually no change for cases based on ATF trace data only (average purchaser age, 35.25 years) compared to cases based on enhanced trace data (average purchaser age, 35.4 years). Thus, the addition of last known purchaser data with enhanced trace data does not change the age distribution of crime firearm purchasers.

Table 28

Comparison of the Purchaser's Age for ATF Trace Only Data and for Enhanced Trace Data Updated with California DROS Data

Purchaser Age		Only ATF Trace Data	Enhanced Trace Data
18 – 24	N	2347	2223
	%	23.4	21.6
25 – 34	N	3315	3422
	%	33.0	33.3
35 - 49	N	2936	3080
	%	29.2	30.0
50+	N	1441	1548
	%	14.4	15.1
Total	N	10039	10273
	%	100.0	100.0
Mean		35.25	35.77
Median		32.00	33.00
Paired sample t-test for mean distance to dealer		t= -6.33, p<.001, df=10038	

The final purchaser characteristic examined is the number of traced firearms associated with a purchaser. Table 29 compares the number of traced firearms associated with a purchaser based on ATF trace data only versus enhanced trace data. The number of traces associated with a purchaser is based on the 10,273 traces in the matched ATF trace and California DROS data set. There are 708 cases with missing information on this measure for the ATF trace data only. These cases are missing because some component of the purchaser key was missing in ATF trace data, which usually was birth month or year information.

As Table 29 indicates, the number of traces associated with a purchaser shows a modest statistically significant increase between cases based on ATF trace data only compared to cases based on enhanced trace data with the average number of traced guns per purchaser rising from

an average of 1.34 firearm traces to and an average of 1.58 traced guns per purchaser. Thus, the addition of last known purchaser data with enhanced trace data does not change the age distribution of crime firearm purchasers.

Table 29

Comparison of the Number of Traces to a Purchaser for ATF Trace Only Data and for Enhanced Trace Data Updated with California DROS Data

Traces to a Purchaser	Only ATF Trace Data	Enhanced Trace Data
Mean	1.34	1.58
Median	1.0	1.0
N	9565	10273
Paired sample t-test for distance to dealer	t= -16.80, p<.001, df = 9565	

We next examine indicators of the relationship between the purchaser of the recovered firearm and the possessor of the gun, including the distance from the home residence of the purchaser of a recovered firearm to the residence of the possessor (Table 30) the age proximity between the purchaser of a firearm and the possessor of the firearm (Table 31), and cases where the last name of a purchaser is the same as a possessor but the birth date of is different (Table 32). The information on these indicators is presented for the subsample cases where we have determined that the purchaser and possessor of the recovered firearm are not the same individual (based on the enhanced trace data). We do this because purchaser/possessor relationship comparisons are the most relevant where purchaser and possessor are different persons.

Table 30

Comparison of the Purchaser/Possessor Residence Proximity (for Purchaser/Possessor Unknown) for ATF Trace Only Data and ATF/California DROS Updated Data

Purchaser/Possessor Residence Proximity		Only ATF Trace Data	Enhanced Trace Data
0 -5 miles	N	1099	1278
	%	35.0	39.3
6 - 10 miles	N	468	494
	%	14.9	15.2
11 - 25 miles	N	669	659
	%	21.3	20.2
26 - 50 miles	N	331	338
	%	10.5	10.4
51 – 100 miles	N	245	250
	%	7.8	7.7
101 plus miles	N	332	236
	%	10.6	7.3
Total	N	3144	3255
	%	100.0	100.0
Mean		67.49	32.83
Median		11.00	9.00
Paired sample t-test for mean distance to dealer		t= 8.298, p<.000, df=3143	

Table 30 presents a comparison of the distance from the home residence of purchaser of a recovered firearm to the residence of the possessor for ATF trace data only versus enhanced trace data. Both these measure have significant missing data because home residence address data was missing or incomplete for firearm possessors. For recovered firearms that where ATF trace data only, the average distance between purchaser and possessor residence shows a statistically significant decrease from an average of 67.49 miles to 32.83 miles, however the median distance between residences shows a smaller decrease from 11 to 9 miles. The difference in these two measures arises from the decrease in the proportion of cases where the purchaser and possessor live more than 101 miles distant from each other. These declined from 10.6 percent of the cases based on ATF data only to 7.3 percent of the cases with enhanced trace data.

Table 31 presents a comparison of age proximity between the purchasers of recovered firearms and the possessors for ATF trace data only versus enhanced trace data. Average age proximity for purchasers and possessors shows a modest decrease (but statistically significant decrease) in age difference from an average of 14.82 years difference to 14.03 age difference and with a drop in the median of difference from11 to 10 years, for ATF trace data only versus enhanced trace data.

Table 31

Comparison of the Purchaser/Possessor Age Proximity (for Purchaser/Possessor Unknown) for ATF Trace Only data and for Enhanced Trace Data Updated with California DROS Data

Purchaser/Possessor Age Proximity		Only ATF Trace Data	Enhanced Trace Data
0 -1 years	N	623	687
	%	13.3	14.3
2 - 5 years	N	839	921
	%	17.9	19.2
6 - 10 years	N	779	828
	%	16.6	17.2
11 - 15 years	N	599	573
	%	12.7	11.9
16 – 25 years	N	890	876
	%	18.9	18.2
26 years plus	N	969	920
	%	20.6	19.1
Total	N	4699	4805
	%	100.0	100.0
Mean		14.82	14.03
Median		11.00	10.0-
Paired sample t-test for mean distance to dealer		t= 7.824, p<.000, df=4698	

Table 32 presents a comparison of purchasers and possessors with the same last name but who were identified as different persons because their birthdates (based on year and month) or their first names were different for ATF trace only data and for enhanced trace data. The proportion of firearms with where the purchaser and possessor had the same last name but were different persons was 8.2 percent of the cases using ATF data only and 9.6 percent of the cases

based on enhanced trace data updated with California DROS information. This modest increase was statistically significant at a p value of .016.

Table 32

Purchaser/Possessor Same Last Name but Diff Person for ATF Trace Only Data and for Enhanced Trace Data Updated with California DROS Data

Purchaser/Possessor Same Last Name but Diff Person		Only ATF Trace Data	Enhanced Trace Data
Not Same Last Name	N	4410	4343
	%	91.8	90.4
Same Last Name	N	395	462
	%	8.2	9.6
Total	N	4805	4805
	%	100.0	100.0
Chi-square test		Chi-square = 5.75, p = .016, df = 1	

The type of transactions associated with the ATF trace data sample, for the matched ATF trace data and California DROS data, should almost entirely be dealer sale transactions because they are based ATF tracing procedures, which generally go to first-time retail dealer/private citizen purchases. However, as noted, there are exceptions in ATF tracing procedures that do not follow this process. In particular, ATF may complete some traces directly by referencing a state firearms registry database (DROS in the case of California) or by referencing ATF"s of out-of-business records or the agency's multiple firearms purchase records. ATF traces using California DROS records will provide information on the type of transaction associated with the sale of a firearm or transfer in the case of pawnshop redemptions.

Table 33 examines the type sale/transfer associated with firearm transactions for firearms based only enhanced trace data. Most ATF traced data should represent a transaction through a firearm dealer unless the state registration system was used to trace the firearm, in which case a private citizen transaction might be identified. The major categories of sales/transfers associated with firearms transactions in California are; 1) the sale of a curio firearm or other transactions including law enforcement and out-of-state transfers, 2) the sale of a firearm from one private citizen to another private citizen (though a licensed dealer), 3) the redemption of a firearm from a pawnshop, and 4) the sale of a firearm by a licensed dealer. Table 33 shows that 86.2 percent of the recovered firearms were associated with sales from licensed dealers, 9.2 percent of the cases were private citizen transactions, 2.2 percent were pawnshop redemptions and 2.2 percent were associated with other types of transactions.

Table 33

Type of Firearm Sale/Purchase for Enhanced Trace Data Updated with California DROS Data

Type of Sale/Purchase		Enhanced Trace Data
1. Curio/Other	N	231
	%	2.2
2. Private	N	940
	%	9.2
3. Pawn/redeem	N	250
	%	2.4
4. Dealer Sale	N	8852
	%	86.2
Total	N	10273
	%	100.0

However, previous analyses of DROS data have also indicated that approximately 10% of handgun transfers are identified as private party transactions (unpublished data, G Wintemute). This may represent substantial underreporting of private parties by retailers, or more likely the fact that many private party transfers are not routed through licensed retailers, though state law requires them to be. The best available estimate, based on nationwide survey data, is that as many as 40% of all firearm acquisitions involve private party transfers.(Cook and Ludwig, 1996).

B. Impact of Determinants of Time-to-Crime Using California DROS Data on Last Known Purchaser

As with the nationwide analyses, we examine the potential determinants of time-to-crime using California DROS data on last known purchaser for the sample of cases that are restricted to purchasers and possessors who are not the same individuals. The sample is different the national analyses, however, in two ways. First, the analysis is restricted to firearms recovered traced (matched to a California DROS record) to a sale in California, whereas in the national analysis examined firearms recovered in a given state traced to firearms that were sold in any of the fifty states. Second and most important the analysis of time-to-crime is based on last known purchaser not on ATF trace information which is usually only the first purchaser. In addition, the analysis is conducted for the sample of all types of sales and for dealer-only sales.

As in the nationwide analysis, we examine the same groups of potential determinants of time-to-crime, with the exception of the legal context variables, specifically: 1) dealer characteristics; 2) purchaser characteristics; 3) purchaser possessor relationship; and 4) and possessor and gun characteristics. In addition, there are some differences in the variables contained within each of the explanatory subgroups due to data availability and sample differences. Thus, for the dealer related determinants of time-to-crime we do not have out-of-

state sales because the sample of recovered firearms is only for firearms purchased in California. Instead, the analysis has the number of miles from the sale dealer to the location where the firearm was recovered. In addition, we do not have information in this phase of the analysis for multiple sale purchases associated with a dealer and whether the dealer was a pawnshop.

We conduct the analysis on subset dealer only sales as well as the broader sample, because the procedures and computerized record keeping in place in California dealer-only sales are very likely to be recorded and contain accurate information. In contrast, other types of sales we have reason to believe other types of sales (e.g., private party sales) are under reported.

Descriptive statistics for the dependent variable, time-to-crime using California DROS data on last known purchase includes 20 explanatory variables of time-to-crime listed in Table 34 for the two samples; 1) all recorded California firearm sales and 2) dealer-only sales. For those variables that represented counts of events (e.g., the number of traces from a specific dealer or purchaser), we transformed the variable by taking the natural log. Dummy variables were used for dichotomous independent variables (e.g. Purchaser is female). In addition, to account for missing data associated with some of the explanatory variables, a dummy variable was included in the analysis to control for missing information associated with the variable.[27]

Dealer characteristics, the first block on independent variables, include the natural log of the number of traces to a dealer, a dummy variable for whether a dealer was not in business is included as a control variable (i.e., dealers who are still in business have more opportunity to have shorter time-to-crime guns traced to them, all other things being equal), and the number of miles from the sale dealer to the location where the firearm was recovered. In addition, a dummy variable was included in the analysis to control for subsequent sale data for firearms traced to a

[27] (see Little and Rubin 1987 for a discussion of techniques available to researchers that deal with the problem of missing data in multivariate analyses)

second or later purchaser. This was done to account for possible shorter time-to-crime associated with such transactions.

Purchaser characteristics, the second block, includes a dummy variable for purchasers aged 18 to 24 (which is a group with a distinctly lower time-to-crime than older age groups), the natural log of the number of traces to an individual purchaser, and the gender of the purchaser.

Purchaser/possessor relationship indicators are the third block. Variables in this block include, the natural log of the difference in age between purchaser/ possessor, the natural log of the distance between a purchaser's and possessor's home zip codes, a dummy variable for missing data on distance between purchaser and possessor home zip codes, and a dummy variable for purchasers who have the same last name as the possessor but are identified as different persons based on different birth dates.

The characteristics of possessors and gun make up the final block of explanatory variables. This includes dummy variables for possessors less than 18 years of age, 18 to 24, and 25 to 34 with 35 and older as the reference category. The one weapon characteristic entered into the analysis is a dummy variable for whether the gun was a pistol or some other type of handgun.

As Table 34 shows, time-to-crime and each of the explanatory and control variables have very similar distributions for the full sample of recorded transactions and for each of the explanatory variables. This is especially surprising since the dealer-only sale sample is a subset of the all recorded sale sample. The sample size for the full recorded sale sample is 4,780 and for the dealer-only sample is 4,162 for firearms recovered in California and matched to a California DROS record for firearm transactions where the purchaser and possessor were not the same person.

Table 34. Variables for the Multivariate Analysis of Time-to-Crimewith Updated with California DROS for Purchasers and Possessors who are not the Same Individual for: 1) all California Firearm Sales and 2) Dealer Only Sales (Firearms Recovered in California)

Type of Sale Sample	All Recorded Sales			Dealer only Sales		
	Mean	Std.	N	Mean	Std.	N
Time-to-crime	4.3262	2.67714	4780	4.4259	2.69807	4162
Independent Variables						
1 LN of distance from a dealer to recovery location	2.2693	1.53603	4780	2.2500	1.52057	4162
2 Dummy variable for missing dealer to rec. data[1]	.8310	.37482	4780	.8272	.37808	4162
3 LN of number of traces to a dealer	3.6463	1.63203	4780	3.7565	1.62712	4162
4 Dummy for dealer business status inactive[2]	.4234	.49415	4780	.4277	.49480	4162
5 Dummy for dealer business status unknown[3]	.2031	.40238	4780	.2122	.40888	4162
6 Control dummy variable for subsequent sale data[4]	.1950	.39623	4780	.1252	.33096	4162
7 Purchaser age dummy 18-24[5]	.2052	.40391	4780	.2158	.41140	4162
8 Purchaser is female[6]	.1519	.35894	4780	.1588	.36555	4162
9 Dummy variable for gender missing data[7]	.0356	.18522	4780	.0370	.18879	4162
10 LN of number of traces to purchaser	.1411	.39150	4780	.1363	.38738	4162
11 Dummy for purch/poss - same last name/diff ind[8]	.0958	.29437	4780	.0980	.29739	4162
12 LN of Age difference between purch. and poss	2.2454	1.08340	4780	2.2302	1.08287	4162
13 LN of distance from purch. to poss. home	1.5649	1.66251	4780	1.5610	1.65296	4162
14 Dummy for missing purch/poss. data[9]	.6778	.46736	4780	.6824	.46561	4162
15 Possessor age dummy under 18[10]	.0634	.24369	4780	.0646	.24591	4162
16 Possessor age dummy 1824[10]	.3448	.47534	4780	.3450	.47543	4162
17 Possessor age dummy 2534[10]	.3368	.47267	4780	.3357	.47228	4162
18 Possessor is a female[11]	.0575	.23288	4780	.0572	.23222	4162
19 Possessor gender dummy for missing data[11]	.0506	.21926	4780	.0502	.21842	4162
20 Gun type pistol[12]	.8295	.37611	4780	.8433	.36352	4162

Reference category is: 1) dealer to recovery distance data is missing, 2) active firearm dealers, 3) traces with no subsequent sale, 4) firearm purchasers age 25 years of age and older. 5) male or unknown gender purchasers, 6) firearm purchaser traces with gender data, 7) firearm purchasers without the same last name or with no information 8) firearm traces without purchaser or possessor home location zip code data, 9)firearm possessor's age is 35 year of age or older, 10) firearm purchaser gender data is male, 11) firearm possessor is male, 12) any firearm that is not a pistol.

The results of the multivariate analysis are presented in Table 35. Ordinary least squares analysis is again employed as the multivariate strategy for assessing the impact of potential factors on time-to-crime because analysis of the residuals from this analysis showed reasonably normal distributions even though the univariate distribution time-to-crime is a skewed distribution.[28] Employing this approach also provides a convenient assessment of the overall variance explained in time-to-crime by the available explanatory variables. The omnibus tests of the model for each of the samples shows the overall variance explained by the complete set of explanatory variables for all recorded sales sample the is 13.0 % percent, while the variance explained by the complete set of explanatory variables for the dealer-only sale sample is 15.6%. This result conforms with the proposition that dealer-only sales may represent a more complete and accurate sample of that type of transaction than is the case for other types of transactions, in particular private party sale transfers of firearms.

[28]A plot of the standardized residuals from the multivariate analysis indicates the distribution of the residuals is fairly normal and an examination of a normal p-p plot of the regression analysis standardized residuals indicates this as well.

Table 35. OLS Regression Results for Variables Predicting Time-to-Crime based with Updated with California DROSfor Purchasers and Possessors who are not the Same Individual for 1) all California Sales and 2) for Dealer Only Sales (Firearms Recovered in California)

	California All Sales			California Dealer only Sales		
Variables	B	StdErr	Sig	B	StdErr	Sig
1. LN of distance from a dealer to recovery location	.110	.036	.002	.120	.040	.003
2. Dummy variable for missing dealer to rec. data	-.286	.144	.047	-.260	.154	.092
3. LN of number of traces to a dealer	-.156	.024	.000	-.196	.025	.000
4. Dummy for dealer business status inactive	1.067	.082	.000	1.016	.088	.000
5. Dummy for dealer business status unknown	.372	.101	.000	.297	.107	.005
6. Control dummy variable for subsequent sale data	-.131	.095	.170	.328	.120	.006
7. Purchaser age dummy 18-24	-.251	.098	.010	-.297	.102	.004
8. Purchaser is female	-.546	.103	.000	-.598	.108	.000
9. Dummy variable for gender missing data	.220	.198	.266	.362	.206	.079
10. LN of number of traces to purchaser	.006	.096	.950	.062	.103	.549
11. Dummy for purch/poss - same last name/diff person	-.288	.130	.027	-.322	.137	.019
12. LN of Age difference between purch. and poss	.525	.039	.000	.559	.042	.000
13. LN of distance from purch. to poss. home	.103	.034	.002	.095	.036	.008
14. Dummy for missing purch/poss. data	.080	.117	.495	.100	.124	.419
15. Possessor age dummy under 18	-.554	.169	.001	-.627	.178	.000
16. Possessor age dummy 1824	-.716	.101	.000	-.782	.108	.000
17. Possessor age dummy 2534	-.371	.097	.000	-.410	.104	.000
18. Possessor is a female	.178	.157	.257	.116	.168	.489
19. Possessor gender dummy for missing data	-.165	.168	.326	-.214	.179	.232
20. Gun type pistol	-.195	.099	.050	-.385	.109	.000
Constant	3.705	.193	.000	4.053	.207	.000
adjR^2	.130			.156		
F	36.575		.000		39.397	.000
Sample	4,779			4,161		

Table 35 presents the B coefficients, the standard error of the Bs and the statistical significance of the Bs. The B coefficients and standard errors facilitate the comparison of predictors across the two samples, but we will focus primarily on the results from the dealer-only sample because of the more representative character of the sample for this group of transactions.. The analysis focuses on the final stage of the analysis that includes all of the four groups of explanatory 20 predictors. Examining the first set of explanatory variables, the natural log of the distance from a dealer to recovery location is positive with a B value of .120 on time-to-crime. The natural log of the number of traces to a dealer in time-to-crime has a positive B value of -.196 on time-to-crime. If we take the standard deviation of the natural of the number of traces to a dealer (i.e., 1.62712, Table 31) we can see that over the range of plus or minus two standard deviations this indicator produces a 1.2757 years decrease in time-to-crime (i.e., 4 x 1.62712 x -.196 = - 1.2757 years). The effects of gender (female is a purchaser) and age of purchasers (purchasers 18 to 24) both show negative effects on time-to-crime in the dealer only sample (-.598 years for female purchasers and -.297 for purchasers 18 to 24).The natural log of the number of traces to a purchaser, however, does not have a statistically significant effect on time-to-crime. This is not surprising given the restriction on multiples sale purchases in California since January 1, 2000.[29]In addition, it is also not surprising that the effects the multiple trace purchaser indicator in this analysis are different from those found in the analysis of firearms recovered in California using ATF trace data (i.e., see Tables 14a and 14b where the estimated B coefficient of multiple sale purchases on time-to-crime is -1.460) because ATF trace based

[29]Assembly Bill 202 (Chapter 128, Statutes of 1999). Effective January 1, 2000, the Department of Justice *(DOJ)* began screening all handgun transactions to ensure compliance with Assembly Bill 202 (Chapter 128, Statutes of 1999). This new law prohibits California firearm dealers from selling/transferring title of any handgun to any person who has already acquired a handgun within the State of California in the past thirty (30) days. This law has been incorporated into California Penal Code (PC) sections 12071 and 12072.

analysis includes both in-state and out-of-state sales whereas, by design, the analysis presented in Table 35 is restricted to only in-state purchases.

The third set of variables, purchaser/possessor relationship indicators include the natural log of the difference in age between purchaser and possessor and the natural log of the distance between purchaser and possessor's home zip codes. The effects of both these variable are positive although relatively modest. When the effects of these two variables are examined over a range of plus or minus standard deviations: 1) the natural log of the difference in age between purchaser and possessor indicator produces a 2.4223 years increase in time-to-crime (i.e., 4 x 1.08287 x .559 = 2.4223 years), and 2) the natural log of the distance between the home location of the purchaser and possessor a .628 years increase in time-to-crime (i.e., 4 x 1.65296x .095 = .628 years).The dummy variable for traced firearms where the purchaser and possessor were different persons but had the same last name had a modest statistically significant negative effect on time-to-crime (B = -.322).

The final set of explanatory variables; including age of possessor dummy variables and type of handgun have expected effects on time-to-crime. Younger gun possessors have lower time-to-crimes than their older counterparts (i.e., possessors over 35), and pistols (versus other types of handguns, most of which are revolvers) also have shorter time-to-crimes (B = -.385).The indicator for female firearm possessor was not statistically significant.

VI. Discussion and Policy Implications

Criminal misuse of guns kills or injures tens of thousands of Americans every year. The threat of such violence imposes a heavy burden on our standard of living, not only on groups that have the highest victimization rates, but on the entire community. Using a contingency valuation approach, Cook and Ludwig have estimated the societal cost of gun violence at $100 billion annually (Cook and Ludwig, 2000).Guns are frequently used in crime in the United States partly because they are so easy to acquire. This ease of access, in turn, is attributable in part to the fact that there are two systems of retail gun commerce in this country, one involving licensed gun retailers and the other based on private-party gun sellers, and only the first of these systems is regulated. Some 85% of all guns used in crimes and then recovered by law-enforcement agencies have been sold at least once by private parties (Wintemute, Braga, and Kennedy, 2010).

The secondary gun market, sometimes called the private-party or informal gun market, has long been recognized as a leading source of guns used in crimes (Wintemute, Braga, and Kennedy, 2010). Although secondary market sales are primarily a convenience for the law-abiding(no paperwork, no background check, no waiting period), such sales are also the principal option when the prospective purchaser is a felon, domestic violence offender, or other person prohibited by law from owning a gun. Secondary market sales facilitate the diversion of guns from legal commerce into criminals' hands: although it is always illegal for prohibited persons to buy a gun, it is only illegal to sell a gun to such people if the seller knows or has reasonable cause to believe that he or she is doing so. Unscrupulous private sellers may simply avoid asking questions that would lead to such revelations (Wintemute, 2009).

As regulations on primary market sources increase, secondary market sources will become even more attractive to criminals seeking guns (Cook et al., 1995).For instance,

implemented in February 1994, the Brady Handgun Violence Prevention Act required licensed dealers to conduct a background check on all handgun buyers and mandated a one-week waiting period before transferring the gun to the purchaser. In November 1998, waiting periods for background checks were eliminated for a National Instant Check System (NICS). Over a five-year period (1994-1999), 13 million Brady criminal background checks were conducted of prospective handgun purchasers (BJS, 1999). Nearly 320,000 requests were denied, of which 220,000 were due to prior felony convictions or pending indictments (BJS, 1999). Nevertheless, it seems easy enough for criminals to circumvent the provisions of the Brady Act by acquiring guns through the unregulated secondary market (Jacobs and Potter, 1995). An evaluation of the Brady Act found no discernible impact on homicide trends and suggested that criminals acquiring firearms from the unregulated secondary market may have undermined the effectiveness of the Brady Act in preventing homicide (Ludwig and Cook, 2000).

A comprehensive gun violence reduction portfolio requires a concerted effort directed in part at separating guns and violence. In our judgment, that effort should include a variety of efforts to reduce the availability of guns to youths and dangerous adults from primary and secondary market sources. However, the will to pursue this approach may not be available at the federal level. While some modest innovations were put in place during the Clinton Administration (Braga et al., 2002), there appears to be little appetite for doing more now. For instance, concerns about private-party gun sales and gun shows' importance as a source of guns used in crimes have led to repeated calls for "closing the 'gun show loophole'" — by which advocates usually mean requiring that private-party sales at gun shows be routed through a licensed retailer who will do a background check and keep a record of the purchase. President Barack Obama endorsed such a measure during his 2008 presidential campaign, as did President

George W. Bush in 2000 and 2004. "Loophole" legislation has been introduced in both the Senate and the House of Representatives, but no hearings have been scheduled.

In fact, there is no "gun show loophole" as such (Braga and Kennedy, 2000; Wintemute et al., 2010). Federal law is silent on gun shows and permits private-party gun sales to occur anywhere. As a result, such a limited measure might well have no detectable effect on the rates of firearm-related violent crime.

The existing federal legal framework on firearms commerce actually impedes effective action. In particular, prosecuting gun traffickers is remarkably difficult (Braga, 2001). Since the telltale paperwork is not available for unregulated transactions in the secondary market, unlicensed dealers illegally engaged in the business of selling firearms can avoid prosecution by claiming that they were selling only a handful of firearms from their private collection. Corrupt FFLs who illegally divert firearms face very small penalties. The McClure-Volkmer Firearms Owners Protection Act reduced most of these record-keeping violations from felonies to misdemeanors in 1986. Straw purchasers are also difficult to prosecute, given various legal loopholes. As a result, US attorneys typically prosecute gun traffickers on charges unrelated to trafficking such as "felon in possession" or drug trafficking (ATF, 2000a).

The enforcement of laws against gun trafficking is also hindered by the rather cumbersome procedure ATF is forced to use to trace firearms (Braga, 2001). The limits of current record-keeping procedures thwart routine firearms tracing of secondhand firearms sold by licensed dealers and prevent ATF from identifying straw purchasers and scofflaw dealers who divert secondhand firearms. Trace data also provide ATF investigators with little support in examining the robust trade in secondhand firearms on the secondary market. Modest statutory changes in the system for tracking firearm purchases and sales could make a big difference in

developing an effective supply-side strategy (Travis and Smarrito, 1992). For example, a requirement for licensed dealers to report serial numbers for all sales to ATF would greatly facilitate the tracing process without creating a central registry of gun owners.[30] A requirement that all secondary market transaction pass through federally licensed dealers—with the same screening and paperwork provisions as if the gun were being sold by the dealer—would be useful in a variety of ways, including in detecting gun traffickers. However, both proposals would likely be vigorously challenged as infringing on the rights of lawful gun owners and as violating FOPA, which prohibits ATF from establishing any national system of gun registration (Braga, 2001).

More promising, politically speaking, is the possibility of action at the state and local level. Fortunately, there is much that can be done at those levels. States could assume some of the responsibility for tracing crime guns and investigating dealers. As described earlier, local police departments can quite possibly be effective at disrupting local gun markets, but only if they concern themselves with gathering the necessary intelligence and acting on it. Most police departments have been focused on getting guns off the street instead of focusing on where the guns are coming from (Moore, 1980; Moore, 1983). In recent years, however, local police practices have changed in many major cities due in part to efforts by ATF and the U.S. Department of Justice to form partnerships to reduce the availability of guns to youth and criminals (see, e.g. ATF 2000a; ATF 2000c).

[30] Under such a program the serial number, manufacturer, type firearms and model of purchased firearms would be submitted to the ATF's National Tracing Center (NTC) by all FFL dealers. The NTC would store information on the serial number, date of purchase, type of gun and dealer that sold the weapon. No information on the purchaser would be sent to the NTC. Under this arrangement, the NTC could only request purchaser information on the firearm from the dealer that last sold the weapon if that weapon was recovered by a law enforcement agency. As a result, there would be no centralized system that contained the names or addresses of firearm owners and such information could only be requested from a dealer if a weapon was recovered by a law enforcement agency.

The research carried out in this report suggests that state-level laws backed up by a strong commitment to regulate firearms dealers can reduce the ease through which criminals illegally divert firearms from legal commerce. The stringency of state-level firearms laws and regulations on primary and secondary firearms sales and, in the case of California, the regular enforcement of state regulations leads to consistently longer time-to-crime for firearms from gun dealers located within their jurisdictions. Our analyses also suggested that crime guns originating from states with both purchase and registration laws were associated with larger reductions in time-to-crime when compared to crime guns originating from states that had one of these types of laws but not both. Furthermore, the analyses suggests that California enforcement of state laws and regulations through routine dealer inspections and the ongoing analysis of automated records on firearm transactions for suspicious sales and purchase patterns further reduced time-to-crime of recovered crime guns originating from in-state dealers.[31]

Our research also compared illegal firearm market characteristics using information from ATF trace data (based primarily on first-time, retail-sourced information) relative to illegal firearms market characteristics using enhanced trace data that was updated with information from matched California DROS data. This latter data source provides information on the last known purchaser of a firearm recovered by law enforcement. Our comparison revealed that including information on the last known purchaser of a firearm significantly reduced the median time-to-crime of California-sourced crime guns relative to time-to-crime calculations based on standard ATF trace data. This finding reveals that guns sometimes move very rapidly from subsequent market transactions to use in crime. These enhanced firearm trace data can be very useful in guiding law enforcement actions against gun traffickers and criminals directly acquiring

[31] These results are similar to those observed in other industries, such a manufacturing, where researchers have found that productivity is typically higher when complementary processes and practices are adopted together as a system rather than when they are adopted separately (Brynojolfsson and Saunders, 2010 review this work).

firearms through secondary market sources. The utility of law enforcement data that can aid investigators and guide law enforcement was highlighted in the national evaluation report of Project Safe Neighborhoods (McGarrell et. al., 2009). McGarrel et. al., found that a key to success of PSN programs was the ability to focus LE resources on specific high gun crime places and contexts, and that timely crime specific data was very important in helping LE in this process.[32]

We found that state level purchase and registration laws affected time to crime in a manner that suggests that the laws impede gun trafficking, even when controlling for comprehensiveness of gun tracing. Purchase and registration laws together had greater effects than either did by itself. States with lax gun laws and high rates of gun violence could impact the flow of recently purchased firearms to criminals by enacting more stringent purchase and sales laws, tracking all primary and secondary firearms transactions, and more closely regulating licensed firearms dealers. Increasing the number of states with more stringent gun controls would also have the desirable effect of reducing the export of newer guns to criminals in tighter gun control states. Of course, criminals in states with newly adopted gun controls can find ways to substitute other sources of guns such as theft from residences or making connections to gun traffickers operating in nearby lax-gun-law states. As described earlier, these types of gun market actions are not intended to eliminate all potential sources of guns. Rather, this approach would seek to diminish the ease by which criminals acquire guns through illegal diversions from what were once unregulated local secondary market sources. By raising the effective price of acquiring guns, criminals would have to economize on gun possession and use that would hopefully translate into reduced violent gun offending.

[32] McGarrel et. al. also found that "The most common barrier to research integration was the availability of crime data. This typically reflected the availability of timely and electronic crime data as opposed to administrative or legal barriers to information. Particularly problematic was the lack of crime data specific to gun crime." (2009, p iv.)

Appendix 1: Merger of California DROS Records with ATF Trace Data

The research plan relied on the acquisition and analysis of two sets of firearms related data to develop new approaches to identifying secondary market sources of illegal firearms. The two sets of firearms related data are firearms trace data from the Bureau of Alcohol, Tobacco, Firearms, and Explosives and California's handgun sale and licensed retailer data from California's Department of Justice's Automated Firearms System (AFS).

As noted, California handgun sales data and licensed retailer data were obtained from the California Department of Justice (CDOJ) computerized Dealer's Record of Sale (DROS) system since 1977 for all handgun sales made by federally-licensed firearms dealers, and since 1991, for firearm transfers between private parties who are required to route sales through licensed dealers so that a background check can be conducted and a DROS record kept on file.

California firearm purchase and sale records were obtained from the AFS system for the years 1996 through 2006. The starting year of 1996 was selected because the recording of data in a uniform way began that year (Wintemute et al 2004, 2005).The 2006 end date was selected because this coincides with end date (late 2006) for the ATF trace data obtained for this study. Approximately 1.8 million records on firearms transaction were obtained from California's AFS system for this period.

In terms of ATF trace data there were 93,292 of all types of firearms recovered in California by law enforcement between 2003 and 2006. However, since California only collects computerized purchase and sale data on handguns, the actual relevant sample of ATF traces applies to only 63,854 pistols and revolvers recovered by law enforcement (see Table 1).

Table 1
Type of Firearm Recovered in California by Law Enforcement and Traced between 2003 and 2006

	Frequency	Percent
pistol	40967	43.9
revolver	22887	24.5
rifle	17564	18.8
shotgun	11370	12.2
other	504	.5
Total	93292	100.0

Cross-referencing firearms trace request data submitted by law enforcement agencies to ATF with DROS state records on the purchase and sale of firearms sold in California allows us to trace a firearm recovered by law enforcement agencies in any state to a first-time sale and purchase firearm DROS record, and for a firearm subsequently resold and purchased in California, we can trace the firearm to the last-known sale and purchaser records in the DROS system. On this basis we can compare trace results based on ATF tracing procedures with the results obtained from tracing firearms by cross-referencing DROS state firearm purchase and sale information with recovered firearm identification information. Table 2 presents an overview of the enhancement that cross-referencing state purchase, sale information and ATF trace request data potential provides.

Table 2

Potential New Areas of Information Added by California DROS Data

	State Firearm Sale And Purchase Data Status		
General ATF Trace Data Status	1. No data provided by state DROS records	2. CA DROS data provides first-time retail firearm sale data, which is the same as ATF trace purchaser/dealer	3. CA DROS provides data on last known retail firearm sale data
1. Trace request provided – no dealer or purchaser information added by tracing	ATF trace status remains the same – no retail sale info	Some new info on first retail sale –is provided by the addition of California DROS data	New info added on most recent sale - updates the info on retail sale to last known sale
2. Trace and request plus tracing provides first-time dealer purchaser information	ATF trace provides info on first retail sale – no state info added	No new info -ATF trace status remains the same on retail sale	New info added on retail sale to last known sale where no ATF trace data existed
Blue = new or updated information from state purchase and sale data.			

Two matching techniques were used to link guns in ATF's trace dataset and with CDOJ's database of DROS firearms data. Our original algorithm for linking guns in ATF's trace dataset and CDOJ's Dealer's Record of Sale (DROS) archive followed the model used in several previous studies (Wintemute et al 2004, 2005). To identify the guns for which trace requests have been submitted among a larger population of guns that have been sold, we followed procedures from our prior studies to link records for handguns and individual persons in the respective sales and trace request data sets. For handguns, a match between sale and trace

records on manufacturer and serial number alone is insufficient, as some manufacturers have used serial numbers repeatedly. We declared a match when the manufacturer, serial number, handgun type, and caliber are identical. When one of the latter two variables is discordant, we will compare both records manually, reviewing the handgun model designations if present and referring to standard firearm catalogs (Fjestad S., annual publication and Schwing N., annual publication) when necessary to determine whether the discordance is real or due to an error in the trace request record or sales record. For individuals, tentative matches are made on last name, first initial, and date of birth. All tentative matches were reviewed manually.

This algorithm was sensitive to the possibility that the ATF and CDOJ data would contain discrepancies arising from errors in recording handgun type and caliber. Our data preparation also took into account a known difference in the recording of serial numbers—ATF recorded hyphens when these were part of the number as stamped on the gun by the manufacturer, and CDOJ did not. The algorithm was not sensitive to the possibility that there would be discrepancies in the manufacturer coding, as both agencies used the same NCIC table of manufacturer codes, (our data preparation did include a search for non-existent codes) nor did the algorithm allow for the possibility of errors in entering serial numbers.

Based on the first set of merger procedures 10,213 DROS records for traced guns in our study sample were matched to California purchases or pawnshop transactions over the period 1996 through late 2006 for non-law enforcement handgun transactions in California. This resulted in a match to 8,911 unique ATF traced firearms (Table 3, merger procedure 1, categories 1, 2 and 6) because for some traces there was more than one DROS record that matched a given traced firearm. We attached the information from the last DROS transaction for these firearms.

The lack of matches to AFS data from firearms traced to the 2,865 recovered guns and traced to California purchases raised the question of whether there are data quality issues that were not accounted for in our matching routines (see Table 3, merger procedure 1, and category 4). The question arose because although these firearms were purchased in California in 1996 or later and were traced by ATF to a California firearms dealer, we did not find a match to them in California AFS data with our first set of matching procedures. This occurred even though, as noted, California DROS data on the purchase and sale of handguns was available starting for sales that were transacted in 1996 or later. Equally important, we can assume that for the most part data from an ATF firearm trace to a purchaser and dealer is accurate information a great majority of the time because if it was not accurate the firearm would not have been successfully traced to a dealer/purchaser for the simple reason that the tracing process is conducted in term of firearms manufacturer, serial number and caliber.

Fortunately, we could use the 2,865 cases of firearms that ATF traced to a purchaser in California for handguns purchased after 1995 but not California DROS records to identify potential problems in our merger of ATF and California data. Specially, we were able to match cases within the group to DROS data using only serial numbers to determine whether there were systematic discrepancies in data attributes (i.e., manufacturer codes and/or caliber) that existed between ATF firearms data and California DROS handgun data. Idiosyncratic discrepancies could also arise from actions such as data entry mistakes and more systematic errors such as, differences in nomenclature for the same firearm (e.g., ATF using a manufacturer importer code for a traced firearm, and California using the manufacturer code not the importer code).Using this method we were able to determine that a significant fraction of the failures using the first

merger procedures to identify sales records could stem from minor discordances in the gun manufacturer and to a lesser extent discordances in serial numbers between the two data sources.

Table 3

Comparison of First and Second Merging Procedures of ATF and California Data

ATF data	Merging Procedure 1		Merging Procedure 2	
	Frequency	Percent	Frequency	Percent
1. ATF trace and CA DROS same sale	6531	10.2	8295	13.0
2. ATF trace data and CA DROS sale data matched to a later transaction	1651	2.6	1978	3.1
3. AFT trace data only for a CA purchase before 1996	16012	25.1	15890	24.9
4. ATF trace data only for CA purchase after 1995	2865	4.5	897	1.4
5. ATF trace data for a non-CA purchase	10567	16.5	10482	16.4
6. CADROS sale data but no ATF trace data	728	1.1	926	1.5
7. No ATF trace data or CA sale data (only trace request data)	25494	39.9	25296	39.6
8. Discordance between CA and ATF sale date of more than 90 days	1	.0	85	.1
Total*	63849	100.0	63849	100.0

***** Five traces were dropped because of a lack of purchaser date information even in ATF records.

The major types of discordances for manufacturing codes we identified from analysis of the ATF sale data with comparable California DROS are presented in Appendix 1. Below, Table 18 provides an overview of the general types of discordance we noted in analyzing the 2,865 cases with ATF purchaser/dealer data but not California DROS data.

Table 4

Types of Discordance and Data Errors in ATF and California DROS Data

A. Discordance on manufacturer codes (a more complete set of manufacturer discordances are presented in Table 5)

1. Discordance where two different codes used for same manufacturer. Examples:
   BER and FII, SSS and SIG, JEI and BRY

2. Discordance on manufacturer and importer codes where the US manufacturer code is used in 1 data set (usually ATF) and code for importer used in the other (usually CDOJ). Example: IMI and MGN

B. Discordance on serial numbers. These are listed in the order in which they were found. The first 3 appear to be the most frequent. These were included in our new matching procedures. Item 12 was also included in the matching procedures because it seemed to be more frequent when we examined the broader sample of possible matches.

1. Absence of terminal "US"

2. Replacement of "O" by "0" or vice versa

3. Replacement of "I" by "1" or vice versa

4. Alpha character off by 1 in alphabetical sequence

5. Numeric character off by 1 in numeric sequence. Sometimes the terminal digit; these might represent consecutively-manufactured guns

6. Absence of leading "0" or multiple zeroes

7. Transposition of characters

8. Alpha character off by 1 in keyboard sequence
   A for S

9. Dropped character, either internal or terminal

10. Multiple dropped characters

11. Replacement of character by visually similar character
   5 for S
   2 for 7
   7 for 9
   6 for 0

12. Absence of initial "SN," but unclear whether inclusion or deletion is error

13. Replacement by prior character in string
   441 for 411

Based on the information derived from the analysis of ATF traces post 1995 that were not matched to DROS data we first conducted additional cleaning of serial number data to account for items B. 1, 2, 3, and 13 in Table 18. The full range of discordances in manufacturer and importer code designations that were incorporated into the new matching procedure are presented in Appendix 1. With this information a new gun identifier key was developed that concatenated type of gun, manufacturer, serial number, and caliber. We then proceeded with an automated matching process between ATF trace and California DROS records. A second pass at matching was made which dropped caliber from the concatenated firearm key. These matches were reviewed manually and checked to determine whether they may have been a true match. A modest number of this subset was evaluated as correct matches.

The new merger procedures resulted in an additional 2,919 matched cases between ATF trace and California DROS data. Overall the new procedures increased the matches of California DROS records to ATF traced records from 8,911 traced handguns (Table 3, merger procedure 1, categories 1, 2, and 6) to 11,199 traced handguns (Table 3, merger procedure 1, categories 1, 2, and 6). As noted earlier the increase in matched traced handguns is less than the 2,919 new matches DROS to ATF records because it is possible for more than one DROS record to be matched to an ATF trace. In addition, as category 8 shows in Table 3, there were 85 matches where the was a discordance between CA and ATF sale date of more than 90 days of firearms that were matched on the basis of manufacturer, serial number and caliber. These cases may be correctly matched correctly[33], but given the sale date discordance they were classified as non matches. Importantly, these 85 cases represent less than one percent of the cases that were successfully matched (i.e., 85/11,199 = .075%).

[33] Differences in sale data information might arise for such reasons as incorrect data entry or differences arising from dates associated when a firearm background check was conducted and when a firearm was actually picked up by the purchaser.

The increase in number of ATF trace and DROS matches generated by the new merger procedures rose about equally for trace requests that had been traced to a dealer and purchaser using ATF tracing procedures (Table 3, categories 1 and 2) going from 8,182 to 10,273 matched cases (a 25.6% increase) and for trace requests that were not traced to a dealer/purchaser using ATF tracing procedures (Table 3, category 6) going from 728 to 926 cases (a 27.2% increase). The largest change resulting from the new merger procedures occurred, not surprisingly, for cases traced by ATF to a California purchaser for sales after 1995 for which there was not California DROS data matches (Table 3, category 4). These decreased from 2,865 to 897 cases (a 68.7% decrease).

Information from merger 2 procedures in Table 3 provides an estimate of how many possible cases remain unmatched between ATF and California DROS records for handguns purchased in California after 1995. By comparing the categories of cases successfully traced by ATF to a purchaser for sales after 1995 and matched to DROS data (10,273 cases in Table 3 categories 1 and 2) versus the number of cases successfully traced to purchaser by ATF but still not matched to DROS records (Table 3 category 4), we can calculate a ratio of all potential ATF/DROS matches (Table 3 categories 1, 2 and 4 for 11,199 cases) to only the actual successfully matched ATF/DROS records (Table 3 categories 1 and 2 for 10,273 cases). This ratio computes to 1.090 (11,199/10,273) and can be thought of as correction factor for under-matching which is obtained from known purchased handguns in California based on ATF tracing data.

Importantly, we can also use the estimated correction factor to estimate under matching of trace requests for handguns that were not traced by ATF to a purchaser. For merger procedure 2 (Table 3) this amounted to 26,222 cases (categories 6 and 7 in Table 3). Of these 26,222 cases

(not traced to a dealer/purchaser by ATF) there were 926 cases that were matched to California DROS purchaser/dealer records. One question is how many more cases could one expect to add to theses 926 cases with further enhance matching procedures. We can generate such an estimate if we assume the under-matching ratio calculated for handguns, and if the ratio of total possible matches to actual matches is similar for these cases to what was calculated for the ATF traces to a purchaser. Using the under-reporting estimate of 1.090, error free matching would yield an increase of about 84 additional handguns matched to California DROS data (i.e., 926 x 1.090 = 1,009.3 cases or an increase of about 83 cases).

Our enhanced matching procedures do not account for trace requests that could not be completed because information, such as manufacturing or importer codes or serial numbers, was actually missing or completely incorrect. These problems can arise for a variety of reasons some of which relate to problems with data recording by law enforcement agencies submitting trace requests, some of which arise from unclear and or confusing firearms marking procedures implemented by manufacturers or importers, some which arise from record keeping problems with firearms dealers, and some of which may arise from conscious attempts to obliterate marking information on a firearm.

In addition, the enhanced matching procedures also may have introduced a modest error into our matching procedures. The evidence for this observation is the increase in number of cases, from matching procedure 1 to matching procedure 2, where the discrepancy between the recorded California DROS and ATF traced sale date was more than 90 days even though the cases were matched on the basis of firearm manufacturer, serial number and caliber. As Table 3 (category 8) shows the number of discordances between California and ATF Sale date of more than 90 days rose from 1 for the first merger procedure to 85 for the second merger procedure.

Fortunately, the increase in sale data discordances is less than 1 percent of the matched California and ATF matched cases using merger procedure 2. As noted, these 85 cases were not categorized as firearms that were matched between the California DROS and ATF trace records.

Overall, using matching procedure 2, of the 63,849 handgun recovered in California between 2003 and 2006, 17.5 percent represented cases where ATF traced handguns to a purchaser and California DROS data were successfully matched (see Table 3)[34]. This is an artificially low estimate, however, because 15,890 cases are ATF traces for California purchases prior to 1996, 10,482 cases are for ATF traces to non-California purchasers and 25,296 cases are for ATF trace requests that ATF was unable to trace to a purchaser and for which there was not matches to California DROS data either (see Table 3, merger procedure 2). This represents a total of 51,688 cases (see Table 3, merger procedure 2 categories).

When these 51,688 cases are excluded the percentage of DROS records matched to ATF data for which there is a reasonable chance of finding a match Table 3 (see column 2) shows that approximately for 92.1 percent of these cases DROS records were successfully matched to ATF trace records (i.e., 11,199/12,161= 92.1%). In addition, Table 3 (column 2) also shows that of the 10,273 firearms where ATF and CA DROS data was matched, there were 1978 cases (19.3 percent) where DROS sale data was matched to a later transaction.

The overall matching rate of 92.1 percent, may be a slight over estimation of how successfully ATF traces were matched to California DROS data because some cases may have been missed among firearms not traced by ATF to a purchaser, or firearms originally purchased in another state and was resold in California, or ATF traces to a California purchaser for a sale before 1996 but were missed by our matching procedures. It is likely that this is a fairly small

[34]For merger procedure 2, cases in matched categories 1, 2 and 6 divided by the total number of handgun guns recovered (i.e., 11,199/63,849 = 17.5%).

number of cases given our analysis of under-matching above. A potentially more serious problem lies with trace requests that could not be traced because information, such as manufacturing codes, importer codes, model type or serial numbers were missing or incorrectly recorded.

Table 5

Major Manufacturer Discordance Tabulations from Sample of After 1995 California Handgun Sales That Were Traced but Not Matched to California DROS records

Matches in 2,865 Subsample for Records with Discordant Manufacturing Codes in ATF and AFS Records				
Match	CA man. code	ATF man. code	No. of matches	Matching rationale for cases matched on serial numbers in the 2,865 subsample
1	EAM	TFG	10	European American Arms Corp (EAM), was not European American Armory (EAB), but was frequently mistaken for it. Given high pre-test probability, would code these as a match.
2	BER	FII	483	BER is Beretta Italy; FII is Beretta USA (was previously Firearms International Industries, but with coincidence of other identifiers probability of true match is very high)
3	EAB	TFG	15	European American Armory (EAB), which is importer for Tanfoglio (TFG)
4	FOZ	CZ	55	Alternate codes for Ceska Zbrojovka
5	ISR	IMI	5	Alternate codes for Desert Eagle; IMI also maps to Israel Military Industries
6	JEI	BRY	96	Jennings (JEI) was exclusive distributor for Bryco (BRY), owned by husband and wife
7	MGN	IMI	65	Magnum Research (MGN), importer of Desert Eagle made by Israel Military Industries. Magnum Research has other products as well.
8	SPH	IMB	44	Springfield Armory (SPH; Illinois) is an importer for Imbel (IMB) of Brazil
9	SPH	IMC	123	Springfield Armory (SPH; Illinois) is an importer of XD pistols for I M Metal Ozalj, Croatia (IMC), aka HS Produkt
10	SPR	IMC	5	Springfield Arms (SPR, Massachusetts), a 19th-century manufacturer. If there are serial numbers, the guns aren't from this company. Almost certainly Springfield Armory (SPH).
11	SSS	SIG	328	SIG USA (SSS) and SIG Europe (SIG). They wouldn't do that to us, would they?
12	SWD	FMJ	27	SWD and Full Metal Jacket (FMG) were owned by Sylvia and Wayne Daniel

13	JFT	BRY	5	Jennings Fine Tuning (JFT), North Hollywood, CA and Bryco (BRY). JFT is probably not JEI, but coder probably thought it was. Given high pre-test probability and BRY coding by ATF, will call a match.
14	SPH	SGD	60	Springfield Armory (SPH; Illinois) now sells Springfield Armory M1A (coded SGD when located in Devine, Texas)
15	APT	TWP	5	Armscor Precision (APR), Philippines, appears to be manufacturer of 1911s for Twin Pines (TWP), Philippines. Both companies do other things as well.
16	CAC	CTR	13	Charter Arms (CAC), Shelton, CT; Charter 2000 (CTR), Huntington, CT. CAC was bankrupt ~1995-2005, CTR made same guns ~2000-2005, when it went bankrupt. CAC now back in business, controlled by MKS. Match, unless we want to assume that the two companies recycled serial numbers.
17	EAB	WEI	13	European American Armory (EAB) is an importer for Herman Weihrauch (WEI).
18	EAB	WEI	13	European American Arms Corp (EAM), was not European American Armory (EAB), but was frequently mistaken for it. EAB is an importer for WEI. Given high pre-test probability, would code these as a match.
19	EAM	WEI	6	Interarms (INR) was an importer for Star (STA)
20	INR	STA	8	Kimel (KIM) guns were manufactured by AA Arms (AAC)
21	KIM	AAC	5	Kassnar-Fias Imports (KSI) is one of Kassnar-owned companies, another of which (KBI) is listed frequently as an importer for FegyveresGepgyar (FEG).
22	KSI	FEG	6	Makarov (MAV) is the name given to former Soviet issue pistol; Izhevsk (IZH) is a former Soviet arsenal
23	MAV	IZH	11	Norinco (NON) is essentially a synonym for North China Industries (NCI)
24	NON	NCI	10	SW Daniel (SWD) is parent of Leinad (LND). Daniel….Leinad.
25	SWD	LND	5	Century International Arms (CIA) was an importer for Rexio (RXO), Argentina
26	CIA	RXO	6	Beretta Europe (FII) and Beretta USA (BER)
27	FII	BER	5	Hi-Point (HIH) sells guns made by Haskell (HSK) and others under its own name (since 1993).
28	HIH	HSK	6	Hi-Point (HIH) was (is?) an importer for Iberia (IBE)
29	GAA	AEI	33	Gabilondo/Llama (GAA), Spanish, and Bersa (AEI), Argentinian. Marketed together, may have same importer
30	GAA	FBA	41	Gabilondo/Llama (GAA), Spanish
31	CHD	SQB	17	Charles Daly and Kassnar/Squires/Bingham (Philippines). Now appear to have ownership in common (Michael Kassnar
32	APT	TWP	6	American Spirit Arms (APT) is US maker of AR rifles. Coder may have meant APR.

Appendix 2. Merger of California DROS Records with ATF Trace Data: Implications for Weapon Marking Conventions, Laws, and Procedures.

The merger procedures used to cross-reference California DROS records with ATF trace data indicate that current firearms marking conventions and methods do not in all cases consistently allow law enforcement to accurately trace firearms. This section examines: the relationship between firearms tracing methods and current marking conventions, and the potential for developing more rigorous firearms marking systems.

Two major methods of firearms tracing are available: 1) the standard ATF method of tracing firearm recovered by a law enforcement agency (using marking information on the firearms including manufacturer, serial number and caliber) from the original manufacturer or importer of the firearm, through the change of commerce (e.g., wholesalers, dealers) to the first time retail purchase of the firearm by a licensed dealer to a private citizen, 2) cross-referencing firearm marking information (including manufacturer, serial number and caliber) on guns recovered by a law enforcement agency with firearm marking information available in various data repositories, such as California's DROS data on dealer record of firearms sales, state registries of firearms owned or purchased in a given state, ATF's firearms marking information from records of out-of-business federally licensed firearms dealers that were submitted to ATF when the dealer ceased business operations, or data on records of firearms imported into a given country or exported from a country. For example, some California law enforcement agencies have been reluctant to conduct ATF gun traces because they can, with less effort, search for recovered guns in the state's AFS data and retrieve information on the most recent sale preceding the gun's recovery, not the first sale that would be reported by ATF, as long as that sale occurred in California.

Firearms marking methods are important for both methods of tracing, but more exacting firearm marking standards may be somewhat less important for ATF "change of commerce" methods of tracing. This is because ATF's National Tracing Center (NTC) has trained personnel who can contact firearms manufacturers to ascertain whether a recovered firearm was manufactured by them, and if so, to whom it was sold. Under these conditions if there is an error in the firearms marking information submitted by a law enforcement agency (e.g., manufacturer code, caliber of the weapon, firearm model, serial numbers[35]), ATF tracing personnel may be able to check on potential marking discrepancies by contacting appropriate manufacturers or by using other information and experience they have developed about potential errors that arise in firearms marking information submitted to them. Cross-referencing tracing procedures typically would not have access to such external sources of information. However, both types of firearm tracing would be easier, more accurate and faster if firearms were uniquely identified (without reference to caliber or gun model) in a manner that was resistant to tampering. Current methods of firearms marking do not achieve this objective.

Existing international marking conventions for firearms have largely been guided by the United Nations (U.N.). The U.N. stated in their May 2001 resolution, Protocol against the Illicit Manufacturing ofand Trafficking in Firearms, Their Parts and Components and Ammunition, U.N. General Assembly Resolution 55/255, that their primary mission in regulating and mandating the marking of weapons is to "…prevent, combat and eradicate the illicit manufacturing of and trafficking in firearms, their parts and components and ammunition."(United Nations, 2004a, p. 78) The U.N. Firearms Protocol addresses marking of firearms in Article 8, which states that "at the time of manufacture of each firearm, either require

[35] There are some fairly systematic discrepancies that occur in the recording of serial numbers that can sometimes be corrected via computer checking algorithms or by directly checking with the manufacturer of a weapon.

unique marking providing the name of the manufacturer, the country or place of manufacture and the serial number…" (United Nations, 2004a, p. 75). The U.N. also notes that their efforts to make sure all weapons are marked in a uniform and consistent way is aimed at organized crime and civil conflict (United Nations, 2009). Additionally, the U.N. recommends that each member state develop a body which maintains manufacturers' compliance with marking and tracing rules (United Nations, 2004b).

Other international organizations have also contributed policy recommendations for firearm marking and tracing. In June of 2000, the World Forum on the Future of Sport Shooting Activities made several important recommendations regarding international standards for weapons marking. The Forum consists of governments, intergovernmental organizations and the United Nations, as well as representatives of the Firearms industry. The body made five key recommendations. First, firearm manufacturers must mark weapons in a way that is forensically recoverable. Second, manufacturers must control for duplicate markings. Third, manufacturers must keep marking records for at least ten years. Fourth, trace requests from law enforcement will be processed within 72 hours. Finally, periodical evaluation of marking technologies must be taken under advisement (World Forum on the Future of Sport Shooting Activities, 2000).

The United States along with other member nations are in agreement with the United Nations' efforts to ensure that all weapons are stamped with an individual serial number and that all parts in the manufacturing process bear registered markings from their respective manufacturer. Within the United States there are a number of laws which govern the standards for marking and identifying weapons. [36] The two most important and prominent laws regarding firearms marking conventions are the National Gun Control Act of 1968 and the National

[36] These include: 1) 18 U.S.C. 923(i): Identification of Firearms, 2) 26 U.S.C. 5842(a): Identification of Firearms, 3) 27 CFR 478.92(a): Identification of Firearms, 4) 27 CFR 478.92(a)(4)(i): Alternate Means of Identification, 5) 27 CFR 479.102(a): Identification of Firearms, 6) 27 CFR 479.102(c): Alternate Means of Identification (ATF, 2009).

Firearms Act (NFA) Title 26 U.S.C., section 5842(a).The National Gun Control Act of 1968, Title 18, United States Code (U.S.C.) Section 923(i) and 27 Code of Federal Regulations (CFR), Section 478.92, and the National Firearms Act of Title 26 U.S.C, section 5842(a) were the first federal laws to require a standardized form of identification for all new weapons (ATF, 2009). This law establishes that all firearms produced by licensed manufacturers must be marked, whether manufactured in the U.S. or imported from abroad"…by means of a serial number engraved or cast on the frame or receiver of the weapon, in such a manner as the Attorney General shall by regulations prescribe" (ATF, 2009, p. 1). In addition, ATF's, Guidebook to Importation and Verification of Firearms, Ammunition, and Implements of War Firearms Verification (2009), referencing 27 CFR 478.92(a)(1)(i) regarding how licensed manufacturers and importers must identify firearms, states that "The serial number must be placed in a manner not susceptible of being readily obliterated, altered, or removed, and must not duplicate any serial number placed by you on any other firearm" (2009, p. 3).[37]

Other industries have developed more robust identification systems for uniquely marking their products. The automobile industry provides a fairly direct analogue to the product identification challenges found in the gun industry in several critical ways. First, both goods are produced by a variety of companies both domestic and international. This means they are subject to a variety of different local, national, and international shipping standards and laws. Second, they are both bought and sold between businesses, individuals and second hand stores (e.g. used car deals vs. pawnshops). Third, they are both durable consumer goods which remain in

[37] The National Gun Control Act of 1968 also made the defacement or removal of serial numbers a felony offense. In 2001, the ATF updated their standards to require that serial number have a minimum height of 11/16 inch and a minimum depth of .003 inches in order to make them more resistant to tampering (ATF, 2009). Additionally, as noted by the Bureau of Alcohol, Tobacco, Firearms, and Explosives (ATF), all manufacturers participating in the production of a weapon must either encode the item with their own identifying markings (which are registered and recognized by ATF) or request a marking variance from the ATF (2009)."

operation for extended periods of time after production. Finally, they are both high interest targets for theft and other crimes, and for this reason are required to be marked and traceable. Hence, looking at how automobiles are marked is analogous and is likely to shed light on the potentially helpful practices for the gun industry.

The marking system for automobiles is known as the VIN or Vehicle Identification Number system. Vehicle Identification Numbers have been required on every car in the United States since 1981. The United States Department of Transportation created the Unified VIN System using federal regulations under Title 49, Chapter V, Part 565. Prior to this, individual manufacturers would sometimes use their own marking systems, and no uniform standard existed. The introduction of the new VIN system brought American standards into compliance with the International Organization for Standardization's 1977 marking conventions known as ISO 3779(International Organization for Standardization, 2009). This standard requires that the first section identifies the manufacturer, the second section identifies the type of vehicle and finally, the third section be a vehicle specific code.[38]The VIN is used not only to prevent theft but also to track the history of a car(NHTSA, November 16, 2010). State Motor Vehicle Records databases provide centralized searchable records for the history of a vehicle. This provides an easy and public means of checking whether a vehicle has been stolen, where it has been registered, or whether it has been moved.

Motor vehicle manufacturers have a responsibility to report VIN information to the National Highway Traffic Safety Administration provide users of the VIN, such as State motor

[38] The VIN consists of a 17 character sequence made up of both letters and numbers, excluding the letters I, O, and Q for the purpose of clarity. No two vehicles produced within 30 years of each other may have the same VIN. At least one copy of the VIN can be easily found prominently displayed inside the door or under the hood and is always visible on the driver's side dashboard from the outside. However, beginning in 1987, the Department of Transportation's 'Motor Vehicle Theft Prevention Standard' mandated that all major parts of the automobile be stamped with the VIN.

vehicle agencies, with "the necessary deciphering information before vehicle purchasers begin registering their vehicles"(NHTSA, November 16, 2010, p. 22).[39] In addition, motor vehicle manufacturers also have a responsibility to "submit to NHTSA identifying information and a description of the items they produce not later than 30 days after manufacturing begins. Not later than 30 days after any relevant business information changes, manufacturers must notify NHTSA to ensure that their records remain current, accurate, and complete" (NHTSA, November 16, 2010, p. 8-9).[40]

Given the similarity of the two products and the urgent need to accurately trace crime related weapons, a VIN type marking system for identifying specific manufactured goods and also the VIN type system for managing and recording manufacturer product information is a worthwhile model to consider for improving the firearms marking process currently used by the firearms industry. This approach could help insure that firearms are uniquely identified and it could also help insure that product information is unambiguous, unique, up-to-date and easily identified (e.g., manufactures codes,, serial numbers, model codes and caliber).

The Internet and telephone services are two other industries that provide potentially useful insights for developing a more robust firearms marking system. Both these industries require require rigorous product identification systems to operate successfully. For example, the delivery of Internet services requires the assignment and management of completely unique

[39]"Under 49 CFR 565.26, a motor vehicle manufacturer must submit to NHTSA, either directly or through an agent, information the agency will need to decipher the manufacturer's VIN characters not later than 60 days before the manufacturer offers for sale the first vehicle identified by that VIN or if information concerning vehicle characteristics sufficient to specify the VIN code is unavailable to the manufacturer by that date, then within one week after that information first becomes available. The purpose of the 60-day requirement is to permit users of the VIN, such as State motor vehicle agencies, to obtain the necessary deciphering information before vehicle purchasers begin registering their vehicles. The VIN deciphering information must be addressed to: Administrator, National Highway Traffic Safety Administration, 1200 New Jersey Avenue, SE., Washington, DC 20590, Attention: VIN Coordinator."(NHTSA, November 16, 2010, p. 22)

[40]The European Union has rules similar to the VIN system. However, while they are compliant with the ISO 3779 standards, European VINs are not required to track year or place of production or any of the vehicles attributes (International Organization for Standardization, 1977).

Internet Protocol addresses. The Internet Corporation for Assigned Names and Numbers (ICANN) is a nonprofit public corporation that acts as the sole organizing body for unique internet identifiers. While the ICANN does not control content on the net, it does develop policies regarding the unique identifiers used to keep the internet secure, stable and functional (ICANN, retrieved May 23, 2011, http://www.icann.org/en/participate/what-icann-do.html). ICANN operates the Internet Assigned Numbers Authority (IANA) that "allocates and maintains unique codes and numbering systems that are used in the technical standards ("protocols") that drive the Internet" (IANA, retrieved January 3, 2011). ICANN notes that, "to reach another person on the Internet you have to type an address into your computer - a name or a number. That address has to be unique so computers know where to find each other. ...Without that coordination we wouldn't have one global Internet." (ICANN, retrieved January 3, 2011).

Finally, the cell phone industry is another industry that has successfully addressed the issue of providing unique identifiers for their products. The unique number attached to each is analogous to the use of serial numbers to uniquely identify a weapon, although the actual numbers of specific phone numbers is much greater than the number of existing firearms.[41] In the United States and North America the North American Numbering Plan Administration "holds overall responsibility for the neutral administration of NANP numbering resources, subject to directives from regulatory in the countries that share the NANP." (NANPA, retrieved July 20, 2011 from http://www.nanpa.com/about_us/index.html). NANP, the North American Numbering Plan, "is an integrated telephone numbering plan serving 19 North American countries that share its resources" (NANPA, retrieved July 20, 2011 from

[41]The International Telecommunications Union (ITU) reported that mobile cellular phone subscriptions would reach 5 billion in 2010. is "…the leading United Nations agency for information and communication technology issues, and the global focal point for government and private sector developing networks and services" (ITU, Retrieved on July 20, 2011, from http://www.itu.int/newsroom/press_releases/2010/06.html).

http://www.nanpa.com/about_us/abt_nanp.html). Under this plan each participating country has regulatory authority over numbering resources, but these resources are shared cooperatively.

The lessons offered by the automobile, Internet and phone industries indicate that there are robust models for creating, assigning and managing unique identifiers that can be usefully adapted to the firearms industry. In addition, the challenges these industries faced in creating and managing unique identifiers is no less and probably greater than that faced by the firearms industry.

The most important lessons derived from the merger procedures that were developed for this project is that current standards for marking firearms need to be enhanced in order insure that markings are unique to the firearm, standardized, obliteration resistant. In addition, information on firearm manufacturers, importers and wholesalers should be maintained in a manner that is up-to-date, accurate and maintained in readily available formats. Finally, advances in technology such as laser etching and deep security markings should facilitate the process of marking firearms and can be used to effectively increase the security of these markings.

Taken together, the examples set by other industries and the our examination of current firearms marking procedures, the development and implementation of rigorous firearms marking systems is an achievable and important policy goal. This is important because the capacity to accurately and uniformly trace a weapon throughout its life is critical for understanding illegal firearm markets and initiating investigations of firearms trafficking. Cook, Molliconi, and Cole (1995) note that gangs and other violent criminals prefer untraceable guns because of their capacity to hinder investigations, and they note that proper marking of weapons does not limit legal access or use of firearms. In addition, Support for these types of reforms in marking firearms has been generally high in the past.

In terms of public support for the these type of policy initiatives, the work of Teret and colleagues (1998) conclude from their work, "Support for New Policies to Regulate Firearms: Result of Two National Surveys, that that thereis widespread

> "…support for policies designed to reduce the illegal sale of guns, such as mandatory tamper-resistant serial numbers. Respondents were told that serial numbers on handguns, which permit gun tracing, could be made harder to remove, and that this could increase the price of the handgun slightly, still, 90 percent favored a law requiring handgun manufacturers to make serial numbers tamper-resistant" (813).

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Sale or Purchase of More Than One Handgun within a Thirty Day Period Prohibited, LA Municipal Code Ch 5, Article 5, Sec. 55.14

Fingerprinting of Firearms Purchasers, LA Municipal Code Ch 5, Article 5, Sec. 55.15,

CA State Law PC Sec. 1 1270 -1076

AB 86 (Stats. 2005, ch. 167) Levine

Assembly Bill 202 (Chapter 128, Statutes of 1999). Effective January 1, 2000, the Department of Justice *(DOJ)* begin screening all handgun transactions to ensure compliance with Assembly Bill 202 (Chapter 128, Statutes of 1999). This new law prohibits California firearm dealers from selling/transferring title of any handgun to any person who has already acquired a handgun within the State of California in the past thirty (30) days. This law has been incorporated into California Penal Code (PC) sections 12071 and 12072.

California Assembly Bill (AB) 2011 (Chapter 911, Statutes of 1998); California Penal Code (PC) Section 11108.3, effective January 1, 2002, mandates local law enforcement agencies to report to the Department of Justice (DOJ) the recovery of firearms which have been used in a crime