FIRE APPARATUS MANUFACTURERS' ASSOCIATION

Fire Apparatus – An Industry Far from Complete Recovery

CONFIDENTIAL REPORT

Developed By: Sage Policy Group, Inc.
for the Members of FAMA

Sage Policy Group, Inc.

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Submitted to:

The Fire Apparatus Manufacturers' Association (FAMA)

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The Fire Apparatus Manufacturers' Association (FAMA) tasked Sage Policy Group, Inc. (Sage) with organizing and analyzing FAMA data in order to generate insights regarding observed industry trends and likely future performance. There are two key questions that this analysis endeavors to answer:

a. Why has the North American firefighting fleet failed to recover in conjunction with the broader economy in terms of units booked?
b. What can the industry expect in light of economic forecasts and known demographics?

The market for new fire apparatus achieved its peak during the 2006-2008 period, when more than 6,000 new apparatus were booked in North America. As the Great Recession began to take its toll, municipal budgets were devastated and fire departments were required to truncate their budgets and forestall capital expenditures. The impact was gradual and grinding as opposed to sudden. Sales did not attain a cyclical nadir until 2012.

The market has improved since, but complete recovery remains elusive. While units booked increased after 2012, they declined 11 percent in 2016. The most recent data indicate that units booked grew by 20.5 percent during 2017's third quarter, after declining by nearly 16 percent in the second quarter. Units booked were down 1 percent from a year ago in the third quarter, and sales remain low by historic standards. Sales during Q2:2017 were more than 20 percent below the quarterly average observed over the past 14 years. Sales in Q3:2017 were still more than 5 percent below the quarterly average.

The study team has identified four primary explanatory factors:

1. State and local governments have been shifting expenditures toward non-infrastructure categories, including toward Medicaid, health insurance for employees, and underfunded pensions;
2. States and local governments are collectively taking on less debt to finance capital expenditures. Correspondingly, between 2005-2015, total fire protection capital outlays fell by nearly 11 percent after rising 64 percent the prior decade;
3. Federal Assistance to Firefighters Grants (AFG) program funding has shrunk dramatically since FY2009. That year, grants totaled $500 million. By FY2016, grant funding was a bit more than $300 million.
4. There have been sharp declines in units booked per 100,000 housing units in many parts of the American Midwest and South as many communities have lost the financial capacity to re-investment in fire safety and emergency response.

- Looking Ahead

The most likely outcome is for units booked to stay relatively flat over the next few years with occasional strong quarters followed by weak ones. This is because state and local government budgets appear to have heavily tilted toward other priorities and that is unlikely to change. Many state and municipal pensions remain underfunded. Healthcare costs will continue to rise, at least in the U.S. Moreover, in the current political environment, few policymakers are willing to raise taxes to finance capital expenditures. There will also be a growing need for communities to pay for professional firefighters as the number of available volunteers continues to decline.

Introduction

- Analyzing an Industry Critical to Public Safety

The Fire Apparatus Manufacturers' Association (FAMA) tasked Sage Policy Group, Inc. (Sage) with organizing and analyzing FAMA data in order to generate insights regarding observed industry trends and likely future performance. This report is organized as follows:

1. A discussion of the performance of FAMA members relative to historic norms along key dimensions like orders/sales;
2. An analysis of the state of the U.S. firefighting fleet;
3. An identification of economic, demographic and policy factors that appear to be shaping industry performance.

- Two Primary Research Questions Addressed

There are two key questions that this analysis endeavors to answer:

c. Why has the North American firefighting fleet failed to recover in conjunction with the broader economy in terms of units booked?
d. What can the industry expect in light of economic forecasts and known demographics?

One can, of course speculate on causal factors. There are a number of candidates, including the slow and erratic pace of economic recovery since the financial crisis' conclusion, concomitant slow recovery in public revenues, or a perception that existing equipment has not yet sufficiently depreciated to justify significant new investment in additional capital.

While these explanations are conceivable, there exist reasons to at least partially dismiss them. First, while the economic recovery has not been particularly robust, it has been protracted. As of this writing, the U.S. economy has completed 100 months of economic expansion, rendering the current growth cycle the third lengthiest in American history. While output growth has been erratic, the nation has created 16 million jobs since the end of the downturn, enjoys a 17-year low in unemployment and has experienced a surge in wealth creation due to booming equity markets and a recovering housing market. The IMF expects Canadian economic growth to be 3.0 percent in 2017, one of the best performances in the advanced world. Growth has helped to improve fiscal health of many local, state and provincial governments. Moreover, the most recent fire equipment replacement cycle began more than a decade ago, suggesting that there has been abundant depreciation.

Nonetheless, industry orders only recently began to accelerate and remain below historic norms. While many public budgets have recovered, the share allocated to infrastructure, capital equipment, and/or firefighting has declined as governments struggle to shore up underfunded pensions, strive to accelerate student achievement, face rising healthcare costs, or simply choose not to take on as much debt in support of capital formation.

I. FAMA Industry Performance

Current & Historic Performance

The market for new fire apparatus achieved its peak during the 2006-2008 period, when more than 6,000 new apparatus were sold (measured as units booked) in North America (FAMA members). As the Great Recession began to take its toll in earnest after the failure of Lehman Brothers on September 15, 2008, municipal budgets were devastated and fire departments were required to truncate their budgets and forestall capital expenditures.[1] The impact was gradual and grinding as opposed to sudden. Sales did not reach a cyclical nadir until 2012. At that point, bookings were down 35 percent from their pre-established peak.

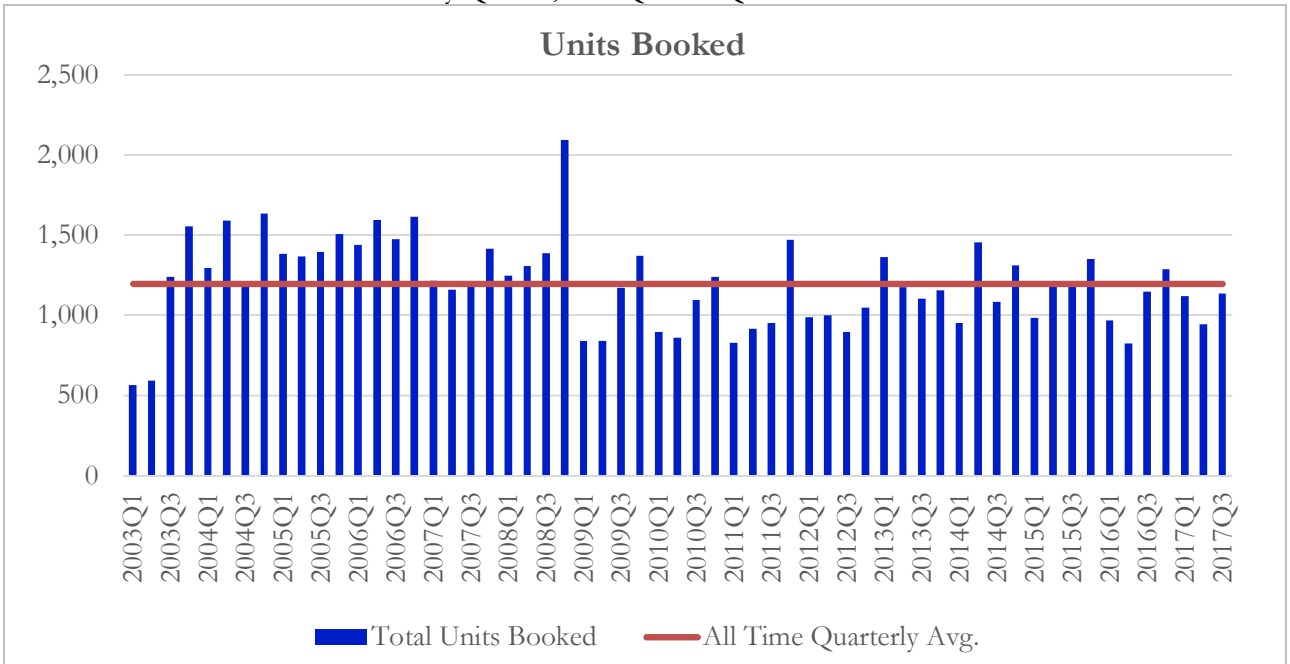
Exhibit 1. FAMA Members' Units Booked: Recent Historic Highs & Lows

	Time Period	Units Booked
Low	2012 Quarterly Average	982
Highs	2006 Quarterly Average	1,529
	2008 Quarterly Average	1,507

The market has generally improved since, but complete recovery remains elusive. While total sales of new fire apparatus in North America (measured in terms of units booked) had been increasing since 2012 for a period, they declined 11 percent in 2016. The most recent data indicate that units booked grew by 20.5 percent during 2017's third quarter, after declining by nearly 16 percent in the second quarter. Units booked were down 1 percent from a year ago in the third quarter, and sales remain low by historic standards. Sales during Q2:2017 were more than 20 percent below the quarterly average observed over the past 14 years. Sales in Q3:2017 were still more than 5 percent below the quarterly average.

[1] FAMA. "Big Data in The Fire Service" https://www.fama.org/forum_articles/big-data-fire-service/.

Exhibit 2. Total Units Booked by Quarter, 2003Q1-2017Q3



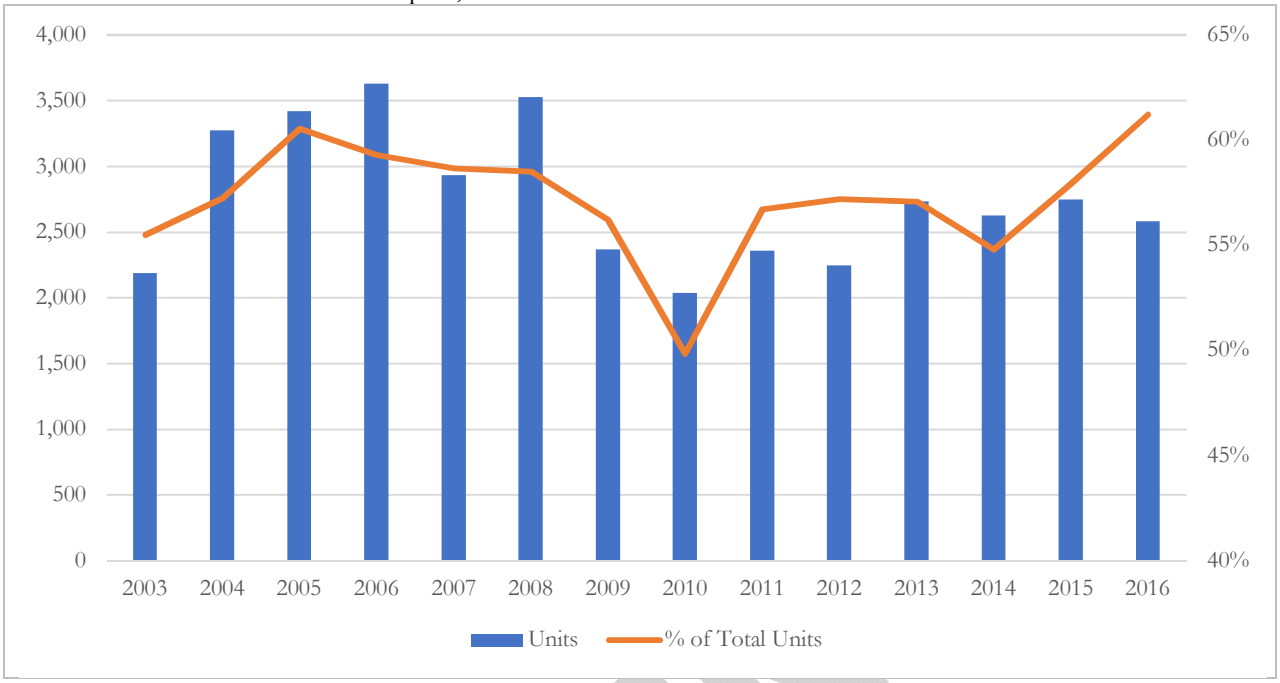
	2012 Low	2006 High	2008 High	All Time Q Avg.
Current Quarter vs.	+15.6%	-25.8%	-24.7%	-5.1%

Source: FAMA; Sage

Vehicle Class

Pumpers represent the majority of sales, historically around 57 percent of all units booked. There has been a declining sales trend for pumpers overall, however, with sales down 3.3% annually on average from 2006-2016 (compound annual growth rate). If one looks at just the past five years, the picture is meaningfully more sanguine. After experiencing a compound annual growth rate (CAGR) of -9.8 percent from 2005-2010, pumpers recovered slightly and grew at a 1.8 percent CAGR from 2011-2016.

Exhibit 3. Units Booked: Pumpers, 2003-2016

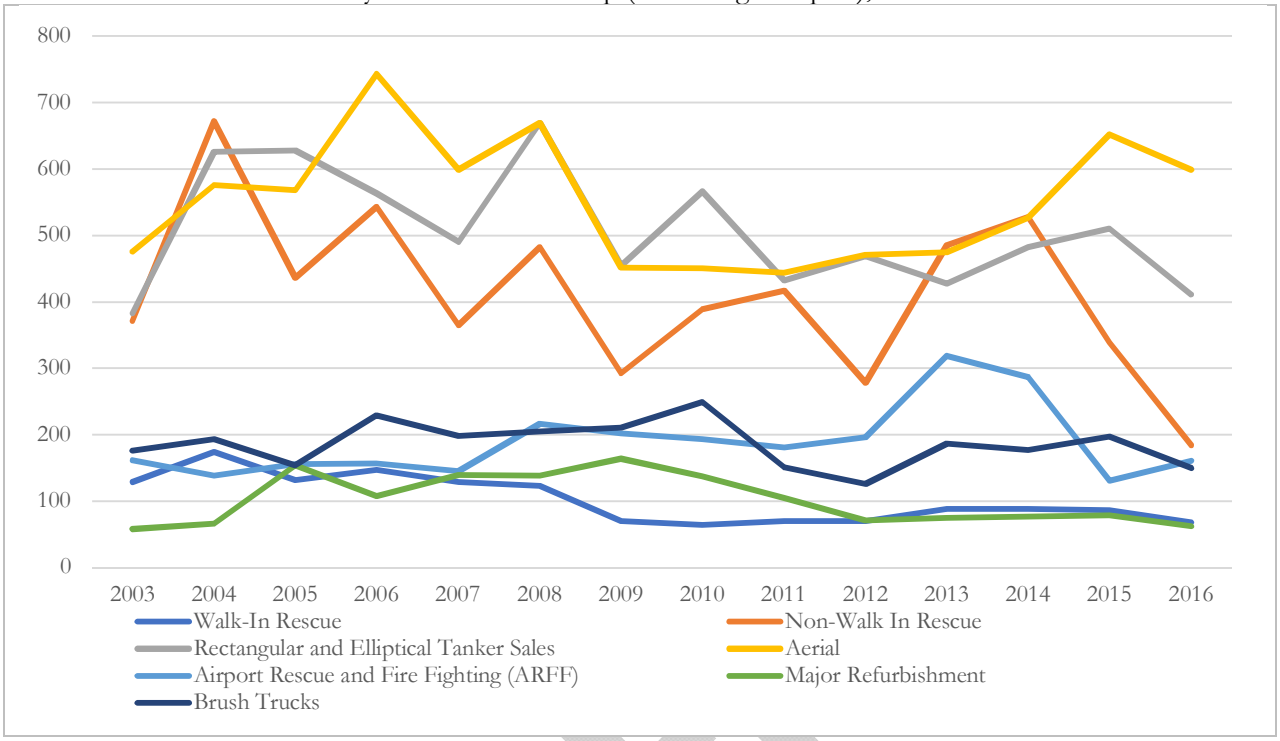


Source: FAMA; Sage

Arial apparatus, rectangular and elliptical tankers, and non-walk in rescue represent the next largest sources of sales. Aerial apparatus is the only category to experience significant growth in sales in recent years, with units booked expanding 6.2 percent annually on average from 2011-2016 (CAGR). Rectangular and elliptical tanker sales have been relatively steady, experiencing a small decline in booking activity during the 2011-2016 period. Within that category, rectangular tankers have far outpaced elliptical tankers. Elliptical tankers have declined from around 46 percent of tanker sales in 2003 to just around 11 percent of tanker sales in 2016, while rectangular tankers have grown from 53 percent to 89 percent of tanker sales over that period. This may be because some rectangular tankers provide more capacity.[2] Non-walk in rescue had been growing steadily, largely in response to the shift toward firefighters responding to more medical emergencies.[3] However, sales of non-walk in rescue declined significantly in recent years, particularly from 2014-2016.

[2] FAMA. "Changes in Fire Apparatus Now and in the future". https://fama.org/wp-content/uploads/2015/09/1441730972_55ef119c7b1f3.pdf.
[3] FAMA. "Changes in Fire Apparatus Now and in the future".

Exhibit 4. Units Booked by Vehicle Class Group (Excluding Pumpers), 2003-2016



Source: FAMA; Sage

Exhibit 5. Units Booked by Vehicle Class, Compound Annual Growth Rate (CAGR) Over Select Periods

Vehicle Class	CAGR	
	2005-2010	2011-2016
Pumpers	-9.8%	1.8%
Walk-In Rescue	-13.5%	-0.6%
Non-Walk In Rescue	-2.3%	-15.1%
Rectangular and Elliptical Tanker Sales	-2.1%	-1.0%
Aerial	-4.5%	6.2%
Airport Rescue and Fire Fighting (ARFF)	4.3%	-2.3%
Major Refurbishment	-2.3%	-10.0%
Brush Trucks	10.1%	-0.1%
Total Units Booked	**-6.3%**	**0.3%**

Source: Fama; Sage

The most recent full year of data shows an overall decline in units booked of 11 percent across all vehicle classes. Non-walk in rescue saw the largest decline, falling by nearly 46 percent from 2015-2016. However from 2016Q3-2017Q3, non-walk in rescue sales were up 52.5 percent. Interestingly, airport rescue and fire fighting (ARFF) bookings, which had been declining steadily[4], expanded in 2016.

Exhibit 6. Units Booked by Vehicle Class, 2015 v. 2016

Vehicle Class/Units Booked	2015	2016	2015 v. 2016	
			Net	%
Pumpers	2,745	2,581	-164	-6.0%
Walk-In Rescue	86	68	-18	-20.9%
Non-Walk In Rescue	339	184	-155	-45.7%
Rectangular and Elliptical Tanker Sales	510	411	-99	-19.4%
Aerial	652	599	-53	-8.1%
Airport Rescue and Fire Fighting (ARFF)	131	161	30	22.9%
Major Refurbishment	79	62	-17	-21.5%
Brush Trucks	197	150	-47	-23.9%
Total Units Booked	**4,739**	**4,216**	**-523**	**-11.0%**

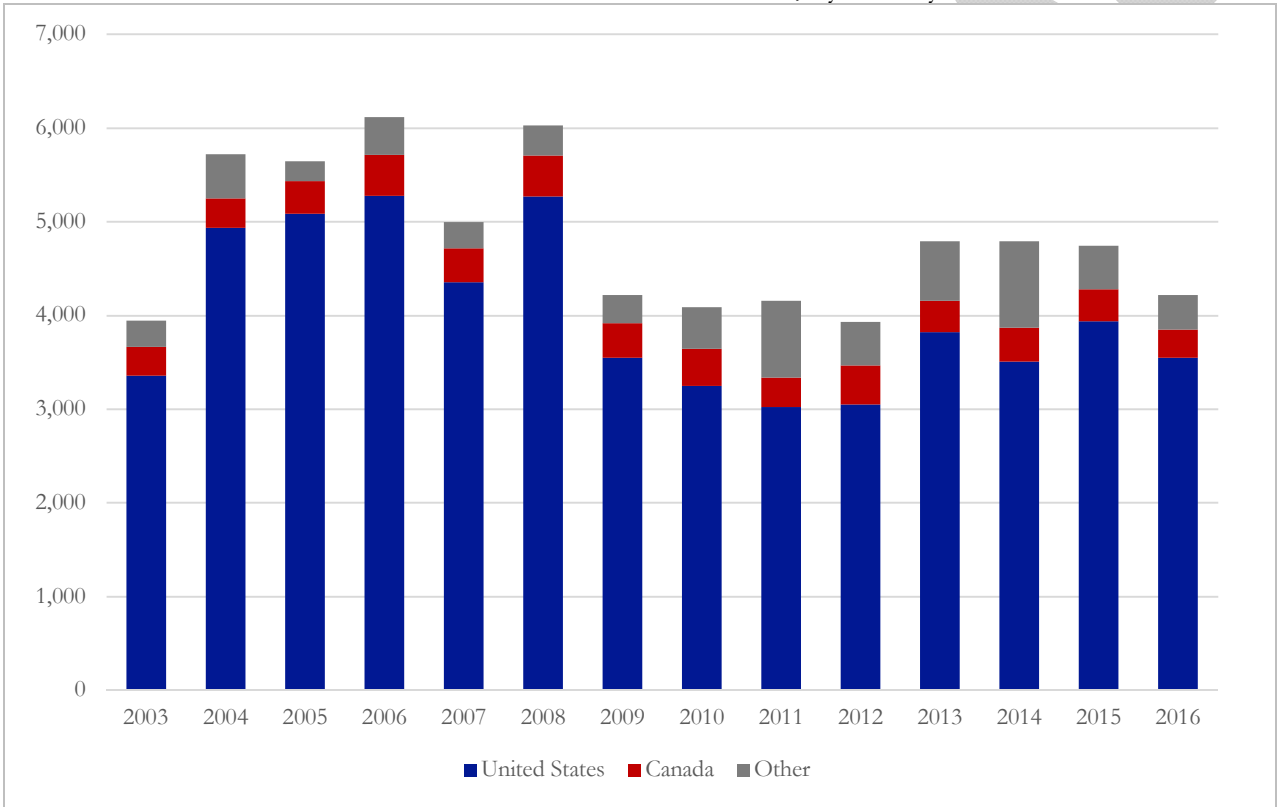
Source: Fama; Sage

[4] FAMA. "Changes in Fire Apparatus Now and in the future".

State, Provincial & Regional Trends

Given the fact that the U.S. is the largest economy in the world and Canada is tenth, it comes as little surprise that the majority of sales in North America originates in the U.S. Canadian economic growth has picked up sharply this year after stumbling in 2015 and 2016. As a result, more local governments may feel empowered to move forward with equipment purchases. As of Q3:2017, units booked in Canada were up by almost 17 percent year-to-date compared to a year ago.

Exhibit 7. 2003-2016 Historic Performance: Total Units Booked, By Country



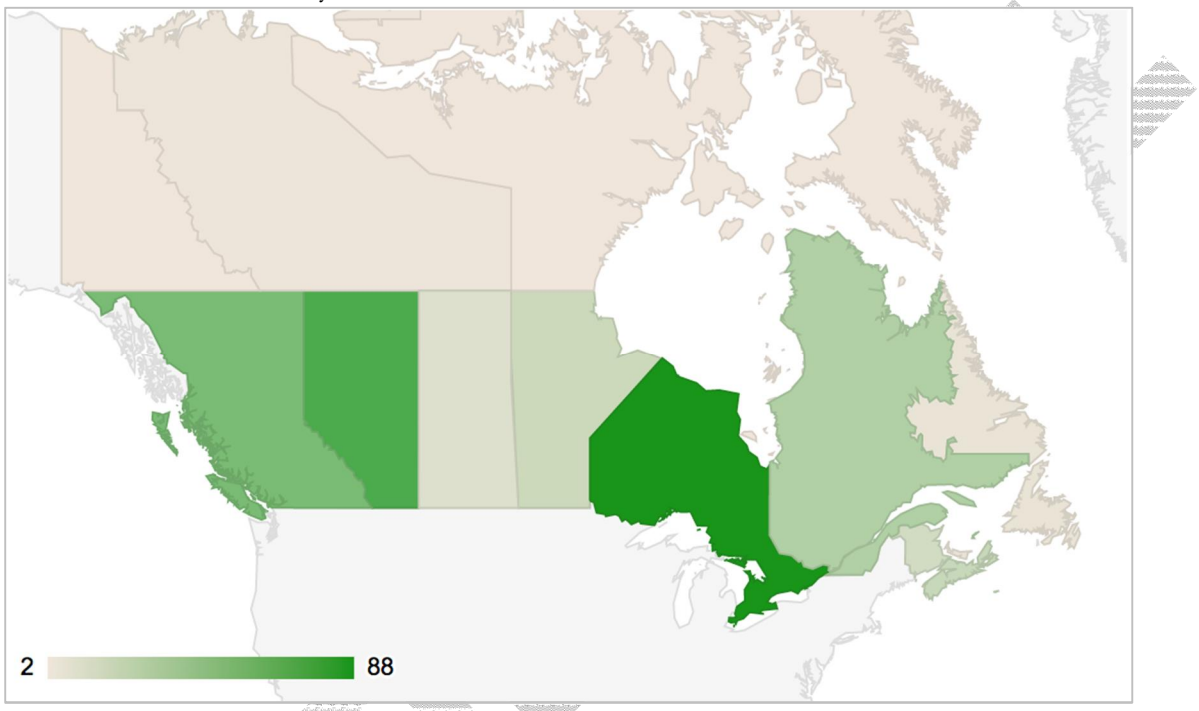
Total Units Booked	2012	2015	2016	2012 v. 2016 % Chg.	2015 v. 2016	
					Net	%
United States	3,051	3,933	3,548	16.3%	-385	-9.8%
Canada	414	344	296	-28.5%	-48	-14.0%

Exhibit 8. Units Booked by Country, YTD 2016 v. 2017

Total Units Booked	YTD		YTD 2016Q3 v. 2017Q3	
	2016Q3	2017Q3	Net	%
United States	2,413	2,708	295	12.2%
Canada	217	253	36	16.6%

Canada. Within Canada, apparatus sales tend to be concentrated in Ontario, Alberta, and British Columbia. This is also hardly shocking given that many of the nation's primary metropolitan areas, including Toronto, Ottawa, Calgary, Edmonton, and Vancouver are in these large provinces. British Columbia and Quebec jointly represented the bulk of decline in Canadian units booked from 2015 to 2016.

Exhibit 9. Units Booked by Canadian Province, 2016



Source: FAMA; Sage.

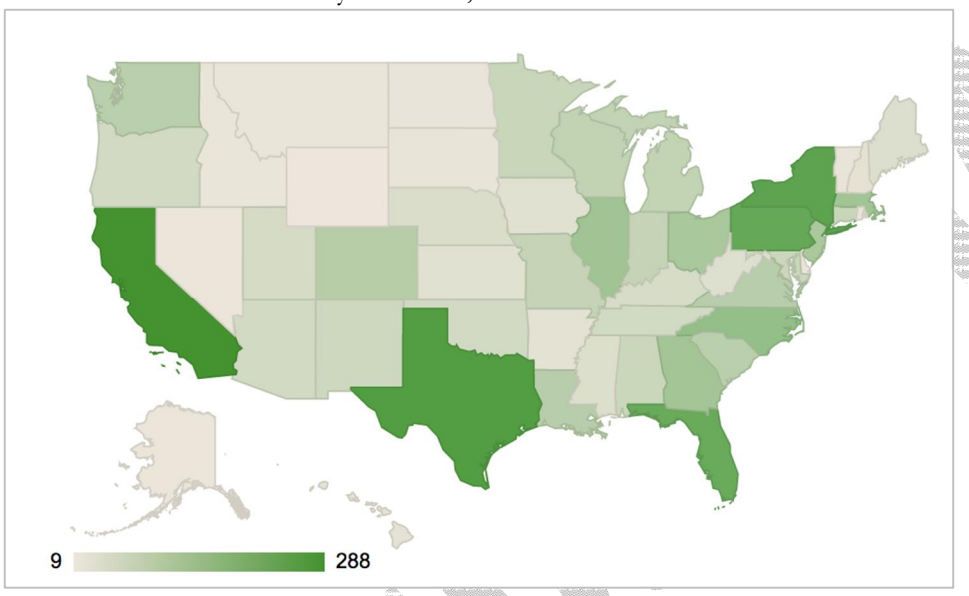
Exhibit 10. Units Booked by Canadian Province, 2015 v. 2016

State	2015	2016	2015 v. 2016	
			Net	%
Alberta	57	65	8	14.0%
British Columbia	70	47	-23	-32.9%
Manitoba	31	16	-15	-48.4%
New Brunswick	9	13	4	44.4%
Newfoundland and Labrador	2	4	2	100.0%
Nova Scotia	21	17	-4	-19.0%
Northwest Territories	1	3	2	200.0%
Nunavut	4	2	-2	-50.0%
Ontario	86	88	2	2.3%
Prince Edward Island	1	4	3	300.0%
Quebec	47	26	-21	-44.7%
Saskatchewan	11	9	-2	-18.2%
Yukon	4	2	-2	-50.0%
Total Canada	**344**	**296**	**-48**	**-14.0%**

Source: FAMA; Sage.

United States. Within the U.S., large states like California, Texas, New York, Pennsylvania unsurprisingly represent large shares of total sales. Florida, Colorado, and Pennsylvania experienced the largest net increases in units booked from 2015-2016, while Missouri and New Jersey experienced the largest net declines. New Jersey has one of the nation's most underfunded pensions, while Missouri is home to much of the struggling St. Louis metropolitan area.

Exhibit 11. Units Booked by U.S. State, 2016



Source: FAMA; Sage

Exhibit 12. Units Booked by U.S. State, 2015 v. 2016

Rank	State	Chg. in Units Booked	Rank	State	Chg. in Units Booked	Rank	State	Chg. in Units Booked
1	Florida	44	17	Montana	-1	35	Michigan	-16
2	Colorado	33	17	Nebraska	-1	36	California	-17
3	Pennsylvania	32	20	Minnesota	-2	36	New York	-17
4	Massachusetts	25	21	New Mexico	-3	38	Iowa	-18
5	Connecticut	17	21	Oklahoma	-3	39	Alaska	-19
6	Washington	11	21	Rhode Island	-3	39	Arkansas	-19
7	Hawaii	8	24	District of Columbia	-4	41	Oregon	-22
8	Illinois	7	24	Maryland	-4	42	Georgia	-23
9	Utah	6	26	Wisconsin	-5	43	North Carolina	-24
10	Delaware	5	27	Tennessee	-6	44	Idaho	-26
10	Maine	5	27	Wyoming	-6	45	Ohio	-27
12	Vermont	4	29	Kansas	-8	46	Mississippi	-31
13	Kentucky	3	30	Arizona	-10	47	Texas	-34
13	New Hampshire	3	31	Nevada	-11	48	South Carolina	-44
13	South Dakota	3	32	Indiana	-12	48	Virginia	-44
16	West Virginia	2	32	Louisiana	-12	50	New Jersey	-47
17	Alabama	-1	34	North Dakota	-13	51	Missouri	-60
							Total U.S.	**-385**

Source: FAMA; Sage. Notes: 1. There were 0 units booked in 2015 and 2016 for the following areas: Virgin Islands, American Samoa, Guam, Northern Marianas, Puerto Rico. 2. See Appendix for more data regarding units booked by state in 2015-2016.

II. Industry Performance in Context

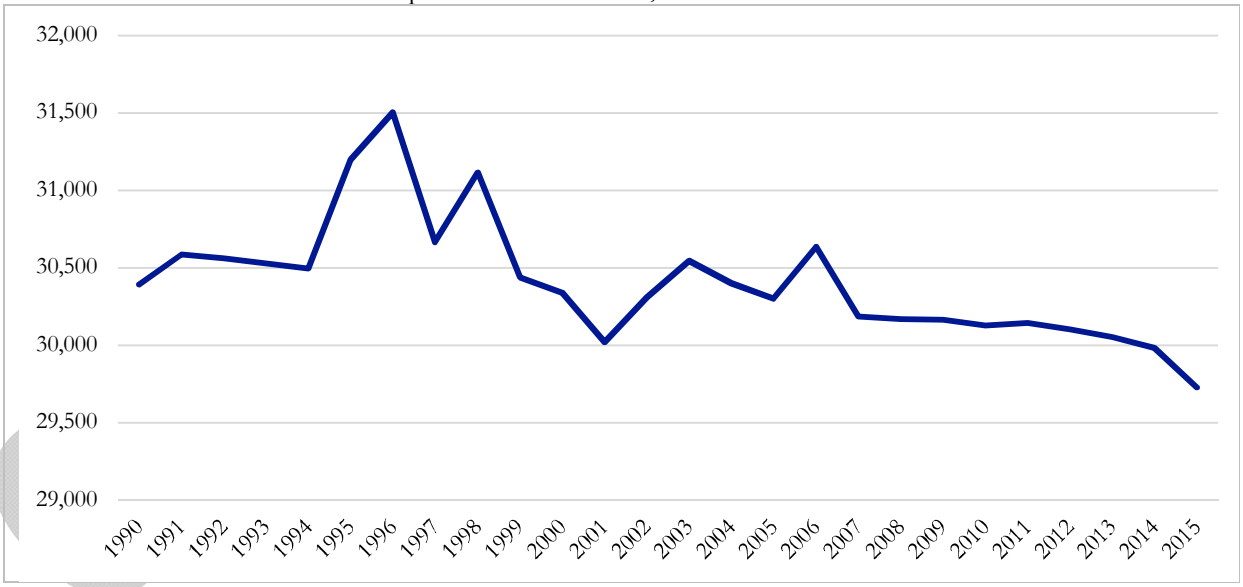
Why has Industry Performance Lagged Broader North American Recovery?

To put FAMA member performance in context, one must consider a range of influencing factors. These include the prevailing condition of the U.S. fire fleet, patterns of government spending, and other demographic and fiscal factors. This part of the report is devoted to considering these and other salient issues.

The U.S. Fire Fleet

Fire Stations. According to National Fire Protection Association (NFPA) Fire Service Inventory as well as surveys of fire departments, there were 29,727 fire departments in the U.S. as of 2015 (see Exhibit 13 below). As of January 2017, there were more than 27,000 fire departments listed with the U.S. Fire Administration (USFA) National Fire Department Registry, representing about 91 percent of all U.S. fire departments. Registration for the list is voluntary, which is one reason USFA estimates differ from NFPA estimates. Registered fire departments represent more than 51,000 fire stations. While the majority of fire departments have just one station, approximately 17 percent of fire departments have two stations and 14 percent have three or more stations.[5]

Exhibit 13. Number of Fire Departments in the U.S., 1990-2015

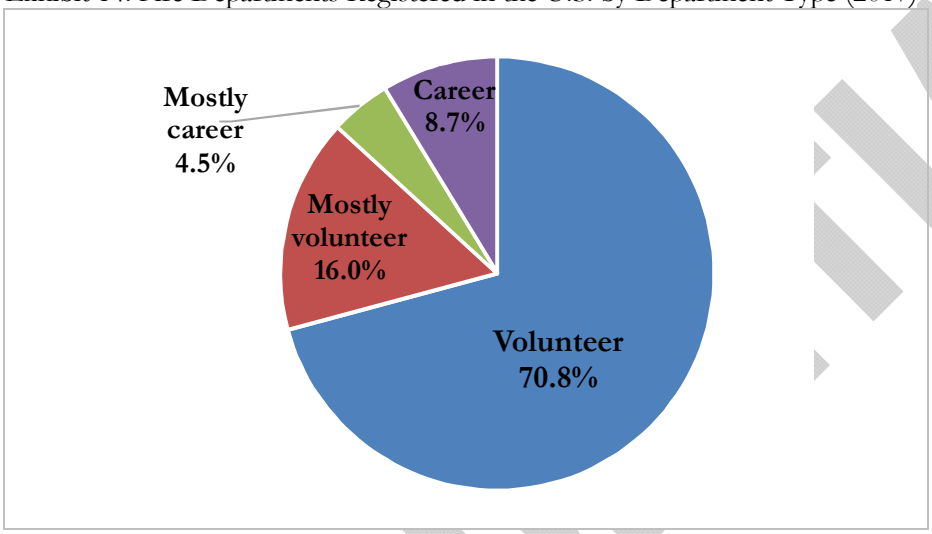


Source: 1. Sage; 2. National Fire Protection Association (NFPA). "U.S. Fire Department Profile-2015". April 2017. Note: A fire department is a public or private organization that provides fire prevention, fire suppression and associated emergency and non-emergency services to a jurisdiction such as a county, municipality, or organized fire district.

[5] U.S. Fire Administration (USFA). "National Fire Department Registry quick facts". https://apps.usfa.fema.gov/registry/summary.

Local fire departments (which include career, volunteer, and combination departments) represent 96 percent of registered fire departments. Four percent of registered fire departments in the U.S. are state and federal government fire departments, contract fire departments, private or industrial fire brigades, and transportation authority or airport fire departments.[6] Fire departments are predominately volunteer (70.8%) or mostly volunteer (16.0%). The propensity to operate primarily volunteer fire departments varies greatly by state, as reflected in Exhibit 15.

Exhibit 14. Fire Departments Registered in the U.S. by Department Type (2017)



Source: 1. Sage; 2. U.S. Fire Administration (USFA).

Exhibit 15. Percentage of Registered Depts by Volunteer/Career Status, Top 20 States by Rank (2017)

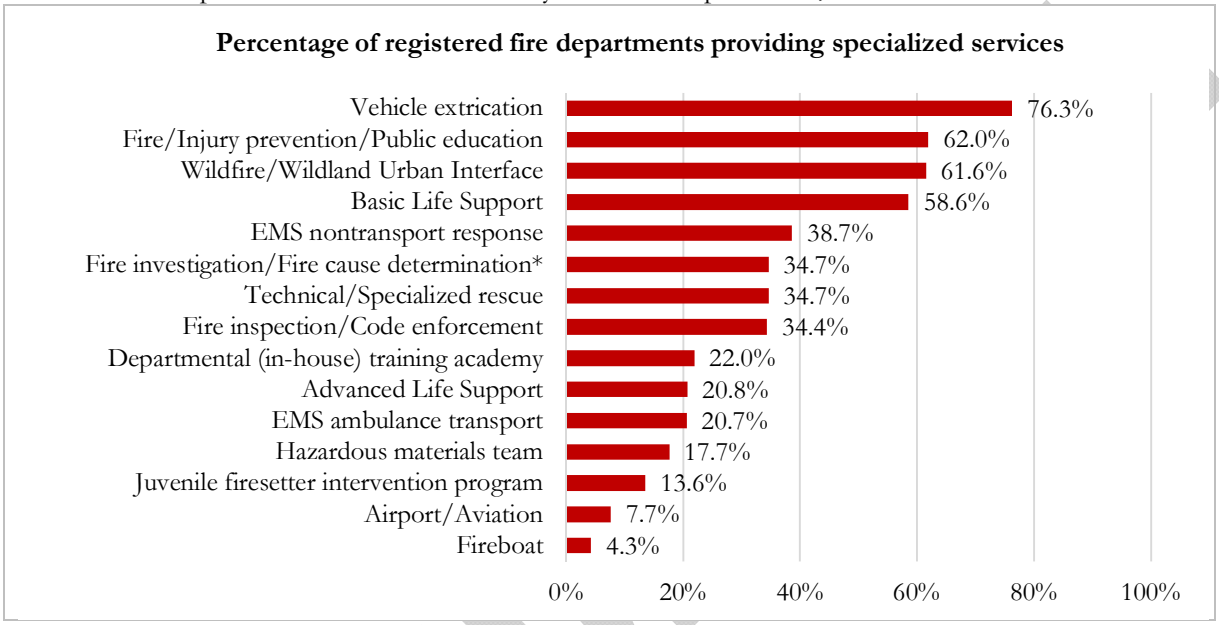
Volunteer & Mostly Volunteer			Career & Mostly Career		
Rank	State	%	Rank	State	%
1	Delaware	98.2%	1	District of Columbia	100.0%
2	Minnesota	97.4%	2	Hawaii	90.9%
3	Pennsylvania	97.0%	3	Florida	52.3%
4	South Dakota	96.6%	4	Massachusetts	45.0%
5	North Dakota	96.6%	5	Arizona	42.3%
5	Vermont	96.6%	6	California	41.6%
7	Nebraska	96.2%	7	Rhode Island	38.1%
8	Iowa	95.9%	8	Georgia	24.8%
9	West Virginia	95.6%	9	Colorado	22.7%
10	New York	94.6%	10	Washington	20.1%
11	Maine	94.3%	11	Nevada	20.0%
12	Montana	93.6%	12	Illinois	19.4%
13	Arkansas	93.5%	13	South Carolina	18.3%
14	Wisconsin	92.5%	14	Ohio	17.0%
15	Oklahoma	91.8%	15	Connecticut	15.2%
16	North Carolina	91.2%	16	Texas	15.1%
17	Kentucky	90.8%	17	Missouri	14.9%
18	Oregon	90.3%	18	New Hampshire	14.6%
19	Kansas	90.1%	19	Louisiana	14.2%
20	Idaho	89.7%	20	Mississippi	13.3%

Source: 1. Sage; 2. U.S. Fire Administration (USFA).

[6] U.S. Fire Administration (USFA). "National Fire Department Registry quick facts".

Exhibit 16 supplies statistical detail regarding the share of registered fire departments in the U.S. that supply a particular specialized service. With respect to emergency medical services (EMS), nearly 60 percent of all departments offer basic life support and just over 20 percent offer advanced life support. The most common specialized service is vehicle extrication, a service provided by more than 76 percent of registered fire departments.

Exhibit 16. Specialized Services Provided by U.S. Fire Departments, 2017

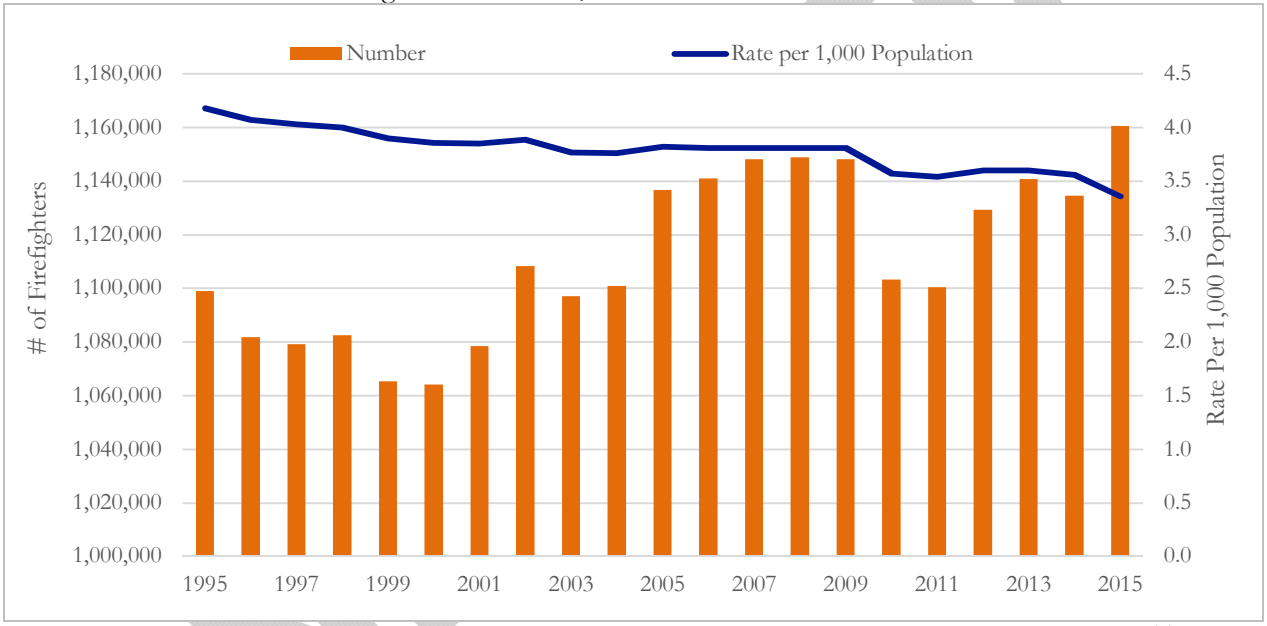


Source: 1. Sage; 2. U.S. Fire Administration (USFA). Notes: EMS: Emergency Medical Services. *Of the departments that provide fire investigation/fire cause determination services, 17.9 percent have sworn investigators with power to arrest.

Firefighters. The National Fire Protection Association (NFPA) conducts a number of surveys of fire departments that generate data characterizing the active American fire fleet. Data characterizing firefighters and fire apparatus in this section of the report are sourced from NFPA reports and their extrapolations based on survey results.

According to NFPA estimates based on 2015 National Fire Experience Survey data, the number of firefighters in the U.S. expanded 2.3 percent in 2015 to 1,160,450. Unremarkably, few firefighters fall beyond the ages of 20 and 59 years old. Thirty to thirty-nine year olds represent the largest share of firefighters (26.7%). Approximately 24 percent of firefighters fall in the 40-49 age group and approximately 21 percent fall in the 20-29 age group.

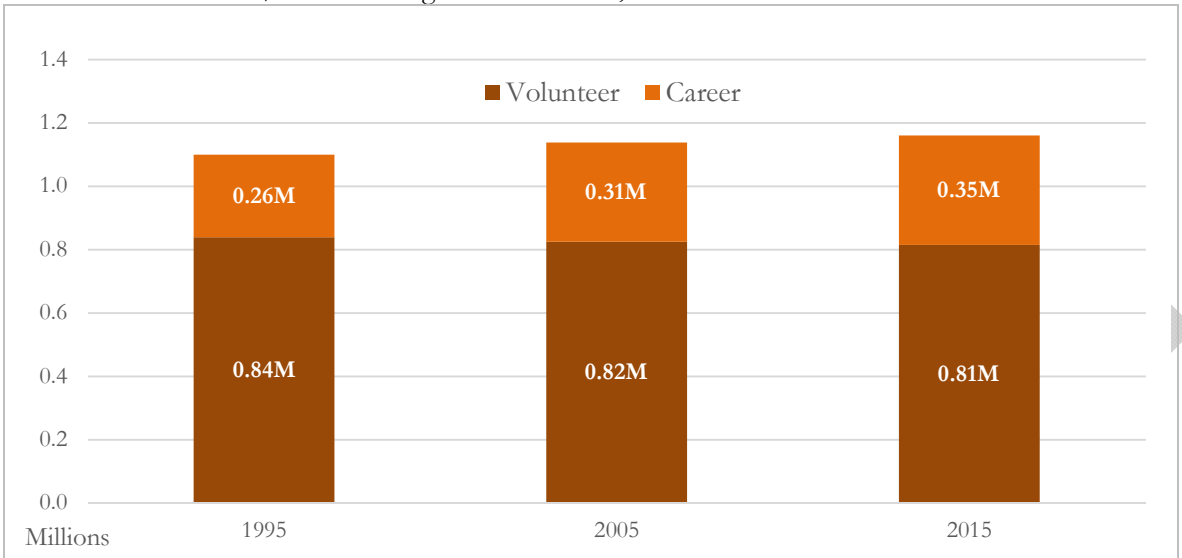
Exhibit 17. Number of Firefighters in the U.S., 1995-2015



Source: 1. Sage; 2. National Fire Protection Association (NFPA). "U.S. Fire Department Profile-2015". April 2017. Note: The NFPA's "U.S. Fire Department Profile" is based on two data sources: the annual NFPA Survey for U.S. Fire Experience, 2015, and the NFPA Fire Service Survey, 2013-2015. The U.S. Fire Experience Survey utilizes a sample of fire departments in the United States to make national projections of the fire problem. The sample is stratified by the size of the community protected by the fire department. All U.S. fire departments that protect communities with a population of more than 2,500 are included in the sample. (National Fire Protection Association (NFPA). "U.S. Fire Department Profile-2015". April 2017. p. 2).

According to NFPA, as of 2015, approximately 70 percent of firefighters are volunteers, the balance are career firefighters. The number of career firefighters in the U.S. has been increasing steadily and peaked in 2013 at 354,600. By contrast, the number of volunteer firefighters has been declining over time, in part because of the growing need for two income households.

Exhibit 18. Volunteer/Career Firefighters in the U.S., 1995-2015



Year	Firefighters per 1,000 Population		
	Aggregate	Career	Volunteer
1995	4.18	1.70	7.42
2005	3.82	1.68	7.30
2015	3.36	1.54	6.71

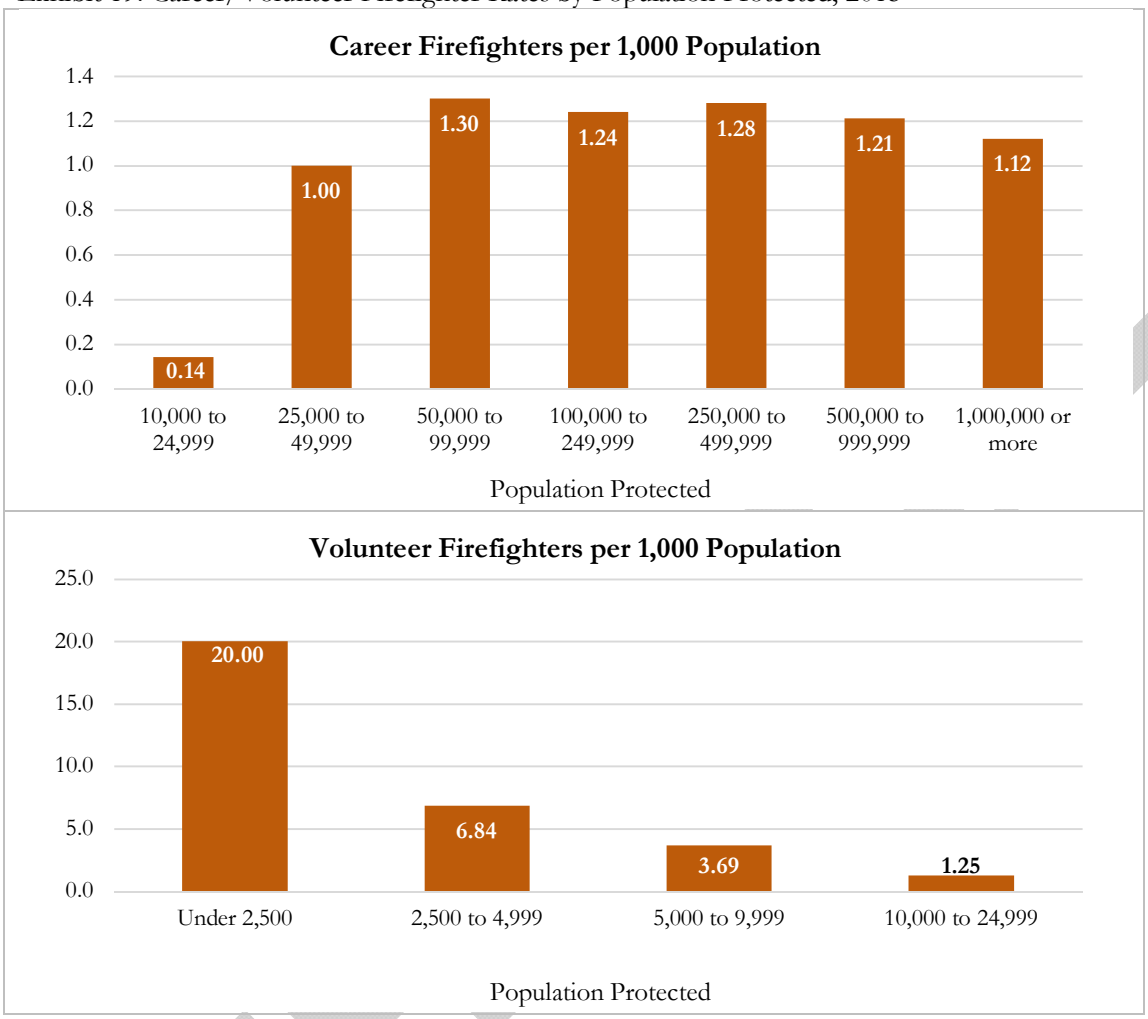
Source: 1. Sage; 2. National Fire Protection Association (NFPA). "U.S. Fire Department Profile-2015". April 2017

According to data reported to the NFPA, as of 2015 the median number of career firefighters per 1,000 population in the U.S. was 1.54, while the median number of volunteer firefighters per 1,000 population was 6.71. One reason for the higher rate of volunteer firefighters is that smaller communities often rely exclusively on this type of personnel, and there needs to be a minimum number of firefighters to staff a department irrespective of the size of the community. Furthermore, volunteer firefighters are often available only on a part-time basis, so it frequently takes more volunteers to ensure adequate response to each call.[7]

The rates of firefighters can vary widely by community size because departments in different communities may "face great variation in their specific circumstances and policies including length of work week, unusual structural conditions, types of service provided to the community, geographical dispersion of the community, and other factors."[8] Exhibit 19 shows the range of rates for career firefighters in departments protecting at least 10,000 people and for volunteer firefighters in departments protecting a population less than 25,000 people.

[7] National Fire Protection Association (NFPA). "U.S. Fire Department Profile-2015". April 2017. p. 11.
[8] National Fire Protection Association (NFPA). "U.S. Fire Department Profile-2015". April 2017. p. 10.

Exhibit 19. Career/Volunteer Firefighter Rates by Population Protected, 2015



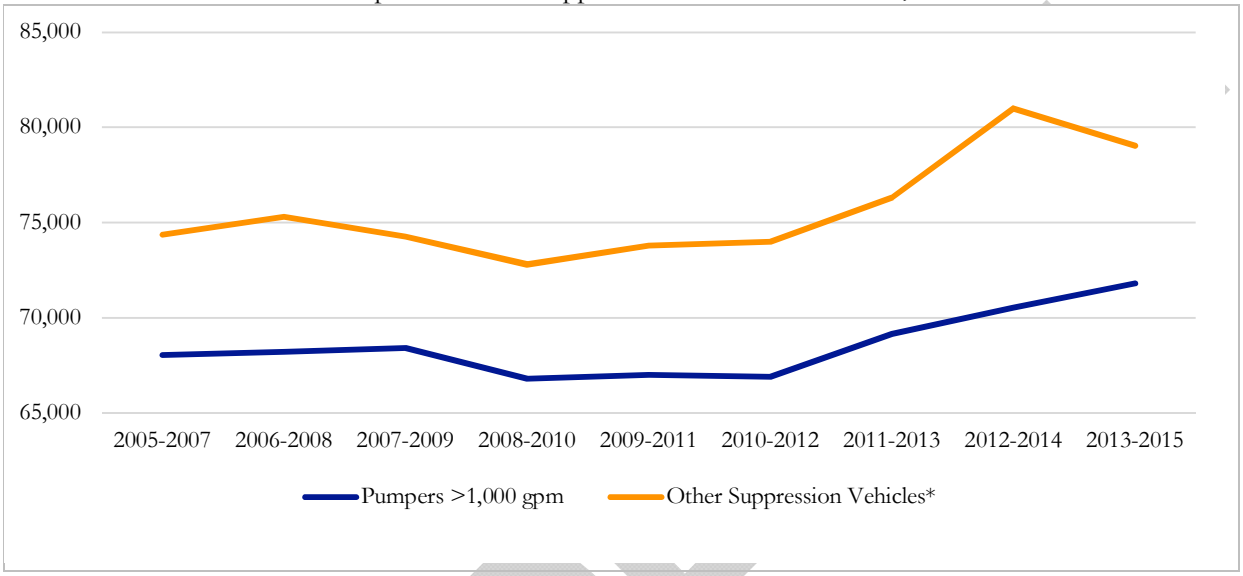
Source: 1. Sage; 2. National Fire Protection Association (NFPA). "U.S. Fire Department Profile-2015". April 2017.

Fire departments protecting communities of 10,000 people or more are associated with median rates of career firefighters per 1,000 people between 0.14 (10,000 – 24,999) and 1.30 (50,000 – 99,999). For fire departments protecting communities with fewer than 25,000 people (where departments are much more likely to be all or mostly-volunteer), the median rate of volunteer firefighters per 1,000 people ranges from 1.25 to 20.0. This wide range reflects the fact that a minimum number of firefighters is needed to staff a department regardless of community size. The median volunteer firefighter rate declines as population protected increases.[9]

[9] National Fire Protection Association (NFPA). "U.S. Fire Department Profile-2015". April 2017. p. 11.

Fire Apparatus. NFPA estimates indicate that the number of fire apparatus in the United States included 71,800 pumpers, 7,300 aerial apparatus, and 79,050 other suppression vehicles as of 2013-2015.[10] While the number of pumpers has exhibited an upward trend in recent years, the pattern of growth in other suppression vehicles has been more erratic as reflected in Exhibit 20.

Exhibit 20. Number of Pumpers & Other Suppression Vehicles in the U.S., 2005-2015



Source: 1. Sage; 2. National Fire Protection Association (NFPA). "U.S. Fire Department Profile-2015". April 2017. Note: * Other suppression vehicles include apparatus with pumps less than 1,000 gpm, hose wagons, brush fire vehicles, tankers, etc.

NFPA's Fourth Needs Assessment of the U.S. Fire Service, which is based on surveys sent to all departments in the NFPA fire service inventory and NFPA estimates for nonresponding departments, supplies estimates for apparatus usage by U.S. fire departments.[11] These estimates indicate that for each fire department there are 3.6 engines, 0.8 ladders, 1 tanker, and 1.5 ambulances on average.

Exhibit 21. Average Apparatus Per Department (All Community Populations), 2013-2015

	Average Number Per Department			
	Engines	Ladders	Tankers	Ambulances*
In Service	3.55	0.81	1.05	1.52
In Reserve	0.81	0.16	0.04	n/a

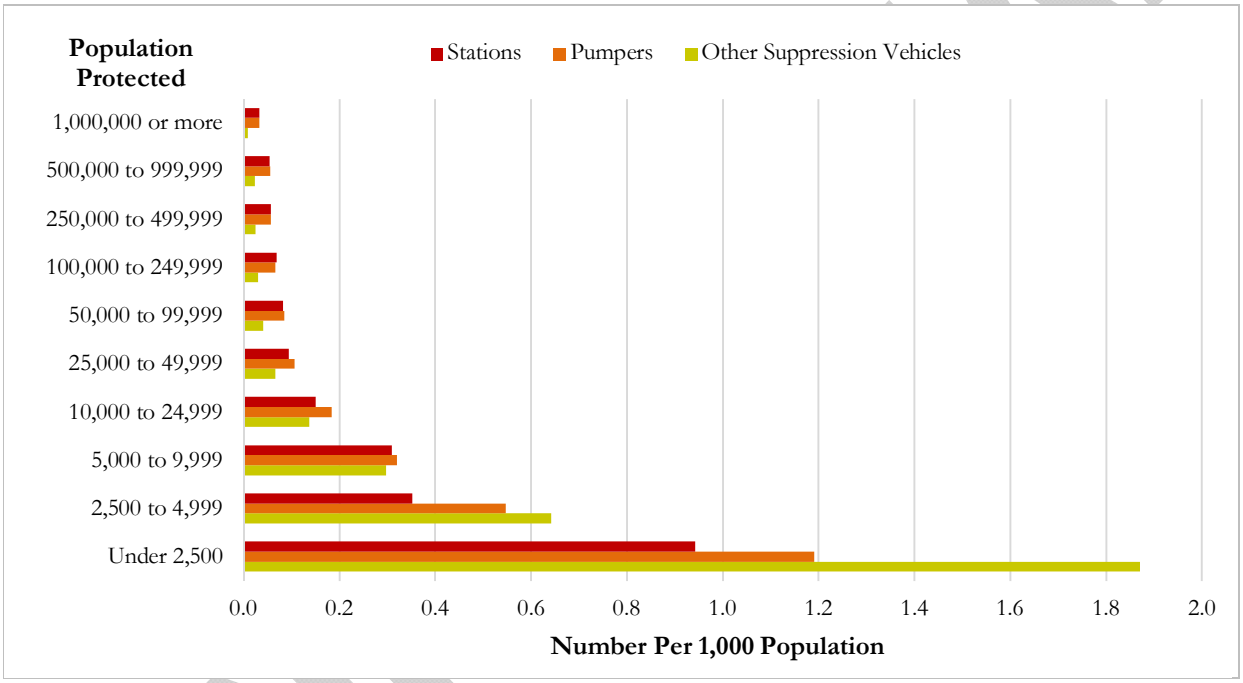
Source: 1. Sage; 2. National Fire Protection Association (NFPA). "Fourth Needs Assessment of the U.S. Fire Service". November 2016. Notes: *Ambulances include other patient transport vehicles.

[10] National Fire Protection Association (NFPA). "U.S. Fire Department Profile-2015". April 2017.

[11] The "Fourth Needs Assessment of the U.S. Fire Service" was based on surveys NFPA sent out as a census, meaning that all U.S. fire departments with administrative and fire response responsibilities who were listed in the NFPA fire service inventory were contacted. In all, in 2015, 26,322 fire departments were included in the target population and a total of 5,106 fire departments responded to the survey (19%). In many of the results reported in the "Fourth Needs Assessment of the U.S. Fire Service" the numbers and percentages from respondent departments are projected within population size strata in order to sum to the total of 26,322 known fire departments. This assumes that the survey non-respondent departments are similar to respondents. The projection allows for the calculation of an overall percent, which is based on the sum of the number of projected departments in each population group and not just on those respondent departments. (National Fire Protection Association (NFPA). "Fourth Needs Assessment of the U.S. Fire Service". November 2016. p. xxxiv).

Average apparatus and station rates differ significantly by community size. Exhibit 22 displays the average number of apparatus per 1,000 people by the size of protected population. Rates of stations, pumpers, and other suppression vehicles per 1,000 people are much higher for departments protecting smaller communities (under 2,500). This is because operating a fire department requires a minimum number of stations and apparatus irrespective of the number of people protected. The NFPA notes that these figures reflect average apparatus and station rates reported to NFPA, and not a recommended rate or defined fire protection standard.

Exhibit 22. Average Station and Apparatus Rates per 1,000 Population by Community Size, 2013-2015

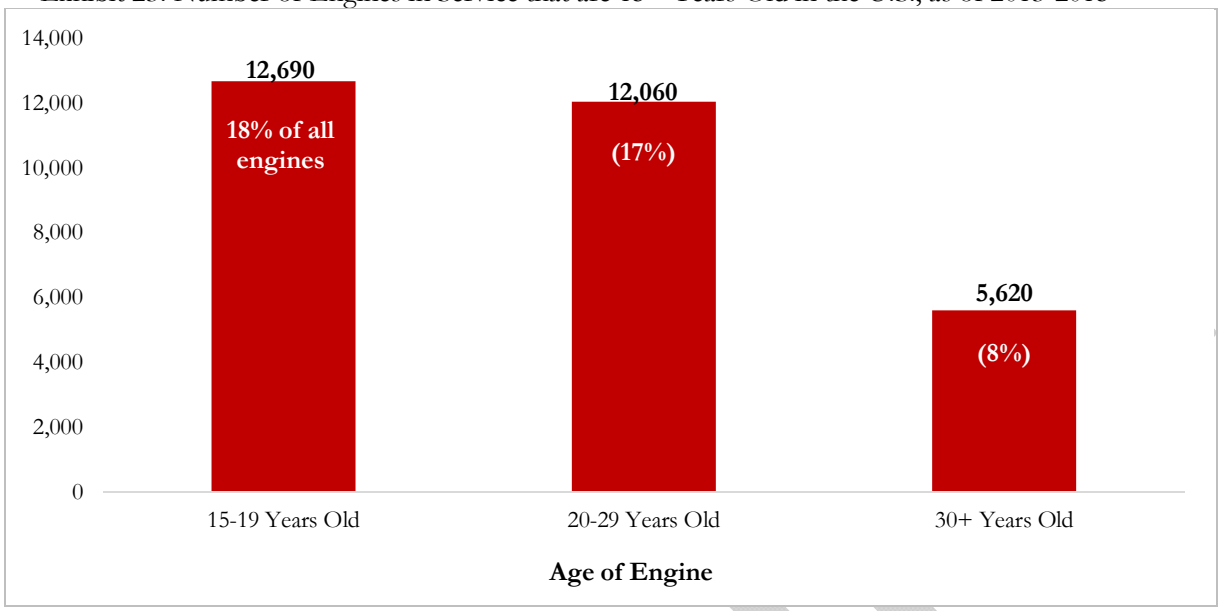


Source: 1. Sage; 2. National Fire Protection Association (NFPA). "U.S. Fire Department Profile-2015". April 2017.

In 2015, approximately 43 percent of all fire department engines and pumpers were at least 15 years old according to NFPA estimates. A quarter of all units are at least 20 years old. The NFPA notes that while vehicle age alone is not sufficient to confirm the need for replacement, it is indicative of a potential need, which should be examined.[12] Based on this piece of data and others, there is clearly a significant amount of potential need for replacement.

[12] NFPA. "Fourth Needs Assessment of the U.S. Fire Service". November 2016. p. 124.

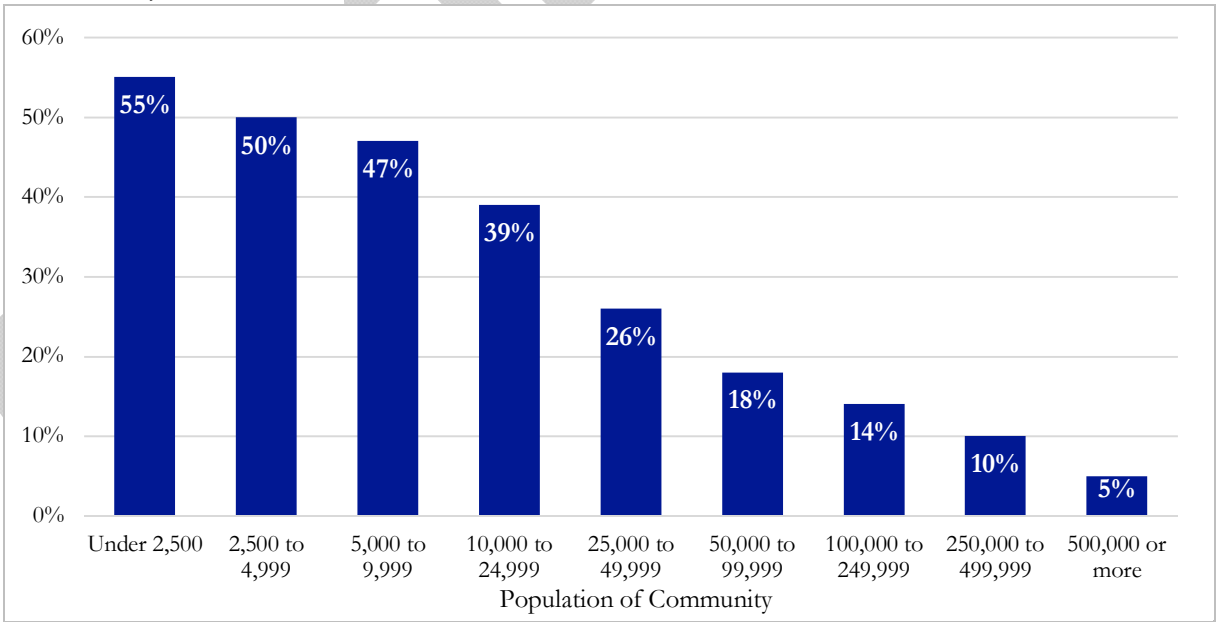
Exhibit 23. Number of Engines in Service that are 15+ Years Old in the U.S., as of 2013-2015



Source: 1. Sage; 2. National Fire Protection Association (NFPA). "Fourth Needs Assessment of the U.S. Fire Service". November 2016.

As Exhibit 24 indicates, smaller communities are much more likely to have aging fire apparatus relative to larger communities. In communities with fewer than 10,000 people, approximately one-half of engines and pumpers in service are at least 15 years old. The share falls steadily the larger the community on average.

Exhibit 24. Percent of Engines and Pumpers in Service that are 15+ Years Old by Size of Community Protected, as of 2013-2015



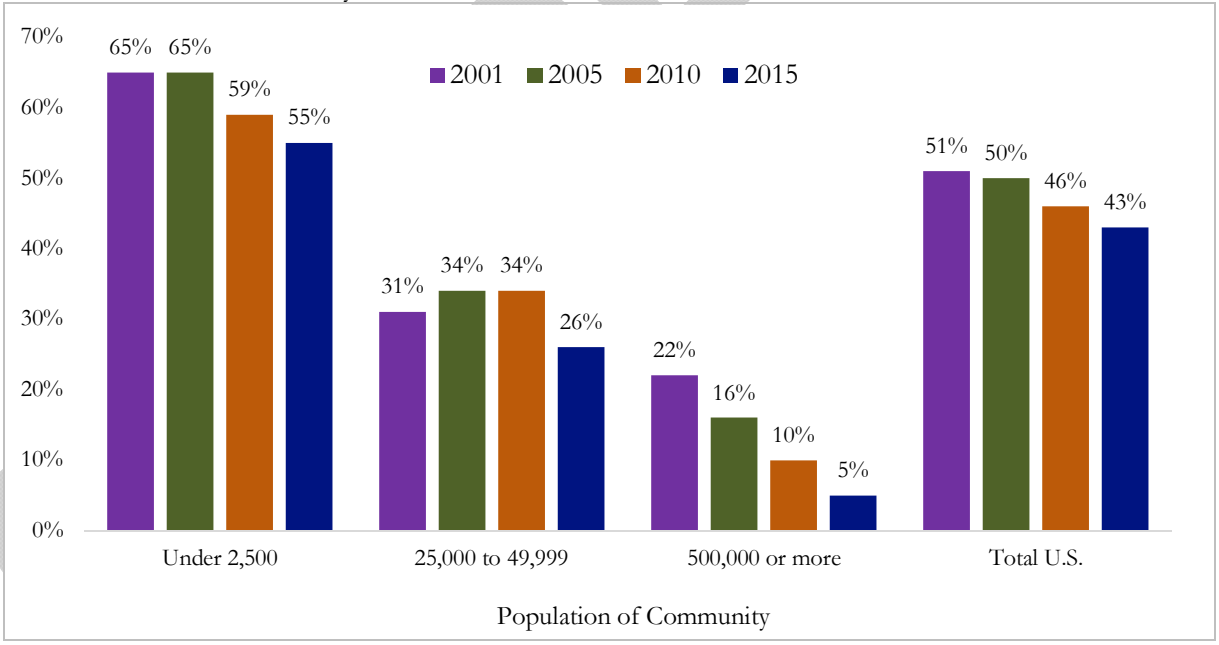
Source: 1. Sage; 2. National Fire Protection Association (NFPA). "Fourth Needs Assessment of the U.S. Fire Service". November 2016.

- Has a Replacement Cycle Begun in Earnest?

NFPA survey responses collectively hint that there has been some progress in reducing the age profile of the nation's engines and pumpers in recent years. Across the NFPA's four Needs Assessment Surveys, the share of engines/pumpers in service that are at least 15 years old has declined from 51 percent in 2001 to 43 percent in 2015. However, this formulation may be misleading and likely understates the level of improvement. This is because a significant amount of replacement is needed simply to hold the age of apparatus constant. According to the NFPA, "without engine replacement nearly all of the 19% of engines that were at least 20 years old in 2005 would have been at least 30 years old in 2015, but the actual percentage of engines that were at least 30 years old in 2015 was 8%."[13]

One of the important benefits of a replacement cycle is that the removal of older fire vehicles from service has the effect of promoting compliance with NFPA 1901, which recommends removing fire vehicles that are over 15 years old from first-line service and calls for departments to replace vehicles over 25 years old.[14] Thus, while the number of fire apparatus has not increased as one might have anticipated over time, there is a body of evidence suggesting that there has been a significant amount of turnover in operating units.

Exhibit 25. Percent of Engines and Pumpers in Service 15+ Years Old by Size of Community Protected over Four Survey Periods



Source: 1. Sage; 2. National Fire Protection Association (NFPA). "Fourth Needs Assessment of the U.S. Fire Service". November 2016.

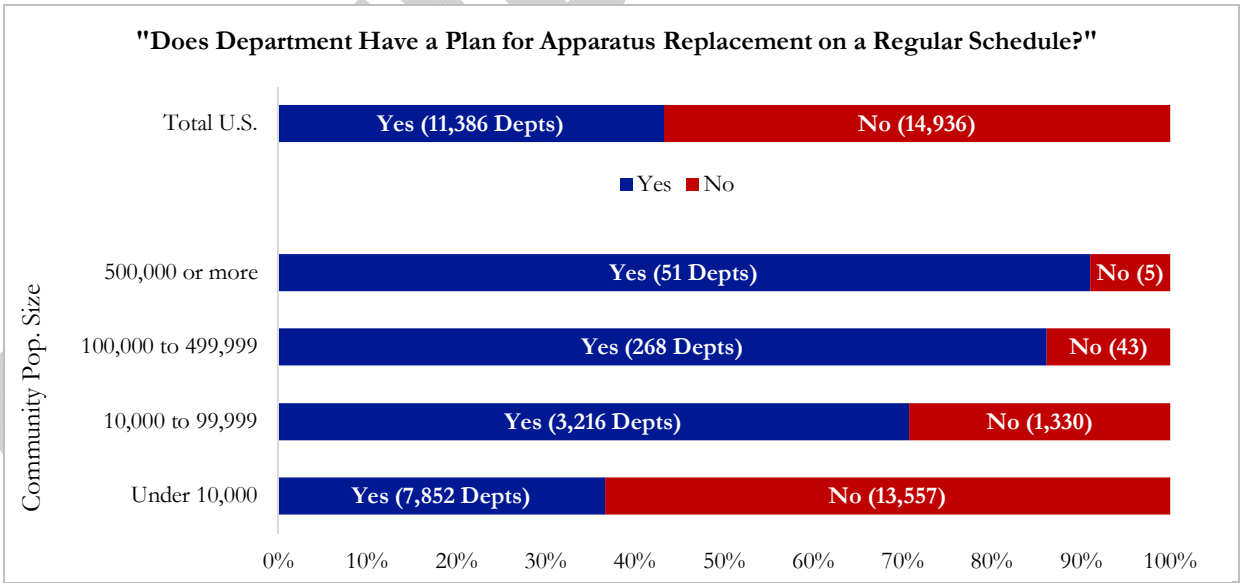
[13] NFPA. "Fourth Needs Assessment of the U.S. Fire Service". November 2016. p. 126.
[14] Federal Emergency Management Agency (FEMA). "Assistance to Firefighters Grant Program Performance Assessment System". Fiscal Year 2015 Annual Report to Congress. October 19, 2015.

Exhibit 26 reflects NFPA survey results regarding fire department intentions for planned apparatus replacement on a specified schedule. Nationally, 43 percent of U.S. fire departments have plans to replace apparatus on a regular schedule.

Larger communities are far more likely to maintain regular replacement plans. This is not surprising since larger communities are more likely to be served by career or mostly career fire departments. These departments are more likely to be reflected in annual municipal or county budgets. Department personnel, particularly department leadership, are better positioned to make equipment purchase requests to policymakers in the interests of public safety. These larger communities are also likely to have substantial borrowing capacity and therefore are able to put forth long-range capital improvement plans. For communities where departments are protecting at least 10,000 people, at least 70 percent of departments have established plans for apparatus replacement. That compares to just 36.7 percent for communities under 10,000 population.

Still, there is an observable, upward trend with respect to replacement planning. An expanding share of departments (43%; 2015) have plans for replacing apparatus on a regular schedule, up from 39 percent in 2010 and 35 percent in 2001.[15] Still, there are nearly 15,000 departments that do not have replacement plans. This means that fewer than half of all departments across the U.S. have replacement plans. Many are likely applying for federal or other grants in the hopes of serendipitous support.[16]

Exhibit 26. Departments with Plans for Regular Apparatus Replacement by Community Size, 2013-2015



Source: 1. Sage; 2. National Fire Protection Association (NFPA). "Fourth Needs Assessment of the U.S. Fire Service". November 2016.

[15] NFPA. "Fourth Needs Assessment of the U.S. Fire Service". November 2016. p. 127.
[16] NFPA. "Fourth Needs Assessment of the U.S. Fire Service". November 2016. p. xii.

Trends in Community Fire Protection Spending

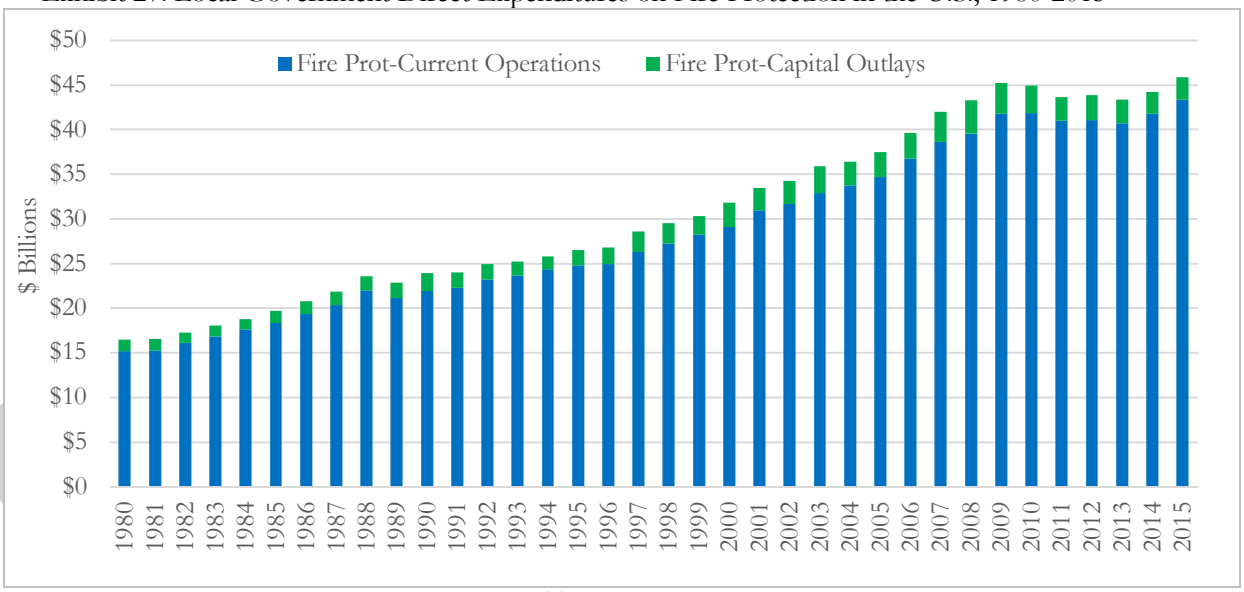
- There Has Been Growth Over Time (Just Not Lately)

Exhibit 27 supplies data characterizing inflation-adjusted local government expenditures on fire protection in the U.S. from 1980 to 2015. Total expenditures grew 185 percent from 1980 to 2015, which represents a compound annual growth rate of 3.0 percent in real terms. This trend is not unique to fire protection; other municipal service costs like police protection have also risen in a similar manner. Spending on fire protection declined from 2009 to 2013 before reestablishing an upward trajectory.

Factors driving community fire protection costs higher include: 1) shrinkage of the work week for some departments, resulting in a need to increase staffing and apparatus or to pay firefighters at overtime rates; (2) increasing EMS responsibilities requiring increased staffing and in some communities more frequent replacement of apparatus; and (3) rising costs of retirement and health benefits.[17]

Historically, capital outlays have represented a small portion of total expenditures on fire protection, but that share has slipped even lower in recent years. From 1980-2015, capital expenditures represented around 7.6 percent of total local fire protection spending on average, but in 2015, capital expenditures represented less than 6 percent of total spending.

Exhibit 27. Local Government Direct Expenditures on Fire Protection in the U.S., 1980-2015

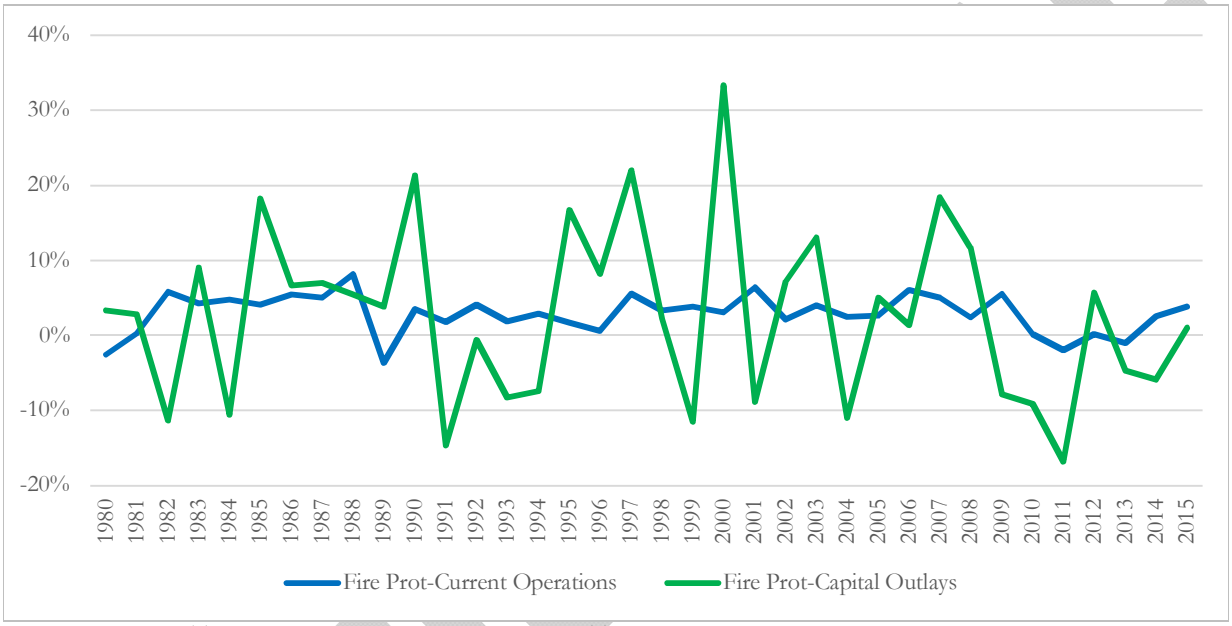


Source: 1. Sage. 2. Urban Institute-Brookings Institution Tax Policy Center. *State & Local Government Finance Data Query System.* Data from U.S. Census Bureau, Annual Survey of State and Local Government Finances. Notes: Figures are in 2015 dollars (inflation adjusted).

[17] National Fire Protection Association (NFPA). "U.S. Fire Department Profile-2015". April 2017.

Exhibit 28 reveals something that should be of enormous interest to fire apparatus manufacturers and distributors. Capital outlays for fire protection are remarkably volatile over time, tending to sag dramatically during and after recessions, and then surging during the very late stages of economic expansion cycles (e.g. 1989-90, 2007). Operating expenses, which tend to heavily reflect spending on human capital, are far more stable from year-to-year.

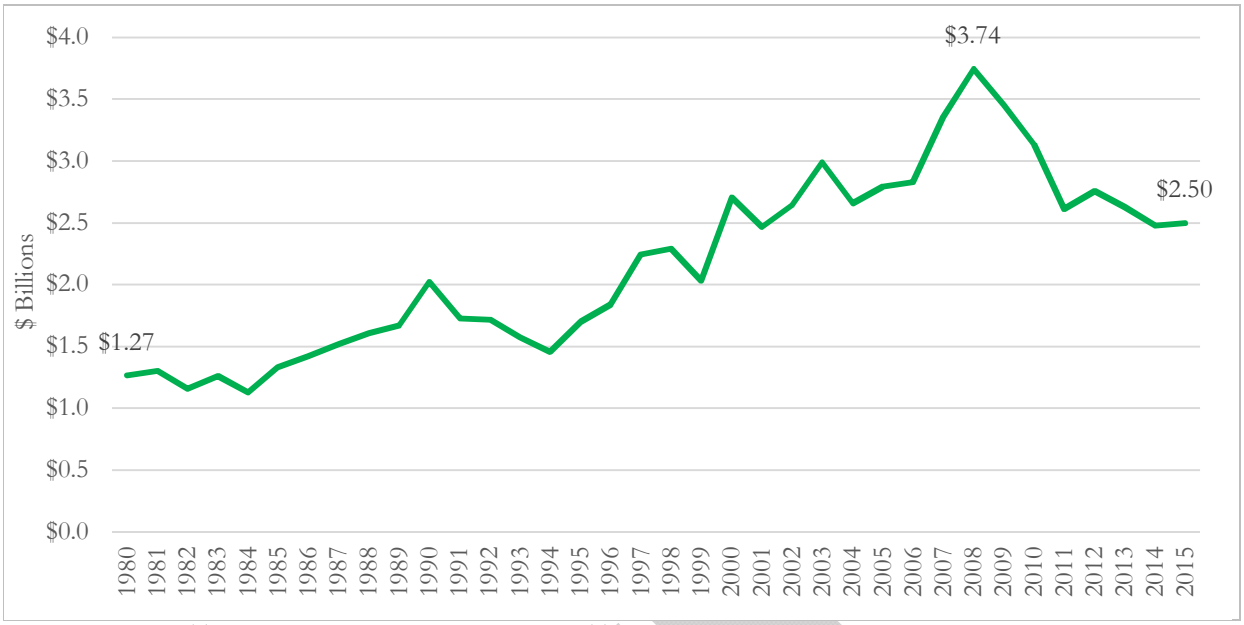
Exhibit 28. Annual Growth: Local Government Direct Expenditures on Fire Protection in the U.S., 1980-2015



Source: 1. Sage. 2. The Urban Institute-Brookings Institution Tax Policy Center. *State & Local Government Finance Data Query System*. Data from U.S. Census Bureau, Annual Survey of State and Local Government Finances. Notes: Figures are in 2015 dollars (inflation adjusted).

As reflected in Exhibit 29, local government capital outlays for fire protection in the U.S. peaked in 2008 at $3.7 billion before declining to $2.5 billion by 2015. That represents a decline of more than 33 percent.

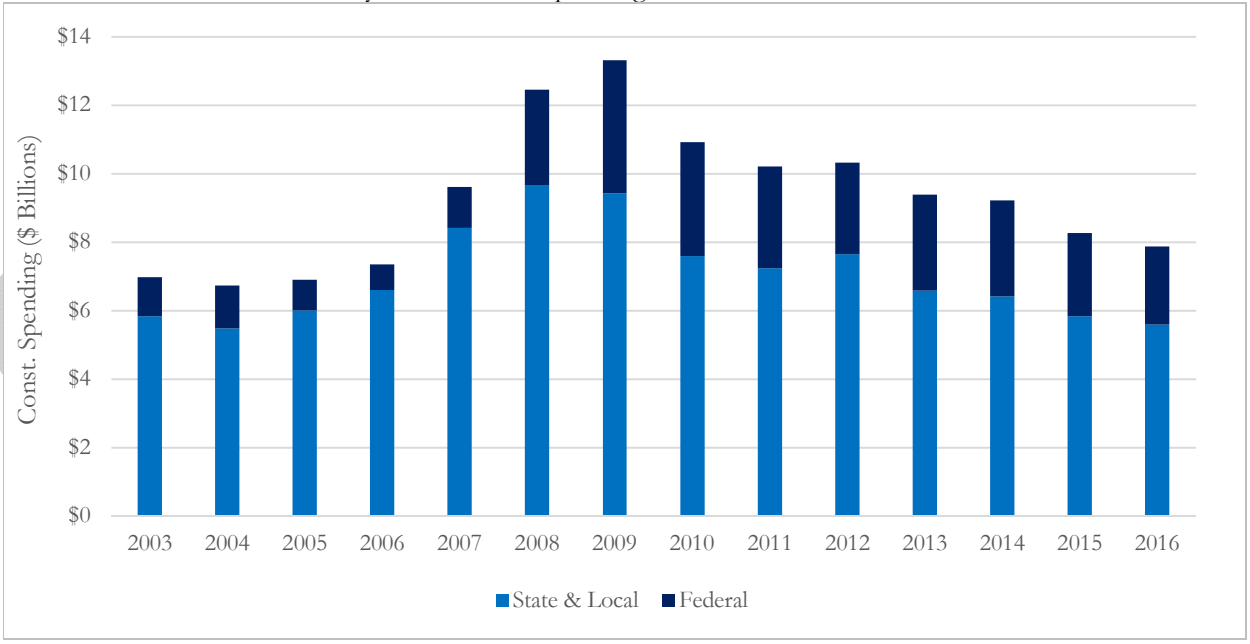
Exhibit 29. Local Government Direct Expenditures on Fire Protection in the U.S.-Capital Outlays, 1980-2015



Source: 1. Sage. 2. The Urban Institute-Brookings Institution Tax Policy Center. *State & Local Government Finance Data Query System*. Data from U.S. Census Bureau, Annual Survey of State and Local Government Finances. Notes: Figures are in 2015 dollars (inflation adjusted).

Construction Spending. The lack of public investment is observable in many categories. Spending on many forms of physical infrastructure has been in decline in recent years despite the ongoing economic recovery. This has been especially true in the public safety category -- a category encompassing the construction of new fire stations.

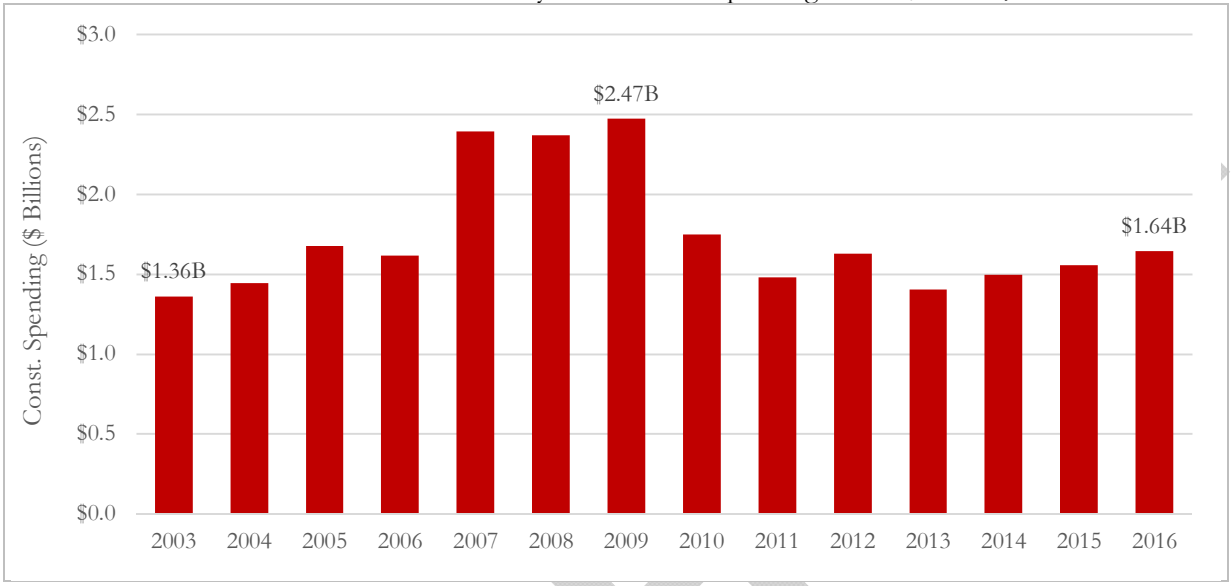
Exhibit 30. U.S. Public Safety Construction Spending, 2003-2016



Source: Sage; FAMA; U.S. Census Bureau

State and local construction spending in the fire/rescue category totaled $1.64 billion in 2016. That was 33.5 percent lower than the peak level of spending recorded in 2009, when state/local construction spending in this category approached $2.5 billion.

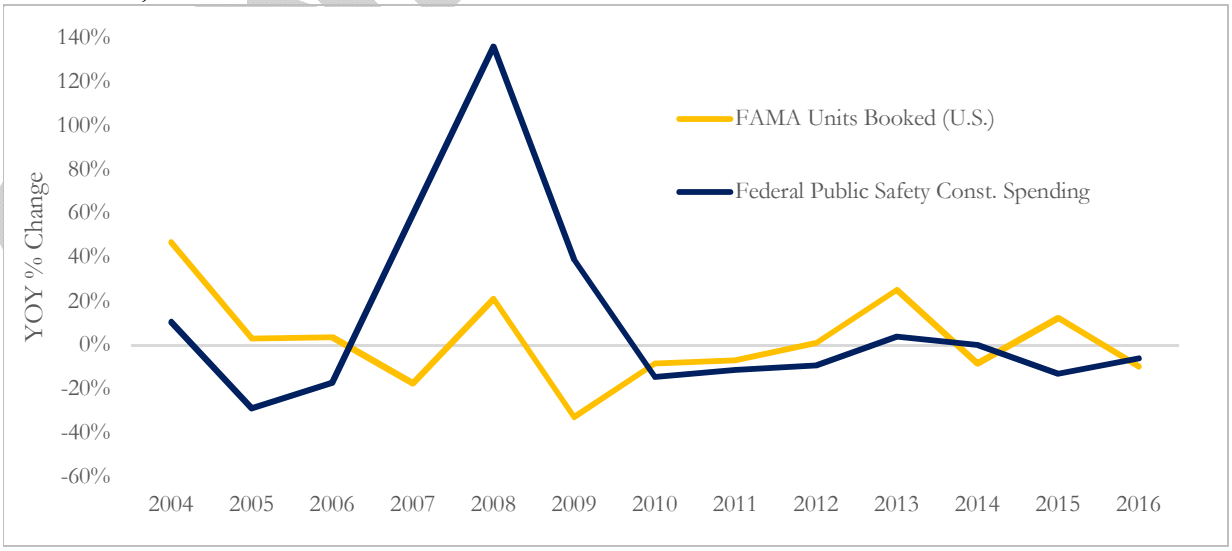
Exhibit 31. U.S. State & Local Public Safety Construction Spending on Fire/Rescue, 2003-2016



Source: Sage; FAMA; U.S. Census Bureau

Interestingly, though virtually all direct spending on fire protection originates at the levels of state and local government, FAMA member performance in terms of units booked seems to closely mimic changes in federal public safety construction spending. This may have much to do with federal grant funding for fire departments that lack a predictable replacement schedule.

Exhibit 32. Annual Growth: U.S. Federal Public Safety Construction Spending & FAMA Units Booked, 2004-16



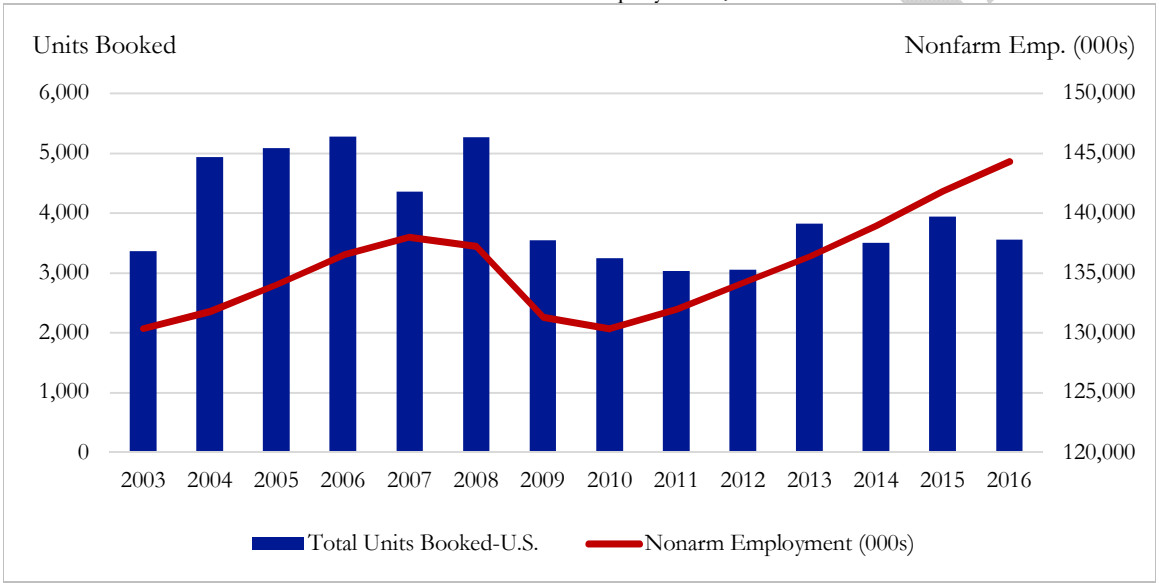
Source: Sage; FAMA; U.S. Census Bureau

Looking for Explanatory Factors: Demographics & Economic Conditions

- Solving the Mystery of Incomplete Recovery in Units Booked

Importantly, while the U.S. economy has gained steam in recent years (e.g. 2015, when U.S. output measured in terms of gross domestic product rose 2.9 percent), the FAMA units booked variable has failed to respond commensurately as reflected in Exhibit 33, which juxtaposes U.S. nonfarm employment with units booked. While this could be easily explained during the early years of economic recovery as reflecting weak state/local government finances or concerns for a double-dip recession, these rationales are far less compelling after more than eight years of economic expansion.

Exhibit 33. Total Units Booked vs. U.S. Nonfarm Employment, 2003-2016



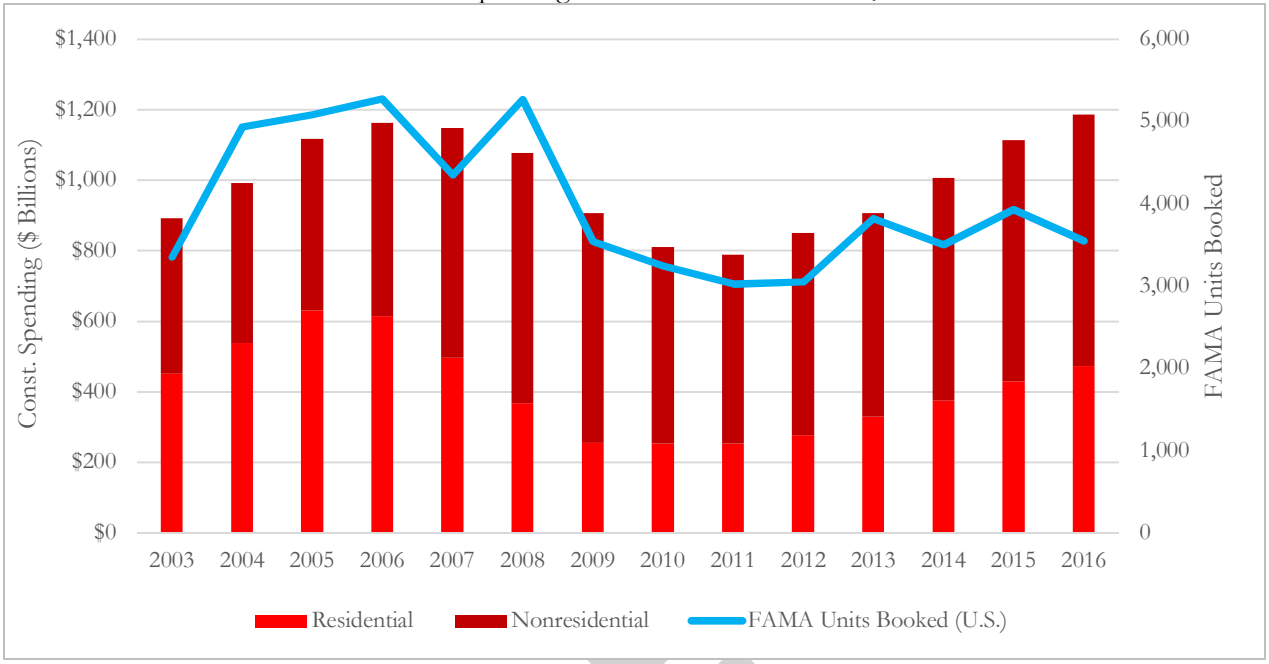
Source: FAMA; U.S. Bureau of Labor Statistics; Sage

This is not merely about available revenues or confidence among those who craft budgets. The current economic expansion has been associated with surging construction of new hotels, office buildings, apartments, casinos, fulfillment and data centers. As construction activity expands, fire departments have a larger stock of buildings to protect, which strongly implies growing demand for both firefighters and apparatus.

Historically, FAMA sales have closely tracked construction activity, but that has not been the case in recent years (since roughly 2013). In recent years, public construction investment in many categories including water supply, flood control, highways/streets, sewage/waste disposal and public safety has been in sharp decline even as private construction spending has accelerated. Since commercial and residential property tax bases have been expanding in recent years in many communities, one would think that rising demand for fire protection combined with expanding public resources would translate into brisk investment in public

safety construction, aggressive hiring of professional firefighters and a sharp upward tilt in apparatus sales. As the data in this report indicate, that has simply not transpired.

Exhibit 34. Total U.S. Construction Spending and FAMA Units Booked, 2003-2016



Source: Sage; FAMA; U.S. Census Bureau

In much of the U.S., units booked per 100,000 housing units has remained remarkably stable over time. For instance, in the Northeast, units booked per 100,000 housing units in 2003 stood at 3.36. Thirteen years later, the corresponding ratio stood at 3.37, nearly identical. Similarly, in the western United States, in 2003, the number of units booked per 100,000 housing units stood at 2.46. Thirteen years later, the ratio stood at 2.47. The implication is that in much of the nation, the number of units booked has expanded at roughly the rate of household formation.

However, in other communities, the ratio of units booked per 100,000 housing units has fallen sharply. This is particularly true in the Midwest, where the ratio has fallen from 2.75 to 2.29. In the West North Central sub-region, which includes states like Iowa, Kansas, Nebraska, and North Dakota, the ratio fell from 3.62 to 2.68 in thirteen years.

Similar dynamics are apparent in the South, where the ratio declined from 2.64 to 2.53 between 2003 and 2016. In the East South Central sub-region, which includes states like Alabama, Kentucky, and Mississippi, the ratio declined from 2.95 to 2.16.

Exhibit 35. Units Booked by U.S. Census Bureau Region & Division Per 100,000 Housing Units

Region/Division	Units Booked		Housing Units Estimate*		Units Booked Per 100,000 Housing Units		
	2003	2016	2003	2016	2003	2016	2003 v. 2016
NORTHEAST	**763**	**808**	**22,703,915**	**23,953,366**	**3.36**	**3.37**	**0.01**
Division I: New England	191	262	6,106,864	6,505,268	3.13	4.03	0.90
Division 2: Middle Atlantic	572	546	16,597,051	17,448,098	3.45	3.13	-0.32
MIDWEST	**771**	**687**	**28,013,805**	**29,964,039**	**2.75**	**2.29**	**-0.46**
Division 3: East North Central	461	435	19,459,396	20,574,376	2.37	2.11	-0.25
Division 4: West North Central	310	252	8,554,409	9,389,663	3.62	2.68	-0.94
SOUTH	**1,187**	**1,322**	**44,996,117**	**52,151,021**	**2.64**	**2.53**	**-0.10**
Division 5: South Atlantic	649	736	23,951,411	27,861,757	2.71	2.64	-0.07
Division 6: East South Central	225	182	7,627,908	8,422,853	2.95	2.16	-0.79
Division 7: West South Central	313	404	13,416,798	15,866,411	2.33	2.55	0.21
WEST	**634**	**731**	**25,811,623**	**29,629,500**	**2.46**	**2.47**	**0.01**
Division 8: Mountain	239	281	8,219,835	9,962,732	2.91	2.82	-0.09
Division 9: Pacific	395	450	17,591,788	19,666,768	2.25	2.29	0.04

Source: Sage; FAMA; U.S. Census Bureau, Population Division. Notes: *Estimate as of July 1st.
NORTHEAST Region—Division I: New England (Connecticut, Maine, Massachusetts, New Hampshire, Rhode Island, Vermont); Division 2: Middle Atlantic (New Jersey, New York, Pennsylvania).
MIDWEST Region—Division 3: East North Central (Illinois, Indiana, Michigan, Ohio, Wisconsin); Division 4: West North Central (Iowa, Kansas, Minnesota, Missouri, Nebraska, North Dakota, South Dakota).
SOUTH Region—Division 5: South Atlantic (Delaware, District of Columbia, Florida, Georgia, Maryland, North Carolina, South Carolina, Virginia, West Virginia); Division 6: East South Central (Alabama, Kentucky, Mississippi, Tennessee); Division 7: West South Central (Arkansas, Louisiana, Oklahoma, Texas).
WEST Region—Division 8: Mountain (Arizona, Colorado, Idaho, Montana, Nevada, New Mexico, Utah, Wyoming); Division 9: Pacific (Alaska, California, Hawaii, Oregon, Washington).

- Fiscal Considerations

Federal Funding. While funding for firefighting is predominately provided by state and local governments, there are several federal grant programs that support firefighting operations. In many instances, these programs were developed in response to local financial conditions prevailing during the 1990s, which were often characterized by fiscal shortfalls. Before the establishment of these federal grant programs, there had been few if any dedicated funding programs exclusively for firefighting.[18]

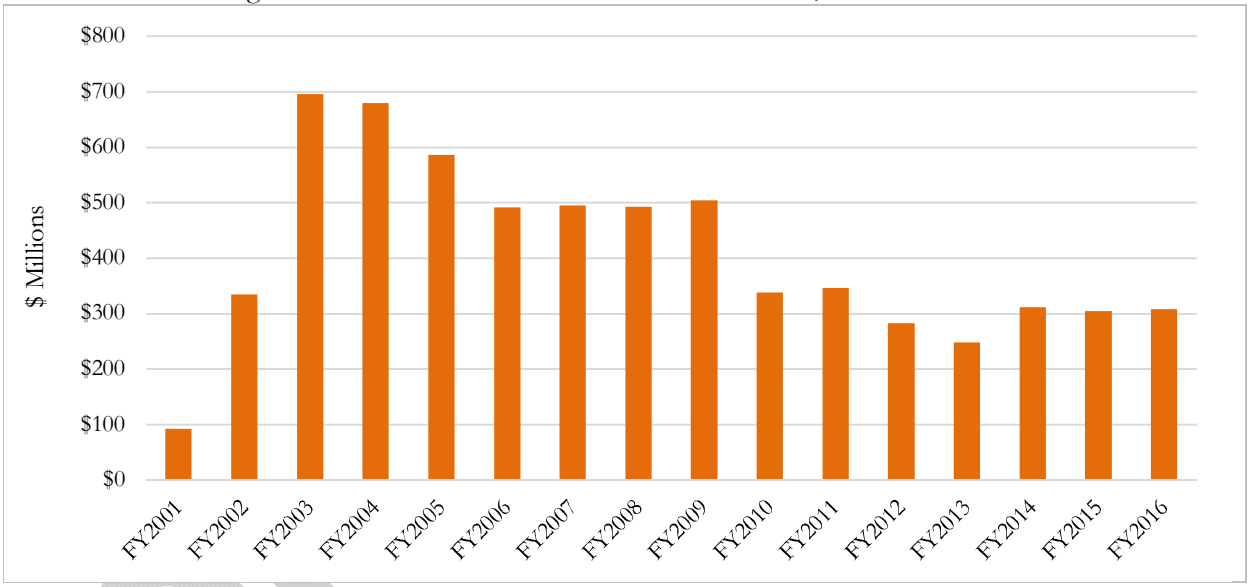
There are three primary firefighting grant programs operated by the Federal Emergency Management Agency (FEMA): 1) the Assistance to Firefighters Grants (AFG) program, 2) the Staffing for Adequate Fire and Emergency Response (SAFER) Grants program, and the 3) Fire Prevention and Safety (FP&S) Grants program. SAFER grants fund the hiring of salaried firefighters and costs of recruitment and retention of volunteer firefighters.[19] FP&S

[18] Congressional Research Service, "Assistance to Firefighters Program: Distribution of Fire Grant Funding". October 5, 2017. Author: Lennard G. Kruger, Specialist in Science and Technology Policy. p. 1.
[19] U.S. Government Accountability Office (GAO). "FIRE GRANTS: FEMA Could Enhance Program Administration and Performance Assessment", GAO-16-744. September 2016.

grants are dedicated to projects that enhance the safety of firefighters and the broader public from fire and related hazards.[20]

The AFG grant program is the most relevant to firefighting apparatus. AFG program funding targets "critically needed resources to equip and train emergency personnel to recognized standards, enhance operations efficiencies, foster interoperability, and support community resilience."[21] Program funds can be used for equipment (such as personal protective equipment, vehicles, and other operational equipment) as well as operational programs (such as projects to modernize facilities, deliver training, and develop health and fitness programs).[22] Note that the amount of AFG grants distributed has shrunk dramatically since FY2009. That year, grants totaled more than $500 million. By FY2016, grant funding was a bit more than $300 million. Even before FY2009, there had been a decline in funding. In FY2003, which came shortly on the heels of 9/11, AFG grant funding approached $700 million.

Exhibit 36. Firefighter Assistance: FEMA AFG Grants Distributed, FY2001-FY2016



Source: Sage; Congressional Research Service, "Assistance to Firefighters Program: Distribution of Fire Grant Funding". Author: Lennard G. Kruger, Specialist in Science and Technology Policy. Notes: AFG: Assistance to Firefighters Grants.

AFG grants used for vehicle replacement are used to replace sub-standard or unsafe vehicles. These replaced vehicles are typically older vehicles that are permanently removed from service. On average, more than 99 percent of fire vehicles that AFG grant recipients replaced during FY2008-FY2011 were at least 15 years old, and nearly 86 percent were 25

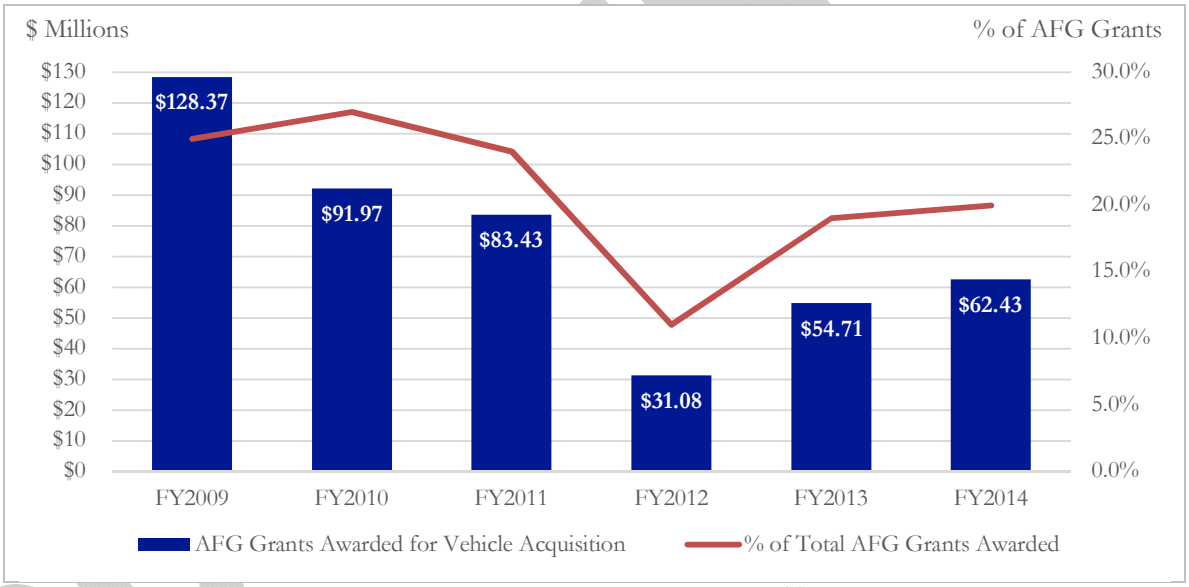
[20] Federal Emergency Management Agency (FEMA). *Fire Prevention & Safety Grants*. https://www.fema.gov/fire-prevention-safety-grants.
[21] Federal Emergency Management Agency (FEMA). *Assistance to Firefighters Grant Program.* https://www.fema.gov/welcome-assistance-firefighters-grant-program.
[22] U.S. Government Accountability Office (GAO). "FIRE GRANTS: FEMA Could Enhance Program Administration and Performance Assessment", GAO-16-744. September 2016.

years old or older. Approximately 98 percent of grant recipients indicated that the vehicle had been permanently removed from service.[23]

AFG funds for vehicle replacement are in high demand. There were 2,585 applications submitted for AFG funds for vehicle acquisition in FY2014 alone. Of those, just 201 applications were awarded grants (7.8%).[24] From FY2014-FY2016, funds for vehicles have represented around 44 percent of total funds requested by applicants.[25] However, no more than 25 percent of available AFG grant funds may be used by recipients for the purchase of vehicles and 10 percent of that amount is set aside for ambulances.[26]

In FY2014, AFG grants for vehicle acquisition totaled $62.4 million and represented 20 percent of all AFG grants awarded (see Exhibit 37). The NFPA's Fourth Annual Needs Assessment states: "Considering AFG funding, approximately 19% of 2011-2014 funds were distributed for vehicle acquisition. While this helps hold the line on the aging of vehicles and apparatus, it is far less than the need."[27]

Exhibit 37. Distribution of Assistance to Firefighters Grant (AFG) Awards for Vehicle Acquisition, FY2009-FY2014



Source: 1. Sage. 2. U.S. Government Accountability Office (GAO). "FIRE GRANTS: FEMA Could Enhance Program Administration and Performance Assessment", GAO-16-744. September 2016.

[23] Vehicles that are not permanently removed from service may be placed in reserve status or otherwise removed from front-line operations. (Federal Emergency Management Agency (FEMA). "Assistance to Firefighters Grant Program Performance Assessment System". Fiscal Year 2015 Annual Report to Congress. October 19, 2015.)
[24] U.S. Government Accountability Office (GAO). "FIRE GRANTS: FEMA Could Enhance Program Administration and Performance Assessment", GAO-16-744. September 2016.
[25] Mark Price and Brad Cole. "Assistance to Firefighters Grant" Presentation. May 19, 2017. https://www.preparingtexas.org/Resources/documents/2017%20Conference/Assistance%20to%20Firefighters%20Grant.pdf.
[26] The Department of Homeland Security (DHS). "Notice of Funding Opportunity (NOFO). FY 2016 Assistance to Firefighters Grants (AFG)". https://www.fema.gov/media-library-data/1472840920028-6ecc836fb21bf4152f3c06ec942564cb/FY16_AFG_NOFO_final_v3_09_01_2016.pdf.
[27] NFPA. "Fourth Needs Assessment of the U.S. Fire Service". November 2016. p. xi.

Future of Grant Funding. The current AFG and SAFER statute contains a sunset provision for each program that will eliminate the programs on January 2, 2018 unless Congress acts to renew them. On April 5, 2017, Senator McCain of Arizona introduced S. 829, the AFG and SAFER Program Reauthorization Act of 2017. This piece of pending legislation was referred to the Committee on Homeland Security and Governmental Affairs. On August 2, 2017, the Senate passed S. 829 by unanimous consent. On September 28, 2017, H.R. 3881, the AFG and SAFER Program Reauthorization Act of 2017, was introduced by Representative Pascrell and referred to the Committee on Science, Space, and Technology. H.R. 3881 is identical to S. 829 as passed by the Senate.

Exhibit 38. Recent and Proposed Appropriations for Firefighter Assistance (Millions of Dollars)

	FY2016 (P.L. 114- 113)	FY2017 (Admin. request)	FY2017 (P.L. 115-31)	FY2018 (Admin. request)	FY2018 (H.Rept. 115-239)	FY2018 (H.R. 3354)
FIRE Grants (AFG)	$345.0	$335.0	$345.0	$344.3	$345.0	$345.0
SAFER Grants	$345.0	$335.0	$345.0	$344.3	$345.0	$365.0
Total	$690.0	$670.0	$690.0	$688.7	$690.0	$710.0

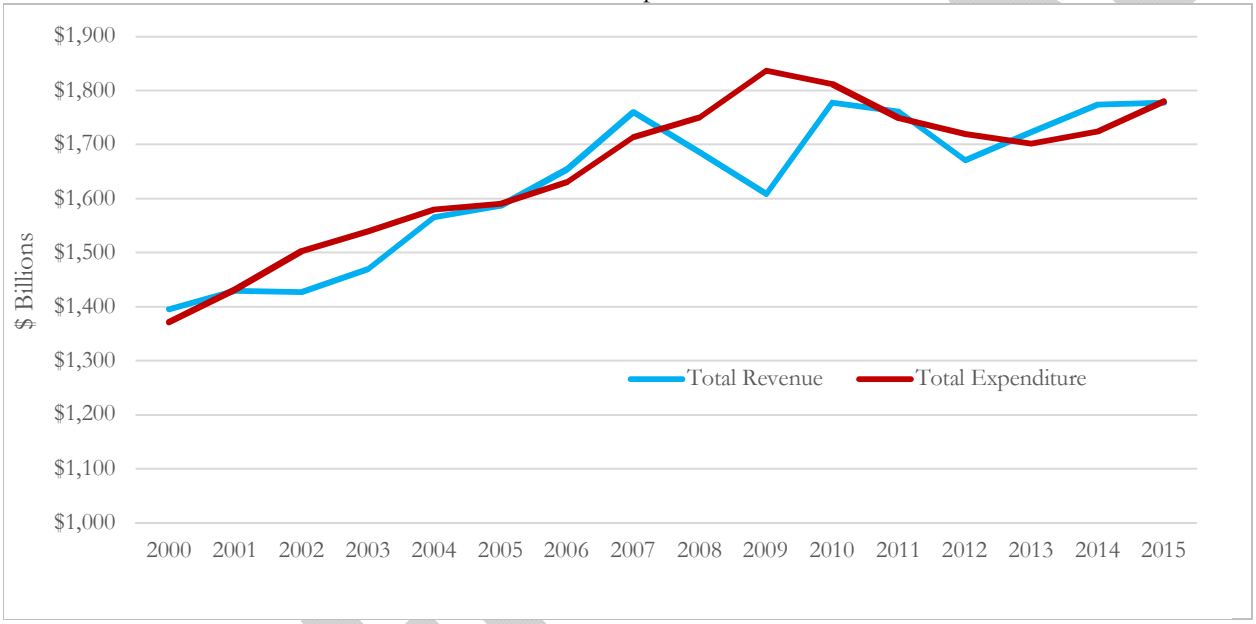
Source: Sage; Congressional Research Service, "Assistance to Firefighters Program: Distribution of Fire Grant Funding". Author: Lennard G. Kruger, Specialist in Science and Technology Policy.

Congress will also consider budget appropriations for AFG and SAFER. As is the case with many federal programs, concerns regarding the federal budget deficit will likely impact AFG and SAFER budget levels. At the same time, firefighter assistance budgets will likely receive heightened scrutiny from the fire community in the context of the local budgetary shortfalls that many fire departments face.[28] Exhibit 38 above supplies recent and proposed appropriated funding for the AFG and SAFER grant programs.

[28] Congressional Research Service, "Assistance to Firefighters Program: Distribution of Fire Grant Funding". 10/5/2017. Author: Lennard G. Kruger, Specialist in Science and Technology Policy.

State & Local Finances. Funding and overseeing firefighting activities are traditionally the responsibility of state and local authorities.[29] Over the past quarter century, total local government expenditures have generally trended higher in America, including during recent years. All things being equal, this should translate into much better units booked readings than are presently observable. There is a strong implication that the share of local government monies being spent on firefighting has declined. In order to determine whether that state of affairs will persist, it is important to understand which categories have been securing greater local government expenditure share.

Exhibit 39. U.S. Local Government Revenues & Expenditures, 1990-2015

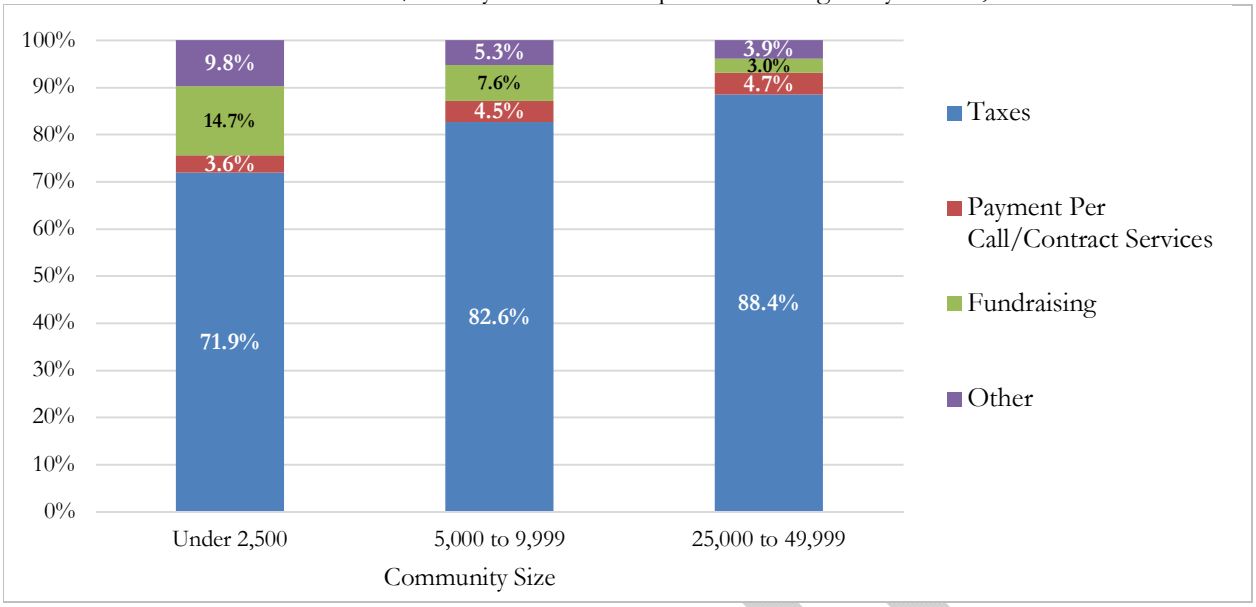


Source: 1. Sage. 2. The Urban Institute-Brookings Institution Tax Policy Center. *State & Local Government Finance Data Query System.* Data from U.S. Census Bureau, Annual Survey of State and Local Government Finances. Notes: Figures are in 2015 dollars (inflation adjusted).

All or mostly-volunteer fire departments (which make up more than 70 percent of all departments in the U.S.) derive a large share of their revenues from local taxes. Exhibit 40 indicates budgeted revenue sources for all-volunteer or mostly-volunteer fire departments by community size. Most revenues for all/or mostly-volunteer departments are covered by taxes, either a special fire district tax or some other tax. The share of revenues from taxes is approximately 72 percent for communities of less than 2,500 people and between 83-88 percent for communities of 5,000 to 49,999 people. Apparatus constitute the principal costs for volunteer departments, so one would expect fire apparatus sales to neatly and predictably correlate with local tax revenues.

[29] Congressional Research Service, "Assistance to Firefighters Program: Distribution of Fire Grant Funding". October 5, 2017. Author: Lennard G. Kruger, Specialist in Science and Technology Policy. p. 1.

Exhibit 40. Share of Volunteer/Mostly-Volunteer Department Budgets by Source, 2015



Source: 1. Sage. 2. National Fire Protection Association (NFPA). "Fourth Needs Assessment of the U.S. Fire Service". November 2016. Note: NFPA analyzed questions regarding revenue only for communities of less than 50,000 in population, which is the maximum community size for which at least 30% of departments are all- or mostly-volunteer.

In response to a number of sources of fiscal stress, state and local governments have been reshaping their finances since the Great Recession. Notable sources of stress include slow tax revenue growth, Medicaid spending growth driven by recession-related enrollment and the Affordable Care Act of 2010, and underfunded pensions. Responses to these strains have included cutting capital spending, cutting infrastructure investment, and cutting other budget categories.[30]

Since the recession in 2007-2009, state tax revenues have been slower to rebound than after any of the three previous downturns and trends have varied widely by state. According to the Pew Charitable Trusts, in early 2017 inflation-adjusted tax revenue was lower in 22 states compared to the peak before or during the recession. More states than at any time since the end of the recession reported midyear budget gaps in fiscal year 2017, and according to Pew many states forecast that sluggish tax revenue growth will continue in fiscal 2018.[31]

[30] Boyd and Dadayan. 2016. "State and Local Governments Reshape Their Finances". July 1, 2016. http://knowledgecenter.csg.org/kc/content/state-and-local-governments-reshape-their-finances.
[31] The Pew Charitable Trusts. "Weak Growth in State Tax Revenue Persists in 2017". *Fiscal 50: State Trends and Analysis*. October 17, 2017. http://www.pewtrusts.org/en/research-and-analysis/analysis/2017/10/17/weak-growth-in-state-tax-revenue-persists-in-2017.

Exhibit 41. Inflation Adjusted Tax Collections in 2017Q1 Compared with Each State's Peak

Source: The Pew Charitable Trusts. *Fiscal 50: State Trends and Analysis*. Note: figures are Pew Charitable Trusts' analysis of data licensed by the Nelson A. Rockefeller Institute of Government, which adjusts U.S. Census Bureau's quarterly summary of tax revenue.

While revenue growth has been soft, demands placed upon government from a variety sources have been expanding briskly. For instance, in 2015, total state and local government expenditures were 0.4 percent above 2010 levels, but employee retirement expenditures were 23.3 percent higher.

Revenue stagnation can not only render it difficult for states to balance their operating budgets, but can also restrain the capacity of state and local governments to borrow money in support of capital investment. For example, the State of Connecticut has a debt limit tied to tax collections and in 2016 the State was forced to delay selling approximately $1 billion in bonds due to lower than anticipated tax collections.[32]

Exhibit 42 reflects the dropoff in long-term debt issuance since 2007, the year the most recent recession began. Stimulus funds supported debt issuance in 2010, but since then there have been ongoing declines in general. Debt can be used to support many types of expenditures, but undoubtedly public safety spending has been negatively impacted by this trend.

[32] The Wall Street Journal. 2016. "Slowdown in State, Local Investment Dents U.S. Economy" by Eric Morath and Ben Leubsdorf. October 26, 2016. https://www.wsj.com/articles/slowdown-in-state-local-investment-dents-u-s-economy-1477495758.

Exhibit 42. U.S. State & Local Governments' Total Long-Term Debt Issued ($ Billions), 2005-2015

Source: 1. Sage. 2. Urban Institute-Brookings Institution Tax Policy Center. *State & Local Government Finance Data Query System*. Data from U.S. Census Bureau, Annual Survey of State and Local Government Finances. Notes: 1. Figures are in 2015 dollars (inflation adjusted).

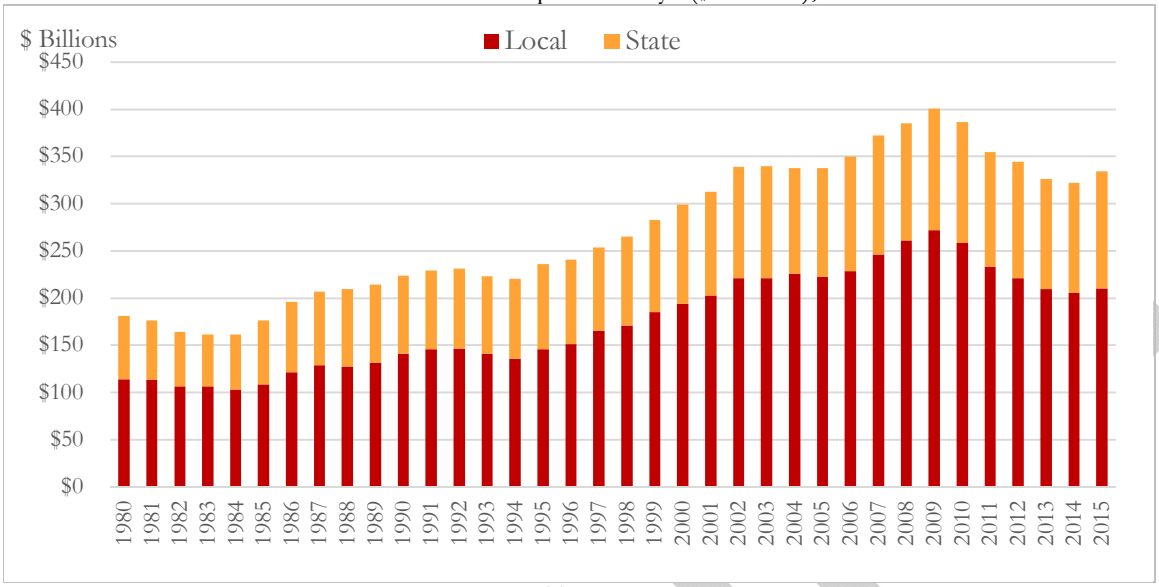
Past economic expansions gave states the opportunity to build up rainy day funds to buffer against recession and make critical investments. During the recent recovery, this hasn't happened in some states. According to the Pew Charitable Trusts, during fiscal year 2016, the median state could run on its reserves for 29.2 days, down 14 days from the corresponding level a decade earlier. This also serves to restrict policymaker appetite for additional indebtedness.[33]

With a few exceptions, state and local governments have responded to sharply constrained resources not by raising taxes, but by slashing capital spending and other areas of the budget.[34] According to U.S. Census Bureau data, capital expenditure cuts have been widespread. On a per capita basis, the level of real capital outlays by state and local governments was down by more than $100 per capita in 34 states (2015 compared to 2009 levels). Exhibit 43 supplies relevant statistical and visual detail.

[33] The Wall Street Journal. 2016. "Slowdown in State, Local Investment Dents U.S. Economy" by Eric Morath and Ben Leubsdorf. October 26, 2016. https://www.wsj.com/articles/slowdown-in-state-local-investment-dents-u-s-economy-1477495758.

[34] Boyd and Dadayan. 2016. "State and Local Governments Reshape Their Finances". July 1, 2016. http://knowledgecenter.csg.org/kc/content/state-and-local-governments-reshape-their-finances.

Exhibit 43. U.S. State & Local Government Capital Outlays ($ Billions), 1980-2015



Source: 1. Sage. 2. Urban Institute-Brookings Institution Tax Policy Center. *State & Local Government Finance Data Query System*. Data from U.S. Census Bureau, Annual Survey of State and Local Government Finances. Notes: Figures are in 2015 dollars (inflation adjusted).

This pattern is particularly apparent in Exhibit 44. For instance, between 1985 and 1995, total capital outlays in the fire protection category rose more than 27 percent. During the ensuing decade, fire protection-related capital outlays expanded more than 64 percent. But between 2005 and 2015, they fell by nearly 11 percent, which unquestionably impacted some fraction of FAMA members.

Exhibit 44. Growth in U.S. Local Government Capital Outlays by Function ($ Billions), 1985-2015

Period	% Change		
	1985-1995	1995-2005	2005-2015
Total Capital Outlays	**34.2%**	**52.5%**	**-5.5%**
Construction	*22.7%*	*71.8%*	*-5.4%*
Other Capital Outlays	*68.3%*	*11.0%*	*-6.0%*
By Function			
Education	106.7%	73.9%	-18.9%
Fire Protection	27.4%	64.3%	-10.5%
Police Protection	48.2%	20.4%	6.7%
Corrections	19.3%	-17.5%	-40.6%
Financial Admin. & Gen Control	86.9%	51.2%	-27.9%
General Public Buildings	58.0%	18.5%	-15.1%
Health & Hospitals	4.8%	39.4%	13.9%
Highways	26.4%	29.8%	13.3%
Housing & Community Dev.	-3.6%	35.6%	-35.3%
Libraries	55.7%	55.5%	-28.2%
Natural Resources	0.1%	56.3%	-8.8%
Parks & Recreation	31.4%	64.0%	-16.7%
Utilities	2.2%	41.5%	22.4%
Sanitation	7.4%	21.6%	5.7%
Other	53.4%	89.3%	-13.5%

Source: 1. Sage. 2. Urban Institute-Brookings Institution Tax Policy Center. *State & Local Government Finance Data Query System*. Data from U.S. Census Bureau, Annual Survey of State and Local Government Finances. Notes: Figures are in 2015 dollars (inflation adjusted).

Conclusion

Sluggish Growth in Units Booked Despite Stronger North American Economy

During the second quarter of 2017, units booked among FAMA members were 21 percent below the 2003-2017 quarterly average. While units booked grew in the third quarter, sales were still more than 5 percent below the 2003-2017 quarterly average. Indeed, units booked have failed to recover in conjunction with a strengthening economy. This outcome is primarily driven by dynamics characterizing the United States as opposed to Canada.

This report supplies both summary detail regarding industry performance over time as well as an analysis of explanatory factors. We conclude that there are four factors that explain sluggish recovery in units booked since the end of the financial crisis.

1. State and local governments have been shifting expenditures toward non-infrastructure categories, including toward Medicaid, health insurance for employees, and underfunded pensions.
2. States and local governments are also collectively taking on less debt to finance capital expenditures. Correspondingly, between 1985 and 1995, total capital outlays in the fire protection category rose more than 27 percent. During the ensuing decade, fire protection-related capital outlays expanded more than 64 percent. But between 2005 and 2015, they fell by nearly 11 percent.
3. Among federal grant programs, the Assistance to Firefighters Grants (AFG) program is the most relevant to firefighting apparatus. The amount of AFG grants distributed has shrunk dramatically since FY2009. That year, grants totaled $500 million. By FY2016, grant funding was a bit more than $300 million. Even before FY2009, there had been declines in funding. In FY2003, which came shortly on the heels of 9/11, AFG grant funding approached $700 million.
4. There have been sharp declines in units booked per 100,000 housing units in many parts of the American Midwest and South. In the West North Central sub-region, which includes states like Iowa, Kansas, Nebraska, and North Dakota, the ratio of units booked per 100,000 housing units fell from 3.62 to 2.68 during the 13-year period analyzed in this report. In the East South Central sub-region, which includes states like Alabama, Kentucky, and Mississippi, the ratio declined from 2.95 to 2.16. The likely explanation is that many communities in these states no longer have the wherewithal to invest in modern fire apparatus. Instead, much of North America's newfound prosperity can be found in cities like Seattle, Atlanta, Boston, San Jose, Austin, Minneapolis, Toronto, Vancouver, New York, and Washington, D.C. where units booked per 100,000 population tends to be lower because of economies of scale.

Looking Ahead

A combination of economic and demographic forces suggest that units booked should climb going forward. Both the U.S. and Canadian economies have been improving recently, with financial markets flourishing, unemployment falling, and job creation remaining steady. Moreover, both the Canadian and U.S. populations continue to age, which is consistent with significant growth in the number of service calls.

Despite that, the most likely outcome is for units booked to stay relatively flat with occasional strong quarters followed by weak ones. This is because state and local government budgets appear to have heavily tilted toward other priorities and that is unlikely to change. Many state and municipal pensions remain underfunded. Healthcare costs will continue to rise, at least in the United States.

Moreover, in the current political environment, few policymakers are willing to raise taxes in non-emergency situations (e.g. Illinois recently passed tax increases in a desperate attempt to pass a balanced budget) and there is a relative lack of appetite for debt accumulation in support of capital expenditures despite extraordinarily low interest rates. The U.S. government is wrestling with a $20 trillion debt and rather than consider tax increases to support much-needed infrastructure investment, is presently attempting to reduce America's federal tax burdens.

As a final point, there will also likely be increased expenditure on professional firefighters as the number of available volunteers continues to decline due to a host of factors, including the growing need for two incomes to support a given household. This will further dissipate resources available for apparatus. The future, therefore, may be associated with a growing number of professional firefighters working with inadequate physical capital.

Appendix

FAMA Members: Units Booked

Exhibit A1. FAMA Members-Total Units Booked by U.S. State, 2015 v. 2016

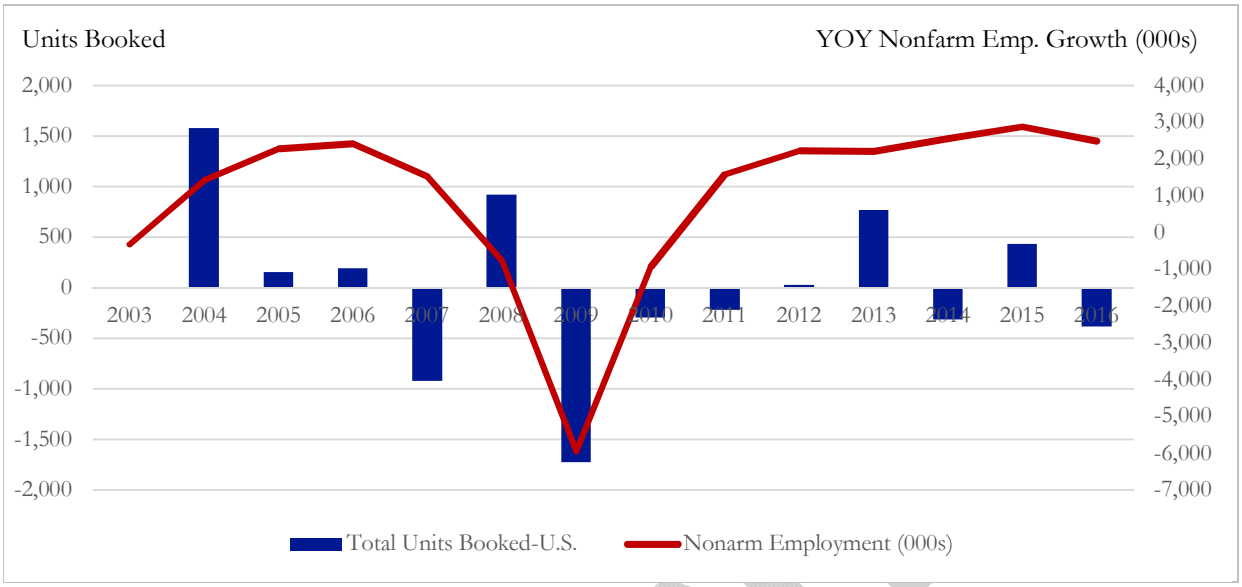
State	2015	2016	2015 v. 2016	
			Net	%
Alaska	32	13	-19	-59.4%
Alabama	60	59	-1	-1.7%
Arkansas	42	23	-19	-45.2%
Arizona	56	46	-10	-17.9%
California	305	288	-17	-5.6%
Colorado	55	88	33	60.0%
Connecticut	45	62	17	37.8%
District of Columbia	16	12	-4	-25.0%
Delaware	8	13	5	62.5%
Florida	164	208	44	26.8%
Georgia	137	114	-23	-16.8%
Hawaii	13	21	8	61.5%
Iowa	45	27	-18	-40.0%
Idaho	40	14	-26	-65.0%
Illinois	113	120	7	6.2%
Indiana	79	67	-12	-15.2%
Kansas	36	28	-8	-22.2%
Kentucky	37	40	3	8.1%
Louisiana	96	84	-12	-12.5%
Massachusetts	91	116	25	27.5%
Maryland	60	56	-4	-6.7%
Maine	27	32	5	18.5%
Michigan	86	70	-16	-18.6%
Minnesota	64	62	-2	-3.1%
Missouri	127	67	-60	-47.2%
Mississippi	65	34	-31	-47.7%
Montana	15	14	-1	-6.7%
North Carolina	160	136	-24	-15.0%
North Dakota	28	15	-13	-46.4%
Nebraska	38	37	-1	-2.6%
New Hampshire	19	22	3	15.8%
New Jersey	151	104	-47	-31.1%
New Mexico	56	53	-3	-5.4%
Nevada	24	13	-11	-45.8%
New York	244	227	-17	-7.0%

State	2015	2016	2015 v. 2016	
			Net	%
Ohio	134	107	-27	-20.1%
Oklahoma	49	46	-3	-6.1%
Oregon	68	46	-22	-32.4%
Pennsylvania	183	215	32	17.5%
Rhode Island	17	14	-3	-17.6%
South Carolina	126	82	-44	-34.9%
South Dakota	13	16	3	23.1%
Tennessee	55	49	-6	-10.9%
Texas	285	251	-34	-11.9%
Utah	38	44	6	15.8%
Virginia	128	84	-44	-34.4%
Vermont	12	16	4	33.3%
Washington	71	82	11	15.5%
Wisconsin	76	71	-5	-6.6%
West Virginia	29	31	2	6.9%
Wyoming	15	9	-6	-40.0%
American Samoa	0	0	0	-
Guam	0	0	0	-
Northern Marianas	0	0	0	-
Puerto Rico	0	0	0	-
Virgin Islands	0	0	0	-
Total U.S.	***3,933***	***3,548***	***-385***	***-9.8%***

Exhibit A2. FAMA Members-Total Units Booked by Canadian Province, 2015 v. 2016

Province	2015	2016	2015 v. 2016	
			Net	%
Alberta	57	65	8	14.0%
British Columbia	70	47	-23	-32.9%
Manitoba	31	16	-15	-48.4%
New Brunswick	9	13	4	44.4%
Newfoundland and Labrador	2	4	2	100.0%
Nova Scotia	21	17	-4	-19.0%
Northwest Territories	1	3	2	200.0%
Nunavut	4	2	-2	-50.0%
Ontario	86	88	2	2.3%
Prince Edward Island	1	4	3	300.0%
Quebec	47	26	-21	-44.7%
Saskatchewan	11	9	-2	-18.2%
Yukon	4	2	-2	-50.0%
Total	***344***	***296***	***-48***	***-14.0%***

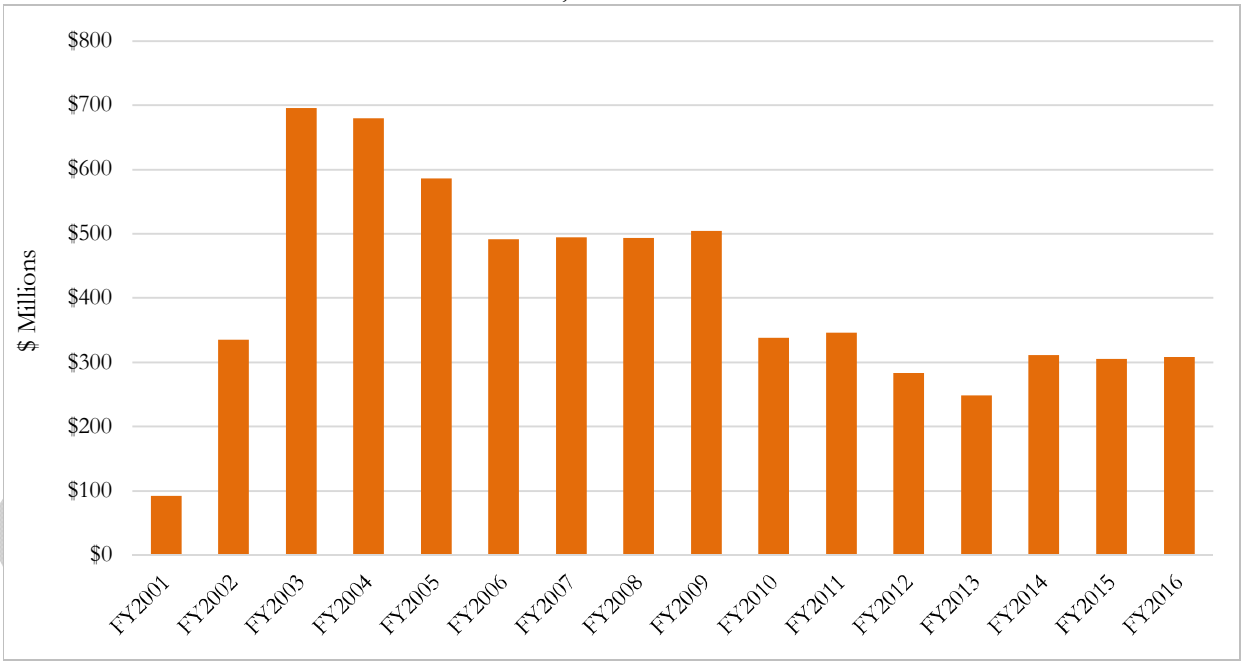
Exhibit A3. YOY Growth: Total Units Booked in the U.S. and U.S. Nonfarm Employment, 2003-2016



Source: FAMA; U.S. Bureau of Labor Statistics; Sage

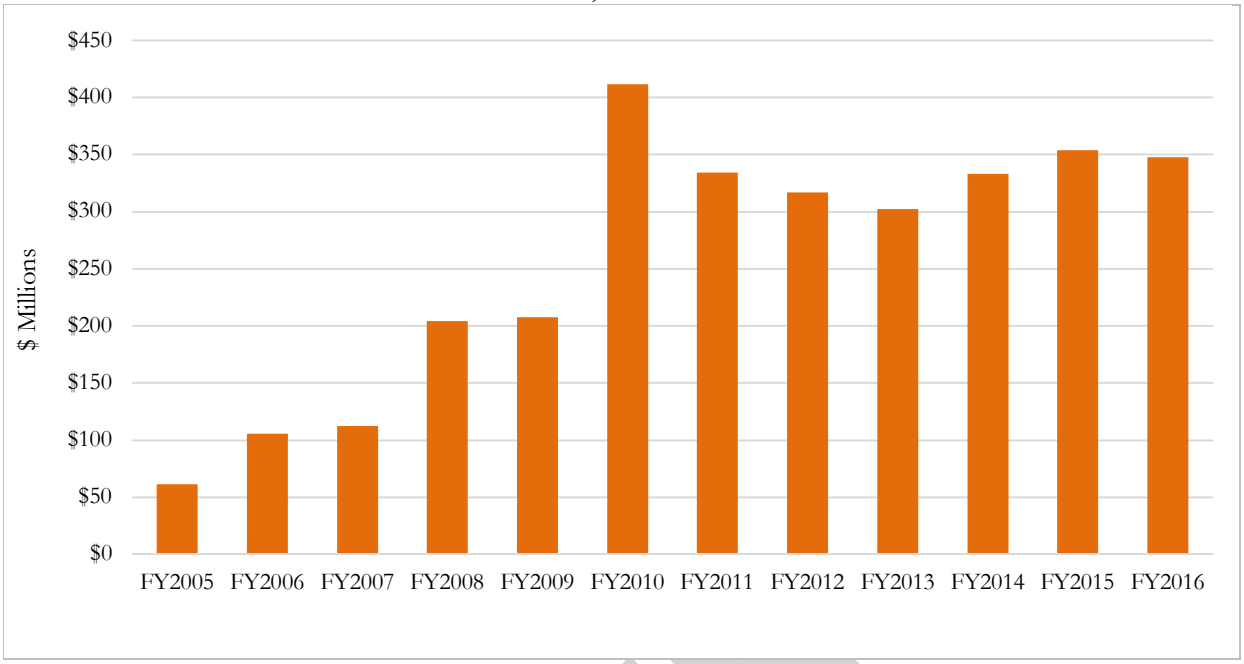
FEMA Grants

Exhibit A4. FEMA AFG Grants Distributed, FY2001-FY2016



Source: Sage; Congressional Research Service, "Assistance to Firefighters Program: Distribution of Fire Grant Funding". Author: Lennard G. Kruger, Specialist in Science and Technology Policy.

Exhibit A5. FEMA SAFER Grants Distributed, FY2005-FY2016



Source: Sage; Congressional Research Service, "Assistance to Firefighters Program: Distribution of Fire Grant Funding". Author: Lennard G. Kruger, Specialist in Science and Technology Policy.

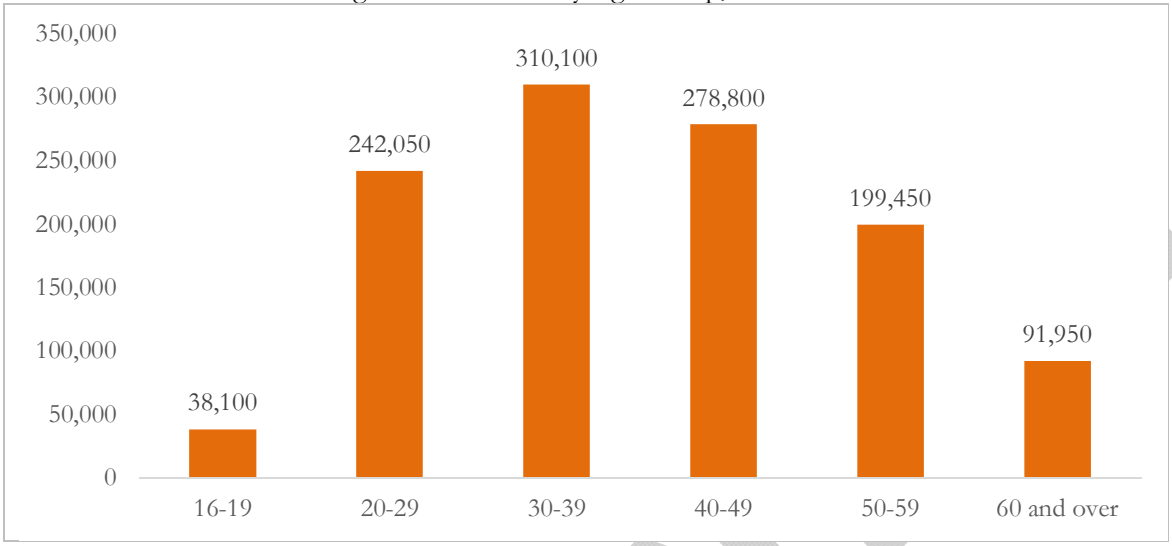
Exhibit A6. Assistance to Firefighters Grants (AFG) Awarded by State, 2005-2016

State	AFG Grants ($ Millions)			
	FY2005-2010	FY2011-2016	Net Chg.	% Chg.
Alaska	$8.81	$4.94	-$3.88	-44.0%
Alabama	$120.66	$90.92	-$29.74	-24.6%
Arkansas	$46.29	$19.74	-$26.55	-57.4%
Arizona	$29.91	$26.50	-$3.40	-11.4%
California	$133.82	$128.91	-$4.92	-3.7%
Colorado	$26.00	$18.85	-$7.15	-27.5%
Connecticut	$34.72	$22.88	-$11.84	-34.1%
District of Columbia	$2.37	$2.47	$0.10	4.1%
Delaware	$4.55	$5.13	$0.58	12.8%
Florida	$64.87	$61.74	-$3.13	-4.8%
Georgia	$51.26	$32.95	-$18.31	-35.7%
Iowa	$57.87	$24.22	-$33.65	-58.1%
Idaho	$19.62	$9.57	-$10.06	-51.2%
Illinois	$129.85	$66.73	-$63.12	-48.6%
Indiana	$83.09	$31.58	-$51.50	-62.0%
Kansas	$31.32	$15.98	-$15.34	-49.0%
Kentucky	$78.95	$38.26	-$40.69	-51.5%
Louisiana	$43.56	$27.84	-$15.72	-36.1%
Massachusetts	$63.70	$60.27	-$3.44	-5.4%
Maryland	$42.14	$31.11	-$11.03	-26.2%
Maine	$28.03	$13.24	-$14.79	-52.8%
Michigan	$89.31	$74.47	-$14.84	-16.6%
Minnesota	$95.47	$40.78	-$54.70	-57.3%
Missouri	$71.83	$41.81	-$30.03	-41.8%
Mississippi	$47.65	$20.28	-$27.37	-57.4%
Montana	$32.88	$7.29	-$25.58	-77.8%
North Carolina	$110.13	$64.78	-$45.36	-41.2%
North Dakota	$15.65	$4.34	-$11.31	-72.3%
Nebraska	$23.06	$9.93	-$13.13	-56.9%
New Hampshire	$18.14	$13.00	-$5.15	-28.4%
New Jersey	$78.73	$49.61	-$29.12	-37.0%
New Mexico	$9.43	$6.84	-$2.59	-27.5%
Nevada	$7.31	$5.13	-$2.18	-29.8%
New York	$159.28	$88.15	-$71.13	-44.7%
Ohio	$159.43	$124.72	-$34.71	-21.8%
Oklahoma	$44.47	$13.07	-$31.40	-70.6%
Oregon	$46.00	$23.87	-$22.14	-48.1%
Pennsylvania	$222.00	$152.80	-$69.19	-31.2%
Rhode Island	$10.40	$18.73	$8.33	80.1%
South Carolina	$59.99	$36.91	-$23.08	-38.5%
South Dakota	$14.38	$5.88	-$8.50	-59.1%
Tennessee	$79.86	$42.57	-$37.28	-46.7%
Texas	$109.07	$44.77	-$64.31	-59.0%
Utah	$13.99	$16.97	$2.97	21.2%
Virginia	$53.84	$31.22	-$22.63	-42.0%
Vermont	$9.06	$6.14	-$2.92	-32.2%
Washington	$75.94	$48.84	-$27.10	-35.7%
Wisconsin	$91.07	$35.58	-$55.49	-60.9%
West Virginia	$40.79	$24.08	-$16.71	-41.0%
Wyoming	$7.41	$1.80	-$5.61	-75.7%

Source: Sage; Congressional Research Service, "Assistance to Firefighters Program: Distribution of Fire Grant Funding". Author: Lennard G. Kruger, Specialist in Science and Technology Policy.

Characteristics of Firefighters in the U.S.

Exhibit A7. Number of Firefighters in the U.S. by Age Group, 2015



Source: 1. Sage; 2. National Fire Protection Association (NFPA). "U.S. Fire Department Profile-2015". April 2017

Exhibit A8. Median Rates of Career Firefighters per 1,000 People by Region and Population Protected, 2015

Source: 1. Sage; 2. National Fire Protection Association (NFPA). "U.S. Fire Department Profile-2015". April 2017.

FIRE APPARATUS MANUFACTURERS' ASSOCIATION

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