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## The Effects of 9/11 on the Fire Fighter Labor Market

### Abstract

The purpose of this study is to look at this apparent increase in demand for fire protection services in the theoretical framework of derived demand. The theory of derived demand tells us that the demand for labor in a certain field is determined by the demand for the goods or services produced by that labor (Freeman, 1972). More specifically, we should expect to see a shift to the right of the demand curve for fire protection services since September Eleventh. This should lead to greater employment levels and higher wages in the labor market for fire fighters.

# The Effects of 9/11 on the Fire Fighter Labor Market

*Kathleen Frawley*

*"I have no ambition in this world but one, and that is to be a fireman. The position may, in the eyes of some, appear to be a lowly one; but we who know the work which the fireman has to do believe that his is a noble calling. Our proudest moment is to save lives. Under the impulse of such thoughts, the nobility of the occupation thrills us and stimulates us to deeds of daring, even of supreme sacrifice."*  
~Chief Edward F. Croker, FDNY (*American-Firefighter.com*)

## Introduction

On September 11, 2001, the threat of terrorism became real as the United States of America found itself amidst the devastation and destruction of the worst terrorist attack to ever occur on American soil. While news channels showed images of hundreds of survivors running for their lives away from the crumbling World Trade Center towers, it was the fire fighters in the New York City area that were the first to respond and run in the opposite direction—toward the danger and ruins—to pull those still hanging on to life out of the burning buildings and put out the flames.

Now, in the post-September 11th world that we live in, fire fighters are expected to do even more to save the lives of American citizens all over the country. As stated in the International Association of Fire Fighters' (IAFF) *Fire Fighter Issues Book – 108<sup>th</sup> Congress First Session*, "Terrorism places additional pressures on the acute staffing shortage. In the past, fire fighters responded to isolated incidents. In this new world, our fire and emergency medical services need to be prepared for a coordinated, well-orchestrated series of attacks on American citizens" (IAFF, 2003).

This means that, while fire fighting is already considered by the American Heart Association as one of the top twenty-five occupations in causing stress, there are now additional demands for fire protection services being placed on these fire fighters (Hoover, 1996).

The purpose of this study is to look at this apparent increase in demand for fire protection services in the theoretical framework of derived demand. The theory of derived demand tells us that the demand for labor in a certain field is determined by the demand for the goods or services produced by that labor (Freeman, 1972). More specifically, we should expect to see a shift to the right of the demand curve for fire fighters from the increased demand for fire protection services since September Eleventh. This should lead to greater employment levels and higher wages in the labor market for fire fighters.

Section II gives the background of the increased demand for fire protection services since September Eleventh. Section III will follow by presenting the theory of derived demand. This will set up the hypothesis that employment numbers and wages for fire fighters should have increased after September Eleventh from the increased demand for fire protection services causing a rightward shift in demand for fire fighters. Section IV will lay out the model and data that will be used to test this hypothesis, and Section V will examine the results obtained by testing our model so that we can draw conclusions and policy implications from them. Such implications could be quite useful to the Department of Homeland Security as well as local governments as they work to improve the preparedness of first responders to respond to and recover from potential acts of terrorism.

### **I. Background: A Post-9/11 Increase in Demand for Fire Protection Services**

It is argued here that there has been an increase in the demand for firefighters as a result of September Eleventh. In the months following the September Eleventh attacks, the Bush Administration created the Department of Homeland Security and announced its plan to use this new department's budget to accomplish five main objectives. One of these objectives was to support first responders in their preparation for future acts of terrorism. The federal government planned to execute this through grants to state and local governments (Hobijn, 2002). The Office for Domestic Preparedness was incorporated under the Department of Homeland Security to provide grants to train fire fighters to respond to a variety of terrorism incidents (chemical, biological, radiological, nuclear and explosive) (IAFF, 2003). In 2002, the federal budget offered \$4.8 billion for local first responder and bioterrorism preparedness (Hobijn, 2002). In 2003, \$2.2 billion in grants was set aside for new equipment and technology for first responders. For fiscal year 2004, the First Responder Program was proposed as a way for the federal government to fund planning, training, equipment needs and exercises (IAFF, 2003).

This kind of funding for preparation indicates that these first responders would have to learn to provide more than their current level of services. The Federal Emergency Management Agency (FEMA) expects fire fighters to be able to respond to larger scale chemical or biological incidents and building collapses, but found in 2002 that only thirteen percent of departments were able to handle a chemical or biological attack in which ten or more people were injured and only eleven percent were prepared to respond to a building collapse involving more than fifty occupants (Hall, 2004). According to the Associate General President of the IAFF, Kevin O'Connor, in his testimony before Congress in April of 2005, the current National Response Plan holds that all emergency incidents within the United States should be dealt with at the lowest

possible jurisdictional level (O'Connor, 2005). This means that fire fighters must be prepared to handle any and all national emergencies; terrorist, natural or otherwise. Fire fighters must be able to address all hazards, not just fires (O'Connor, 2005).

The World Trade Center and Pentagon incidents were also evidence that emergency incidents are no longer simply local matters. Instead, many potential emergencies are on a national scale and require response by several fire departments from many jurisdictions (IAFF, 2003). Past studies have found that there is a statistically significant difference between fatal and non-fatal incidents "in the average distance from an incident of the closest responding companies" (Rider, 1979). Greater fire protection implies a reduction in the number of fatalities, which in turn implies more fire departments in order to ensure that one is close to any emergency incident that may occur and that others are nearby to assist. To have more fire departments, there must be more fire fighters. In his study on the distribution of fire protection services, Kenneth Rider states that, "The more fire companies a city maintains, the better the chances that if a new incident breaks out a fire company will be available nearby to respond." Companies that are not needed for a particular call will still be available to respond to additional calls, "providing coverage" (Rider, 1979). In order to provide this backup coverage, there must be more fire fighters employed so that there can be a full and efficient response to all calls.

In the post-September Eleventh world, the demand for fire protection services has clearly increased. Not only are fire fighters expected to provide an increased variety of fire protection services as indicated by the additional funding that has been set aside for new equipment, exercises and training, but they are also expected to maintain their old responsibilities and increase coverage. In addition, fire fighters cannot simply be sent away from their shift for the day to participate in training. When a fire fighter is absent for training, another fire fighter is needed to fill that position

and respond to calls (O'Connor, 2005). All of this increased demand stems from the goal of making first responders better prepared to respond to future incidents of terrorism so that the American people are protected. However, many fire chiefs in cities all over the country are reporting that without more staff to cover these additional services, first responders will be unprepared to respond to future incidents and citizens will be left dangerously unprotected (Hall, 2004).

## II. Theory

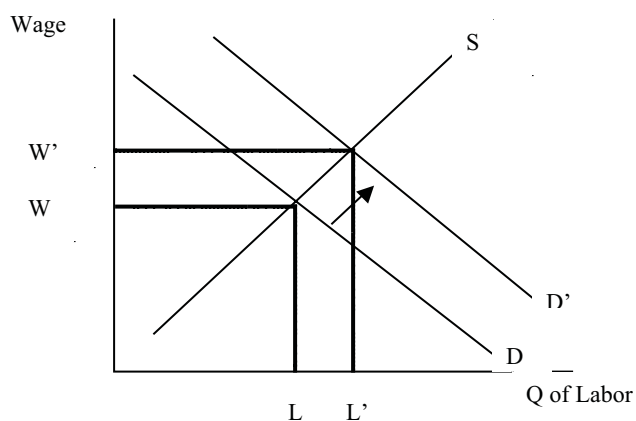
Increased demand for fire protection services and coverage is translated into higher employment levels and wages through the theory of derived demand in the labor market. As Richard Freeman states in *Labor Economics*, "The demand for labor is different from that for commodities. In the first place, employers [usually] do not hire labor for the intrinsic pleasure of having employees, the way consumers purchase goods or services. Workers are hired because they help produce goods for consumers" (Freeman, 1972). Demand for labor is derived from the demand for the goods or services that labor produces. When "demand for goods changes, all else being equal, the demand for labor changes in the same direction" (Freeman, 1972). Therefore, as the demand for fire protection services increases, *ceteris paribus*, the labor demand curve for fire fighters should shift to the right, increasing the equilibrium employment and wage levels (as illustrated in Figure 1).

The theory of derived demand appears to hold true for fire services as goods and fire fighters as labor. Since demand for fire protection services increased after September Eleventh, "the foremost need of the fire service is adequate personnel" (IAFF, 2003). The International Association of Fire Fighters estimated in 2003 that 75,000 new fire fighters were still needed to fulfill post-September Eleventh demands (IAFF, 2003). The Congressional Research Service has reported that while local responders have taken on a larger role in "homeland security activities," without an increase in personnel, they will "have difficulties

performing day-to-day operations and responding to homeland security emergencies" (Reese-CRS, 2005). This increased need and demand for fire personnel is derived from the increased demand for the services that these fire personnel provide. Kenneth O'Connor of the IAFF seemed to summarize why derived demand fits especially well with the fire fighter labor market in his testimony before Congress. O'Connor stated that, "The fire service is not like many occupations in which a person who is receiving training can simply be away from their desk for a day. When a fire department assigns a fire fighters to attend training, that fire fighter's position must be 'backfilled' by another fire fighter" (O'Connor, 2005). In the field of fire fighting, you cannot continue to increase the demand for the labor's services without increasing the number of personnel. If more personnel are not added, the fire fighters that are employed will not be able to take full advantage of the training and equipment being presented to them through federal grants (Grossman, 2003). Fire fighters will not be prepared to meet the post-September 11th demand.

While the fire fighter labor market seems to fit the theory of derived demand especially well, there is a problem that presents itself. In the field of fire fighting, there are both paid professional and volunteer fire fighters. When looking at the demand for more fire fighters, we must determine which group of personnel to examine. In their study, Alexia Brunet, Larry DeBoer, and Keven

Figure 1: Derived Demand



McNamara ask the question, “What determines a community’s choice between volunteer and professional fire protection?” (Brunet, 2001). The authors state that, “Volunteer and professional costs differ primarily in the pay, recruitment, training, and administration costs of fire fighters. To increase the level of fire protection, more fire fighters must be employed and paid” (Brunet, 2001). There is evidence that while volunteer departments are more cost effective for lower levels of fire protection, professional departments are more cost effective when more fire protection services and quicker response times are demanded (Brunet, 2001).

Because September Eleventh has produced an increased demand for more fire protection services, quicker response times and more coverage, the increase in employment should come in the form of an increased number of paid fire fighters. The increase in skills required to provide more services and expanded coverage also suggests an increase in demand for full-time, paid, and highly trained fire fighters. Therefore, in this study, we will assume a shift to the right in the derived demand for paid fire fighters, allowing us to hypothesize an increase in employment levels and wages. Since fire protection services are a public good, it must also be noted that our model is based on the assumption that political processes are working efficiently so that notional demand has become effective demand. With this assumption, the derived demand theory leads directly into our hypotheses that since September Eleventh, the increased demand for fire fighters caused a significant increase in wages and employment levels for fire fighters across the United States.

### **III. Empirical Model**

The hypotheses will be tested in two parts. The first part will be more of a visual test, while the second part will be statistical. In order to set these tests up, data was obtained from the United States Bureau of Labor Statistics (BLS) and *Congressional Quarterly’s State Fact Finder (1998-2004)*. BLS has created a database of wages

by occupation and region. From this database, state level statistics on wages and employment for fire fighters (category does not include fire investigators) have been pulled for the years 1998 through 2004. BLS’s job description for fire fighter is defined as follows:

“Control and extinguish fires. Protect life and property. Maintain equipment as employee of city, township, or industrial plant. Respond to fire alarms, direct stream of water or chemicals onto fire, position and climb ladders. May inspect buildings for fire hazards and compliance with fire prevention ordinances, issue forms to building owners listing fire regulation violations, drive and operate firefighting vehicles and equipment. May be assigned duty in marine division of fire department” (BLS.gov).

Among the reported statistics for fire fighters are number of fire fighters employed and average hourly wage.

The first way in which this data will be used to test our hypothesis is by setting up national aggregate graphs. For employment, the national average number of fire fighters will be charted over the years 1998 through 2004. For wage, the national average hourly wage will be charted over the same years. From these graphs, we will be able to see if there has been a steeper increase in the number of fire fighters and/or fire fighter wages since September 11, 2001. In other words, we will expect to see steeper increasing slopes in the years 2002 through 2004.

The second test of our hypothesis consists of two OLS linear regression models. The first model will be set up for employment and the second model will be set up for wage. By using these models, we can control for factors ignored in the graphs. Past studies have found that it is more difficult to achieve a certain level of fire protection when there is a large population in an area (Brunet, 2001). Therefore, our employment model will include state population as a control. An increase in wage leads to increased employment as



well, so fire fighter real wages (adjusted using CPI measure) will be added as a control. It would also make sense that as average real income in a state increases, average real wage for fire fighters will increase. In order to control for this effect, the wage model will include average state real income. Because both of these variables could cause an increase in either fire fighter employment or wage respectively, a positive coefficient is expected for each. Additionally, forty-nine dummy variables for the individual states will be included in both equations in order to control for differences between states. For example, the first dummy variable will assign Alabama a value of one and all of the other states a value of zero. The signs on these variables are not important to our study; the goal is simply to weed out any differences in fire fighter employment and wages that may be attributed to differences between states and that are not already controlled for by the other variables in each equation.

Since our goal is to see if wages and the number of fire fighters have increased after September Eleventh, our models must include a way to test for this. The solution is to use a dummy variable for “pre” versus “post” September Eleventh. Because the effects of September Eleventh would manifest themselves starting in the following year’s data, the data for 2001 will be coded as “pre 9/11,” indicated by a value of zero. The years 1998 through 2000 will also be coded with a zero as pre-September Eleventh years and the years 2002 through 2004 will be coded with a one for the years after September Eleventh. The coefficients for these variables should be positive if the demand curve in the fire fighter labor market truly has shifted to the right since the terrorist attacks. With this dummy variable and the control variables, the two equations will be set up as follows:

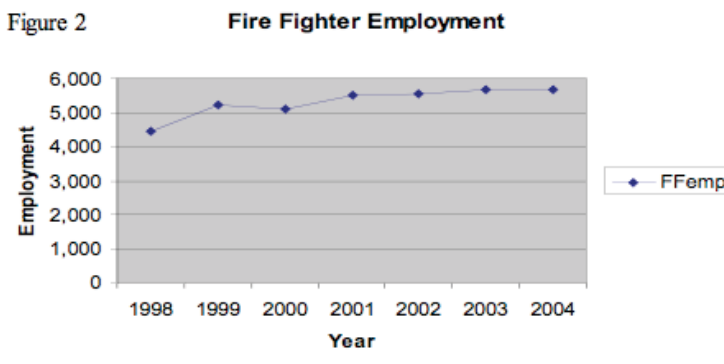
1)  $FFemp = \alpha + \beta_1 PostElev + \beta_2 Pop + \beta_3 FFwage + \mu$   
 (49 State controls will also be included in this equation)

2)  $FFwage = \alpha + \beta_1 PostElev + \beta_2 Income + \mu$   
 (49 State controls will also be included in this equation)

#### IV. Results

##### TEST 1

The initial test of the hypotheses is a visual analysis. From the state level data, a national average was obtained for each year. In Figure 2, the national averages for firefighter employment are graphed over the years 1998 through 2004. What we find is that while there was some fluctuation in fire fighter employment levels prior

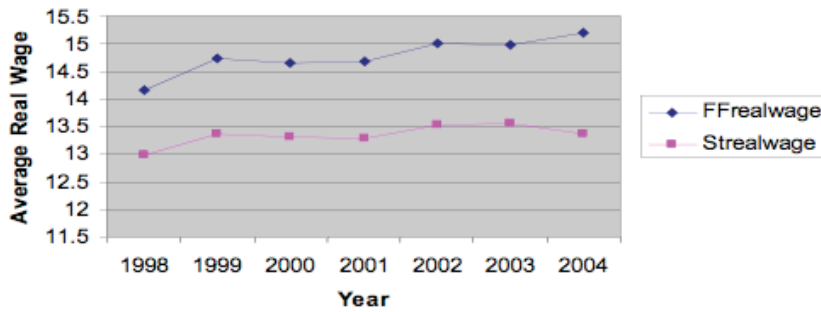


to 2001, levels have flattened out since. By looking just at this, it appears that September Eleventh did not have any major effect on employment levels. The increase in demand since the terrorist incidents that was evident in the literature has not been met with increased employment.

Graphing the national average for fire fighter wages (adjusted for inflation) along with the national average wage in general (adjusted for inflation) over the years 1998 through 2001, we come to a similar conclusion. **Figure 3** shows that while the fire fighter wage remained slightly above the general wage, it followed the general wage pattern closely for all years except 2001-2002 and 2003-2004. From 2001 to 2002, the increase in fire fighter wage appears to be greater than the increase in state average wages. In 2004, there appears to be a slight variation with fire fighter wage increasing and general wage decreasing. Neither of these variations appears to be very large, however, they are important to note. The

Figure 3

Real Wages



slight increase in wage seen from 2001-2002 and 2003-2004 may be a result of compensating wage differentials. Locales may be forced to increase fire fighter wages a small amount simply to retain current personnel facing greater risks and higher levels of stress. If this is the case, then we are still failing to see an increase in wage due to increased derived demand since September Eleventh. The derived demand curve has not shifted out to the right as seen by the lack of increased employment and only slight variations in wage levels. This means that although a post-9/11 increase in demand for fire fighters is evident in the literature, graphs of the national average number of fire fighters and national average fire fighter wages over years preceding and following 2001 do not show effects of such a shift in demand.

**TEST 2**

The results from the second test of the hypotheses tell more of the story. **Table 1** shows the results of four different regression models that were run for fire fighter employment.

From **Table 1**, we can see that even though Models 1 and 2 contain control variables for each state (making them fixed effect models) and Models 3 and 4 do not, all of the models for fire fighter employment explain a large amount of the variance in

employment levels. However, it is also quite clear that the “population” variable is doing most of the explaining. “Population” is the only variable in any of the models that is significant at the .001 level. The only other variable that is significant at all is fire fighter real wage in Model 3. Even then, the sign is the opposite of what we would expect, telling us that as fire fighter real wage

increases, employment decreases. This indicates that the derived demand curve did not shift to the right, because if it had, employment and wage would have increased together.

The most remarkable finding in **Table 1**, however, is that in all four of the models, the “PostSept11” variable is insignificant. This reinforces the visual conclusions in telling us that even though the literature suggests an increase in demand for fire fighters since September Eleventh, that demand has not been met. The derived demand curve has not shifted to the right to meet notional demand. Instead, it appears that the increase in demand due to anything other than population has been ignored. Employment levels are responding only to natural population growth which has nothing to do with the September Eleventh attacks and the increased demand for greater fire protection after them.

The next step is to look at the regression

Table 1: Fire Fighter Employment Regressions (t statistics in parentheses)

Variable	Model 1 (fixed)	Model 2 (fixed)	Model 3	Model 4
PostSept11	185.651 (1.303)	200.581 (1.434)	230.001 (.951)	185.595 (.765)
Population	.001*** (3.932)	.001*** (3.901)	0.001*** (39.984)	.001*** (43.258)
FFWage	3.628 (.060)		-108.21** (-2.607)	
Adj. R2	0.958	0.958	0.849	0.846
n	339	340	339	340

\* indicates significance at .05 level  
 \*\* indicates significance at .01 level  
 \*\*\* indicates significance at .001 level



Table 2: Fire Fighter Wage Regressions (t statistics in parentheses)

Variable	Model 1 (fixed)	Model 2
	.544***	.404
PostSept11	(4.405) -.114	(1.178) .455***
StWage	(-1.335)	(4.274)
Adj. R2	0.882	0.051
n	343	343

\* indicates significance at the .05 level

\*\* indicates significance at the .01 level

\*\*\* indicates significance at the .001 level

results for fire fighter wages to see if they also indicate a failure to meet increased demand for fire fighters. The results for the two fire fighter wage models are presented in Table 2.

When looking at the results in this table, we see that there is a great difference between the adjusted R<sup>2</sup> for each model. This is because **Model 1** is a fixed effect model - containing all of the state controls (dummy variables for 49 states). The difference in adjusted R<sup>2</sup> indicates that these state controls are responsible for most of the variance in fire fighter real wage being explained in **Model 1**. Once the controls are removed in **Model 2**, the amount of variance explained suffers a great decline. The “PostSept11” variable is significant at the .001 level in **Model 1**. However, the fact that the large R<sup>2</sup> results from the state controls explaining most of the variance, along with the beta value for “PostSept11” being small (.084) in **Model 1** and insignificant in **Model 2**, tells us that the effect September Eleventh had on fire fighter wage is miniscule. The slight increase that we saw in 2002 and 2004 back in **Figure 3** (that could be attributed to compensating wage differentials) may be why we see significance in “PostSept11” in **Model 1**, however, the increase was small and disappeared all together in **Model 2**.

As with the employment models, the fact that the “PostSept11” variable had little effect on fire fighter wage indicates that there has not been a shift in the derived demand curve for fire fighters. Even though the literature shows that there has

been a resounding call for more, better, and an increased variety of fire protection services, leading to an increased demand for fire fighters, the statistics show us that the demand has not been met. While the notional demand is there, the effective demand has not been achieved.

## V. Conclusion

In the wake of the September Eleventh terrorist attacks, American citizens were looking for answers. Among the questions many wanted answers to was, “why were we not prepared?” Since the terrorist attacks on our nation, the demand for more preparedness has led to a greater demand on fire fighters. The literature reveals that citizens are demanding more fire protection services, better response capabilities and that more responsibilities be placed on first responders all over the nation. In order to achieve the level of preparedness and protection being demanded, more fire fighters are needed. Our statistical analysis, however, shows us that this increased demand for fire fighter employment is not being met. In economic terms, there is notional demand that is not being made effective. So, the question is what is keeping this demand from being met?

The apparent answer to this question is government. We cannot assume, as we did in the beginning, that government processes are working efficiently to realize the increased notional demand or make notional demand equal effective demand. As Kevin O’Connor stated in his testimony before Congress, “The bottom line is that far too much of the money allocated by Congress never reaches the front line emergency responders” (O’Connor, 2005). Jeff Grossman reported in the *Homeland Defense Journal Online* in 2003 that, “Much of the \$2.2 billion in grants slated for first responders in President Bush’s \$79 billion emergency wartime spending measure is focused on newer equipment and technologies for first responders.” In the meantime, “recent state and local budget shortfalls – estimated to be between \$70 and \$85 billion this year – have caused some first responder units to lay off personnel” (Grossman, 2003). This

problem of failing to increase the number of fire fighters to meet increased demand is manifesting itself all over the nation. Slight increases possible in a few locales may be counteracted by growing budgetary problems leading to the reductions of fire fighters employed in other cities. *USA Today* in 2004, reported that, “at least two-thirds of the nation’s fire departments are understaffed” (Hall, 2004).

The answer to the problem of failing to meet demand for more fire fighters and even having to cut back on personnel in certain cities’ departments lies in new federal government policies. As of right now, the federal government is willing to pay for training, exercises and new equipment. However, the role of funding fire fighter personnel is left up to cities and locales. With cities already failing to achieve effective demand for more fire fighters and budget cuts only getting worse, it is become painfully evident that locales cannot be left on their own to fully fund fire fighter positions. New federal policies may not even require more money, but simply a redirection of money already in the appropriations bills. Funds can be reallocated from training and equipment to the build up of personnel until adequate levels are met. Assistance in funding or matching grant programs can be established so that locales and the federal government are sharing the costs of hiring new fire fighters. Future research focusing in on per capita statistics and differences between groups of states with similar characteristics could even lead to answers about where exactly funding should go in order to be most effective.

To the federal government’s credit, it has begun the Staffing for Adequate Fire and Emergency Response (SAFER) grant program, but this may not be enough. In a June 9, 2005 *CRS Report For Congress*, it was still being reported that, “State and local government officials and emergency responders have stated that the hiring and retention of personnel is one of their principal homeland security needs” (Reese, 2005).

While increased demand for fire fighter services and therefore fire fighters is evident in

the literature, statistical analysis shows that the increased demand for fire protection services and therefore fire fighters is not being met with increased employment and wages. If the government does not take a serious look at this problem and redirect its policies and funding to solve it, America will not be better prepared and will remain vulnerable to terrorist attacks like the one that took so many lives on September 11, 2001.

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