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The US Firearms Industry

Production and Supply

by Jurgen Brauer

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Small Arms Survey
Graduate Institute of International and Development Studies
47 Avenue Blanc, 1202 Geneva, Switzerland

t + 41 22 908 5777
f + 41 22 732 2738
e sas@smallarmssurvey.org
w www.smallarmssurvey.org

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About the author

Jurgen Brauer, Ph.D., is a professor of economics at the Hull College of Business, Georgia Regents University, and co-editor of *the Economics of Peace and Security Journal*. His recent books include *Castles, Battles, and Bombs: How Economics Explains Military History* (with H. van Tuyll; University of Chicago Press, 2008), *War and Nature: The Environmental Consequences of War in a Globalized World* (Altamira Press, 2009), and *Peace Economics: A Macroeconomic Primer for Violence-afflicted States* (with J. Paul Dunne; US Institute of Peace Press, 2012). A native Berliner, Brauer has held visiting professorships in Australia, Colombia, South Africa, Spain, and Thailand. He may be reached at brauer.jurgen@gmail.com or via http://StoneGardenEconomics.com.

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Abbreviations and acronyms

AFMER	*Annual Firearms Manufacturing and Export Report*
ATF	Bureau of Alcohol, Tobacco, Firearms, and Explosives
Customs	US Customs and Border Protection
FAET	Firearms and ammunition excise tax
FBI	Federal Bureau of Investigation
FFL	Federal firearms licence
GIS	Geographic information system
HHI	Herfindahl-Hirschman Index
IRS	Internal Revenue Service
MSGF	Multiple gun sales factor
NAICS	North American Industrial Classification System
NICS	National Instant Criminal Background Check System
RDS	Region, District, Sequence
Ruger	Sturm, Ruger & Co. Inc.
SEC	US Securities and Exchange Commission
USCB	US Census Bureau
USITC	US International Trade Commission

Introduction

This working paper considers economic aspects of the US firearms industry, specifically the civilian, private security, and law enforcement (i.e. non-military) markets for pistols, revolvers, rifles, and shotguns. Although it provides estimates of annual firearms demand in the United States from 1999 to 2010, primarily the paper examines supply-side issues, including: (1) the number of firearms producers selling weapons to end users; (2) the number of firearms produced and disposed of in trade; (3) freedom of entry into and exit from the industry; (4) industry consolidation in the various firearms market segments; (5) competition by overseas firms; (6) firearms exports and imports that complement US-based production; and (7) the structure of the industry (ranging from competitive to monopolistic). The production of 'miscellaneous firearms' (e.g. machine guns or separate frames or receivers, actions, or barrelled actions; see below) and production for export are not considered in this paper. Similarly, intra-industry trade, such as contract manufacturing, is not dealt with here.

Perhaps the most striking, novel features of the paper are the estimation of firearms demand, the estimation of non-reported weapons production, firearms resales (trade in used firearms), insights into the changing composition of firearms sales in terms of domestically produced and imported weapons, and the computation of firearms market concentration measures.

The analysis is based on a data record drawn from the Bureau of Alcohol, Tobacco, Firearms, and Explosives (ATF), the Federal Bureau of Investigation (FBI), US Customs and Border Protection (Customs), and the US Census Bureau (USCB). Although some dates back to 1980, most of the data employed in this paper covers the years 1986–2010. For this latter period, the paper identifies 2,288 US-based firearms manufacturers and traces domestic net production (net of exports) of pistols, revolvers, rifles, and shotguns for domestic sale (i.e. excluding production for export) of over 98 million firearms in the United States between 1986 and 2010, and the net import of

probably at least 48 million firearms more for the same years. The result has been a domestic supply of about six million newly produced or imported firearms per year during the 25-year period covered in the paper.

Despite the limited scope of the study, centred as it is around numbers of firearms producers and quantities of firearms produced, the paper generates a great deal of new information based on data that is excruciatingly difficult to access, assemble, assess, and process. Recognizing that different readers will have different interests in the issues, the main findings may be grouped into two categories: (1) producers, production, imports, and net supply of firearms to the US market; and (2) market and supplier characteristics.

Producers, production, imports, and net supply of firearms

- Judged by ATF reports, the frequency and size of data revisions, and interviews with ATF personnel, it appears that firearms production reporting compliance with US law among manufacturers of firearms has been improving. An estimate for the ten-year period 2001–10 suggests underreporting of about 320,000 weapons. While large in absolute numbers, this amounts to less than 1 per cent of overall reported production.
- For the civilian, private security, and law enforcement markets, from 1986 to 2010 some 2,288 US-based producers of civilian firearms have been identified, possibly the most extensive public record yet in existence.[1]
- The production of firearms for domestic, non-military use is highly cyclical, particularly for the pistol segment of the market, having oscillated between three million and 5.5 million firearms per year since 1980.
- During the period 1986–2010 overall production of 106,079,100 weapons is reported (i.e. including miscellaneous and exported firearms), or about 4.24 million firearms for each of the 25 years in the database.
- Handgun production (pistols and revolvers) declined by about 10 per cent between 1993 and 2010 when measured in per capita terms. In contrast, in 2008, 2009, and 2010 per capita rifle production reached its highest levels since 1986.
- Firearms imports into the United States have risen almost linearly, from around 500,000 units in the early 1980s to about 3.5 million units by 2010.[2]

US firearms producers have come under considerable import competition pressure not unlike that experienced by other branches of US manufacturing.

- The annual firearms supply (production for domestic use plus imports) per 100,000 people has stayed fairly constant (2,258 in 1989, as compared to 2,272 in 2008), and has increased remarkably since then (2,674 in 2010). However, the *composition* of the firearms supply sources has changed markedly. In 1989 about 80 per cent of firearms came from domestic sources; this figure fell steadily to between 55 and 65 per cent in the late 2000s.
- An estimate of US domestic firearms resales via licensed firearms dealers (i.e. trade in 'used' weapons) suggests the resale of about 1.5 million units in 2010 alone. For the average of the years 1999–2010, domestically produced new and imported weapons satisfied an estimated 75 per cent of US market demand, while resales of 'used' weapons satisfied the remaining 25 per cent.[3]

Market and supplier characteristics

- From 1980 to 2010 the industry went through severe business cycles, with reported production levels both declining and rising by 50 per cent within very short time periods, possibly posing severe challenges to the management of firearms firms.
- For the 1986–2010 period around half of all US firearms manufacturers reported production levels of between one and nine weapons per year.[4] Only a small percentage of firms—between 1.3 and 7.5 per cent—produced more than 100,000 weapons per year.
- Three brands (Sturm, Ruger & Co. Inc. (hereafter Ruger), Remington, and Smith & Wesson) each produced ten million or more weapons over the entire 1986–2010 period, or about 41 per cent of all domestically produced firearms for domestic use documented in this paper (40 million out of 98.2 million).
- Almost all manufacturers specialize in the production of only one weapon type. On the whole, the industry is highly segmented into one of four

product categories (pistols, revolvers, rifles, and shotguns), but since 2007 a number of firms have branched into other product segments.

- Non-US brands have encroached on the US market and have firmly established themselves, particularly pistol manufacturers. In 2010, for example, three of the top five firms were non-US brands (Sig Sauer, Beretta, and Taurus).
- Recent mergers and acquisitions activity has been substantial, particularly in the rifle market, but apparently has not (yet) breached any threshold required for the US Department of Justice to initiate anti-trust investigations.
- In the pistol market considerable market entry and exit—and inter-rank mobility among each year's top 20 firms—can be observed for the 1986–2010 period. The very top ranks of pistol manufacturers, however, have remained fairly stable over time.
- The revolver market is a stable oligopoly dominated by Ruger and Smith & Wesson, which have been the top two producers since 1986. Similarly, the top four producers have remained virtually unchanged since 1996.
- The rifle market features one parent firm that in 2010 held more than one-third of the market.
- The shotgun market is a solid duopoly, with the two leading sellers, O. F. Mossberg/Maverick and Remington Arms, sharing 91 per cent of the market in 2010.

The paper pays particular attention to a thorough understanding of the detail and limitations of the data on which its findings are based. The economic study of the modern US civilian firearms industry is far from complete—indeed, it has barely begun—and may require considerable resources if it is to be developed further. In particular, information on firms' production costs and firearms market prices will be needed to begin a fuller economic analysis of the market.

The paper proceeds as follows. Because of their intricate nature and overwhelming importance to the study, data sources and issues are initially discussed at length. This is followed by sections discussing firearms production levels and the size of firearms-manufacturing firms; a brief section on import

competition; extensive sections on firearms imports and total firearms supply and demand; an analysis of manufacturers' market shares and market concentration measures; an analysis of market entry and exit, as well as a rank order and inter-rank mobility analysis; and a discussion of recent mergers and acquisitions in the industry. A summary and discussion of the conclusions reached complete the working paper.

Data sources and issues

In order to appreciate the detail—and potential limitations—of the findings, this section discusses data sources and issues in some depth.

Limited US firearms market data

No comprehensive economic studies of the US firearms industry have been attempted in recent decades.[5] Primarily, this would seem to be due to the paucity of credible data and the difficulty of accessing it. This is true for data pertaining to both the market as a whole and individual companies.[6]

As for any other market analysis, a comprehensive economic study of the firearms industry would require information about quantities sold, prices charged, revenues obtained, costs incurred, innovations made, regulations imposed, profits gained, and other relevant data. It would also necessitate access to information on the structure of the industry, e.g. the degree to which it is competitive or not; how industry structure may have changed over the years and why; the degree of industry segmentation into distinct product or customer niches; and whether segmentation is contested (i.e. whether companies encroach on one another's turf in an attempt to gain cross-segment market share). Such a study, furthermore, would require information on the role of innovation in firearms platforms, ammunition, and accessories, and the underlying drivers of successful innovation. Much of this has been done for many industries—from health care to beer—but not for the firearms industry, at least not in the public domain. Data limitations make such a full study unfeasible as yet, particularly in terms of production costs and market prices.

Every five years the USCB collects economic census statistics for each industry in the United States. In late 2010 the bureau published the latest numbers for 'Small Arms Manufacturing' under the North American Industrial Classification System (NAICS) code 332994, with data pertaining to 2007

(USCB, 2010a; 2010b).[7] The census records 212 employers operating in this sector, with 224 'employer establishments' and 11,399 employees, a payroll of nearly USD 507 million, and sales revenues of over USD 2,742 million. It lists value-added as over USD 1,814 million,[8] costs of materials as approximately USD 988 million, and capital investment as nearly USD 111 million (USCB, 2010b).[9] While this census data appears to be specific and detailed, it also seems to be incomplete. We know this because the 2007 records from the ATF indicate some 412 US rifle manufacturers alone (see Figure A3), not to mention distinct pistol, revolver, and shotgun manufacturers.

This discrepancy is a clear indication that a study of the US firearms industry needs to expand the scope of its enquiry beyond the limited existing 'industry' data sources. This paper advances knowledge of certain economic aspects of the industry and in particular deals with the number of producers, firearms industry structure, and quantities of non-military firearms produced in the United States in the period 1980–2010.[10] No attempt has been made to convert quantities into market dollar values.

The paper does little to address production costs, location decisions, market prices, total revenue, firearms innovation, or even the effect of government regulation on firms' supply and customers' demand behaviour. At present, much of this information is not available at the industry level.

Data sources

The analysis presented in this paper relies heavily on raw data obtained from the ATF, formerly an agency of the US Department of the Treasury. In 2003 the law enforcement functions of the ATF were transferred to the US Department of Justice, while the tax and trade functions remained with the Treasury (ATF, n.d.a). The ATF collects data supplied by US firearms manufacturers, which are required to obtain a federal firearms licence (FFL) and report annually on calendar-year-based commercial sales (18 USC, para. 923(g)(5)(A); see ATF, 2005, p. 17), i.e. excluding intra-industry trade, such as contract manufacturing, and military sales. The ATF then collates the information in its *Annual Firearms Manufacturing and Export Report* (AFMER); starting with data year 1998, it has placed AFMER online in PDF format.

There are nine types of FFLs. With categories 04 and 05 unassigned, they are:

> *01 Dealer in Firearms Other Than Destructive Devices (Includes Gunsmiths); 02 Pawnbroker in Firearms Other Than Destructive Devices; 03 Collector of Curios and Relics; 06 Manufacturer of Ammunition for Firearms; 07 Manufacturer of Firearms Other Than Destructive Devices; 08 Importer of Firearms Other Than Destructive Devices; 09 Dealer in Destructive Devices; 10 Manufacturer of Destructive Devices; and 11 Importer of Destructive Devices (ATF, n.d.b).*[11]

Reporting is mandated by law for FFL holders in categories 07 and 10:

> *Those Federal Firearms Licensees who hold either a Type 07 (manufacture of firearms), or a Type 10 (manufacture of destructive devices) [license] must file in compliance with 27 CFR § 478.126, on an annual basis (ATF, n.d.c, p. 2).*

Due to the Trade Secrets Act, the publication of AFMER is delayed by more than a year. For example, data for calendar year 2010 was due to be reported to the ATF by 1 April 2011 and was released to the public in early February 2012. At the time of writing, 2010 data was the latest available. Data for additional years, back to 1986, was obtained via a Freedom of Information Act request lodged with the ATF in November 2008.

AFMER states that

> *[f]or purposes of this report only, 'production' is defined as: Firearms, including separate frames or receivers, actions or barreled actions, manufactured and disposed of in commerce during the calendar year (e.g. ATF, 2009).*

The word 'production' is unfortunate and the use of the conjunction 'and' potentially confusing. In fact, the definition refers specifically to sales into commerce, i.e. to wholesalers, retailers, or directly to end users, whether from current-year production or from prior-year inventories.[12] The phrase 'separate frames or receivers, actions or barreled actions' refers to items captured in the 'miscellaneous firearms' category. This paper focuses on complete firearms only (pistols, revolvers, rifles, and shotguns). Machine guns

manufactured for the non-military market are complete firearms, of course, but the 'miscellaneous firearms' category does not identify them separately and so they are not dealt with here.

For each manufacturing site, the ATF assigns and AFMER uses a 'Region, District, Sequence' (RDS) key. This is *not* a permanent manufacturer or manufacturing site ID number. An FFL is issued to a specific legal entity with respect to a specific manufacturing location (the 'premises' or 'establishment'). If a manufacturer changes location, a new FFL would be required, resulting in a new RDS key. Similarly, if a licensee changes its business name, one licence would be retired and a new one issued, resulting in a new RDS key, even if the location of the manufacturing site remains the same. AFMER also contains the name, street address, city, and state of the FFL holder and the self-reported level of unit production.

The ATF conducts on-site inspections of each manufacturer and this includes a check of the manufacturer's records. At present, the bureau attempts to visit manufacturers about once every five years. If errors in the records are found, a correction should eventually enter a revised AFMER. Thus, the last five years of AFMER reports may not be wholly accurate and in the past have been subject to considerable change.

For the research reported here the information on the licensees' names and units produced has been recorded in a database consisting of over 13,000 entries. Eventual entry of the RDS key (such as it is), street address, city, and state will be important for Geographic Information Systems (GIS) mapping and spatial analysis of location patterns.

Each AFMER contains sections regarding quantities of firearms produced, i.e. production of pistols (by calibre: .22, .25, .32, .380, 9 mm, .50, and total); revolvers (by calibre: .22, .32, .357, .38, .44, .50, total); rifles (totals only); shotguns (totals only); and miscellaneous firearms (totals only). Exports for each of these categories are reported in additional AFMER sections. In this paper miscellaneous firearms are not analysed and exports are analysed only in conjunction with attempts to understand firearms trade and import data.

Because the data reported is from manufacturers, unit sales for the larger firms will mostly refer to sales to wholesalers, retailers, private security

firms, and law enforcement agencies at the local, state, and federal levels, but excluding the US armed forces. For smaller manufacturers (often craft producers), most sales are probably direct non-military end-user sales in the United States and abroad.

Detailed unit production data pertaining to pistol, revolver, rifle, and shotgun manufacturing for 2,288 US-based firearms manufacturers was obtained from the ATF for the 25-year period 1986–2010 (Table 1). This would appear to be the most extensive record yet available in the public domain. Further data dating back to 1980 was available in summary form—i.e. not by manufacturer—from another source, *Shooting Industry* magazine (Thurman, 2001, p. 34). Prior to that, some data reaching back to 1946, also in summary form only, was available from the website of the Violence Policy Center (1946–79). Because of questions about the reliability of this data, it is not used for any detailed analysis in this paper. ATF records were not made available in electronic format, only as paper copies. Therefore data for about 106 million firearms in all were hand-entered for processing. Cross-validation computations show that data entry errors are minute in magnitude and can safely be ignored (details are discussed later in this paper).

Additional data was obtained from Customs, the FBI, and other sources. This data is discussed later in the paper.

Data issues

The veracity of ATF unit production data cannot be established independently. Innocuous data reporting or data entry errors cannot ordinarily be detected. In one instance, however, it is clear that exports for 2006 are incorrectly reported: the domestic pistol production numbers for Beretta USA Corp. and Cobra Enterprises of Utah Inc. (74,791 and 42,551 units, respectively) are exactly the same as the companies' reported pistol export numbers. A query lodged with the ATF confirmed that the data entry is correct and that it was the companies who incorrectly reported the numbers. As the ATF cannot arbitrarily correct company-supplied data, the numbers will remain incorrect until a site inspection leads to the issuing of revised data or until the companies themselves note and correct the error.

In spite of a legal mandate to report, even large, very prominent manufacturers do not always report to the ATF. For example, Marlin Firearms Co., ordinarily ranked among the top three rifle manufacturers, did not report rifle production in the original 2005 AFMER. For the bracketing years of 2004 and 2006 the company reported rifle production of 228,092 and 266,761 units, respectively. Total rifle production across *all* reporting companies for 2005 of 1,142,472 units would therefore appear to have been underreported by Marlin's 'usual' share of 200,000 or more weapons. This reporting oversight was later corrected and a revised 2005 AFMER issued. Later sections of this paper estimate the total underreporting of firearms production for the years 2001–10.

Similarly, many companies report weapons production in one year, then disappear from the ATF data record as if they had ceased operations, only to reappear in later years. The presumption must be either that these firms were in continuous operation and failed consistently to report to the ATF or operated as contract manufacturers in the intervening years. For example, Briley Manufacturing Inc. of Houston, Texas reports pistol production in 1991 and then again for 2005–09. Data for the intervening years is missing. Moreover, Briley describes itself on its website as a pistol, rifle, and shotgun manufacturer (Briley Manufacturing Inc., n.d.), but in the AFMER reports it shows up only in the pistol and rifle categories (as well as in the pistol, rifles, and miscellaneous firearms *export* categories). One would be compelled to conclude that Briley produces shotguns only for military customers or as a contractor for other manufacturers. Companies that report only exports in one or more categories without corresponding entries on the 'domestic' side of the ledger are not included in the analysis conducted for this paper, as the focus is on firearms retained for the US market.

As mentioned, the ATF data is available only in PDF format and for the most part cannot be copied electronically into a spreadsheet or other data-gathering software. This situation required hand-entering the data.[13] While this took a great deal of time, it also became clear that many firms report in different years under slightly varying licensee names, such as Company X Inc., Company X Corp., Company X Corp. Inc., Company X LLC, or, simply, Company X. In these cases the study consolidated data records for firms

that evidently were the same operation, even if the company name changed slightly from year to year. The availability of physical addresses for the companies facilitated this task. When in doubt, the original data record was left unchanged.

Combining data records, however, can also complicate the picture. For example, from 1986 to 1991 Thompson Center Arms Co. Inc., a prominent rifle maker, was listed as a division of KW Thompson Tools Co. Inc. Since then the firm has been listed under the Thompson Center name, even after it was acquired in 2007 by Smith & Wesson Holding Corp. (In the trade, the brand is often referred to by its technically more correct designation, Thompson/Center.) One can argue that three records should be kept for what legally were three distinct companies. But, because the Thompson Center firearms brand is continuous, it can also be argued that a single record should be kept. For this study, it was decided to retain the brand identity whenever possible. Thus, Smith & Wesson, Remington, and other very prominent firearms brands that have changed ownership repeatedly (and sometimes changed their legal names, either slightly or substantially) are recorded and analysed under a unified name that carries the brand forward.

However, for some companies' change in location, name, or both it was difficult or altogether impossible to infer continuity. For example, the pistol manufacturer Bryco Arms is listed in the ATF record until 2004. The firm went bankrupt and was acquired by one of its foremen, Paul J. Jimenez, recorded by the ATF as 'Jimenez Paul J' (Butterfield, 2004). In the record both Bryco and Jimenez are listed for 2004 under the same street address in Costa Mesa, California. But in 2006 Jimenez changed the company name and location, with the firm becoming Jimenez Arms Inc. of Las Vegas, Nevada and later of Henderson, Nevada (with a new RDS key). To the uninitiated, it may appear that there are four firms with four different RDS keys. Arguably, however, cases like this reflect one continuous operation and can be uncovered only through painstaking company-by-company research. (In the end it was decided to treat Bryco as an entity separate from the Jimenez entities.)

A small number of companies operate more than one production site. These include major companies, such as Ruger and Remington, but also a number of small-scale producers. The ATF maintains a separate record,

or RDS key, for each production location (or 'premises', or 'establishment'). Where detected, the study combined data records into a single entry for the relevant year and weapons category.

One problem of major proportions that has significant implications concerns the ATF's reporting of data according to the FFL licensee. Thus, a hypothetical 'Brauer Holdings' could own five firearms manufacturers—Harris Arms, Jones Arms, Miller Arms, Smith Arms, and White Arms—each reporting to the ATF as a separate firearms-manufacturing establishment. This study thus reports firm evidence that the market for rifles, for example, is substantially more concentrated than suggested by ATF data alone. Specifically, a single parent company owns at least five prominent rifle brands that in 2010 accounted for more than one-third of the entire US non-military rifle market (see Table 7).

Between 1986 and 2010 ATF records report non-export production (disposal into commerce from current-year production or prior-year inventories) of 98,153,716 pistols, revolvers, rifles, and shotguns—an average of 3.92 million firearms for each of the 25 years. As mentioned, data had to be hand-entered, raising the possibility of data entry errors. Cross-validation computations show, however, that, of the 30,250,858 pistols produced, all but 11 can be traced to specific companies, so that data entry error is minute. All of the 11,645,188 revolvers, 34,652,605 rifles, and 21,605,065 shotguns are accounted for in the database.

The study also experienced severe data problems in relation to import and export numbers. Gabelnick, Haug, and Lumpe (2006) reported import data for the seven-year period 1998–2004, referencing Customs. To match the ATF record, the present study constructed a firearms import and export time series going back to 1980. In order to do this the author purchased various data series from 1980 onward and then pieced them together. Because of changes in data classifications under the US tariff structure, however, it proved impossible to exclude military weapons from the record or to separate pistols from revolvers. Thus, the international trade data includes an unknown, but probably relatively small, number of military weapons.[14]

An initial attempt to reverse compute firearms unit sales at the wholesale level by using federal firearms and ammunition excise tax (FAET) records

failed. This does not mean that this is an impossible task, only that some additional expenditure of time would be necessary—with an as-yet uncertain outcome. Of special note here is, firstly, that one will need to use tax liability rather than taxes collected data and, secondly, that the FAET data is subject to very substantial revisions over time and, of course, needs to be adjusted for inflation. Thirdly, an unknown quantity of weapons sales is tax exempt. Fourthly, data prior to 1991 was collected by a different agency, the Internal Revenue Service (IRS), to the one that has collected the data since then, the Alcohol and Tobacco Trade and Tax Bureau. The IRS does have records on taxes collected, but—it appears at this point in the research—not on taxes assessed.

In terms of market demand, data on the number of criminal background checks of potential firearms end customers via the National Instant Criminal Background Check System (NICS) is available on the FBI website (FBI, n.d.). This data is also problematic because background checks do not equate to firearms purchases. Nonetheless, as detailed later, the study shows how one may approximate the demand for non-military firearms in the United States from the NICS data.

The study obtained merger and acquisitions information in part through Meltwater News, an Internet-based news aggregator. At the time, Meltwater indexed more than 30,000 business, trade, and general publications according to search criteria entered by the user. The present study included writing search codes for some of the major firearms manufacturers, but obtained few hits relevant to production-related information, even for major companies. Because ownership shares of the overwhelming majority of firearms manufacturers are not publicly traded, these firms are not required by law to reveal information about their operations that would have been relevant to this study. As a result, much of the trade news consists of little more than recycled press releases and advertisements for company products or product reviews. In addition, many—indeed, most—search results referenced a company's products as part of a crime news story and this was not relevant to this study. Nonetheless, on occasion the Meltwater-enabled searches located important information that, combined with further Internet-based searches, began to reveal large-scale merger and acquisitions activity in 2007. This is addressed in detail later in the paper.

Civilian market production

This section presents the study's findings related to producers and overall non-export production of pistols, revolvers, rifles, and shotguns by US firearms manufacturers for the civilian, private security, and law enforcement markets. Data on military-related production may in principle be derived from US Department of Defense procurement records but, beyond an exploratory foray, this has not been pursued for the present study. This section first discusses reporting compliance, followed by a discussion of types of producers, and total and average production levels. It also estimates possible underreporting of firearms manufactured and discusses business cycles in the US firearms market between 1980 and 2010.

Reporting compliance

Monthly lists of FFL licensees are now available on the ATF website. The January 2010 list, for example, contains records for 60,602 licence holders. Of these, 3,718 licensees held licence type 07 ('Manufacture of Firearms'), and 224 held type 10 ('Manufacture of Destructive Devices'), for a total of 3,942 licensees mandated to report production levels. Assuming that all licensees were in operation in 2009, one would expect 3,942 producers to be listed in the 2009 AFMER, but in fact only about 1,000 are listed. Even allowing for double counting, such as when one licence holder produces in several of the pistol, revolver, rifle, shotgun, and miscellaneous firearms categories, this would suggest a 'raw' reporting rate of only about 26 per cent. Presumably, most of the remainder is accounted for by intra-industry trade, but data for actual reporting compliance is not made available by the ATF.

According to ATF instructions on ATF E-Form 5300.11,

> *[t]hose Federal Firearms Licensees who hold either a [type 07 or type 10 licence] must file in compliance with 27 CFR § 478.126., on an annual basis …. Even if there has been no production, an annual report must be filed (ATF, n.d.c).*

Interviews with AFMER-related officials at the ATF suggest that, even when the bureau has done so from time to time in the past, ordinarily it does not choose to publish the licensee names of 'zero production' establishments. For the two years for which the ATF itself reported compliance rates, they were in the mid-70 per cent range (the original, unrevised ATF, 2004; 2005). An ATF fact sheet of June 2008 posted on the bureau's website reveals that it views compliance and firearms inventory management and control as somewhat of a problem:

> *In Fiscal Year 2007, ATF conducted approximately 10,000 compliance inspections. More than 40 percent of the licensees inspected were determined to be in full compliance with the law and regulations and no violations were cited. Approximately 100 federal firearms licenses were revoked or were denied renewal due to willful violations of the GCA [Gun Control Act]. This figure is approximately 1 percent of the number of licensees inspected .... To assist licensees in achieving and maintaining compliance, ATF conducts recall inspections on all licensees who have committed violations that warranted a warning conference. In 2007, recall inspections resulted in an overall 85-percent reduction in the total instances of violations. Recall inspections also resulted in a 78-percent reduction in disclosed prohibited sales and a 90-percent decrease in inventory discrepancies (ATF, 2008).*

If 'more than 40 percent' of licensees were in 'full compliance', then about 60 per cent were not. Nonetheless, because there is no obvious reason why compliance would shift from year to year in systematic ways, one may assume that, even though the total number of firearms produced is underreported, it may be underreported in a consistent way. If this is correct, then some of this paper's observations—regarding firearms production business cycles, for instance—would hold in substance, even if not in numbers. Moreover, exceptions notwithstanding, compliance problems appear to affect small-scale producers far more often than the larger, well-known companies, so that any quantitative effect of non-reporting may not be overly large in relation to the total firearms unit production captured in the ATF record.

Types of producers and average production levels

From the 1986–2010 ATF record this study identified 2,228 federal firearms licensees ('firms'). Of these firms, 721 produced pistols, 133 produced revolvers, 1,817 produced rifles, and 332 produced shotguns, giving a total of 3,003 firms, which implies that a number of them produced in more than one product category.

Table 1 shows that only 26 firms produced in all firearms categories, i.e. pistols, revolvers, rifles, and shotguns. A further 67 firms produced in three of the four categories, giving a total of only 3 per cent of all firms. The most common market position is specialization in a single product category (1,692 firms). The 503 firms that produced in two product categories tend to specialize either in the handgun segment (pistols and revolvers) or in the long-gun segment (rifles and shotguns) and only rarely across the two segments.

Table 1 **Total number of US firearms manufacturers, 1986–2010, by product category**

Number of product categories (among pistols, revolvers, rifles, shotguns)	Number of firms	Percentage
4	26	1.1
3	67	2.9
2	503	22.0
1	1,692	74.0
Total	**2,288**	**100.0**

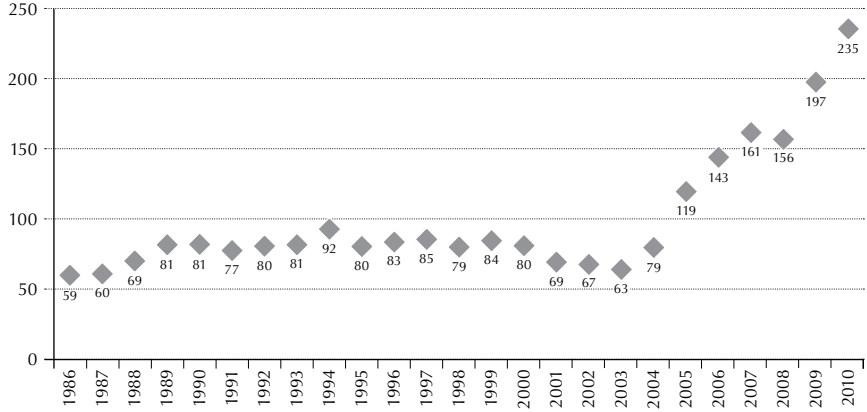
Source: Compiled from ATF (1986–2010)

Figure 1 and Figures A1–A4 in the Annexe show the pattern of the number of firms per firearm type in the period 1986–2010. Until 2004 the number of pistol producers (Figures 1 and A1) consistently numbered between about 60 and 90, and then rapidly increased to well over 200 producers by 2010. Although on a different scale, a similar pattern is seen for revolver manufacturers (Figure A2): the number of producers remains stable at between 15 and 20, then grows from 2004 onward. For rifle and shotgun manufacturers (Figures A3 and A4), a consistent upward trend is apparent from 1986 onwards,

but with a particularly pronounced rise from 2004. Whether this is related in some way to the US invasion of Iraq in 2003 (e.g. to possible increased Iraq-related demand and hence to market opportunities for new suppliers), to better reporting compliance, or to some other cause is not known.

To gauge the importance of large-volume-producing manufacturers relative to all firearms producers for each of the four production categories, one can compare the respective average levels of firearms production. Figures A5–A12 show the results. For example, the average production run for all pistol makers declined from over 25,000 units in the early 1990s to only about 10,000 units by 2001 and stayed at that level (Figure A5). In contrast, the ten largest pistol manufacturers substantially increased their average production levels from about 60,000 units in 1986 to about 180,000 units in 2010, although with large variations in the intervening years (Figure A6). Taking these two facts together indicates: (1) that most market entrants are small-scale firms; and (2) that the larger firms increasingly dominate the market.

Figure 1 **Number of US pistol producers, 1986–2010**



Source: Compiled from ATF (1986–2010)

The decline in average production across all firms is especially noticeable in the rifle and shotgun segments of the firearms market, and yet neither the ten largest nor the 20 largest firms have seen a decline in average production (Figures A9–A12). As for pistols, this suggests that many small-scale

producers entered the market in later years (or that reporting compliance improved). The small firms may not have much of a purely commercial interest in firearms production and sales: they may be hobbyists or craft producers. Nonetheless, they are required to be in possession of an FFL and to report their production.

Over the 25-year data record only 26 of the 2,288 firms in the dataset reported production in all four weapons categories: pistols, revolvers, rifles, and shotguns (Table 1). Among the major manufacturers, this includes only Bushmaster Firearms International, Colt's Manufacturing, Smith & Wesson, and Ruger. A further 67 firms reported production in three weapons categories, including Beretta USA, Remington, Savage Arms, and Thompson Center. For the most part, however, manufacturers specialize in only one firearms category and as a result, and with the exception of the largest firms, the industry appears to be strongly segmented into four product categories. However, since 2007 an increasing number of firms reported production in multiple product categories, perhaps reflecting an attempt to gain economies of scope by branching into other product segments.

Underreporting of firearms production

As mentioned, reporting compliance may be poor. At least three types of non-compliance appear commonplace. Firstly, some firms never report data to the ATF in time. Secondly, many firms appear to 'skip' reporting for certain years. Thirdly, some firms seem to adopt 'censored' reporting in which they do not report in the first year or first few years of operation; subsequently report continuously for a period of time; and then do not report for the final year or final few years before going out of business. In this third case firms are said to 'censor' the first and last year or years of their operations in the ATF record.

In the first case the ATF holds no (timely) records of firms that fail to report, and the bureau's documents therefore underreport firearms production. This is also true of censored reporting: there is no record for the censored years and firearms production is therefore underreported. In the second case, however, it is possible to gain an idea of the magnitude of

underreporting. Even though firms may skip reporting in certain years, their production can be approximated from reported unit production in adjacent years (e.g. a firm does not report in 2007, but numbers for 2006 and 2008 can be used as proxies).

For example, the ATF record shows that Taurus International Manufacturing Inc. did not report in 2003. For 2002 and 2004 the company reported annual production of around 11,000–12,000 pistols. It seems fair to assume that the firm also produced about this number of pistols in the unreported year, 2003. Averaging the numbers from the surrounding years would suggest a missing report in the order of 11,500 Taurus pistols for 2003. Filling in the 'n/a' entries in this way for companies that were top-25 producers in 2010, Taurus, Sig Sauer, Cobra, Springfield, and Phoenix, suggests non-reporting of at least 162,435 pistols over the ten-year period 2001–10, or an additional 1.4 per cent on top of reported production.

Jimenez, Glock, STI International Inc., and Masterpiece Arms Inc. may be examples of censored reporting. As mentioned, Jimenez (ranked 12 in 2010) is the successor firm to Bryco (which reported, but dropped out of the top 25). Since Bryco's numbers are in the record, no adjustment is needed, but this would not be obvious to the casual observer. The case of Glock (ranked 14 in 2010) is interesting because the firm imported firearms into the United States before 2005. Yet, while importers of firearms are required to possess a valid FFL licence, the AFMER reports do not capture imports, only US-based production.

STI and Masterpiece reported for 2009 (ranked 23rd and 24th, respectively), but not for 2010. As of 11 March 2012 both maintained active websites advertising their products so that the 2010 estimated pistol underreporting, based solely on the top 25 ATF-reporting firms for 2010, is a minimum number. (In 2009 STI and Masterpiece reported pistol production just shy of 10,000 units each. If they produced at similar levels in 2010, the underreporting of pistol production in 2010 would correspondingly rise to about 180,000 units.)

Applying this procedure to all four firearms categories for the years 2001–10 suggests underreporting of 1.4 per cent for pistol manufacture (162,435 weapons); 0.7 per cent for revolvers (27,724 weapons); 0.7 per cent for rifles (105,460 weapons); and 0.3 per cent for shotguns (22,895 weapons). Combined, the

numbers suggest underreporting of at least 318,513 firearms for the ten-year period 2001–10, or about 32,000 per year.

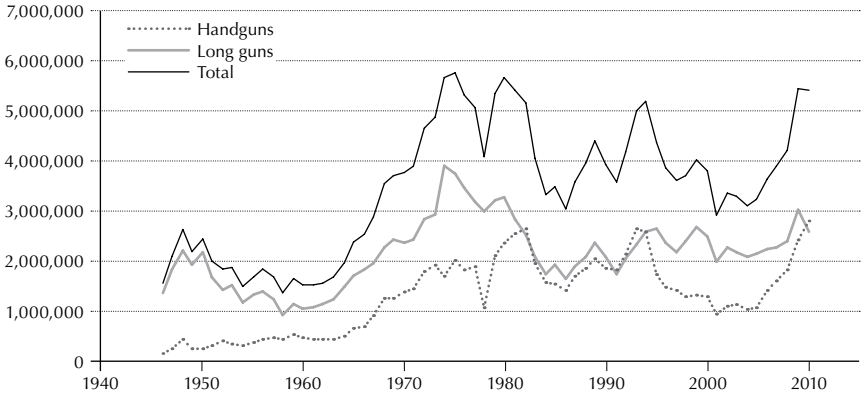
Combined with the relatively slack reporting compliance, these figures suggest a significant understatement of firearms production in the United States in the official record, at least in absolute terms. Of course, this not only complicates an external understanding of the industry, but limits the ability of the industry to understand itself.

US-based total firearms production

Despite the likelihood of poor reporting compliance and underreporting, the data compiled for this paper does suggest that the US firearms industry has experienced severe business cycles over the past several decades.

For example, Figure 2 shows that between 1980 and 1986 total unit production dropped by almost 50 per cent. By 1989 production had risen by more than 40 per cent, falling by around 20 per cent two years later, only to rise by

Figure 2 **Total US firearms production, 1946–2010**



Source: Compiled from ATF (1986–2010); Thurman (2001, p. 34); Violence Policy Center (1946–79)

Note: The Violence Policy Center numbers are self-censored and apply only to FFLs reporting more than 1,000 units of firearms produced in any given year (Violence Policy Center, 2003, p. i). Thus, the data prior to 1980 certainly understates production. Reported handgun production in 1978 in particular would appear to be in error. The *Shooting Industry* numbers (Thurman, 2001) are not revised and thus also may understate production. Since the errors are not likely to be huge in the context of the overall numbers, it was deemed appropriate to show them here, even though for cautionary reasons the pre-1986 numbers are not extensively analysed in this paper.

almost 50 per cent again in 1994. By 2001 production had dropped by one-third—the first time since the late 1960s that fewer than three million units had been manufactured. From then, production rose to around 5.5 million units in 2010.

From the point of view of the firms competing in this market, these drastic variations in production levels may pose a challenge, because they are likely to make capital, debt, labour, production, research and development, marketing, revenue, and other forms of planning and management difficult—and more so because most firms engage in single-firearms-segment production. Moreover, few firms are part of a conglomerate that might be able to ride out business cycles with counter-cyclical activity in other business areas.

Without better information, however, it is difficult to ascertain the impact of market volatility on the firms, particularly information regarding production technology, costs, prices, and profits. Market volatility might pose only minor problems if firms had flexible production methods and/or constant returns-to-scale technology, or if price mark-ups reflected market power, which is a distinct possibility, given the duopoly or oligopoly structures noted later in the paper. Although Hall, Markowski, and Brauer (2008) believe that industry profitability is not stellar, in principle these attributes could permit firms to vary the scale of production without necessarily affecting their profit rates.[15] Thus, without knowing more about the technology of production and the flexibility of input supplies, one cannot say whether or not the industry should consider demand volatility a cause for concern. Furthermore, since the early-to-mid-1990s it appears to be primarily the pistol market that drives overall firearms market volatility, and it is this market that foreign brand names have penetrated most successfully. Volatility in the overall market may be a statistical figment, then, with potential concerns for US manufacturers to be found in the pistol market only. At any rate, it would be of interest for future research to understand firms' management better with regard to demand fluctuations, responses to government regulations, and inroads made by foreign competition.

Figure 2 shows an especially pronounced increase and then drop in firearms production that coincided with President Clinton's administration.

This drop is almost entirely accounted for by the handgun segment (pistols and revolvers). In President George W. Bush's first term (2001–04), production was constant and then increased rapidly during his second term (2005–08).

Despite this latter increase in production, per capita handgun production—a unit of measurement that is rarely considered—*declined* by around 10 per cent in 2010 compared to 1993 (see Figure A13). In contrast, by 2010 per capita rifle production again rose to the high levels of the 1970s and early 1980s (Figure A15). From the early 1980s to the early 1990s handguns and long guns (rifles and shotguns) sold in roughly equal numbers (see Figure 2). Because of the pronounced drop in pistol sales during the Clinton administration, overall handgun production dropped far below the fairly constant number of long-gun sales during the early 1990s to mid-2000s. But, since then, handgun sales have again reached the levels of long-gun production.

As noted, volatility in the market stems primarily from the pistol segment (see Figures A14 and A15 for a disaggregation of the data by weapon type). By contrast, relative to the other segments, the rifle market was fairly stable in per capita numbers for almost 25 years from the early 1980s to the mid-2000s and has seen a drastic increase only since then. The shotgun and revolver segments show slow, sustained declines since the mid-1990s (for revolvers since the mid-1980s), but with recent stabilization and even somewhat of a per capita increase since the mid-2000s.

Manufacturer size

To compare variations in the scale of manufacturing among firms, the study computed the production totals of reported unit production from 1986 to 2010 for each manufacturer. Each manufacturer was then assigned a category rank in order of magnitude (Table 2).

Table 2 **Size distribution of annual firearms unit production, 1986–2010***

Category	Level of production	Pistols	Revolvers	Rifles	Shotguns
6	1,000,000+	8 (1.1%)	2 (1.5%)	6 (0.3%)	5 (1.5%)
5	100,000+	22 (3.1%)	8 (6.0%)	19 (1.0%)	3 (0.9%)
4	10,000+	57 (7.9%)	8 (6.0%)	52 (2.9%)	10 (3.0%)
3	1,000+	62 (8.6%)	13 (9.8%)	113 (6.2%)	13 (3.9%)
2	100+	92 (12.8%)	24 (18.0%)	240 (13.2%)	30 (9.0%)
1	10+	161 (22.3%)	20 (15.0%)	544 (29.9%)	40 (12.0%)
0	1+	319 (44.2%)	58 (43.6%)	845 (46.5%)	231 (69.6%)
Total		**721 (100%)**	**133 (100%)**	**1,819 (100%)**	**332 (100%)**

* The initial number in each cell refers to the number of producers who have produced the same number or more than the number of firearms that define the particular category (see second column). The percentage in brackets indicates the proportion of the total number of producers (given in the 'Total' row at the bottom of the table) that the first number in the cell represents.

Source: Compiled from ATF (1986–2010)

For the 1986–2010 period Table 2 indicates that between two-thirds and three-quarters of the companies each reported production of less than 100 firearms annually. Although competition can be fierce and shifts in annual rank order do occur, these shifts are largely contained within categories 5 and 6 (the large-scale producers of 100,000 or more units). Of the large-scale producers, many initially reported very large production runs in just a few years, but since then have closed operations. For example, of the 30 pistol manufacturers in categories 5 and 6, only 19 were going concerns in 2010.

The largest surviving category 5 and 6 companies and their total production levels across the four firearms groups are listed in Table 3.

Ownership changes make it important not to take these numbers entirely at face value. For example, Remington, Bushmaster, and DPMS Firearms are part of the same holding company, the Freedom Group (Freedom Group, n.d.). Similarly, Henry RAC Holding is listed with the combined production of its predecessor, Argus Publications, which held the trade name and business licences for Henry Repeating Arms and Henry Repeating Rifle Co. (information extracted from ATF, n.d.b). Colt split in the early 2000s into two separate legal entities whereby Colt's Manufacturing would continue only in the handgun market and Colt's Defense would enter the civilian long-gun market so that, technically, Colt's Manufacturing is not a survivor in the latter market. O. F. Mossberg bought Maverick in 2007, but adopted the Maverick brand name for its shotguns. Note that, while Ruger is not the only big-name company producing across all four segments, it is the only category 5 or 6 company manufacturing across all four segments. (Belatedly, however, its reported shotgun production runs are rather small: 1,000–1,300 from 2008 to 2010.)

Table 3 **Total production of large-scale firearms brands, 1986–2010**

Company	Pistols	Revolvers	Rifles	Shotguns
Armalite			152,509	
Arms Technology	709,904			
Beemiller	962,384		286,682	
Beretta USA	2,455,716			
Bushmaster Firearms			747,896	
Century Arms			232,925	
Charco 2000		174,850		
Cobra Enterprises	267,676			
Colt Defense			135,501 (since 2002)	
Colt's Manufacturing	1,411,776	496,569	492,987 (stopped in 2002 and continued by Colt Defense)	
DPMS Firearms			400,524	
Glock	232,566			
H&R 1871			916,896	2,735,761

Haskell Manufacturing	250,864			
Henry RAC Holding			1,012,939	
Heritage Manufacturing		592,565		
Iberia Firearms	164,623			
Jimenez	169,104			
Kel-Tec	931,451			
Keystone Sporting Arms			399,940	
Kimber Manufacturing	699,513			
Marlin Firearms			7,604,693	
Maverick Arms			157,292	2,185,101
North American Arms		607,328		
O. F. Mossberg			134,683	5,564,808 (until 2007; since then under Maverick)
Olympic Arms			114,455	
Phoenix Arms	554,396			
Remington Arms			6,456,868	7,792,539
Rock River Arms			170,798	
Ruger	4,778,037	3,277,413	7,047,949	212,104
Saeilo	272,932			
Savage Arms			2,319,226	289,852 (did not report for 2010)
Sig Sauer	1,299,849			
Smith & Wesson	4,674,459	5,503,658	277,806	
Springfield	489,531		252,835	
Stag Arms			157,797	
Taurus International	371,439			
Thompson Center Arms	293,070		503,184	

Source: Compiled from ATF (1986–2010)

Despite its limitations, this analysis is effective in: (1) identifying variations in the scale of manufacturing among firms; and (2) identifying the larger brands in the firearms market. Ruger leads with about 15.3 million firearms produced in all, followed by Remington Arms (about 14.2 million) and Smith & Wesson (nearly 10.5 million). In terms of the ratings in Table 2, these can be termed 'category 7' manufacturers, with each having produced more than ten million weapons. Together, for the period 1986–2010, the market share of these three brands is 40 million firearms out of 98.2 million, or 40.7 per cent. Measures of market concentration are discussed in another section of this paper.

US vs foreign brand names

When studying firm-by-firm annual records from 1986 onwards, it becomes clear that non-US brands have gradually encroached on the US market and currently are firmly established in it, at least among pistol manufacturers. It is important to understand that, in order to be captured in the ATF record, these firms must have established firearms manufacturing facilities in the United States and should not simply be importing weapons from abroad.

Thus, according to the ATF, in 1986 only the Italian firm Beretta ranked among the top pistol makers (at rank 6). By 2010 the top-ranking manufacturers included five foreign brand names, including the German Sig Sauer (rank 3), Beretta (4), the Brazilian Taurus (5), the Austrian Glock (14), and the Belgian FN (Herstal) Manufacturing (22). Among rifle manufacturers, large US brands still predominate, but a reading of the trade literature indicates that currently components are frequently sourced from countries such as the Russian Federation, Turkey, and Mexico. The next section addresses penetration of the US firearms market by genuine imports, i.e. those *not* captured by the ATF. In addition to domestically produced and retained weapons (i.e. net of exports), these imports constitute a second source of supply to the US market.

Exports, imports, and net firearms supplies

Annual US-based production does not constitute total market supply. This is because some US-manufactured firearms are exported and some non-US-manufactured firearms are imported. Understanding the firearms market therefore requires one to obtain a sense of the magnitude of market demand and the supply of imported firearms, plus domestically produced firearms net of exports (newly produced, domestically retained firearms). But, due to discrepancies between the numbers reported by the ATF and Customs, it is not easy to estimate either net market supply or demand. Further, it is essential to distinguish between used firearms that enter the market for resale and those that have been newly manufactured—abroad or at home—for US domestic sale.

This section of the paper discusses how one may estimate firearms supplies net of exports to the United States. The following section then discusses how to estimate demand for firearms, including used firearms. The logic used is rather intricate and so it may help to visualize the procedure with the assistance of Table 4.

Table 4 **Estimating US non-military firearms supply and demand, 2010**

<table>
<tr><td>[Demand: ~9.8 m]</td><td>Domestically retained firearms</td><td>Imports of firearms</td></tr>
<tr><td>New firearms</td><td>ATF (~5.4 m)</td><td rowspan="2">Customs (~2.9 m)</td></tr>
<tr><td>Used firearms</td><td>[Remainder: ~1.5 m max.]</td></tr>
</table>

Note: Numbers are estimates for 2010. Estimates for other years are given in Table 6.

Consider the whole of the matrix (i.e. Table 4) as equivalent to market *demand*—i.e. demand for new and used firearms—and assume that we know how many firearms are demanded. (The next section discusses the demand

estimation. As explained in conjunction with Table 6, for 2010 this turned out to be about 9.8 million firearms, indicated by the expression placed in square brackets in the top-left, dark-grey-shaded cell of Table 4.) On the *supply* side, ATF records contain information on US-based firearms manufacturers' annual domestic production *and* their exports, so that it is a simple matter to place the number of *domestically retained* firearms, labelled 'ATF', in Table 4 as well. This amounted to about 5.4 million weapons in 2010. As discussed in detail in the following two sub-sections, from Customs data one can obtain numbers for the import of firearms. For 2010 this amounted to about 2.9 million civilian market (i.e. non-military) firearms.

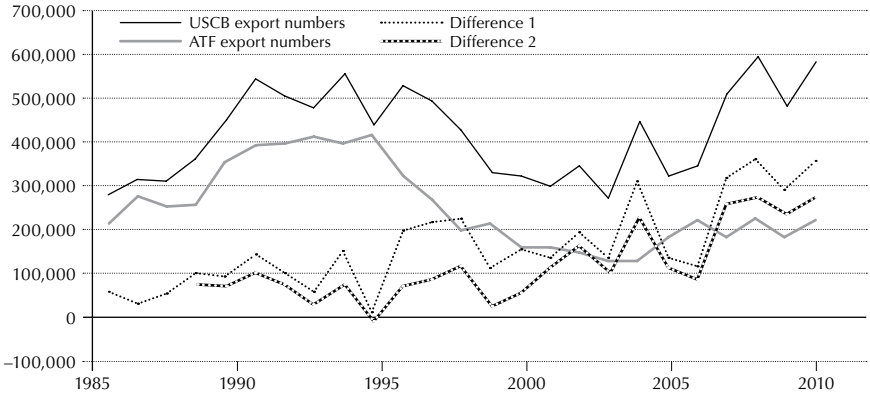
Unfortunately, Customs does not differentiate between new and used imported weapons. Nonetheless, as may be seen from Table 4, if total demand for new and used firearms equals 9.8 million weapons, and 2.9 million of these are supplied by net imports, then the domestically supplied portion must be the remaining 6.9 million. But we know from ATF figures that, of these 6.9 million, 5.4 million were supplied as 'new'. Therefore, the number for the used, non-imported firearms component of the market—the size of the resale market—must be the remainder of about 1.5 million firearms. (An important caveat is that this applies exclusively to used firearms sales via federally licensed firearms outlets; see the next main section for details.)

Having laid out the logic of the argument, the following two sub-sections discuss export and import data so that net import supply may be computed. The following main section then discusses the details of estimating the remainder of supply and market demand.

Export data

Figure 3 displays USCB export data and also export data compiled by the ATF. On the whole, the USCB reports a far higher number of firearms exports than does the ATF and the difference is not uniform from year to year. In fact, the difference between the two datasets has been growing steadily from under 100,000 weapons in the mid-1980s to about 300,000 weapons by 2010 (see Figure 3). The discrepancy relates to a number of features of the data-collecting agencies and to the data itself.

Figure 3 **USCB and ATF firearms export numbers, 1986–2010**



Source: Compiled from data purchased by the author from the USCB; ATF (1986–2010)

Let us take the USCB data first and begin with an institutional note. Customs *reports* data on firearms imports and exports based on tariff schedules published by the US International Trade Commission (USITC) (see USITC, n.d.). But neither Customs nor the USITC *collects* all of the raw data. Instead, raw export data is collected by the USCB, with Customs serving as the reporting agency. Yet if one wishes to *purchase* data, whether import or export, this again is handled by the USCB.[16]

This study purchased the relevant firearms import and export data for the period 1980–2010 from the USCB.[17] There are several problems with the data: the import-export data: (1) does not distinguish between newly manufactured firearms and used weapons; (2) does not consistently distinguish between pistols and revolvers (so that one has to use a combined handgun category); and (3) does not consistently distinguish between military and non-military firearms. Moreover, the USITC's tariff classification, in terms of which Customs reports USCB data for hand-held firearms, has changed repeatedly since 1980 and did so in an especially major way in data year 1989.

As a consequence of all this, some of the data in the handgun category, for example, may refer to weapons intended for the military market, which would make direct comparison to the ATF's non-military production and export numbers difficult. Moreover, the introduction of the USITC's new tariff classification system in data year 1989 does not allow for the wholly

consistent translation of pre-1989 firearms-related tariff codes to post-1988 codes. This means that there is a break in the data series. Furthermore, the designation 'military' in both time periods need not imply that the corresponding firearms imports and exports involved only military *customers*, just military-style *weapons*. For example, even though machine guns are available to civilians, there is no 'non-military' machine gun classification in the US Harmonized Tariff Schedule. They must, therefore, have come from the 'military' classification.

Secondly, there is also at least one pertinent problem with the ATF dataset. As noted, ATF data for handgun exports in 2006 is incorrect. Two firms, Beretta and Cobra, each reported the export of the entirety of its 2006 pistol production, which is obviously a data-reporting error on their part. One suspects that similar errors by other companies exist, resulting in the over- or underreporting of exports. (In the author's database, an estimated correction has been entered for the 2006 exports of Beretta and Cobra.)

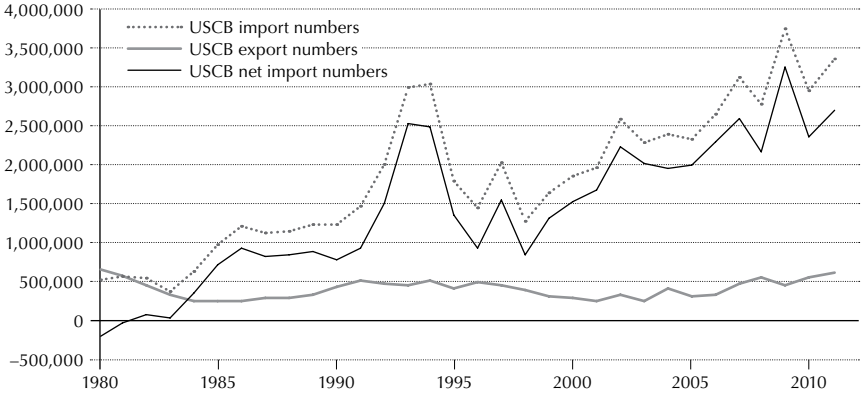
If we compare the two export datasets, for 2010 the ATF reported exports of 225,206 pistols, revolvers, rifles, and shotguns. In contrast, the USCB reported 'domestic exports' totalling 585,801 firearms. The discrepancy amounts to 360,595 firearms, labelled 'Difference 1' in Figure 3. Subtracting explicitly identified 'military' USCB-reported exports of 81,497 firearms (i.e. 'military' rifles, shotguns, and rifle-shotgun combinations) results in 'Difference 2' of 279,098 weapons, but for 2010 does relatively little to reduce the discrepancy between USCB and ATF numbers. Either way, Figure 3 shows an increasing disparity between ATF and USCB numbers, recently in the order of 250,000 firearms per year.

Data collection and categorization differences might be expected to produce some disparity between datasets: the ATF compiles company-supplied, non-military data for newly produced weapons, while USCB data includes 'military' and 'non-military' exports of new *and* used weapons. Since the USCB's categories are broader, its export figures should be larger, as indeed they are. But this does not explain the *rising* difference between the two datasets, which remains a puzzle to be solved.

Imports

Figure 4 displays the results when one subtracts USCB-reported firearms exports from imports, to arrive at firearms net import numbers for the period 1980–2010. (These numbers therefore include 'military' and 'used' weapons.) The figure shows that net imports have been rising almost linearly, from around zero in the early 1980s to well over three million units by 2009, with a pronounced spike in 1993 and 1994 around the time of the Clinton administration's time-limited assault weapons ban. To a large extent this rise in net imports is primarily due to increased imports of 'military' and 'non-military' rifles and secondarily to increased handgun imports. In particular, just as the assault weapons ban—and fears about possible restrictions on firearms owning and carrying—appears to be responsible for the huge jump in domestic production levels in the early 1990s (see Figure 2), it also may have driven up weapons imports (Figure 4).

Figure 4 **Estimated US net imports of non-military firearms, 1980–2010**



Source: Compiled from data purchased by the author from the USCB
Note: Net imports are calculated as imports minus exports.

Estimating US firearms supply and demand

A long-standing goal of researchers has been to compute US non-military firearms demand and, separately, to estimate the 'new' and 'used' components of this demand. The preceding section discussed the logic of a method for achieving this goal (see the discussion in conjunction with Table 4). This section discusses the details.

One can combine various pieces of information from the ATF, USCB, and FBI to arrive at an approximation of which proportion of the US civilian firearms market is filled by 'new, domestically produced and retained' and by 'new and used imported' weapons, and, therefore, which portion must be filled by 'used domestically produced' (i.e. resold or used) weapons. Neither the logic nor the numerical approximations are entirely airtight, but for the first time in the literature provide a sense of the likely order of magnitude involved.

The reasoning begins with information gleaned from the FBI's NICS, implemented as from November 1998. Monthly data through December 2010 is listed in Table 5 and shows, for example, 1,023,102 background checks conducted in May 2009. The number of background checks cannot, however, be equated with firearms purchases. For example, from November 1998 to February 2012 NICS recorded ten million so-called 'permit' checks for the state of Kentucky. For the same state it also recorded more than one million additional 'handgun' checks and 1.6 million 'long gun' checks. A 'permit' refers to a firearms-carrying licence issued by the state of Kentucky. The state checks monthly whether any of its permit holders may no longer be eligible for gun ownership, e.g. as a result of having committed a felony. Thus, Kentucky's permit checks amount to continued eligibility checks that are wholly unrelated to a prospective customer's intent to purchase a firearm from a licensed dealer. Similarly, Utah's permits are checked every 90 days against FBI records. Each state maintains its own rules regarding the frequency, if any, with which its issued permits are checked against FBI records.[18] Thus,

to compute annual firearms demand, the NICS numbers must be adjusted in some way.

Table 5 **Total number of NICS checks, 1998–2010**

	Jan.	Feb.	Mar.	Apr.	May	June
1998						
1999	591,355	696,323	753,083	646,712	576,272	569,493
2000	639,972	707,070	736,543	617,689	538,648	550,561
2001	640,528	675,156	729,532	594,723	543,501	540,491
2002	665,803	694,668	714,665	627,745	569,247	518,351
2003	653,751	708,281	736,864	622,832	567,436	529,334
2004	695,000	723,654	738,298	642,589	542,456	546,847
2005	685,811	743,070	768,290	658,954	557,058	555,560
2006	775,518	820,679	845,219	700,373	626,270	616,097
2007	894,608	914,954	975,806	840,271	803,051	792,943
2008	942,556	1,021,130	1,040,863	940,961	886,183	819,891
2009	1,213,885	1,259,078	1,345,096	1,225,980	1,023,102	968,145
2010	1,119,229	1,243,211	1,300,100	1,233,761	1,016,876	1,005,876

	July	Aug.	Sept.	Oct.	Nov.	Dec.	Total/year
1998					21,196	871,644	**892,840**
1999	589,476	703,394	808,627	945,701	1,004,333	1,253,354	**9,138,123**
2000	542,520	682,501	782,087	845,886	898,598	1,000,962	**8,543,037**
2001	539,498	707,288	864,038	1,029,691	983,186	1,062,559	**8,910,191**
2002	535,594	693,139	724,123	849,281	887,647	974,059	**8,454,322**
2003	533,289	683,517	738,371	856,863	842,932	1,008,118	**8,481,588**
2004	561,773	666,598	740,260	865,741	890,754	1,073,701	**8,687,671**
2005	561,358	687,012	791,353	852,478	927,419	1,164,582	**8,952,945**
2006	631,156	833,070	919,487	970,030	1,045,194	1,253,840	**10,036,933**
2007	757,884	917,358	944,889	1,025,123	1,079,923	1,230,525	**11,177,335**
2008	891,224	956,872	973,003	1,183,279	1,529,635	1,523,426	**12,709,023**
2009	966,162	1,074,757	1,093,230	1,233,982	1,223,252	1,407,155	**14,033,824**
2010	1,069,792	1,089,374	1,145,798	1,368,184	1,296,223	1,521,192	**14,409,616**
Total							**124,427,448**

Source: FBI (n.d.)

The magnitude of the demand for firearms in the United States can be approximated if one is willing to make two assumptions: firstly, that all *permit* checks are routine procedural checks by states against FBI records and are not associated with an intent to purchase a gun; and, secondly, that all *in-store* (retailer) checks by licensed firearms dealers against FBI records result in at least one firearms purchase. In terms of these assumptions, the percentage of in-store checks out of all NICS checks yields an approximated annual demand.

More specifically, NICS also reports data on 'multiple' background checks. This means that a potential customer's record is checked for *both* an impending handgun and a long-gun purchase. In addition, a series of retail dealer interviews in Georgia and Ohio suggest that, as a rule of thumb, perhaps 1.1 firearms are sold per in-store customer. This will include multiple handguns only (with a single handgun check), multiple long guns only (with a single long-gun check), or a combination of handguns and long guns (with a 'multiple' check). As approximations go, one may then add 'handgun' checks, plus 'long gun' checks, plus two 'multiple' checks (at least one handgun and one long gun), and augment the resulting number by a factor of 1.1, termed here the multiple gun sales factor (MGSF). This perhaps overstates demand, but it would be easy to employ a smaller factor such as 1.05, for example. Of the 14,409,616 total NICS checks conducted in 2010, a total of 8,700,794 were under the 'handguns', 'long guns', and 'multiple' designations. Counting the 'multiples' twice and augmenting by the MGSF of 1.1 results in a 'demand' of 9,769,543 million firearms at the level of federally licensed firearms dealers.

If this is a reasonable way to approximate retail demand, then the *sources* of market supply can now be computed as well, as shown in Table 6. For example, for 2010 ATF-reported domestic unit production resulted in 5,391,311 domestically retained non-military *new* weapons. Adding in the 2010 USCB-reported import figure of 2,880,333 new and used 'non-military' units thus far yields an overall *supply* of 8,271,644 weapons to licensed dealers. Call this the *commercial supply*. But since *demand* was 9,769,543, the difference of 1,497,899 firearms must have come from domestic weapons resales at the dealer level. (The logic of this is analogous to 'new' and 'used' automobile sales via car dealerships.)

Table 6 **Estimating US civilian market firearms purchases by source of supply, 1999–2010**

Year	ATF-reported domestic non-military production ('new') (units)	+ USCB-reported non-military imports ('new' and 'used') (units)	= domestic non-military, commercial market supply (FFL SUPPLY) (units)	NICS-adjusted background checks with MGSF = 1.1 (FFL DEMAND) (units)	= domestic 'used' gun purchases (units)	New + imported gun purchases (%)	Domestic used gun purchases (%)
1999	4,007,910	1,482,990	5,490,900	8,757,843	3,266,943	62.7	37.3
2000	3,763,345	1,625,996	5,389,341	7,879,752	2,490,411	68.4	31.6
2001	2,907,580	1,807,001	4,714,581	8,035,308	3,320,727	58.7	41.3
2002	3,345,195	2,308,853	5,654,048	7,084,617	1,430,569	79.8	20.2
2003	3,277,426	2,132,623	5,410,049	7,075,868	1,665,819	76.5	23.5
2004	3,079,517	2,217,721	5,297,238	7,371,405	2,074,167	71.9	28.1
2005	3,218,315	2,117,859	5,336,174	7,750,274	2,414,100	68.9	31.1
2006	3,614,452	2,497,273	6,111,725	8,240,265	2,128,540	74.2	25.8
2007	3,867,152	2,948,421	6,815,573	8,640,641	1,825,068	78.9	21.1
2008	4,195,873	2,713,303	6,909,176	9,473,556	2,564,380	72.9	27.1
2009	5,417,003	3,641,952	9,058,955	10,053,577	994,622	90.1	9.9
2010	5,391,311	2,880,333	8,271,644	9,769,543	1,497,899	84.7	15.3

Source: Author's calculations from ATF (AFMER), USCB, and FBI data for the relevant years

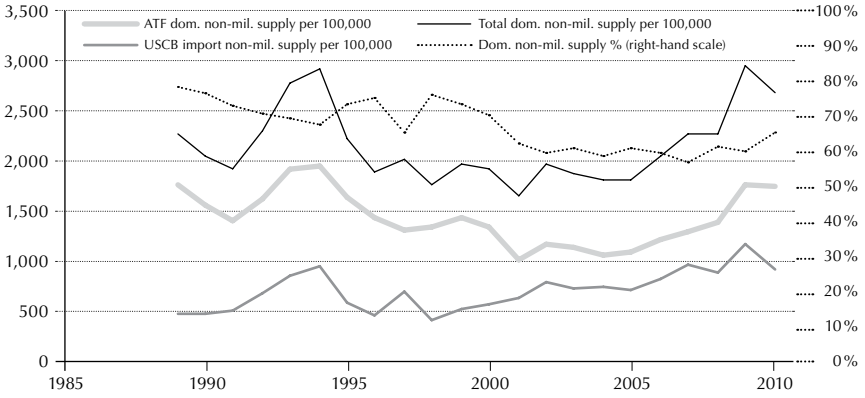
If we apply this logic to the period 1999–2010, Table 6 then suggests that 'domestic new' (ATF) and 'imported new and used' weapons (USCB) satisfy roughly 75 per cent of the market. 'Used weapons' (weapon resales) satisfy the remaining 25 per cent. This calculation can be done only from 1999, because this is the first full year for which NICS data is available. Happily, post-1988, USCB data is separated into that for 'military' and 'non-military' firearms, at least for long guns, if not for handguns, so that we now not only have an approximation of annual firearms demand, but have it separated by the source of supply, domestic new, imported, and domestic resales. It is worth repeating that this estimate of domestic used firearms of about 1.5 million in 2010 applies only to FFL-licensed resale points rather than through classified newspaper advertisements, gun shows, garage sales, or friend-to-friend sales. The rough percentage breakdown of 75/25 per cent would be the baseline number to confirm (or refute) when conducting random sampling of FFL dealers in the United States. At any rate, this approximation appears to

be the first data-based attempt in the literature to derive an order of magnitude of the possible unit size of domestic firearms resales.[19]

ATF data on 'domestically retained, new, non-military production' and the import numbers from the USCB can also be used to compute the per capita *source* of supply (domestic or foreign) and the *changing composition* of commercial supplies. The results are shown in Figure 5. (Due to the break in the time series, the USCB data is displayed only from 1989.) The numbers suggest that the domestically produced supply of new, non-military firearms decreased from around 1,769 per 100,000 people in 1989 to 1,020 per 100,000 people in 2001. Since then, this rate has increased to 1,743 per 100,000 people in 2010. In contrast, imports of non-military firearms increased from 489 per 100,000 people in 1989 to 931 per 100,000 people in 2010. Total commercial supply per 100,000 people stayed about constant (2,258 in 1989, compared to 2,272 in 2008, albeit with a large increase by 2010 to 2,674). The weapons' source *composition*, however, has changed markedly. In 1989 domestic manufacturers provided 78.4 per cent of the firearms. This percentage has fallen steadily to 55–65 per cent in the late 2000s.

It may be said, then, that the research reported in this paper has documented a fundamental change in the supply side of the US firearms market. It finds massive—and massively increasing—firearms imports. It also finds an increasing presence of non-US brand names that have established manufacturing facilities in the United States and, with this, increasing market penetration by foreign brand names against US brand names. So far, these observations would appear to be restricted to the pistol market in particular, but as noted above, US rifle manufacturers increasingly appear to source parts from abroad. Moreover, according to the USCB data, non-military long-gun imports have more than doubled from a level of about 600,000 in the very early 1990s to above 1.2 million by the late 2000s. As foreign brand names as such are not prominent on the US civilian long-gun market, one suspects that the established US brands simply import large numbers of overseas-produced long guns, and this would need to be confirmed in separate research.

Figure 5 **Commercial US firearms supplies per 100,000 people, 1989–2010**



Source: Author's calculations

Taken as a whole, these findings suggest that traditional US firearm brands/producers have experienced import pressures not unlike those that have affected other branches of US manufacturing, such as automobiles, consumer electronics, or household furniture. From the point of view of industrial economics, the US firearms industry appears to operate 'just like any other industry', facing the same kinds of market turmoil and pressures as do other branches of US manufacturing. This implies, for example, that any firearms import restrictions would be countered by a resurgence of domestic manufactures, even if at increased end-user prices. Similarly, any restriction of production within the United States—which has already happened in terms of state-level regulation—would likely lead to a displacement of manufacturing to more 'gun-friendly' states or to an even greater reliance on firearms imports.

As for the possibly confounding effect of the 'military' handguns category being included in the USCB handguns data, it is likely that the numbers delivered to military customers are small relative to the size of the overall handgun market.

Market share and market concentration measures

Industrial organization is a branch of economics that, among other things, studies how an industry is structured in terms of the number of suppliers, the degree of competition among them, and the pricing power suppliers may be able to exercise over customers. Common sense suggests that a monopolist supplier can charge higher prices than can any one supplier in a marketplace filled with numerous competitors. This is of interest to economists and policy-makers because market concentration—i.e. a reduction in the number of competing suppliers—is often associated with a decline in social welfare, which is a measure of economic well-being for society at large. Thus, virtually all countries maintain government institutions to monitor markets for anti-competitive practices that might diminish social welfare. In the United States, the Antitrust Division of the US Department of Justice carries out this function (US DoJ, n.d.a).

The mere fact of being the sole seller of a product in a market does not necessarily violate anti-trust (anti-competitive) laws. Instead, it is the specific behaviour of a firm, and particularly its pricing behaviour, that is important. What counts, therefore, is any one firm's *conduct* rather than the *structure* of the market as such. While market concentration alone does not imply abuse of market power, the fewer firms in a market, the greater the potential for collusion to limit competition, curtail supply, and drive up prices and profits, and hence improve the firms' *performance*. Thus, measures of market concentration, such as the share of the market dominated by one or more top-level firms, constitute an important first indicator of potential market power.[20]

Using the relevant definitions of the US Department of Justice, this section of the paper shows that the revolver and shotgun segments of the US firearms market are 'concentrated' and that the pistol and rifle segments are 'moderately concentrated'. The paper also demonstrates that market concentration, especially in the rifle market, is at least twice as high as sole reliance

on ATF records would suggest (see the later section on mergers and acquisitions).

Conventional measures of market concentration include calculating the sum of the percentage market shares of the top four or top eight suppliers relative to the total size of the market. For example, if firms 1 to 8 hold, respectively, 20, 20, 20, 20, 5, 5, 5, and 5 per cent of the market each, then the sum is 100 per cent, with the top four suppliers holding 80 per cent of the market. But this measure can be misleading: for instance, if the percentages of market shares are 50, 10, 10, 10, 5, 5, 5, and 5, then the top four suppliers again hold 80 per cent, but the top supplier is a far more dominant player in the market than in the first example.

Thus, to give more weight to larger market shares, the Herfindahl-Hirschman Index (HHI) computes the sum of the *squared* percentages, $HHI = \sum s_i^2$, where s_i is the market share of each of the firms (US DoJ, n.d.b). Thus, for the two examples given above, HHI equals 1,700 and 2,900, respectively. The theoretical maximum HHI equals 10,000 (i.e. 100 squared).

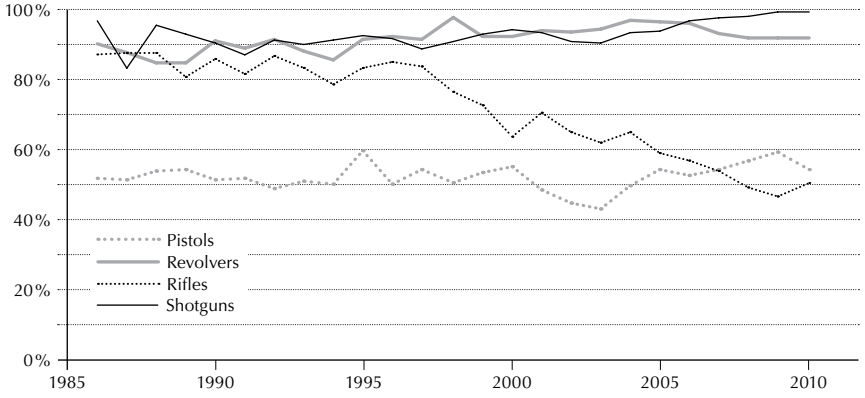
In terms of US anti-trust policy,

> *[m]arkets in which the HHI is between 1000 and 1800 points are considered to be moderately concentrated, and those in which the HHI is in excess of 1800 points are considered to be concentrated. Transactions [i.e. mergers and acquisitions] that increase the HHI by more than 100 points in concentrated markets presumptively raise antitrust concerns under the Horizontal Merger Guidelines issued by the U.S. Department of Justice and the Federal Trade Commission* (US DoJ, n.d.b).[21]

As demonstrated below, there was substantial merger and acquisition activity in the US firearms industry in 2007 in particular. A search of the US Department of Justice's website, however, did not uncover any firearms-market-related anti-trust activity, presumably because an HHI of 1,800 was not exceeded.

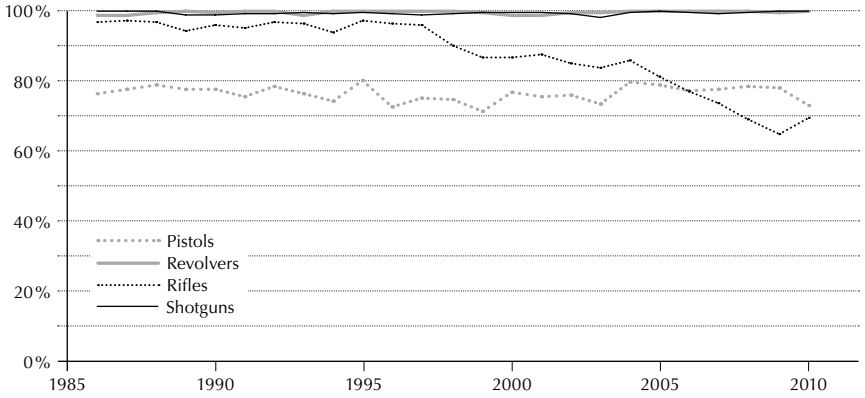
Figures 6 and 7 display the top four and the top eight concentration ratios for the period 1986–2010 by weapons type—pistols, revolvers, rifles, and shotguns—while Figure 8 displays the HHI numbers for the same period and by weapons type.

Figure 6 **Market concentration of the top four firms, 1986–2010 (total production)**



Source: Compiled from ATF (1986–2010)

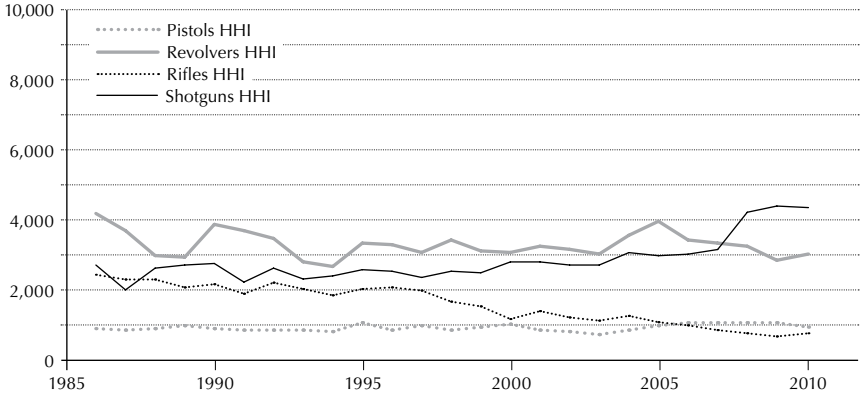
Figure 7 **Market concentration of the top eight firms, 1986–2010 (total production)**



Source: Compiled from ATF (1986–2010)

For the 25 data years plotted in Figures 6, 7, and 8, it might seem remarkable that the top four and top eight shares for pistols, revolvers, and shotguns are fairly stable. They hover between 80 and 100 per cent for revolvers and shotguns (top four) and between 40 and 60 per cent for pistols (top four.) For the top eight firms, this stability is even more pronounced: shares are

Figure 8 **Market concentration, 1986–2010 (HHI)**



Source: Compiled from ATF (1986–2010)

virtually 100 per cent for revolvers and shotguns, and between 70 and 80 per cent for pistols. Moreover, since the early 2000s the shotgun market has become markedly more concentrated. By 2010 two brands, Maverick and Remington, held 91 per cent of the shotgun market. These two brands now form a duopoly in this market.

An exception to this market concentration appears to occur in the rifle market, in which the top four concentration ratio was above 80 per cent until 1997 and since then appears to have dropped to below 50 per cent by 2010. In terms of the top eight rifle manufacturers, the percentage was above 90 per cent until 1997 and since then appears to have fallen to about 70 per cent. This might suggest that the increasing number of firms in the rifle market (see Figure A3) has contributed to competitive pressure and loss of market concentration. This would appear to be corroborated by the number of rifles produced by the top ten firms (Figure A10), a number that since the early 1990s has oscillated between 100,000 and 140,000 units, with an average of about 120,000. Except for during the late 2000s, the total number of rifles produced has oscillated around 1.3 million units, with no apparent upward trend since the mid-1990s, certainly not in terms of units per 100,000 people. The average for the period 1986–2010 comes to around 500 rifles per 100,000 (Figures A14 and A15). If the top rifle makers produce roughly the same

number of rifles, but the total number of rifle manufacturers increases, then it follows that the market power of the top firms falls, which is what the ATF numbers appear to show.

But the number of firms has increased in the other firearms market segments as well, so this cannot be the whole explanation. In the mergers and acquisitions section of this paper it will be shown that the rifle market is in fact 'moderately concentrated', with the top (parent) firm holding 35.7 per cent of the market in 2010 and the second firm holding another 12.9 per cent.

The HHI measures complement the top four and top eight concentration measures. For example, in 2010 the revolver and shotgun markets are 'concentrated' with HHIs of 3,022 and 4,290, respectively. The pistol market has oscillated around a near-competitive 1,000 for the entire 1986–2010 period. The rifle market started at a 'concentrated' HHI of 2,454 in 1986 and since then appears to have fallen to a rather competitive 793 in 2010. As noted, the section on mergers and acquisitions will show that this is the result of a statistical anomaly and is due to the way in which the ATF collects and reports data. Actual market concentration in the rifle market is far higher than ATF data suggests. By themselves, the top two firms command a joint 50 per cent of the market and their corresponding HHI alone equals 1,441 (i.e. 35.7^2 + 12.9^2) (for details, see Table 7).

Rank order and market entry/exit (displacement) analysis

Based on the ATF dataset, this section examines entry into and exit from the top ranks of the US non-military firearms market. With low capital and other entry requirements, one would expect to see ease of market entry by new firms, just as one would expect ease of market exit by underperforming firms. Moreover, in a vibrant market one would expect that innovative, competitive suppliers advance within the rank order of competitors, selling large quantities of firearms, whereas not-so-nimble or less-efficient manufacturers would be expected to lose favour with customers and fall in the rankings.

This section does find a considerable degree of market entry and exit, but it also finds considerable stability in the ranks of top-level companies and, by focusing on ownership rather than brands, finds instances where there is less change than the ATF record might at first suggest.

Pistol manufacturers

Table A1 (placed in the Annexe because of its size) presents the top-20-ranked FFL holders ('firms') among pistol manufacturers for each year of the 25-year period from 1986 to 2010.

In 1986 the top-ranked producer was Raven Arms and the 20th-ranked was Essex Arms Corp. One year later, in 1987, three firms had disappeared from the top-20 record, i.e. three other firms displaced them by entering the ranks of the top 20. These three firms—International Die Casting, Springfield, and AMAC—are listed in the shaded cells for the year 1987.

The bottom line of Table A1 lists for each year the number of top-20 displacements (exits and, therefore, entries). In all, 69 firms are listed: 20 in the original 1986 top-20 list and 49 since then. Re-entries are not double-counted. For example, in 1988 Grendel ranked in 19th place, then dropped to 22nd (1989), 23rd (1990), and was again 23rd (1991), before re-entering the top 20 in 18th place

in 1992, but it is counted only once. (However, if an existing top-20 firm neglected to report data, for example Springfield in 2004, this would open up a fictitious top-20 spot to be filled.)

Table A1 reflects underlying problems with ATF data. For example, Bryco was ranked third in 2004 and then completely disappears from the record. The reason for this is that the company went bankrupt due to a legal ruling against it. But, as noted, it reopened under new ownership and a new name (Jimenez Paul J) when Paul Jimenez, formerly a Bryco foreman, bought Bryco's assets. Jimenez ranked tenth in 2005.

Data problems notwithstanding, it appears that, of the original top 20 firms in 1986, only 5 (25 per cent) survived to 2010 (Ruger, Colt's Manufacturing, Smith & Wesson, Beretta, and Arms Technology). Of these, the first four also constituted part of the original top six and only one of them (Colt's) has since fallen on hard times, dropping steadily from fourth rank in 1986 to 16th in 2010.

The data also shows firms in ascendance. Beemiller entered the rankings as number 12 in 1993, rose as high as third rank in 2003, and since then has dropped to rank 9 in 2010. Cobra rose from rank 20 in 2001 to rank 8 in 2009 and to 15 in 2010. In contrast, Taurus entered the rankings as number 14 in 1993 and had stable rankings until 2010, when it moved up to fifth rank.

As a whole, the data for the pistol makers suggest that inter-rank mobility can be readily observed. Manufacturers cannot take their customers or market position for granted. Firms do compete for business and companies can fall out of favour with their customers. To stay 'on top of the game', deft management would appear to be a necessary ingredient of firm survival in a heavily cyclical, competitive market with domestic and foreign challengers entering with relative ease.

Revolver manufacturers

The market top-20 entry/exit situation is somewhat different in the case of revolvers. Table A2 (also in the Annexe) lists 117 companies reporting revolver production. Smith & Wesson, Ruger, Colt's Manufacturing, and Freedom Arms are listed for all 25 years (forming 20 per cent of the original

top 20 in 1986). The first two have consistently held the number 1 and 2 ranks for all 25 years.

In 1992 and 1993 three companies appeared in the top 20 rankings that, together with Smith & Wesson and Ruger, have developed into a remarkably consistent oligopoly for revolver production, consistently holding ranks 1 to 5 since 2001. The additional three companies are Charco 2000, Heritage Manufacturing, and North American Arms. Together, they are the only firms each producing or having produced in the tens of thousands of revolvers each year (category 4 firms in terms of Table 2).

Even in the case of revolvers, however, there is competitive movement. Both Colt's Manufacturing and Freedom Arms have consistently declining production (Colt's from a high of nearly 53,000 revolvers in 1994 to just 2,086 in 2010; Freedom Arms from over 10,000 in 1987 to just 387 in 2010) and have been eclipsed by several other firms in the rankings. The current sixth-ranked firm, US Firearms Manufacturing, produced 12,007 revolvers in 2010, whereas the fifth-ranked firm, Charco 2000, produced 24,789 units in that year.

The top four firms have been virtually unchanged since 1996, when Heritage entered the fourth rank. Moreover, the top two, Smith & Wesson and Ruger, have held the number 1 and 2 ranks since 1986, thus constituting a clear case of a market-leading duopoly. In terms of Table 2 ratings, each of these two firms is a category 5 producer (100,000 units per year).

Below rank 10, the revolver market amounts to small-scale production, from category 0 (single digits) to category 2 (hundreds). Despite the initial impression that Table A2 might convey, there is little relevant inter-rank mobility in the revolver market. Instead, it is a top-level duopoly, followed in a second tier by an oligopoly of a handful of companies. Market entry is easy as such, but evidently it is far from easy to break into the top tier. Of note, however, is that two prominent pistol manufacturers recently reported revolver production as well. They are Magnum Research since 2005—but bought by Kahr Arms in 2010 (Kahr Arms, 2010)—and Cobra Enterprises since 2009. It remains to be seen if there is an attempt here to reap economies of scope based on the general strength of the brands.

Rifle manufacturers

Regarding rifle production (Table A3), several firms have continuously occupied the top 20 positions over the 25-year period. These firms include Marlin, Ruger, Remington, and Savage, usually the first- to fourth-ranked firms in each of the past ten years. They also include Thompson Center and Springfield, which occasionally have wandered into the top 20 positions. Another firm, US Repeating Arms, is formerly the producer of the Winchester rifle brand, under licence from the trademark holder, Olin Corp., and usually ranked in fourth or fifth place. It last appeared in the record in rank 6 in 2005, with 88,743 units produced. In 2006 Olin signed up with a new trademark licensee, Browning of Morgan, Utah, itself a subsidiary of FN Herstal, Belgium, but neither Browning nor FN Herstal reported civilian rifle production to the ATF in 2006, 2007, or 2008. Instead, FN Herstal's US manufacturing branch in Columbia, South Carolina, called FN Manufacturing, first began to report civilian rifle production of 5,038 units in 2008, and then 21,878 and 19,816 units in 2009 and 2010, respectively. This is where the Winchester Model 70 rifle is now manufactured.[22]

The top-20 listing for the rifle market is particularly difficult to decipher. From 2007 onwards, for example, the Marlin, Remington, H&R 1871, Bushmaster, and DPMS Firearms brands all belonged to a single company, Freedom Group. Likewise, Smith & Wesson Holding acquired Thompson Center Arms, and then entered the top-20 rifle rankings only in 2007. Thompson Center's ranking then declined, while Smith & Wesson's increased, perhaps an indication that the Thompson Center brand is gradually being absorbed.

O. F. Mossberg, primarily known as a shotgun producer, acquired Maverick and rebranded itself under the latter's name. Thus, Mossberg dropped out of a respectable rifle ranking (11th in 2007), to be replaced by a seemingly 'new' Maverick (ninth in 2008 and 2009, and seventh in 2010).

A focus on brands rather than ownership therefore distorts an understanding of entry and exit in rifle production. While the very top ranks appear stable among just four brands, below the top tier there is an illusion of considerable entry and exit. As reflected in the declining top four, top eight, and HHI scores in Figures 6, 7, and 8, respectively, competition in the rifle

market appears to have increased. However, the rifle market is less competitive when viewed in terms of ownership rather than brands. An additional interesting aspect of the rifle market is that in recent years a number of traditional pistol makers have entered the market, including the aforementioned Smith & Wesson, but also Kel-Tec, Kimber Manufacturing, Saeilo (maker of Kahr pistols), and Sig Sauer. Thus, there is movement between and among traditional rifle brands and segment entry by pistol producers.

Shotgun manufacturers

Regarding the shotgun market (Table A4), O. F. Mossberg and Maverick now operate jointly under the Maverick brand name (but Mossberg ownership), so it might be treated as a continuous operation across all 25 years in the dataset. Similarly, Remington, Ruger, and Savage are in the record for the entire time period (although with the latter not reporting in 2010). In the same way as for rifles, US Repeating Arms (i.e. the Winchester brand) was in the record through 2005 (with 30,517 units) and then was brought under the Browning/FN (Herstal) Manufacturing licence. It appears, however, that the shotguns are now manufactured in Belgium and then imported into the United States, in which case they would not be recorded by the ATF.

When examining production volume rather than ranks, one finds that only three firms ever produced in the category 5 range (hundreds of thousands of shotguns annually; see Table 2): they are Mossberg/Maverick, Remington, and H&R 1871 (now, together with Remington, part of Freedom Group). Other firms that are top ranked, such as Savage and Ruger, produce in the very low thousands (category 3), with annual production of around 1,000–1,500 shotguns. When Beretta started shotgun production in the United States in 2002 its production was just 333 shotguns. This increased to 7,553 shotguns by 2004 and was 5,191 by 2010. Currently the shotgun market is a clear duopoly (Maverick and Remington).

Mergers and acquisitions in the US firearms industry

In 2007 US-based Cerberus Capital Management LP, a private equity firm, bought an 80.1 per cent equity interest in the automobile maker Chrysler from DaimlerChrysler. In that year Cerberus started out on a route that led it to also become the country's largest firearms maker. The maze of corporate entities involved is complex. Cerberus created an entity called American Heritage Arms LLC (later, American Heritage Arms Inc.). In turn, American Heritage Arms bought 100 per cent of an entity called RACI Holding Inc., which in turn owned 100 per cent of Remington Arms Co. Inc. Subsequently, towards the end of 2007, Cerberus announced that its new Remington unit had acquired Marlin Firearms Co. and its facilities in North Haven, Connecticut, and Gardner, Maine. The deal was formally closed on 31 January 2008.[23] In 2007 Cerberus also bought Bushmaster Firearms of Windham, Maine, a prominent producer of military-style AR-15 and M16 rifles, and DPMS Panther Arms of St. Cloud, Minnesota, also a well-respected maker of the AR-15 and M16-style rifles. Furthermore, in 2007 Bushmaster in turn acquired Cobb Manufacturing of Dallas, Georgia, a manufacturer of tactical rifles, and announced the formation of a joint venture with Iron Brigade Armory Ltd., which would later be branded Bushmaster Custom Shop by Iron Brigade, located in Jacksonville, North Carolina.

Assembled into an entity called Freedom Group Inc., all of these properties were readied for sale via a public share offering. This happened on 20 October 2009, when Freedom Group filed a registration statement with the US Securities and Exchange Commission (SEC). But then on 1 April 2011 Freedom Group filed a registration withdrawal request. Apparently the company is to remain private after all (US SEC, n.d.).

Since then, Freedom Group has acquired other brands. On 5 June 2009 it closed a deal to acquire Dakota Arms, a shotgun maker, which also includes the Nesika Bay Precision, Miller Arms, and Dan Walter brands, while retaining

Remington's military and ammunition divisions (Freedom Group, 2010). Also in 2009, Freedom Group bought EOTAC, a 'tactical apparel' manufacturer located in West Columbia, South Carolina, and Advanced Armaments Group of Lawrenceville/Norcross, Georgia, a maker of military-grade ammunition. Freedom Group also owns INTC, another military-grade ammunition maker, and Barnes Bullets LLC was acquired in 2009 as well. The group also purchased a 75 per cent stake in Mountain Khakis, another apparel maker. (Remington itself, incidentally, introduced another ammunition brand, UMC, when Cerberus acquired the firm.) Freedom Group, through Remington, has an extensive line of military and law enforcement products and sales. Freedom Group's objective is to produce firearms and ammunition in the military, law enforcement, private security, and civilian markets, both domestically and abroad. On its website it mentions sales in over 80 countries (Freedom Group, n.d.). The firm is branching into pistol production as well, in part via a new Freedom Group subsidiary established in 2008 called E-RPC LLC, which markets and distributes the Remington M1911 pistol. Further, in early 2012 Freedom Group announced the purchase of Para USA, a pistol maker appearing in the ATF record for the first time only in 2009 (*Shooting Industry*, 2012, p. 8).

In addition to horizontal integration (acquiring firms in the same line of business) and further expansion into complementary products (ammunition and apparel), Freedom Group also undertook a modicum of vertical integration (acquiring suppliers or distributors). On 22 September 2009 it acquired S&K Industries Inc., a wooden-gunstock manufacturing concern located in Lexington, Lafayette County, Missouri (near Kansas City) (Freedom Group, 2010, p. 14). This company produced gunstocks for a number of the major firearms manufacturers in the country, including for Remington since 1986. It is unclear whether, following its acquisition, S&K Industries still produces for customers outside of the Freedom Group family. What is certain (via a manager profile posted on LinkedIn) is that, upon acquisition, Remington's H&R-brand wood-gunstock production was moved to the former S&K Industries (see Jackson, n.d.). In addition, Freedom Group has a division that produces firearms metal components. Clearly, Cerberus/Freedom Group has implemented an elaborate strategy of broad-spectrum asset acquisition and

consolidation. On its website it now refers to itself as the 'Largest Manufacturer of Commercial Firearms and Ammunition' (see Freedom Group, n.d.).

The acquisitions of Bushmaster and DPMS in particular signal that Cerberus/Freedom Group might aim not only to dominate the civilian rifle market, but perhaps also to break into the military rifle market, currently led by Colt's Defense of West Hartford, Connecticut, and FN Herstal's US subsidiary, FN Manufacturing, of Columbia, South Carolina. Cerberus/Freedom Group literature prominently states that it hopes to regain military market share from companies headquartered in foreign countries (Freedom Group, 2010, p. 4 and repeated throughout the document). Arguably, this is about as convincing as Ford or General Motors wishing to reclaim market share from Toyota or Honda just because the former are headquartered in the United States and the latter in Japan. In the end, it is not marketing ambitions but costs, prices, and profits that count. Unsurprisingly, then, Freedom Group has already begun to move manufacturing sites around. Marlin's facility in Gardner, Maine, is now closed; its North Haven, Connecticut, plant was to close by June 2011. Remington's UMC ammunition factory in Bridgeport, Connecticut is also designated for closure. Upon acquisition, Barnes Bullets was relocated to Mona, Utah. Freedom Group is also beginning to consolidate—or at least to streamline—acquired brands. The L. C. Smith and New England Firearms brands, for example, are being phased out. Freedom Group also sold its target shooting business and associated facilities that it owned in Ada, Oklahoma, and Findlay, Ohio.

In all, Freedom Group now appears to operate at least 14 facilities with over 3,000 employees and net sales of about USD 550 million and USD 650 million in 2010 and 2009, respectively (Freedom Group, n.d.). Identified as the controlling entity in the 20 October 2009 SEC filing, at the time of writing Cerberus is still the controlling entity of Freedom Group.

Industry consolidation did not end with the Cerberus–Freedom Group acquisitions. On 3 January 2007 handgun maker Smith & Wesson Holding Corp. acquired the rifle maker Thompson/Center Arms (Smith & Wesson, 2007). US Repeating Arms, formerly the maker of the Winchester rifle models under trademark licence from Olin Corp., was closed and a new licence agreement concluded with Browning, a division of FN Herstal. Keystone

Sporting Arms Inc. of Milton, Pennsylvania, the producer of the Davey Crickett rifles (specifically marketed to children to encourage interest in the shooting sports), took over the Chipmunk product line from Rogue Rifle Co. This company then closed down.[24] O. F. Mossberg acquired Maverick Arms and now operates under the Maverick brand name.

Following a wave of lawsuits in the late 1990s and early 2000s, Colt's Manufacturing struck an agreement regarding firearms safety with the outgoing Clinton administration. Subsequently Colt suffered a severe customer backlash, as a consequence of which the company split in 2002 into Colt's Manufacturing and Colt Defense.[25] The latter then replaced the former in the civilian rifle rankings while keeping its military rifle line. Both Colt's Manufacturing and Colt Defense seem no longer to produce civilian shotguns, but the former remains in the civilian revolver business, while struggling in the civilian pistol market.

Argus Publications Inc. was the licensee for the Henry Repeating Rifle. In 2009, when primary ownership changed from father to son, this became the licensee Henry RAC Holding Inc., retaining the former Argus's fifth rank.

While there is no complete public data on overall US firearms production (commercial and military), one can nonetheless gain a sense of the market power that Freedom Group has acquired. Using 2010 ATF data, it would appear that the firm holds more than a one-third share of the overall unit sales of rifles, nearly three times its nearest competitor, Ruger (see Table 7).

Regarding pistol manufacturers, Beemiller, Haskell, and Iberia, each specializing in different calibre pistols, all appear on the January 2010 FFL list with the business name of Hi-Point Firearms, which gives that entity the number 9, 19, and 21 ranks in pistol manufacturing—a combined 5.7 per cent market share, or fifth rank, in 2010. Kahr Arms acquired Auto-Ordnance in 1999. Kahr also produces under the licence names Saeilo Inc. and SMI-MA Inc.; Saeilo is ranked tenth in the pistol rankings for 2010. (Auto-Ordnance disappeared from the ATF list after 1999.) In 2010 Saeilo/Kahr Arms acquired Magnum Research and thus gained entry into the large-calibre segment of the handgun market.

Saeilo/Kahr Arms presents an interesting story because of its complex web of cross-ownerships. From an undated court document (CoM, n.d.)

of a lawsuit filed against Kahr Arms, but evidently drawn up in the early 2000s, defendants are listed as follows (using the court document's spellings and capitalizations): KAHR INC., D/B/A; KAHR ARMS, INC.; KAHR AUTO ORDNANCE CORP.; SAEILO, INC.; SAEILO MACHINERY MA, INC.; SAEILO MACHINERY USA, INC.; SAEILO MANUFACTURING INDUSTRIES; MACHINE INDUSTRIES, INC.; SAEILO EQUITY HOLDINGS, LLP; and ONE UP ENTERPRISES, INC., the last one being the business arm of the Unification Church. The son of the church's founder is the founder, designer, and lead shareholder of Kahr Arms.

Numerous other examples of merger and acquisition activity could be cited, but not systematically and quantitatively. This is because the vast majority of firms are privately held and there is no unified public record to draw on. Nonetheless, it appears clear that in the late 2000s substantial merger and acquisition activity took place and that a number of companies took measures to reposition themselves in the market. There is evidence of horizontal integration not only within product categories (i.e. pistols or rifles), but also across product categories and, evidently, an attempt by Cerberus/Freedom Group to position itself for both the military market and the civilian, law enforcement, and private security markets. In addition, virtually all of the major firms have branched into production and sales of firearms parts and accessories, and even into clothing for articles such as T-shirts and hats. Savage Arms, a leading rifle maker, has branched into the ownership of shooting ranges.

If it were possible to trace accurately underlying ownership rather than FFL licence holders, the various segments in the firearms market would turn out to be more concentrated than they already are.

Table 7 **Top rifle makers' unit production and market share, 2010**

Firm (– *subsidiary*)	Units	%
Freedom Group Inc.	**653,957**	35.7
– *Remington Arms Co. Inc.*	263,934	
– *Marlin Firearms Co.*	253,521	
– *Bushmaster Firearms International LLC*	40,878	
– *DPMS Firearms LLC*	46,891	
– *H&R 1871 LLC*	48,733	
Sturm Ruger & Co. Inc.	**236,616**	12.9
Savage Arms Inc.	**171,472**	9.4
Smith & Wesson Holding Corp.	**153,293**	8.4
– *Smith & Wesson Corp.*	100,051	
– *Thompson Center Arms Co. Inc.*	53,242	
Henry RAC Holding Corp.	**124,701**	6.8
Maverick/O. F. Mossberg	**66,938**	3.7
– *Maverick Arms Inc.*	60,403	
– *O. F. Mossberg & Sons Inc.*	6,634	
Keystone Sporting Arms LLC	**47,835**	2.6
Beemiller Inc.	**35,300**	1.9
Sig Sauer Inc.	**29,764**	1.6
Rock River Arms Inc.	**23,200**	1.3
Springfield Inc.	**20,463**	1.1
Aero Precision Inc.	**19,939**	1.1
FN Manufacturing LLC	**19,816**	1.1
Stag Arms Inc.	**19,545**	1.1
Delaware Machinery& Tool Co. Inc.	**17,149**	0.9

Note: Top two HHI = 1,441; top four = 1,511; top eight = 1,582.
Source: Compiled from ATF (2010)

Summary and conclusions

This working paper has considered some economic aspects of the US non-military firearms industry, i.e. pistols, revolvers, rifles, and shotguns for the civilian, private security, and law enforcement markets. Drawing mainly on detailed data for the period 1986–2010 obtained from the ATF, it mostly examines aspects of the supply side of the market, particularly the numbers of firms, and their production and sales volumes. Industry-wide information on prices, costs, investments, financials, and other relevant factors is not readily available and currently hampers a fuller, more complete analysis of the economics of the firearms market.

The paper identifies 2,288 distinct reporting entities ('firms'), roughly three-quarters of which produce in only one of the four product categories (pistols, revolvers, rifles, or shotguns). Only 26 firms have produced in all market segments, and only a further 67 in three of the four segments. About two-thirds of the 2,288 firms reported small-scale production of fewer than 100 firearms per year. Overall, however, the paper traces the production of more than 98 million firearms produced and retained in the United States between 1986 and 2010, and identifies three firms that each have produced ten million or more firearms since 1986 (category 7 firms; see Table 2), for a total of about 41 per cent of all firearms produced. The paper also approximates the underreporting of firearms production in the order of 320,000 weapons since 2001.

The production of new, domestically produced weapons is highly cyclical, oscillating between three million and 5.5 million firearms per year since 1980. Production cycles are especially pronounced in the pistol segment. Analysing data for 1999–2010 from the FBI, the paper also estimates US firearms demand. It suggests that demand for firearms held steady at between seven and eight million weapons per year, albeit with a seemingly unusual increase to about ten million firearms in 2009 and 2010. The paper further reports on an import/export dataset and finds that imports of firearms have

been rising continuously since the early 1980s, reaching well over three million units in 2010. It is suggested that, of the overall volume of the firearms trade (but excluding trade not requiring an FFL), on the order of 75 per cent is serviced by new domestically produced and imported new and used weapons. The other 25 per cent consists of sales of used firearms that re-enter the supply chain, for instance via pawnshops and consignment sales. (These numbers in particular are to be interpreted as no more than a first marker against which future studies could orient themselves.)

While there is a fair degree of entry into and exit from the firearms market, it is clear that market leaders have firmly established themselves in every market segment, sometimes in long-lasting stable duopolies. The pistol market in particular has been thoroughly penetrated by non-US brands. An analysis of recent merger and acquisition activity reveals ownership concentration—especially in the rifle market—far beyond what an analysis of ATF data suggests. In particular, it was found that in 2010 a single parent company controlled five major rifle brands that in turn held more than one-third of the rifle market and about three times the market share of its nearest competitor. Finally, the paper paid thorough attention to a detailed understanding of the data on which its findings are based.

Many opportunities exist to enhance data collection in order to advance the economic analysis of the industry. An effort could be made to obtain detailed firearms production data from before 1986. One can also go back further in time with regard to Customs or USCB firearms import and export data. To confirm the supply-side numbers produced in this report from another direction, an attempt might be made to obtain federal firearms and ammunition excise tax records. From these one might be able to deduce the dollar *wholesale* market value of the US firearms trade. (Tax records should go back to fiscal year 1920, when the firearms and ammunition excise tax was first collected.) The National Shooting Sports Foundation—a trade association—has done some of this research, but this is proprietary and not in the public domain. An initial check with the agency that currently collects this data—the Alcohol and Tobacco Tax and Trade Bureau of the US Department of the Treasury—suggests that considerable caution needs to be applied in the use of this data.

The importance of assembling data covering many years lies in its potential use in time-series econometrics, e.g. for business cycle analysis. In addition, the manufacturing establishment location information contained in the FFL and ATF data can be used to conduct studies in spatial econometrics or in GIS-based studies of how firms' location decisions respond to changes in federal, state, and local firearms laws and regulation, and other changes in the economic environment (e.g. unionization, improved transportation infrastructure, etc.). An initial exploration employing spatial data—not reported here—suggests, for example, distinct geographic clustering of firearms manufacturing activity both in the United States and abroad. This holds for both contemporary and historical data going back to the late 1700s.

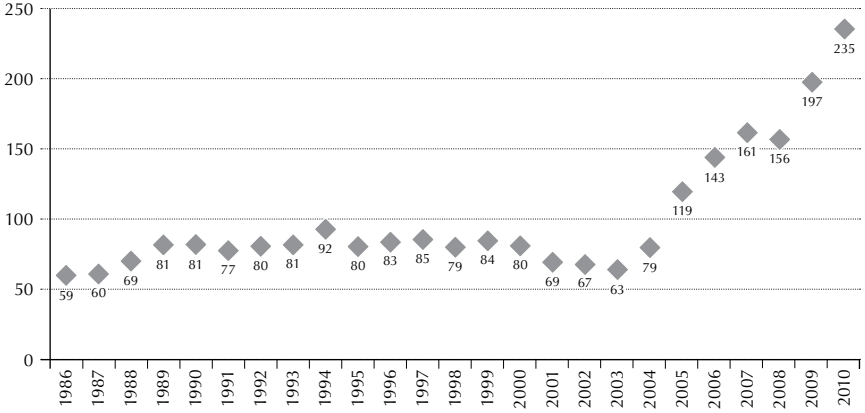
Financial data lodged with the SEC can be obtained for the very few firearms manufacturers that are—or at one point in time were—publicly held corporations (e.g. Ruger, Remington, and Smith & Wesson). For any given financial year this might permit one to extract such economically important data as production costs or levels of research and development expenditure, and investments in plant, property, and equipment. This data might also permit one to compute an average price per weapon sold (sales revenue divided by quantities sold). Assuming competitive pricing, one then might combine this with the ATF's information on quantities produced across all firearms manufacturers, estimate an overall firearms dollar market value, and compare this number to the number derived from the excise tax records or with the USCB's NAICS reports (NAICS 332994: 'Small Arms Manufacturing') or to estimates made by the industry itself. Additional industry information is likely to be contained in court documents. For example, an initial search of the LexisNexis database using the keywords 'firearm' and 'manufacturer' listed 55 cases. Finally, data on *military* firearms production and sales can possibly be acquired via US Department of Defense procurement records. This data could be important, as some companies may well cross-subsidize their civilian market efforts with research and development coming off their military contracts. Further, it may be useful to search company registration records state by state in order to identify ownership and cross-ownership holdings and patterns.

Finally, in terms of industrial economics, it appears that the US *ammunition* industry—the single most important complement to the firearms industry—is very differently organized. But there are at least cursory indications of some degree of ownership overlap between firearms and ammunition companies. As noted in the main text, the Cerberus/Freedom Group, for example, owns several ammunition manufacturers, as does the Winchester brand. Studying complementarities between these two industries should be of interest.

In sum, it is likely that a great deal of information is in fact available that may be used to enhance our understanding of the economics of the US firearms industry.

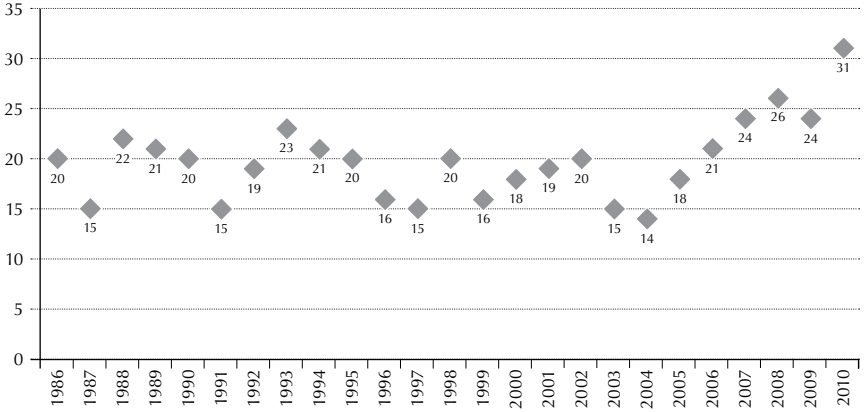
Annexe: figures and tables

Figure A1 **Number of pistol producers, 1986–2010**



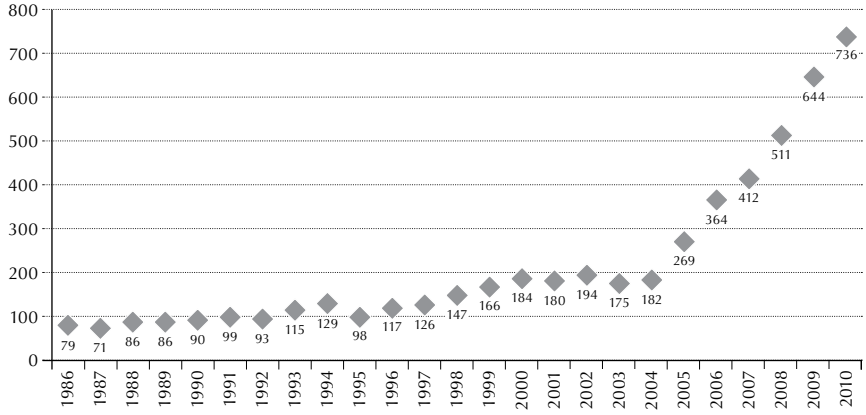
Source: Compiled from ATF (1986–2010)

Figure A2 **Number of revolver producers, 1986–2010**



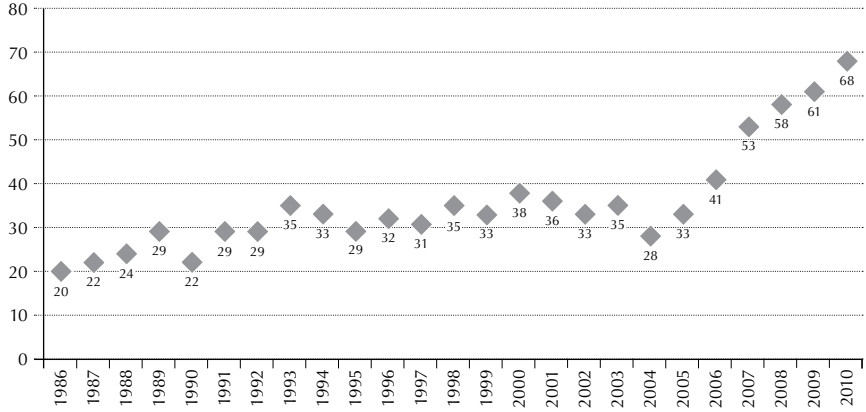
Source: Compiled from ATF (1986–2010)

Figure A3 **Number of rifle producers, 1986–2010**



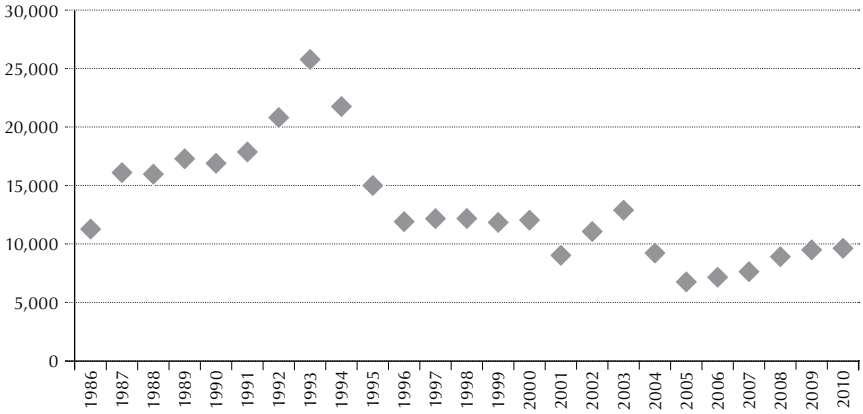
Source: Compiled from ATF (1986–2010)

Figure A4 **Number of shotgun producers, 1986–2010**



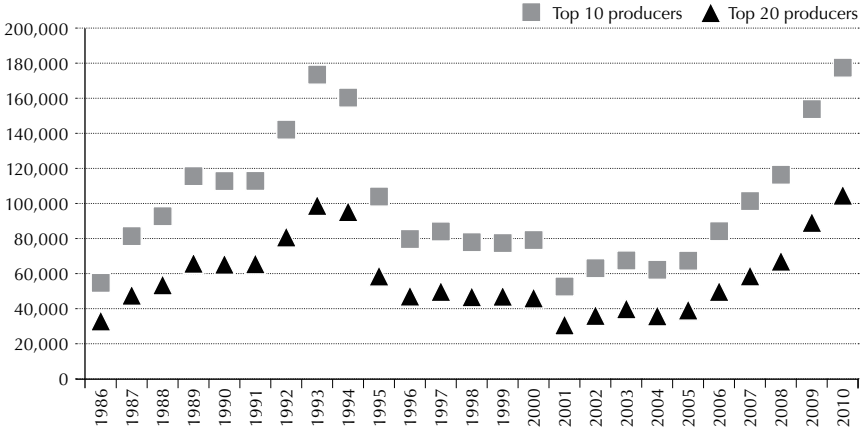
Source: Compiled from ATF (1986–2010)

Figure A5 **Average unit production by pistol makers, 1986–2010**



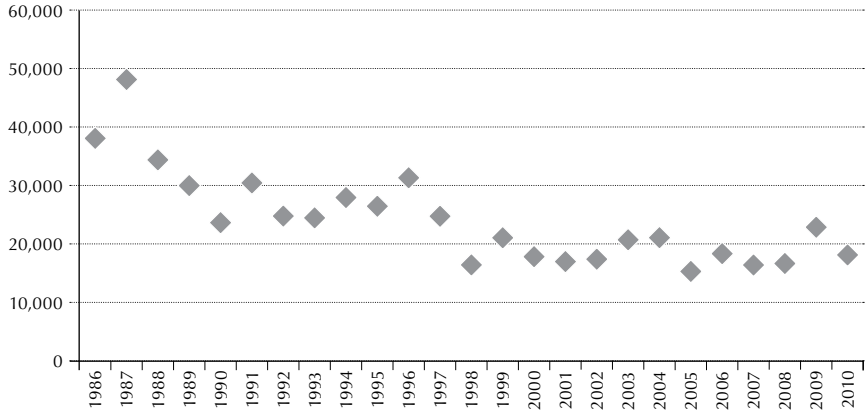
Source: Compiled from ATF (1986–2010)

Figure A6 **Average unit production by top 10 and top 20 pistol makers, 1986–2010**



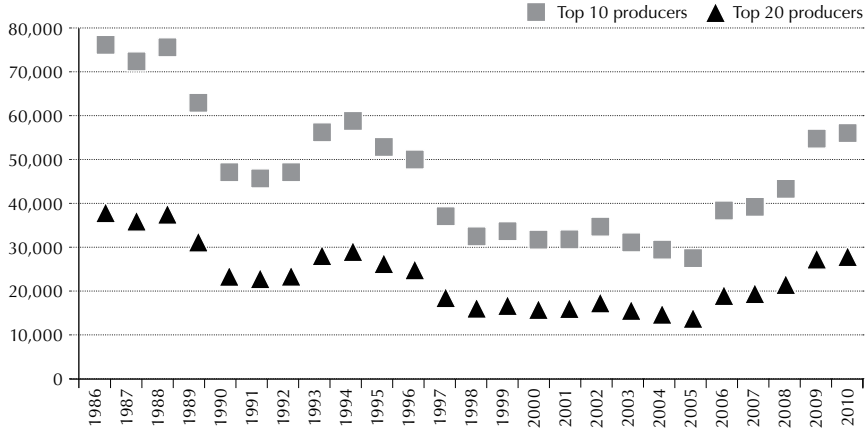
Source: Compiled from ATF (1986–2010)

Figure A7 **Average unit production by revolver makers, 1986–2010**



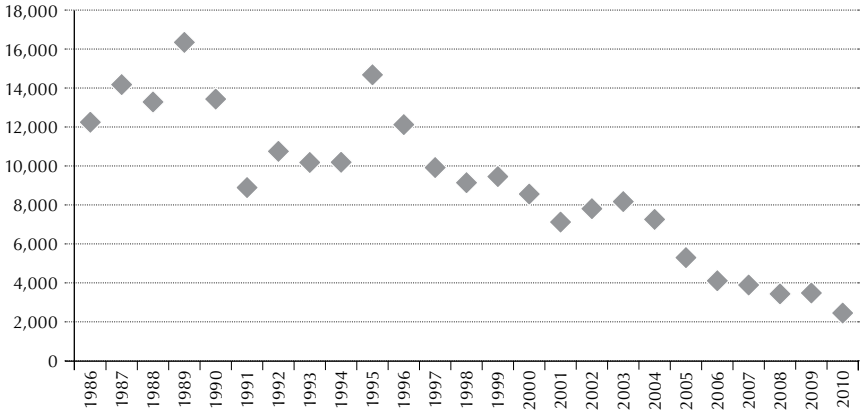
Source: Compiled from ATF (1986–2010)

Figure A8 **Average unit production by top 10 and top 20 revolver makers, 1986–2010**



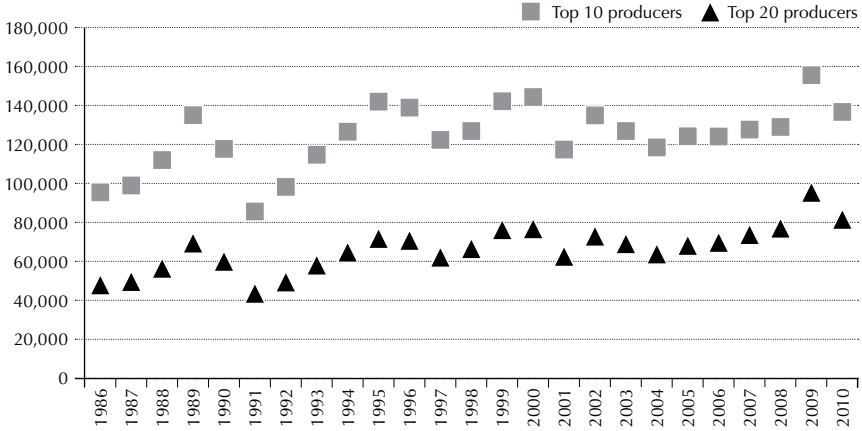
Source: Compiled from ATF (1986–2010)

Figure A9 **Average unit production by rifle makers, 1986–2010**



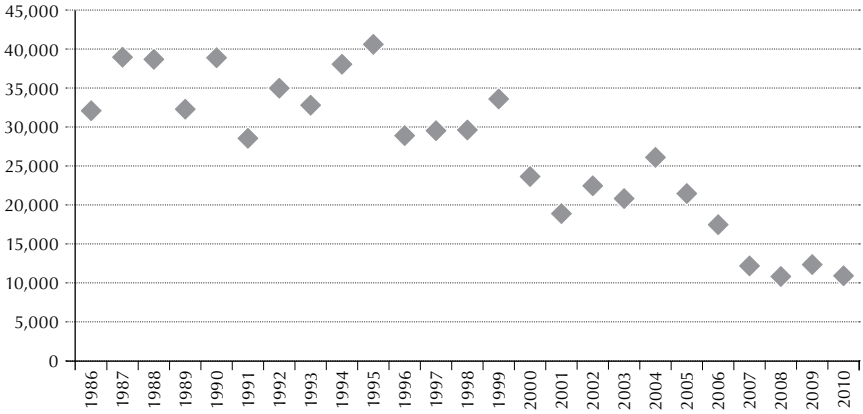
Source: Compiled from ATF (1986–2010)

Figure A10 **Average unit production by top 10 and top 20 rifle makers, 1986–2010**



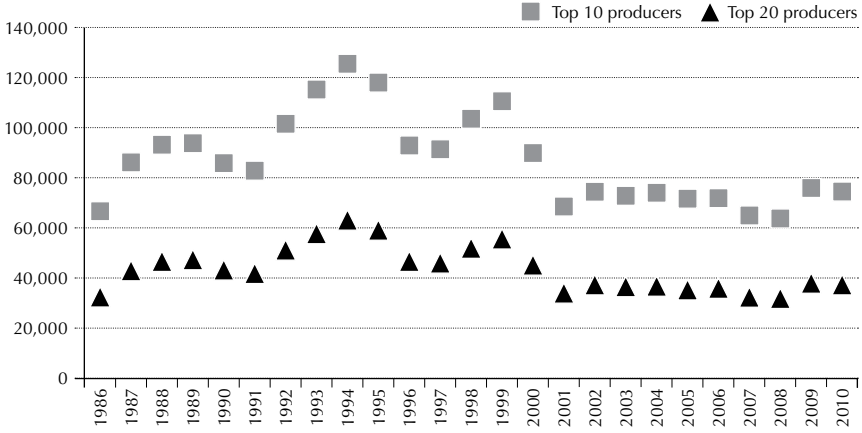
Source: Compiled from ATF (1986–2010)

Figure A11 **Average unit production by shotgun makers, 1986–2010**



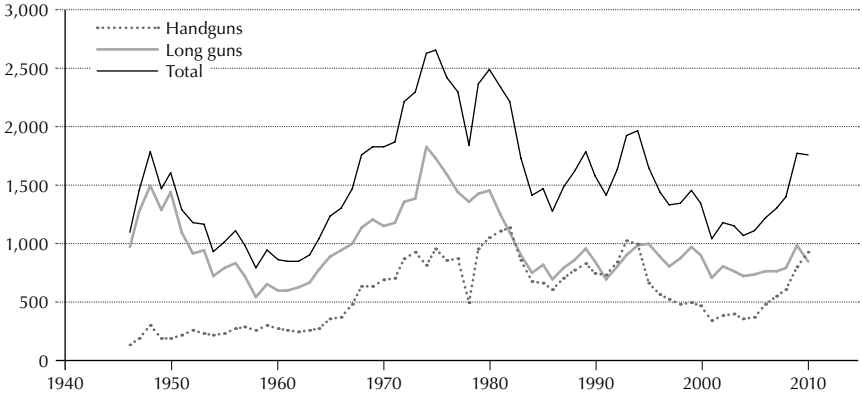
Source: Compiled from ATF (1986–2010)

Figure A12 **Average unit production by top 10 and top 20 shotgun makers, 1986–2010**



Source: Compiled from ATF (1986–2010)

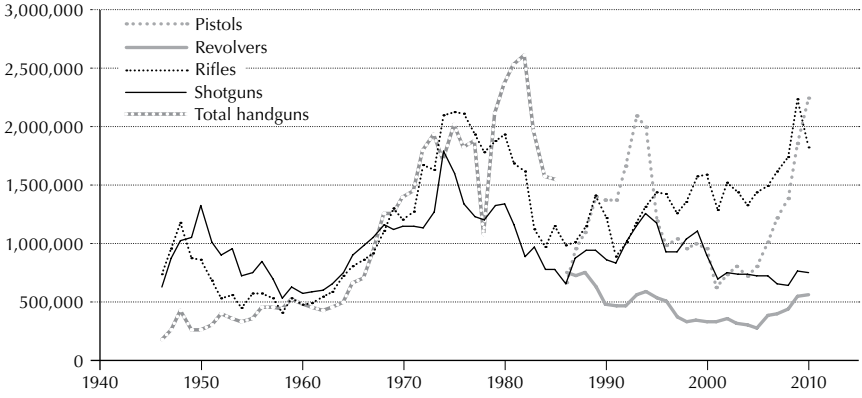
Figure A13 **Total US handgun and long-gun unit production per 100,000 people, 1946–2010**



Source: Compiled from ATF (1986–2010); Thurman (2001, p. 34); Violence Policy Center (1946–79)

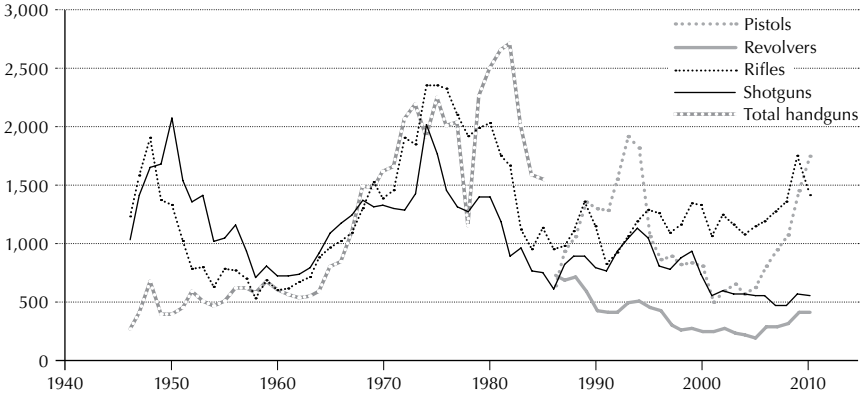
Note: The numbers prior to 1980 are known to understate firearms production. The handguns data point for 1978 may be in error.

Figure A14 **US gun unit production by weapon type, 1946–2010**



Source: Compiled from ATF (1986–2010); Thurman (2001, p. 34); Violence Policy Center (1946–79)

Figure A15 **US gun unit production per 100,000 people by weapon type, 1946–2010**



Source: Compiled from ATF (1986–2010); Thurman (2001, p. 34); Violence Policy Center (1946–79)

Note: Prior to 1986, only combined handgun (pistols and revolvers) data is available. The handguns data point for 1978 may be in error. Prior to 1980 actual production levels for handguns, rifles, and shotguns are known to be understated.

Regarding Tables A1–A4, below, the author worked from 25 years of annual ATF paper records. These give company names in upper case only. From year to year, however, the precise spelling can change, as can periods or commas or period or comma placement, company designations such as INC or LLC, and so on, even when the ultimate reference is to the same company. To tie all the records across 25 years into a single database required that a homogeneous naming convention be adopted.

Table A1 **Market entry and exit among the top 20 pistol maker rankings, 1986–2010**

Producers	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	Count
RAVEN ARMS	1	1	2	3	5	5																				6
STURM RUGER & COMPANY INC	2	4	3	2	2	3	1	2	1	2	2	2	1	1	1	1	1	1	1	2	2	2	2	1	1	25
CALWESTCO INC	3	2	4	7	6																					5
COLT'S MANUFACTURING	4	5	5	4	7	7	8	8	6	4	5	5	6	6	10	10	11	14	17	13	15	16	14	15	16	25
SMITH & WESSON CORP	5	2	1	1	1	4	5	4	2	1	1	1	2	2	4	3	5	5	2	1	1	1	1	2	2	25
BERETTA U S A CORPORATION	6	8	7	6	4	6	6	6	4	3	3	4	3	3	3	4	2	2	4	5	5	5	5	4	4	25
DAVIS INDUSTRIES	7	7	6	5	3	2	3	5	8	9	10	9	9	8	9	11										16
FIREARMS IMPORT & EXPORT CORP	8	10	9	8	9																					5
THOMPSON CENTER ARMS CO INC	9	13	15	14	17	16	17	17	18	16	15	15	17	19	15	14	17	18	16	17	16	20				22
RANGER MANUFACTURING CO INC	10	11	10																							3
ARCADIA MACHINE & TOOL INC	11	9	8		15	15	15	13	13	11	18															10
EXCAM INC	12	12	11																							3
ARMS TECHNOLOGY INC	13	14	14	10	10	11	11	11	12	7	8	10	12	13	13	7	10	11	9	9	12	14	11	12	12	25
INTRATEC USA INC	14	15																								2
IVER JOHNSON ARMS INC	15																									1
S W DANIEL INC	16	16	17	16			20																			5
AUTO-ORDNANCE CORP	17	18	18							18																4
CHARTER ARMS CORPORATION	18	20																								2
AMERICAN DERRINGER CORP	19									19																2
ESSEX ARMS CORP	20																									1
INTERNATIONAL DIE CASTING INC		6																								1
SPRINGFIELD INC		17	12	13	13	12	12	19	17	13	14	16	18	16	11	9	7	4		19	19	17	19	19		22
AMAC INC		19	20																							2
NAVEGAR INC			13	9	16	10	10	10	7	15	19	19	15	14												12
BRYCO ARMS			16		8	1	2	3	3	6	7	7	5	5	2	2	4	6	3							16
GRENDEL INC			19				18	18	20																	4
EMCO INC				11	12	13	14	16	15	12	17	18	16	18												11
IRWINDALE ARMS INC				12																						1
LORCIN ENGINEERING CO INC				15	11	9	4	1	5	5	4	3	4													10
UNITED SOUTHERN INDUSTRIES INC				17		20		20																		3
AMERICAN ARMS INC				18	19																					2
STALLARD ARMS INC				19	14	18	13																			4
AA ARMS INC				20					19																	2
MASTER TOOL CO INC					18																					1

SUNDANCE INDUSTRIES INC					20	17	16	15																		4
STRASSELLS MACHINE INC						8																				1
QUALITY FIREARMS INC						14																				1
HASKELL MANUFACTURING INC						19	19							20	18	13	18	15	11	11	13	11	12	14	19	14
TREFFERS PRECISION INC							7	9																		2
PHOENIX ARMS							9	7	9	8	9	8	8	12	12	19	13	16	15	15		18	16	17		17
BEEMILLER INC								12	16	14	12	11	11	10	6	5	6	3	5	4	6	6	6	6	9	18
TAURUS INTERNATIONAL MANUFACTURING INC								14	14	17	16	12	14	17	14	16	14		13	16	18	19	17	13	5	17
DANIEL WAYNE E									10	10	11	17														4
LIBERTY ARMS WORKS INC									11																	1
KEL TEC CNC INDUSTRIES INC										20	13	13	13	11	8	6	9	9	6	6	4	4	4	5	6	16
SIG SAUER INC											6	6	7	4			3	7	8	3	3	3	3	3	3	13
SAEILO INC											20	20	19		20	12	15	13	12	12	11	10	10	11	10	14
KIMBER MFG INC												14	10	7	7	8	8	8	7	7	7	8	8	7	8	14
NORTH AMERICAN ARMS INC													20			17	20	20								4
SOUTHWEST METAL FINISHING LLC														9	5											2
MUELLER WALTER W MUELLER JEFFREY W														15	16											2
BLACK CREEK INC															17											1
LEINAD INC															19	15	19	19								4
IBERIA FIREARMS INC																18	16	17	14	14	14	13	15	16		9
COBRA ENTERPRISES OF UTAH INC																20	12	12		8	8	9	9	8	15	9
NORDON TOOL AND MOLD INC																		10								1
SMI-MA INC																			10							1
OLYMPIC ARMS INC																			18							1
BOND ARMS INC																			19	20	20					3
STI INTERNATIONAL INC																			20	18						2
JIMENEZ ARMS INC																				10	10	12	13	9	13	6
GLOCK INC																					9	7	7	10	14	5
FN MANUFACTURING LLC																					17	15	18	18		4
SCCY INDUSTRIES LLC																							20	20		2
BURBAK MACHINE CORPORATION																									7	1
ATW COMPANIES																									11	1
PRECISION TOOL & MOLDING LLC																									17	1
CHIAPPA FIREARMS LTD																									18	1
DIAMONDBACK FIREARMS LLC																									20	1
Total = 69	**20**	**20**	**20**	**20**	**20**	**20**	**20**	**20**	**20**	**20**	**20**	**20**	**20**	**20**	**20**	**20**	**20**	**20**	**20**	**20**	**20**	**20**	**20**	**20**	**20**	**7.25**
Top 20 displacement	**n/a**	**3**	**3**	**7**	**2**	**3**	**2**	**2**	**2**	**1**	**2**	**1**	**1**	**2**	**2**	**2**	**0**	**1**	**4**	**1**	**2**	**0**	**1**	**0**	**5**	**49**

Source: Compiled fom ATF (1986–2010)

Table A2 **Market entry and exit among the top 20 revolver maker rankings, 1986–2010**

Producers	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	Count
SMITH & WESSON CORP	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	2	1	1	1	1	1	1	1	1	25
STURM RUGER & COMPANY INC	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	1	1	2	2	2	2	2	2	2	2	25
CHARTER ARMS CORPORATION	3	3	6	5	7	18																				6
FIREARMS IMPORT & EXPORT CORP	4	5	5	3	5	17																				6
TALLEY CORP	5	6	7	6	3	5	4																			7
DAN WESSON CORP	6	7	8	8								14					12	12	10	19						9
COLT'S MANUFACTURING	7	4	4	4	6	3	3	4	4	3	5	5	4	5	5	6	6	6	5	6	6	7	7	7	8	25
H & R 1871 LLC	8	16				6	5	5	6	6	6	6	5	7	19											12
FREEDOM ARMS INC	9	8	9	9	8	8	8	10	9	8	7	7	6	8	8	8	9	9	8	8	8	9	10	11	11	25
EXCAM INC	10	17																								2
SERRIFILE INC	11	18																								2
SUMMIT GEAR INC	12	19																								2
PHELPS E F MFG INC	13	20	14	13	14	20		16	18	15	19															10
DORADO GUNS INC	14																									1
BOROLOY INDUSTRIES INTERNATIONAL INC	15	11																								2
TEXAS LONGHORN ARMS INC	16	13		16	15	13	14	13	10	10	10	12	19													12
SUPER SIX LIMITED	17				11	12																				3
LASER PRODUCTS CORP	18	15																								2
LOWE IRWIN & HILL JOHN THOMAS	19																									1
MARCUS INC	20																									1
NEW ENGLAND FIREARMS COMPANY INC		9	3	7	4	16																				5
INTRATEC USA INC		10																								1
COONAN ARMS INC		12																								1
GREN JOHN E		14	16	15	13	11	13	15	14	11	11	16														11
CENTURY MFG INC			10	10	10	19		18	16	13	18															8
NAVEGAR INC			11																							1
R3B INC			12																							1
EL DORADO ARMS INC			13	12	12	10	12	17	15	12	16	20														10

PETERSON DANIEL M			15																						1
CANNON ANDREW B			17																						1
HILL JOHN T			18																						1
MILLER ARMS INC			19																						1
R & R SPORTING ARMS INC			20																						1
STREET SWEEPER SALES OF GA INC				11	9	9																			3
JOHN JOVINO CO INC				14																					1
BUSHMASTER FIREARMS INTERNATIONAL LLC				17																					1
MUNYER RICHARD HANS				18	17																				2
HARDESTY BOYD A				19			16																		2
KABAR-GONCZ LAJOR JOHN				20																					1
MIL INC					16		9	9	8	9	8	9	10	18											9
ILES PETER					18																				1
JONES SUSAN R					19																				1
SHAFFER CLINTON CECIL JR					20																				1
QUALITY FIREARMS INC						4	20																		2
WESSON FIREARMS CO INC						7	7	7																	3
CLARK CUSTOM GUNS INC						14		19	17	14	12	17	16		18	17									9
LJUTIC LLC						15																			1
NORTH AMERICAN ARMS INC							6	3	3	4	3	3	3	4	3	4	4	4	4	4	4	4	4	4	19
CHARCO 2000							10	8	7					6	6	5	5	5	6	5	5	5	5	5	15
D MAX INDUSTRIES INC							11	12	11			11	8	9	9	13	13	17							10
WILSONS GUN SHOP INC							15						14	14	15	16	18								6
STAR HOLDING							17																		1
HURST MICHAEL W							18																		1
MOA CORPORATION							19																		1
HERITAGE MFG INC								6	5	5	4	4		3	4	3	3	3	3	3	3	3	3	3	17
US HISTORICAL SOCIETY								11																	1
NEW ADVANTAGE ARMS								14																	1
CYLINDER & SLIDE INC								20		18	20										16	20			5
COMPRESSION INCORPORATED									12																1
PHILLIPS & RODGERS INC									13	16	9	13	13	19											6

Producers	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	Count
JONES JOHN DAVID									19	17	14	15	20													5
OGLESBY & OGLESBY GUNMAKERS INC									20																	1
DANIEL WAYNE E										7	17	8														3
DEHART T KEITH										19											20					2
HALL JUDERAL E										20																1
PHELPS GREGORY G											13	18	15	20												4
BOB GIBBONS & SON INC											15	19														2
UNITED STATES FIREARMS MANUFACTURING CO												10			11	9	8	8	15		7	6	6	9		10
OLD WEST CO OF TX INC													7	17												2
MUNITIONS INTERNATIONAL LAB INC													9	10	13	12		11	9	10			13	12		9
AMERICAN FRONTIER FIREARMS													11	13	16											3
NEW YORK INTERNATIONAL CORP													12	12	12	10										4
PRUITT WILLIAM													17													1
RAPINE ELLSWORTH D													18	16	20	18										4
CASULL ARMS CORP														11	14		15	19	11	20						6
LEINAD INC														15	10	11	11	10	16							6
AWA INTERNATIONAL INC															7	20	10	16	20							5
SUPER SIX LLC															17	14	19	14	18							5
CONTRACT MANUFACTURING INC																7	7	7	7	11						5
REEDER GARY NELSON																15	17	13	17	15	12	16	17	16		9
CLEMENTS CHARLES DAVID																19					15	18	16	17		5
WILDEY F A INC																	14	18								2
ULTIMATE ACCURACY INC																	16	20								2
YELTON JEFFREY JOE																	20									1
ST PIERRE THOMAS V																		15	19							2
GUN SMOKE ENTERPRISES INC																			12							1
FATS INC																			13		19					2
WESTERN ORDNANCE INTERNATIONAL CORP																			14							1
US FIREARMS MFG CO																				7					6	2

MAGNUM RESEARCH INC																				9	9	8	9	10		5
HARTFORD ARMORY INC																				12	18					2
VALLEY TOOL & MFG INC																				13	11					2
CZ-USA INC																				14	10	12			19	4
ARSENAL USA I LLC																				16						1
KOHNKE WILLIAM MICHAEL																				17						1
LAND WARFARE RESOURCES CORP																				18						1
APPALACHIAN GUNSMITHING INC																					13	13	15	15	14	5
WHEELER TOPPING LLC																					14					1
GREELEY KEVIN P																					17			20	17	3
AWA USA INC																						10				1
TURNBULL MANUFACTURING COMPANY																						11	11	13	13	4
DUZ MANUFACTURING INC																						14	14			2
MEGGITT TRAINING SYSTEMS INC																						15		18	16	3
BRIENT ROBERT HARLOW JR																						17				1
O'DAY KERRY DEVON																						19				1
CHIAPPA FIREARMS LTD																							8	6	7	3
SUPER SIX CLASSIC LLC																							12			1
HORN'S CUSTOM RIFLES INC																							18			1
CUTTING EDGE ARMS LLC																							19			1
WHITE MELTON RAY																							20			1
COBRA ENTERPRISES OF UTAH INC																								8	9	2
BOJE CORNILS																								14	12	2
ALLEE MICHAEL DAVID																								19		1
HIGH SPEED MACHINING INC																									10	1
SMITH METAL FINISHING INC																									15	1
BAUER RICHARD LAWRENCE JR																									18	1
VERDI ARMORY LTD																									20	1
Total = 117	**20**	**20**	**20**	**20**	**20**	**20**	**20**	**20**	**20**	**20**	**20**	**20**	**20**	**20**	**20**	**20**	**20**	**20**	**20**	**20**	**20**	**20**	**20**	**20**	**20**	**4.27**
Top 20 displacement	**n/a**	**4**	**9**	**6**	**4**	**4**	**7**	**4**	**4**	**3**	**2**	**1**	**6**	**2**	**2**	**3**	**3**	**1**	**3**	**8**	**3**	**6**	**5**	**3**	**4**	**97**

Note: In some years only fewer than 20 companies reported revolver production to the ATF.
Source: Compiled from ATF (1986–2010)

Table A3 **Market entry and exit among the top 20 rifle maker rankings, 1986–2010**

Producers	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	Count
MARLIN FIREARMS COMPANY	1	1	1	1	1	2	1	1	1	2	2	3	2	2	2	2	3	3	3	3	2	2	3	3	2	25
STURM RUGER & COMPANY INC	2	3	3	3	2	1	2	2	2	1	1	1	1	1	1	3	1	2	2	2	3	3	2	1	3	25
REMINGTON ARMS CO INC	3	2	2	2	3	3	3	3	3	3	3	2	3	3	3	1	2	1	1	1	1	1	1	2	1	25
US REPEATING ARMS COMPANY INC	4	4	4	4	4	4	4	4	4	4	4	4	4	4	6	4	4	4	5	6						20
SAVAGE ARMS INC	5	5	5	6	5	5	5	5	5	5	5	5	5	5	4	5	5	5	4	4	4	4	4	4	4	25
IVER JOHNSON ARMS INC	6																									1
COLT'S MANUFACTURING	7	6	7	7	6	6	6	6	6	6	8	6	7	10	10	13	14									17
CHARTER ARMS CORPORATION	8	7	9	19																						4
AMERIND INC	9			12	16																					3
CHIPMUNK MFG INC	10	9	13																							3
KIMBER OF OREGON INC	11	12	8	15																						4
DON FLOYD ENTERPRISES INC	12																									1
THOMPSON CENTER ARMS CO INC	13	15	17		20	16	11	15			17	12	11	13	12	9	9	8	7	9	8	9	12	17	8	22
ESSENTIAL ARMS CO	14	18	15	8		9	12	13																		7
PRECISION BALLISTICS	15	16																								2
SENDRA CORPORATION	16	17																								2
AUTO-ORDNANCE CORP	17				18	19	16	19	19	12	16	16	20													10
SPRINGFIELD INC	18	10	10	10	9	8	9	9	9	9	9	10	16	14	15	15	13	13		15	17	17	20		16	23
FEDERAL ORDNANCE INC	19	19		20	14	12																				5
O F MOSSBERG & SONS INC	20		19																12	11	11	11				6
EXCAM INC		8																								1
AMAC INC		11	11																							2
PWA INC		13	14	11	12	18	17	11	11	13																9
FEATHER INDUSTRIES INC		14	16	18	15	14	14		20																	7
ARCADIA MACHINE & TOOL INC		20				20				18																3
DAISY MANUFACTURING CO INC			6	5	7	7																				4
STREET SWEEPER SALES OF GA INC			12																							1
OREGON ARMS INC			18	14	10	10	8	10	12	10																8

BUSHMASTER FIREARMS INTERNATIONAL LLC			20		17	17	18		7	15	12	9	10	6	9	8	8	9	8	8	7	7	7	7	12	21
NEW ENGLAND FIREARMS COMPANY INC				9	11																					2
OLYMPIC ARMS INC				13			13	12	14	14	15	13	18	18	20	18	18	19	19	18						15
EAGLE ARMS INC				16																						1
BROWN MICHAEL W				17																						1
B-WEST INC					8																					1
SURVIVAL ARMS INC					13	11	15	16	15	11																6
GENERAL DYNAMICS WEAPON SYSTEMS INC					19																					1
H & R 1871 LLC						13	7	7	8	7	6	7	8	8	8	7	7	6	6	7	6	5	10	16	9	20
CALICO LIGHT WEAPON SYSTEMS						15		18	13		20															4
GIBBS RIFLE CO INC							10																			1
WEATHERBY INC							19			8	7															3
SILE INC							20																			1
GLEASON BROS IND INC								8	10																	2
KNIGHTS MANUFACTURING CO								14																		1
ARMALITE INC								17	18	16	14	11	14	15	16	14	15	15	15	20	18	18				15
S W DANIEL INC								20																		1
ARMSCORP USA INC									16																	1
SACO DEFENSE INC									17																	1
BRYCO ARMS										17	10															2
POWDER RIVER RIFLE CO INC										19	19	19														3
COOPER FIREARMS OF MONTANA INC										20																1
BEEMILLER INC											11	8	9	9	13	11	11	17	10	13	16	16			13	13
KEYSTONE SPORTING ARMS LLC											13	14	15	17	14	12	10	10	9	10	10	10	8	12	10	15
DANIEL WAYNE E											18	17														2
DPMS FIREARMS LLC												15	19	19	18	19	17		13	12	9	8	6	8	11	13
KEL TEC CNC INDUSTRIES INC												18					16	16	18	17						5
PASTUSEK INDUSTRIES INC												20														1
HENRY RAC HOLDING CORP													6	7	7	6	6	7		5	5	6	5	5	5	12
MODERN MUZZLELOADING INC													12													1
ROGUE RIFLE COMPANY INC													13	16	19	20		20								5

ACROMETAL COMPANIES INC													17	20	17	17	20								5
WRIGHT PRODUCTS														11	5										2
CENTURY ARMS INC														12	11	10	12	12	14		15	14	14	13		10
ARMS TECHNOLOGY INC																16										1
KIMBER MFG INC																	19	18	16	16	19	20				6
COLT DEFENSE LLC																		11	11		20	19	17	11		6
ROCK RIVER ARMS INC																		14	17	14	14	15	15	15	15	8
ATEK PRODUCTS LLC																			20							1
STAG ARMS LLC																				19	12	12	13	10	19	6
LEGACY SPORTS INTERNATIONAL LLC																					13					1
SMITH & WESSON CORP																						13	11	6	6	4
MAVERICK ARMS INC																							9	9	7	3
DOUBLE STAR CORP																							16			1
SIG SAUER INC																							18	14	14	3
CMMG INC																							19			1
AREOTEK INDUSTRIES LLC																								18		1
AERO PRECISION INC																								19	17	2
TG INTERNATIONAL INC																								20		1
FN MANUFACTURING LLC																									18	1
DELAWARE MACHINERY & TOOL CO INC																									20	1
Total = 79	**20**	**20**	**20**	**20**	**20**	**20**	**20**	**20**	**20**	**20**	**20**	**20**	**20**	**20**	**20**	**20**	**20**	**20**	**20**	**20**	**20**	**20**	**20**	**20**	**20**	**6.33**
Top 20 displacement	**n/a**	**5**	**4**	**5**	**3**	**2**	**3**	**4**	**2**	**3**	**3**	**3**	**4**	**2**	**0**	**1**	**1**	**2**	**1**	**1**	**1**	**1**	**4**	**3**	**2**	**60**

Source: Compiled from ATF (1986–2010)

Table A4 **Market entry and exit among the top 20 shotgun maker rankings, 1986–2010**

Producers	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	Count
O F MOSSBERG & SONS INC	1	1	2	2	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	1				22
REMINGTON ARMS CO INC	2	2	1	1	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	2	2	2	25
US REPEATING ARMS COMPANY INC	3	4	4	3	3	3	4	4	4	4	4	4	4	4	4	4	5	5	4	5						20
SAVAGE ARMS INC	4	5	5	9	8	8	10	15	11	9	9	8	9	8	9	8	9	8	8	8	9	11	9	4		24
STURM RUGER & COMPANY INC	5	7	7	7	6	6	6	7	7	7	6	6	6	6	6	6	6	9	7	6	6	6	8	7	5	25
BROWN MICHAEL W	6																									1
H & R 1871 LLC	7					4	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	21
MARLIN FIREARMS COMPANY	8	9	8	11	12	11	13	11	8	6	10	12	10	10	10			7					12		8	18
SPRINGFIELD INC	9	14	15				11					9	7	7	7	12	10	10								11
HL GRISEL INC	10																									1
SMITH DONALD J	11																									1
LASER PRODUCTS CORP	12	17	17	17																						4
GORDON LAMONT	13																									1
SEDRAN JOHNATHAN	14																									1
CIENER JONATHAN ARTHUR	15	13	18																							3
BEURY TAD	16	18																								2
S W DANIEL INC	17	10																								2
MARCUS INC	18																									1
SAXON ARMS INC	19																									1
SHARP TOOL & TRADE CO INC	20																									1
NEW ENGLAND FIREARMS COMPANY INC		3	3	4	4																					4
AMERIND INC		6																								1
ITHACA ACQUISITION CORP		8	6	6	7	9	9	9	9																	8
LJUTIC LLC		11	13	14	15	16	16		13	12	14	13	14	13	14							20		15	15	16
HATFIELD GUN CO INC		12	11	13	17		17		16																	6
POLICE AUTOMATIC WEAPONS SERVICE INC		15																								1
ELLIS MERC CO DIV OF MONACHE INVESTMENT CO		16																								1
GENECCO KENNETH MICHAEL		19																								1
HARDESTY BOYD A		20	19																							2
SPORTING ARMS MFG INC			9	8	9	7	7	6	6	8	8	7	8	9	8											13
SENTINEL ARMS CORPORATION			10	12	14	15																				4
STREET SWEEPER SALES OF GA INC			12	10	10	12	8	10																		6

Producers	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	Count
COMPONENT METAL PRODUCTS INC			14	18						17																3
GOODRICH CHARLES R & PEINSIPP DENNIS M			16																							1
MCGILL ROBERT TIMOTHY			20																							1
MAVERICK ARMS INC				5	5	5	5	5	5	5	5	5	5	5	5	5	4	4	5	4	4	4	1	1	1	22
SAGE INTERNATIONAL LTD				15	16	17			19																	4
CLASS THREE SUPPLY INC				16						18																2
HECKLER & KOCH INC				19		14																				2
TARGET ARMS INC				20																						1
GILBERT EQUIPMENT COMPANY INC					11	10																				2
GENERAL DYNAMICS WEAPON SYSTEMS INC					13																					1
US COMPETITION ARMS INC					18	13	12	13	12	11			13	12		13	14	15	12	10	10	15		13	11	17
KNIGHTS MANUFACTURING CO					19	20								17	19											4
EDWARDS CLIFFORD & ALICE					20																					1
R M KERNER CO						18																				1
PENN ARMS INC						19	15	12																		3
INTERNATIONAL ORDNANCE CORP							14																			1
TAR HUNT CUSTOM RIFLES INC							18	16	14	13	15	17	18			18	16	17	16	17	17			18	18	15
WEATHERBY INC							19																			1
SILVER SEITZ INC							20	17	15	19	18	18	19													7
BUSHMASTER FIREARMS INTERNATIONAL LLC								8																		1
DANIEL WAYNE E								14	10	10	7	11														5
MULTI PRODUCTS CO INC								18	17																	2
SOUTHERN NEW ENGLAND SHOTGUN TECHNOLOGIES INC								19																		1
COLE ARMS INC								20		20	17	20														4
CONNECTICUT SHOTGUN MANUFACTURING CO									18	14	16	15	15	16	16	15	15	14	13	12	12	9	7	6	7	17
H S PRECISION INC									20					14	13	17	17	19	19							7
NCP PRODUCTS INC										15	20	19			20											4
CONNECTICUT VALLEY CLASSICS INC										16																1
KELBLY'S RIFLE RANGE INC											11															1
ITHACA GUN PARTS & SERVICE CORPORATION											12	10	11			7	7	6								6
COOPER FIREARMS OF MONTANA INC											13	14	16													3
ALFERMANN USA INC											19			19	18	16		20		14	19					7
AIM INC												16	17	18	17			16	14	13	16	18		20	17	11
LEINAD INC													12	11	11	10	12	13			13			12		8
RITCHIE WILLIAM RAYMOND													20													1
WILSONS GUN SHOP INC														15	12	11	11	12	11	9	11	14	11	9	13	12
URBACH MURRAY GLEN														20												1

S R LAMBOY AND CO INC																15	14									2
VERNEY-CARRON USA INC																	9	8		9	7	8	8	10		7
DAKOTA ARMS LLC																	19	19		15	11	15		20		6
SERBU FIREARMS INC																	20									1
BERETTA U S A CORPORATION																		13	11	6		7	5	4	8	4	8
HOENIG GEORGE																		18		20							2
ROBAR COMPANIES INC																		20									1
CAMBRIDGE VALLEY MACHINING INC																			18								1
THERMAL METAL TREATING INC																				10							1
MUTSCHLER DOUGLAS A																				17							1
FATS INC																				18	15						2
NIP MANUFACTURING INC																					16	18					2
NOWICKI WAYNE THOMAS																					18						1
CELESTE TIMOTHY MATTHEW																					19						1
HINELINE DAVID CARL																					20						1
LEGACY SPORTS INTERNATIONAL LLC																						5					1
ITHACA GUNS USA LLC																						14					1
APPALACHIAN GUNSMITHING INC																						20		18	16	16	4
THOMPSON CENTER ARMS CO INC																							7	6	10	9	4
MODERN MUZZLELOADING INC																							10	19			2
YELLOW BRICK ENTERPRISES INC																							12	14	14		3
ITHACA GUN COMPANY																							13	5	5	6	4
WHITSON JON DAVID																							16				1
RODMAN RANDOLPH B																							17				1
DEVAULT INDUSTRIES LLC																							19				1
ALLIANCE MACHINE LLC																								13			
LAWTON MACHINE LLC																								15			
SMITH & WESSON CORP																								16			
GUN SMOKE ENTERPRISES INC																								17			
ADVANCED PRECISION MACHINING																									11		
MEGGITT TRAINING SYSTEMS INC																									17		
KREBS CUSTOM INC																									19		
DEFCOM LLC																										10	
KEYSTONE SPORTING ARMS LLC																										12	
R & R RACING INC																										14	
MACH I ARSENAL LLC																										19	
MOORE DAVID E & MOORE CARLA W																										20	
Total = 106	**20**	**20**	**20**	**20**	**20**	**20**	**20**	**20**	**20**	**20**	**20**	**20**	**20**	**20**	**20**	**20**	**20**	**20**	**20**	**20**	**20**	**20**	**20**	**20**	**20**	**20**	**5.19**
Top 20 displacement	**n/a**	**9**	**6**	**5**	**5**	**2**	**4**	**5**	**2**	**2**	**4**	**1**	**2**	**2**	**1**	**3**	**3**	**1**	**3**	**4**	**3**	**7**	**4**	**3**	**5**	**86**

Source: Compiled from ATF (1986–2010)

Endnotes

1 A further 378 companies reported production of 'miscellaneous firearms' or producing only for export. This brings the total number of identified companies to 2,666 for the years 1986–2010. For comparison, the Small Arms Survey (2005, p. 43) refers to '511 known US producers and repairers of small arms and light weapons', with data mostly pointing to around the year 2004. The Small Arms Survey (2004, p. 7) refers to 1,249 firms in 90 countries 'involved in some aspect of small arms and light weapons production'.

2 The *Small Arms Survey 2009* chapter on transfers noted an increase in the global small arms trade, which was partially explained by imports by the United States (Small Arms Survey, 2009, ch. 1). At the time it was not known whether this was due to an increase in the size of the US market or simply an increase in the market share of foreign producers. This paper provides an answer: there is an overall increase in US supply even as there is an increase in US market share by non-US firms.

3 The estimate pertains to federally licensed firearms dealers only and does not refer to resales via non-licensed channels, such as gun show-related sales or through newspaper advertisements, garage sales, friend-to-friend transfers, and the like.

4 Legally, even very small-scale producers are firearms manufacturers. Very many of these appear to be hobbyists, gunsmiths, and craft-type producers. At least one is a technical college that teaches gunsmithing, and its small production requires reporting. Others, however, are larger establishments ordinarily producing military firearms or other items that do not fall under the reporting requirements for commercial firearms on which this paper concentrates.

5 The last such study, restricted to manufacturers in the Connecticut Valley, dates to 1948 (Deyrup, 1948).

6 For example, extensive financial data is available for only a single major US maker of civilian market firearms, i.e. Sturm, Ruger & Co. Inc., whose shares are publicly traded on the New York Stock Exchange. Sporadic financial records are also available for Smith & Wesson, Remington, and Colt Defense. Financial records for a few non-US companies may be available as well, e.g. for FN Herstal of Belgium.

7 Small arms manufacturing is not restricted to firearms, but excludes both ammunition and the wholesaling and retailing of firearms. NAICS 332994 covers the following: ammunition carts (i.e. 30 mm or less, 1.18 inch or less) manufacturing; barrels, gun (i.e. 30 mm or less, 1.18 inch or less), manufacturing; BB guns manufacturing; belts, machine gun (i.e. 30 mm or less, 1.18 inch or less), manufacturing; carbines manufacturing; clips, gun (i.e. 30 mm or less, 1.18 inch or less), manufacturing; cylinders and clips, gun (i.e. 30 mm. or less, 1.18 inch or less), manufacturing; dart guns manufacturing; firearms, small, manufacturing; grenade launchers manufacturing; gun barrels (i.e. 30 mm or less, 1.18 inch or less) manufacturing; gun magazines (i.e. 30 mm. or less, 1.18 inch or less) manufacturing; guns

(i.e. 30 mm or less, 1.18 inch or less) manufacturing; guns, BB and pellet, manufacturing; links, ammunition (i.e. 30 mm or less, 1.18 inch or less), manufacturing; machine gun belts (i.e. 30 mm or less, 1.18 inch or less) manufacturing; machine guns (i.e. 30 mm or less, 1.18 inch or less) manufacturing; pellet guns manufacturing; pistols manufacturing; pyrotechnic pistols and projectors manufacturing; recoil mechanisms (i.e. 30 mm or less, 1.18 inch or less), gun, manufacturing; revolvers manufacturing; rifles (except recoilless, toy) manufacturing; rifles, BB and pellet, manufacturing; rifles, pneumatic, manufacturing; shotguns manufacturing; sub-machine guns manufacturing; tranquilizer guns, manufacturing. For the definition, see USCB (2010c).

8 This is strange because the cost of materials plus value added cannot exceed sales revenue.

9 According to the USCB (2010d), small arms *ammunition* manufacturing adds another USD 2,339 million in sales revenue to these figures.

10 Handguns are pistols and revolvers; long guns are rifles and shotguns. 'Civilian use' refers to weapons purposed for non-military use, i.e. use by law enforcement agencies, private sector businesses, and citizens. For convenience, this is abbreviated as the US 'firearms' or 'civilian firearms' or 'non-military firearms' industry. Even as important spillover effects may exist from the military segment of the market to the civilian, private security, and law enforcement segments, military firearms are excluded because of lack of data.

11 FFLs must be renewed every three years, while FFL holders who discontinue operations must turn their records over to the FBI so that firearms tracing remains possible.

12 See ATF (n.d.d). Question 12 reads as follows: 'Q: If I manufacture a weapon in one calendar year, but do not sell it, do I still need to report it? No. The AFMER report is used to report the number of firearms that are produced and have entered commerce. Example: If you produce 100 firearms in a calendar year but only 30 have entered commerce within that same calendar year, then you would only report 30. The other 70 firearms are still in your possession (and on your books) and would not be reported until the calendar year that they enter commerce.'

13 Sometimes, but not always, a column-based copy/paste action from the PDF to a spreadsheet program was possible. Even then, all data had to be hand checked.

14 Customs data is also problematic with regard to its reported monetary values (Small Arms Survey, 2009, p. 27, Box 1.2). However, the research reported here relies only on *quantity of units* traded information, not on trade *dollar* values. All this is discussed in more detail below.

15 'Returns to scale' refers to the relation between inputs required and outputs produced. If one unit of input produces one unit of output and two units of input produce two units of output, and so on, then one speaks of 'constant' returns, and the up-and-down movement in the business cycle may allow firms to hire or fire the necessary inputs smoothly without necessarily increasing or decreasing their average costs. Total profits would increase or decrease with the market, but profit per unit sold would not necessarily be affected.

16 On the confusing US data sources with regard to the small firearms trade, see, for example, Small Arms Survey (2009, p. 27).

17 For data purchase, contact Mary E. May, Trade Data Services, USCB (tel.: +1-301-763-2227/2237; email: mary.e.may@census.gov). Data for 1980–88 and 1989–2007 was pur-

chased on 2 December 2008, and data for 2008–09 on 8 February 2011. This data comes with the following notes. *Regarding exports*: 'Data on U.S. exports of merchandise from the U.S. to all countries, except Canada, is compiled from the Electronic Export Information (EEI) filed by the USPPI or their agents through the Automated Export System (AES). The EEI is unique among Census Bureau data collection methods since it is not sent to respondents soliciting responses as in the case of surveys. Each EEI represents a shipment of one or more kinds of merchandise from one exporter to one foreign importer on a single carrier. Filing the EEI is mandatory under Chapter 9, Title 13, United States Code. Qualified exporters or their agents submit EEI data by automated means directly to the U.S. Census Bureau. The United States is substituting Canadian import statistics for U.S. exports to Canada in accordance with a 1987 Memorandum of Understanding signed by the Census Bureau, U.S. Customs and Border Protection, Canadian Customs, and Statistics Canada. Similarly, under this Memorandum of Understanding, Canada is substituting U.S. import statistics for Canadian exports to the United States. This data exchange includes only U.S. exports destined for Canada and does not include shipments destined for third countries by routes passing through Canada or shipments of certain grains and oilseeds to Canada for storage prior to exportation to a third country. These shipments are reported on and compiled from EEIs. Department of Defense Military Assistance Program Grant-Aid shipments being transported as Department of Defense cargo are reported directly to the U.S. Census Bureau by the Department of Defense.' *Regarding imports*: 'Published data on U.S. imports of merchandise is compiled primarily from automated data submitted through the U.S. Customs' Automated Commercial System. Data are also compiled from import entry summary forms, warehouse withdrawal forms and Foreign Trade Zone documents as required by law to be filed with the U.S. Customs and Border Protection. Data on imports of electricity and natural gas from Canada are obtained from Canadian sources.' See USCB (2012).

18 This description of the NICS checking process is based on an author interview on 22 September 2011 with Sammy J. DeMarco, FBI supervisory management and programme analyst, programme manager, Major Case Contact Center.

19 Interestingly enough, when a small—and wholly unscientific—sample of firearms retailers in Georgia and Ohio were asked in late 2010 and early 2011 about the split between 'new' and 'used' firearms sales, all five respondents said 70/30, a split not wholly out of line with the estimate provided in this paper.

20 For an advanced overview of the relevant measures, economic theory, and econometrics, see Perloff, Karp, and Golan (2007).

21 Also see the division's merger guidelines, US DoJ (n.d.c).

22 FN Manufacturing already produced military rifles, but these are not reported to the ATF. FN thus reports non-military rifle production only as from 2008 (and pistol production for many years before that).

23 Remington's history goes back to 1816, Marlin's to 1870. Marlin produced the Marlin, H&R 1871 (Harrington & Richardson), New England Firearms, and L. C. Smith brands of long guns, all of which it had acquired over the years. (Remington already owned the rights to another famous gun, the Charles Parker shotgun.)

24 There is also a Rogue Riv Rifleworks Inc./John Rigby & Co. in the January 2010 FFL list. ATF-reported production is very small. This is a separate legal entity from Rogue Rifle.

25 To participate in the Canadian military and law enforcement markets and international markets, Colt Defense acquired Diemaco in 2005 and renamed it Colt Canada Corporation. (Technically there are two companies: Colt Defense LLC and Colt Defense Inc.) Colt Defense also owns Colt Rapid Mat LLC, a maker of heliopad and landing-strip materials.

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