

Temporal Association between Federal Gun Laws and the Diversion of Guns to Criminals in Milwaukee

Daniel W. Webster, Jon S. Vernick, Maria T. Bulzacchelli,
and Katherine A. Vittes

ABSTRACT *The practices of licensed gun dealers can threaten the safety of urban residents by facilitating the diversion of guns to criminals. In 2003, changes to federal law shielded gun dealers from the release of gun trace data and provided other protections to gun dealers. The 14-month period during which the dealer did not sell junk guns was associated with a 68% reduction in the diversion of guns to criminals within a year of sale by the dealer and a 43% increase in guns diverted to criminals following sales by other dealers. The laws were associated with a 203% increase in the number of guns diverted to criminals within a year of sale by the gun store, which was the focus of this study. Policies which affect gun dealer accountability appeared to influence the diversion of guns to criminals.*

KEYWORDS *Gun violence, Gun policy, Gun trafficking*

INTRODUCTION

Gun violence is one of the most significant threats to the safety of urban residents within the USA. One strategy for addressing this problem is to reduce the availability of guns to individuals prone to violence. Many gun offenders are disqualified from possessing firearms,¹ yet they are often able to acquire guns through illegal transactions.²⁻⁴

Data from crime gun traces and from gun trafficking investigations suggest that a small proportion of licensed gun dealers play a role in supplying a substantial number of guns to traffickers, straw purchasers, or directly to criminals proscribed from possessing firearms.⁵⁻⁷ Relatively little of the vast disparity among gun dealers in the likelihood that the firearms they sell are later traced to crime can be explained by differences in sales volume, customer characteristics, or area crime rates.⁸ Gun dealers can also influence the likelihood that the firearms they sell will be subsequently used in crime by not selling certain types of guns favored by some criminals. Small, low-quality handguns—sometimes referred to as “junk guns”—are more likely to be subsequently used in crime than are other handguns.^{9,10}

Webster, Vernick, and Vittes are with the Johns Hopkins Center for Gun Policy and Research, Johns Hopkins Bloomberg School of Public Health, Baltimore, MD, USA; Bulzacchelli is with the Department of Public Health, School of Public Health and Health Sciences, University of Massachusetts, Amherst, Amherst, MA, USA.

Correspondence: Daniel W. Webster, Johns Hopkins Center for Gun Policy and Research, Johns Hopkins Bloomberg School of Public Health, Baltimore, MD, USA. (E-mail: dwebster@jhsph.edu)

In May 1999, the Bureau of Alcohol, Tobacco, and Firearms (ATF) publically released information about guns recovered from criminals revealing that a Milwaukee-area gun dealer, Badger Guns and Ammo (Badger), led the nation in the number of guns sold which were later traced to crimes. Within days of this release, Badger's owner announced that the store would no longer sell small, inexpensive, poorly made handguns (hereafter referred to as "junk guns") that are most commonly used in crime.¹² Research showed that, following this announcement, the flow of new guns sold by the dealer that were subsequently recovered by police within 1 year of retail sale dropped by 73%.¹²

This prior study examining the effects of Badger's change in sales policy used data for crime guns recovered during the period July 1996 through December 2002. Publication of this study in 2006 prompted Milwaukee law enforcement officials to assemble additional crime gun trace data to assess whether the large reductions in the flow of new guns to criminals from Badger had continued. The additional data covered a period during which new federal policies were adopted which could affect the risk faced by individuals who divert guns from the legal to illegal market. On February 20, 2003, the so-called Tiahrt amendment (named for its sponsor, US Representative Todd Tiahrt) to the consolidated appropriations resolution for FY 2003 was signed into law. This legislation prohibited the ATF from responding to Freedom of Information Act requests for data from crime gun traces, including the number of crime guns traced to specific gun dealers. The Tiahrt amendment was then broadened in October 2003 in two ways. First, it prohibited ATF from requiring gun dealers to do a physical inventory of their firearms as part of a compliance inspection, eliminating a key means of holding gun sellers accountable for abiding by gun sales laws. Second, it required the FBI to destroy data from background checks for firearm purchase applications within 24 hours, limiting law enforcement's ability to investigate the legality of sales made by licensed gun dealers. In 2004, the Tiahrt amendment further restricted crime gun trace data including limiting access to government officials and prohibiting use of crime gun data in proceedings pertinent to firearms dealer license revocations and civil law suits. For the current study, we examine whether the adoption of the Tiahrt amendments was associated with the diversion of guns to criminals in Milwaukee.

METHODS

Design

An interrupted time-series design was used to assess whether there were significant changes in the flow of new guns to criminals in Milwaukee following the adoption of the Tiahrt amendments. Although the prior study of Milwaukee's illegal gun market included comparisons of changes in other Midwestern cities' illegal gun markets, data were not available for comparison in cities for the 2003–2006 period due to the Tiahrt amendment constraints placed on ATF's crime gun trace data.

Data

ATF uses information on the make, model, serial number, and caliber of the firearms recovered by police from criminals and crime scenes to investigate the trail of gun transfers from manufacturer to wholesaler to retailer and finally to the first retail purchaser. Beginning in 1996, many US cities, including Milwaukee, agreed to participate in ATF's Youth Crime Gun Interdiction Initiative. Participating cities

agreed to submit to ATF for tracing all crime guns recovered by police, minimizing selection bias. The data acquired for this study built upon the data collected for our prior study of firearms recovered by the Milwaukee Police Department (MPD) from July 1996 through December 2002 and submitted for tracing by the ATF.¹² For the new data, MPD accessed their crime gun trace requests for the period January 1, 2003, through December 31, 2006, through the ATF's e-Trace system and then supplied the data to the researchers for this study.

Measures Researchers who have studied the diversion of guns from legal to illegal markets, as well as the ATF, have focused their analyses on crime gun traces with a relatively short time interval between retail sale and subsequent connection to crime.¹²⁻¹⁵ As a proxy for illegal gun diversion, we tracked crime guns with an especially short time interval between retail sale and crime (<1 year), but excluded cases in which the criminal gun possessor was also the presumably legal purchaser of the gun. The number of such guns per 2-month sales period was our primary outcome measure, resulting in 57 data points for each time series analyzed.

Data were stratified according to whether the diverted gun was first sold by Badger or by some other licensed dealer. In order to isolate the effects of Badger's sales policies with respect to junk guns and because the initial dramatic reduction in the flow of new crime guns from Badger coincided with the dealer's decision to stop selling these guns, we also stratified the analysis of guns sold by Badger based on whether the gun could be classified as a junk gun (sometimes referred to as "Saturday night specials"). Consistent with our prior study of Milwaukee's crime guns,¹² we classified junk guns as small-caliber (.22, .25) and medium-caliber (.38, .380) handguns manufactured by companies that primarily or exclusively sell small, inexpensive (<\$150) handguns, according to Wintemute's research of this segment of the gun industry¹⁶ and lists of guns prohibited under state laws banning junk guns.¹⁷

Badger's practices concerning the sale of junk guns were measured with an indicator variable set to 1 for the sales interval May 1999 through August 2000 and set to 0 otherwise. These dates were determined from Badger's owner's public statement in May 1999 that the store would no longer sell inexpensive, small handguns most commonly linked to crime and from crime gun trace data which indicated that Badger had clearly resumed selling junk guns in August 2000. Presence of the Tiahrt amendments was measured by a dichotomous independent variable set to 1 for the sales period March 2003 (the first full month following the initial Tiahrt amendment) through December 2005 and set to 0 otherwise.

Analyses

The analyses focused on the temporal association between two changes relevant to local gun dealers—Badger's initial decision to stop selling junk guns and the enactment of the Tiahrt amendments to the US Department of Justice's appropriations law described above—and the diversion of guns to criminals shortly following retail sales. Histograms and Q-Q plots indicated that the outcome variables were approximately normally distributed.

To control for autocorrelation in model errors, we identified and estimated Autoregressive Integrated Moving Average (ARIMA) regression models to estimate the associations between the interventions and the diversion of guns to criminals.¹⁸ To assess the models' adequacy, autocorrelation functions and partial autocorrelation functions of model residuals were plotted, and Ljung-Box Q-statistics¹⁹ of

model fit were calculated. Statistical analyses were performed using SPSS v.17.0 software.²⁰

Temporal patterns in police recoveries of recently diverted crime guns could reflect changes in the degree to which police focus on illegal guns and gun offenders. Therefore, the models controlled for temporal variation in the number of crime guns police recovered which had been purchased from a licensed gun dealer 3 to 11 years prior to police recovery. To account for unmeasured factors that might have influenced the diversion of guns to Milwaukee's criminal market over time, we also included a linear trend term in the models.

RESULTS

During the study period, there were a total of 19,818 guns recovered by the MPD and submitted to ATF for tracing. Of these, 11,474 (58.0%) were successfully traced to a purchaser. The most common reasons that crime gun submissions could not be traced were the gun being too old (15.9%) or inaccurate or insufficient information provided for a successful trace (19.1%). A total of 1,348 crime guns met our definition for the proxy for illegal diversion during the study period; 800 (59.3%) had been sold by Badger.

Figure 1 depicts trends in the illegal diversion proxy for guns sold by Badger and by all other dealers for each 2-month sales period. Prior to Badger's change in sales policy in May 1999, Badger sold the large majority of guns which had been diverted into the criminal market in Milwaukee less than a year following retail sale. Following Badger's announcement that it would no longer sell small, low-quality handguns commonly used by criminals in May 1999, the number of diverted crime guns sold by Badger declined dramatically and remained very low for 14 months. During this period, other dealers account for far more of the newly diverted guns than was the case for Badger. For a 20-month period beginning with guns sold in early 2000, the diversion of guns originally sold by Badger into the criminal market rose gradually. Badger-sold diverted guns increased sharply beginning with the March–April 2003 sales period when the first of the Tiahrt amendments became

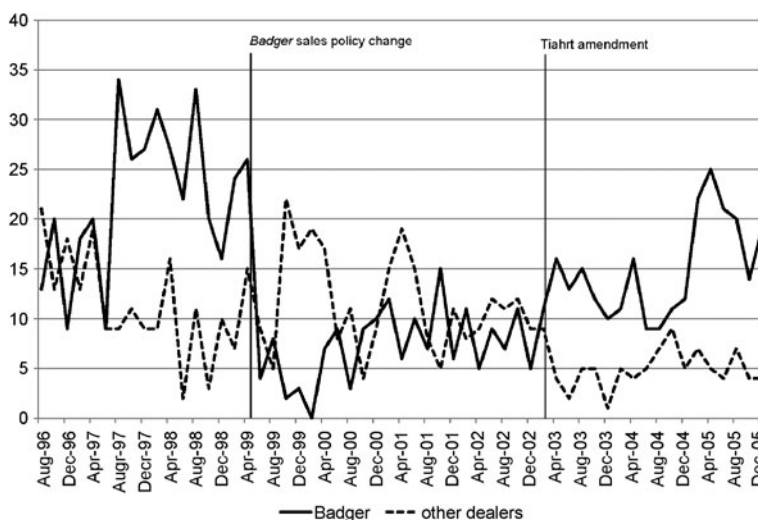


FIGURE 1. Guns diverted to criminals within a year of retail sale by Badger or by other dealers for gun sales periods July 1996 through December 2005.

law. From that point through the end of the study period, the diversion of guns sold by Badger into the criminal market fluctuated. In contrast, guns diverted into the criminal market within a year of sale by other gun dealers increased for guns sold during the later part of 1999, then declined somewhat for guns sold in late 2002 through the end of 2005. By 2003, coincident with the enactment of the first Tiahrt amendment, Badger had regained its previous dominance as a supplier of recently diverted guns to Milwaukee’s criminal market.

To assess whether the temporal patterns depicted in Figure 1 were driven largely by Badger’s decisions about whether to sell junk guns or not, we examined trends for guns diverted to the criminal market within a year of sale by Badger by whether the gun was classified as a junk gun (Figure 2). Although the temporal changes are very pronounced for diverted junk guns, the diversion of non-junk guns sold by Badger follows a similar pattern. There was also a trend away from junk guns toward non-junk guns in the criminal market during the last third of the study period. While the number of diverted junk guns was essentially equal to the number of diverted non-junk guns prior to Badger’s decision to stop selling most junk guns, diverted non-junk guns were more than three times as common as diverted junk guns during the sales period encompassing the Tiahrt amendments.

Data in Tables 1 and 2 compare the means of the outcome measures during three time periods of interest—(a) before Badger announced it would no longer sell junk guns, (b) after this announcement but before the Tiahrt amendments, and (c) when the Tiahrt amendments were in place. Diversion of guns sold by Badger into the criminal market was 66% lower for guns sold May 1999 through February 2003 compared with the previous period, but was twice as high during the Tiahrt amendment period than in the period following Badger’s change in sales policy. In contrast, there was no difference in the mean number of guns diverted following sale by other gun dealers between the first two periods, but 54% fewer guns were diverted from other dealers during the Tiahrt amendment period. Time period differences for diverted guns sold by Badger were most pronounced for junk guns, but were also significant for non-junk guns (Table 2).

Estimates from the ARIMA model (Table 3) for explaining temporal variation in diverted guns which had been sold by Badger indicate that Badger’s decision to stop

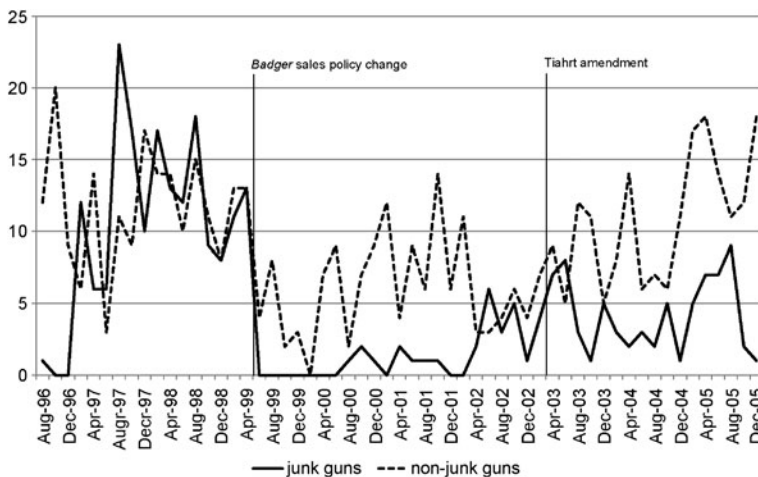


FIGURE 2. Guns diverted to criminals within a year of retail sale by Badger by whether the gun was a junk for gun sales periods July 1996 through December 2005.

TABLE 1 Comparisons of mean measures of new diverted firearms across three periods of firearm sales for Badger versus all other firearm dealers

	Mean (SD)	Sale period comparison	Change
Badger Guns & Ammo			
Sale period			
A. July 1996–April 1999	22.06 (7.56)		
B. May 1999–Feb. 2003	7.39 (3.63)	B–A	–66%
C. Mar. 2003–Dec. 2005	15.00 (4.87)	C–B	+103%
$F=36.22 (2), p<.001$			
Other gun dealers			
Sale period			
A. July 1996–April 1999	11.47 (5.22)		
B. May 1999–Feb. 2003	11.48 (4.85)	B–A	+0%
C. Mar. 2003–Dec. 2005	5.24 (1.86)	C–B	–54%
$F=12.43 (2), p<.001$			

selling junk guns was associated with a reduction in the mean number of diverted guns of 9.75 guns per 2-month period ($\beta=-9.75$, $SE=3.25$) during the relevant 14-month period (May 1999 through June 2000). The introduction of the Tiahrt amendment was associated with an increase of ten diverted guns sold by Badger every 2 months ($\beta=10.06$, $SE=3.95$)—a 203% increase during this period. These estimates control for a baseline linear trend in diverted guns sold by Badger, the number of guns being recovered by police that had sale-to-crime intervals greater than 3 years and a moving average 2 temporal autocorrelation pattern (Table 3, model 1). If we assume that the Tiahrt amendments would not affect gun dealer practices until the beginning of fiscal year 2004 (October 2003) because more new restrictions went into place at that time, then the estimated effect of this policy changes from -10.06 to -6.67 , and the significance level (.077) is higher than the traditional .05 criteria for rejecting the null hypothesis of no association. This alternative model fit the data slightly less well than the primary model ($R^2=.443$ versus $R^2=.493$).

TABLE 2 Comparisons of mean measures of new diverted firearms for junk guns and non-junk guns sold by Badger across three periods of firearm sales

	Mean (SD)	Sale period comparison	Change
Junk guns			
Sale period			
A. July 1996–April 1999	10.35 (6.49)		
B. May 1999–Feb. 2003	1.30 (1.72)	B–A	–87%
C. Mar. 2003–Dec. 2005	9.61 (5.13)	C–B	+639%
$F=25.74 (2), p<.001$			
Non-junk guns			
Sale period			
A. July 1996–April 1999	11.71 (4.09)		
B. May 1999–Feb. 2003	6.09 (3.50)	B–A	–48%
C. Mar. 2003–Dec. 2005	10.82 (4.36)	C–B	+78%
$F=12.01 (2), p<.001$			

TABLE 3 Estimates from regression models on the number of guns diverted to criminals in Milwaukee within 1 year of retail sale by Badger Guns (model 1) and by all other gun dealers (model 2)

	B	Std. error	t	Significance
Model 1—Badger Guns				
Constant	19.45	5.46	3.50	.001
Moving average lag 1 (MA1)	-.126	.135	-.94	.354
Moving average lag 2 (MA2)	-.313	.137	-2.29	.026
Sale period (trend)	-.344	.108	-3.17	.003
Older guns recovered ^a	.037	.054	.69	.491
Badger stops selling junk guns	-9.75	3.25	-3.00	.004
Tiahrt amendments	10.01	3.95	2.55	.014
$R^2 = .493$; Ljung-Box $Q = 18.91$, $df = 16$, $p = .274$				
Model 2—all other gun dealers				
Constant	8.46	3.48	2.43	.019
Sale period (trend)	-.065	.055	-1.18	.245
Older guns recovered ^a	.044	.037	1.18	.242
Badger stops selling junk guns	3.29	1.77	1.86	.069
Tiahrt amendments	-3.06	2.15	-1.42	.161
$R^2 = .380$; Ljung-Box $Q = 16.74$, $df = 18$, $p = .541$.				

^aGuns recovered by police 5 to 7 months following the sales period for the outcome variable that had sale-to-crime intervals of 3 to 11 years

The regression analysis of guns diverted to criminals within a year of retail sale by *other* gun dealers estimated that Badger’s decision to stop selling junk guns was associated with an increase of 3.3 guns per 2-month period ($\beta = 3.29$, $SE = 1.77$, $p = .069$). The Tiahrt amendments were associated with a decrease in guns diverted to criminals that was not statistically significant ($\beta = -3.06$, $SE = 2.15$; Table 3, model 2).

When the models for guns sold by Badger are stratified by whether the diverted guns were junk guns or not, both junk guns and non-junk guns declined in response to Badger’s decision to discontinue sales of junk guns ($\beta = -6.48$, $SE = 2.70$ for junk guns; $\beta = -4.35$, $SE = 1.78$ for non-junk guns). However, the Tiahrt amendments were associated with statistically significant increases only for the diversions of non-junk guns to criminals ($\beta = 5.80$, $SE = 2.15$; Table 4).

DISCUSSION

In debates over the regulation and oversight of gun sellers, licensed gun dealers often claim that they cannot control whether the guns they sell will end up in the hands of criminals.²¹ The data from this study demonstrate how the flow of guns sold by a high-volume gun dealer to criminals changed dramatically coincident with changes to federal gun policy (the Tiahrt amendment) which could have altered the risks licensed gun dealers face if they engage in illegal or careless business practices. A prior study reported that—directly following news reports of a release of ATF data showing Badger had sold more guns traced to crime than any other gun dealer in the US—Badger voluntarily stopped selling junk guns. This, in turn, led to a dramatic reduction in the flow of guns from Badger to criminals.¹² The current study showed

TABLE 4 Estimates from regression models on the number of guns diverted to criminals in Milwaukee within 1 year of retail sale by Badger Guns for junk guns (model 1) and non-junk guns (model 2)

	<i>B</i>	Std. error	<i>t</i>	Significance
Model 1—junk guns				
Constant	5.53	3.98	1.39	.171
Autoregressive lag 1 (AR1)	.576	.119	4.86	<.001
Sale period (trend)	-.188	.100	-2.53	.015
Older guns recovered ^a	.050	.035	1.43	.159
Badger stops selling junk guns	-6.48	2.70	-2.40	.020
Tiahrt amendments	4.22	3.41	1.24	.221
$R^2 = .505$; Ljung-Box $Q = 15.96$, $df = 17$, $p = .526$				
Model 2—non-junk guns				
Constant	10.83	3.49	3.10	.003
Sale period (trend)	-.139	.055	-2.50	.015
Older guns recovered ^a	.015	.037	.39	.697
Badger stops selling junk guns	-4.35	1.78	-2.45	.018
Tiahrt amendments	5.80	2.15	2.69	.010
$R^2 = .245$; Ljung-Box $Q = 9.93$, $df = 18$, $p = .934$				

^aGuns recovered by police 5 to 7 months following the sales period for the outcome variable that had sale-to-crime intervals of 3 to 11 years

that the flow of guns to criminals which had been recently purchased at Badger began to increase 14 months following the dealer's change in sales practices when Badger resumed selling some junk guns.

Perhaps most relevant to current gun policy, the current study estimated a 203% increase in the diversion of guns from Badger to criminals associated with the introduction of the Tiahrt amendments to US gun policy which offered gun dealers a variety of protections. In an alternative model which assumed that gun dealer practices would not be affected until the last quarter of 2003 when additional Tiahrt amendment changes went into effect, the estimate for magnitude of the Tiahrt amendments effect was somewhat lower (yet still substantial), with an alpha level for a type 1 error of .077.

Badger's contribution to the flow of new guns into Milwaukee's criminal market for guns sold prior to 2001 was associated with the dealer's decisions about whether to sell junk guns. However, the increase in the diversion of guns sold by Badger to criminals following the adoption of the Tiahrt amendments cannot be attributed to Badger's sales of junk guns because the increase coincident with the new policies was only evident for non-junk guns. Furthermore, the Tiahrt-associated increase in the diversion of guns to criminals was only evident for guns sold by Badger. There was no significant change in the diversion of guns sold by other gun retailers following the Tiahrt amendments. This selective effect is consistent with ATF agents' perceptions²¹ and prior research which indicates that significant diversion of guns to criminals is not a problem for a large majority of licensed gun dealers.^{5-7,21}

The ability to draw causal inferences from this or any observational study is limited. However, the changes associated with the interventions were relatively large, in the direction that we hypothesized, and selective to the type of dealer we would anticipate. The findings are also consistent with a growing body of research demonstrating that measures which enhance firearm sellers' risk if they engage in illegal or irresponsible practices are associated with lower risk of gun trafficking or illegal sales.^{13,15,22,23} Because the federal policies examined in this study applied to

all US jurisdictions, the study lacked a non-intervention comparison. The Tiahrt amendment restrictions on the sharing of crime gun trace data were responsible for our inability to examine data for other cities.

Some have questioned whether ATF crime gun trace data provide an accurate measure of the illegal gun market.²⁴ If police select only certain guns that they recover for tracing, crime gun trace data can be biased. Selection bias, however, should not be a problem in this study because the MPD has had a policy of tracing every gun it recovers throughout the study period. Another limitation of crime gun trace data is that not all crime guns can be successfully traced to a purchaser. In this study, 42% could not be traced, typically because of inaccurate or insufficient information or because the gun was deemed too old to trace. We doubt that the common reasons for not being able to successfully trace all guns would have much impact on the measure which was the focus of this study—the diversion of guns to criminals within a year of retail sale.

Ideally, we would have had a direct and independent measure of Badger's sales practices concerning junk guns. We used the date of the gun dealer's public announcement stating that the store would no longer sell small, inexpensive handguns commonly linked to crime to "turn on" this indicator variable. There was no public announcement about Badger resuming sales of these guns that could be used to "turn off" the indicator variable, yet Badger's resumption of sales of junk guns in August 2000 was evident in the ATF crime gun trace data. It is best to avoid having an explanatory variable measure be influenced by the same data that generate the outcome measure. However, ignoring the trace data information that Badger had resumed sales of junk guns would have led to measurement error for 66 months for this covariate including all 44 of the months the Tiahrt amendments were in effect. Junk gun sales are more likely to lead to diversions to the criminal market than are sales of other guns.¹⁰ We thought it was more important to accurately control for a key confounder for the association between the Tiahrt amendments and the diversion of guns to criminals than it was to have a "pure" but inaccurate independent variable since the primary aim of this study was to derive an unbiased estimate of the association between the adoption of the Tiahrt amendments and the diversion of guns to criminals.

If the shifting patterns in the diversion of guns to Milwaukee's criminals have been driven by Badger's sales practices, it raises the question of what motivated these changes in sales practices. The initial decision by Badger's owner to cease selling low-cost handguns was made within days of his business receiving unflattering public attention when the store was identified as the nation's leading seller of guns traced to crime. Just prior to these events, another local gun dealer was caught by the ATF in an undercover sting making illegal sales and lost his license to sell firearms. Just weeks earlier, dozens of gun dealers in the Chicago and Detroit metropolitan areas were hit with undercover stings that revealed the dealers facilitating illegal straw purchases, and many were sued by the cities for these practices. These lawsuits were associated with significant reductions in the diversion of new guns to criminals in those cities.¹⁵

The environment Badger faced was very different beginning in March 2003 when the first of the Tiahrt amendments went into effect. Actions were being taken to protect gun dealers from bad publicity, lawsuits, and actions against their federal license to sell firearms. In addition to the Tiahrt amendments, many states had passed or were considering passing laws that prohibited lawsuits against the gun industry,²⁵ and the federal government was poised to do the same.²⁶ Regulation and oversight of gun dealers were unlikely to be as high on the agenda of law enforcement agencies that were taking on new responsibilities for homeland security.

The gun industry and the National Rifle Association have been politically effective in protecting gun retailers from federal regulations and oversight.²⁷ Effective federal regulation of retail firearm sellers may be the best way to ensure that gun dealers do not sell guns to straw purchasers, traffickers, or criminals, but states and localities can also fulfill this function.²⁸ Research has shown that strong state or local regulation and oversight of gun dealers are associated with lower levels of diversion of guns from in-state gun dealers.²³

Further research is needed to assess how the Tiahrt amendments have affected the diversion of firearms from other gun dealers around the US. Unfortunately, the policy itself—by restricting access to trace data—is a major impediment to any such research occurring.

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