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The Effect of Downsizing on Attrition Rates in the Department of Defense (DoD)

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THE EFFECT OF DOWNSIZING ON ATTRITION RATES IN THE DEPARTMENT OF DEFENSE (DOD)

THESIS

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Abstract

Downsizing is an organizational activity designed to purposefully reduce the size of the organization by eliminating positions and jobs (Cascio, 1993:96). This business strategy has been used for many years in both the public and private sectors and is expected to continue. Downsizing has been shown to have an affect on the employees the organization retains, often termed survivors, and has been linked to increased turnover and decreased productivity and effectiveness. With the expected continuation of downsizing actions in the Department of Defense (DoD) and the possible affective reactions experienced by survivors, the intent of this research is to identify the effect downsizing has on attrition rates of military personnel to provide insight to leadership in their decision making process when considering downsizing actions across the DoD.

To my husband, son, and parents.
Nothing would be possible without their continual support.

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THE EFFECT OF DOWNSIZING ON ATTRITION RATES IN THE DEPARTMENT OF DEFENSE (DOD)

I. Introduction

> *Resolved, that the commanding officer be and he is hereby directed to discharge the troops now in the service of the United States, except twenty-five privates, to guard the stores at Fort Pitt, and fifty-five to guard the stores at West Point and other magazines, with a proportionate number of officers; no officer to remain in service above the rank of a captain.*
>
> Resolution of the Continental Congress; Disbanding the Continental Army, 2 June 1784 (Department of the Army, 1992:Ch 6, 0)

Chapter Overview

Downsizing is an organizational activity designed to purposefully reduce the size of an organization by eliminating positions and jobs (Cascio, 1993:96). This business strategy has been used in both the public and private sectors for many years and is expected to continue. The long standing usage of downsizing is evidenced in the opening quotation of this chapter where the Continental Congress disbanded the Continental Army after the Revolutionary War. In the recent past, research on this organizational strategy has been plentiful and indicates that downsizing has been shown to have an affect on the employees the organization retains, often termed survivors, and has been linked to increased turnover and decreased productivity and effectiveness.

With the expected continuation of downsizing actions in the Department of Defense (DoD) and the possible affective reactions experienced by survivors, the intent of this research is to identify the effect downsizing has on attrition rates of military personnel to provide insight to leadership in their decision making process when

considering downsizing actions across the DoD. This chapter provides a recent background on downsizing, a discussion of the research purpose, and a brief discussion on the methodology for this research effort.

Recent Downsizing Background

During the troubled economic times of the 1980s and early 1990s, many civilian organizations implemented downsizing as a way of reducing costs (Clair and Dufresne, 2004:1597). In fact, AT&T implemented an incentive plan in 1989 to eliminate 12,000 jobs, an action that resulted in an estimated $450 million in savings per year (Dichter and Trank, 1991:40). Other companies showed the same interest in downsizing and realized similar financial gains. In the early 1990s, after comparing itself to other international chemical companies, Du Pont decided it needed to reduce costs by one billion dollars (Cascio, 1993:96). The cost reductions came partly from an elimination of 2,500 white-collar jobs from its fibers business and another 20% from in-house engineering (Cascio, 1993:96).

Downsizing has also been used to restructure organizations to gain efficiencies or competitiveness (Cameron, 1994:192). In 2006, Ford Motor Company announced that its restructuring plan would include closing ten plants and cutting 25,000 hourly jobs, with an ultimate goal of gaining efficiencies to increase capacity utilization, expand into new markets, and to increase their diminishing market share (Hoffman, 2006:para 1). Another example of such a downsizing purpose occurred following the end of the Cold War where military manning in the DoD decreased by over 700,000, or 33%, and civilian DoD employees decreased by over 300,000, or 37% (Zamparelli, 1999:13). Prior to the end of

the Cold War, the DoD was sized to simultaneously fight and win two major wars on two fronts. After the Cold War, however, the environment changed to smaller, more regional threats (Schwan, 1995:1) This redefinition triggered the need for a smaller force (DoD-a, 2006:V-7).

The trend of downsizing is expected to continue in the DoD, this time however, with shrinking budgets and the need for replacement of weapons systems, the purpose appears to be cost savings. In fact, the 2006 Quadrennial Defense Review (QDR) Report indicates the DoD will continue to downsize, with the Air Force expecting to lose an additional 40,000 positions in the next five years (DoD-b, 2006:47).

Many researchers have explored the affective reactions of survivors following a downsizing action. Devin, Reay, Stainton, and Collins-Nakai (2003:10) found survivors experience feelings of anger, depression, fear, distrust, and guilt. Moreover, these feelings have been linked to several emotional outcomes that include reduced organizational commitment and increased turnover intentions (Spreitzer and Mishra, 2002:719-721). Other factors, such as role overload and lack of role clarity, can be present after a downsizing action and can lead to the same emotional outcomes of decreased organizational attachment and increased turnover intentions (Allen, Freeman, Russell, Reizenstein, and Rentz, 2001:149). While downsizing is meant to purposefully reduce the size of an organization, the dysfunctional or unplanned turnover of those the organization wishes to retain can harm the organization's productivity and effectiveness (Abelson and Baysinger, 1984:331; Cascio, 1993:99-100). Additionally, turnover costs for employees who leave the organization can be substantial; in fact, estimates can be as

high as $186,000 (inflated to 2005 dollars) per employee (Klewer, Shaffer, and Binnig, 1995:12). Moreover, though some organizations downsize as a managerial strategy to help reduce costs and increase productivity, most organizations experience the opposite effect (West, 2000:7).

Research Purpose

Because downsizing is expected to continue in the DoD (DoD-b, 2006:47), this research will analyze the effect downsizing has on the attrition rates of military personnel in the years following a downsizing action. Specifically, this research will analyze attrition rates and military end strengths by fiscal year to determine whether, in the years following a downsizing action, attrition rates will increase. The question will be addressed for the overall DoD and each branch of service to compare differences based on these categories.

Methodology

To complete the proposed research in the DoD setting, authorizations, end-strengths, and attrition rates, by service and grade, were retrieved from the Defense Manpower Data Center (DMDC). Data for control variables used in the analysis were retrieved from the Bureau of Labor Statistics (BLS), the Military Officer Association of America (MOAA), and Public Affairs and research offices for the services. A panel regression analysis was performed on this data to determine the effects of downsizing on attrition rates in the DoD.

Chapter Summary

As discussed**,** downsizing has been used as a business strategy in both the public and private sectors for many years and is expected to continue. Downsizing has been linked to increased dysfunctional turnover and such unexpected turnover can cost organizations substantial dollars. Because of the possibility of unexpected turnover in the DoD based on its downsizing decisions, as well as the large costs of such unexpected turnover, this research is intended to identify the effect downsizing has on future attrition rates of military personnel. To accomplish this task, this paper will continue with a review of related literature, followed by a more detailed discussion of the methodology and a presentation of the data, an interpretation of the results, and a conclusion to summarize the findings of the analysis and suggest areas for future research.

II. Literature Review

Chapter Overview

The literature on downsizing is plentiful, ranging from unsupported advice on how to downsize to empirical studies on organizations that have downsized. Since the purpose of this research is to study the effect downsizing has on attrition rates of military personnel in the years following a downsizing action, this chapter will give an overview of the downsizing literature with a brief discussion on why firms downsize, followed by a focus on the implications of downsizing on survivors and the organization, a section on the effects of downsizing in a military setting, and a discussion regarding how this research is linked to the civilian sector.

Why Organizations Downsize

Downsizing is thought to reduce costs, improve efficiencies, and improve competitiveness (De Meuse, Bergmann, Vanderheiden, and Roraff, 2004:156). Because of this, it has been used as a business strategy for many years (Lurie, 1998:6-7). Prior to the late 1980s, downsizing was used primarily as a response to survive an economic crisis (Gandolfi and Neck, 2003:16; Lurie, 1998:7). In the 1990s, however, companies who were financially strong were also downsizing (Lurie, 1998:6). Downsizing in profitable firms can perhaps be explained because organizational downsizing is said to have a positive impact on the firm's financial performance by eliminating inefficient processes and reducing labor costs (De Meuse and others, 2004:158). Moreover, it is commonly thought that the firm will increase its profitability by implementing a downsizing strategy even if the firm is already profitable.

Empirical results in the literature, however, seem to be inconsistent on this ruling. Studies have shown that increases in financial performance are not always enjoyed by firms that downsize. In 1998, for example, Cascio found that several companies' financial performance in the Standard and Poor's 500 did not appear to change dramatically, positively or negatively, based on downsizing actions (Cascio, 1998:69). In another study, results showed "the market generally viewed downsizing actions negatively because of concerns that losses from human capital will exceed the benefits gained from lower costs" (Nixon, Hitt, Lee, and Jeong, 2004:1128). Yet another study found that while company performance was worse in the two years following a downsizing, long term performance was likely to improve beginning in the third year (DeMeuse and others 2004:172).

Even with inconsistent financial performance results, downsizing has become part of corporate culture and organizations continue to downsize. The Department of Defense (DoD) is no different. The organization has reduced its manpower by more than 33% since the end of the Cold War (Zamparelli, 1999:13) and it is continuing to use downsizing as a business strategy. DoD leaders are currently motivated to apply this strategy because there is a need to transform the services due to changing threats and fewer dollars available for modernization (DoD-b, 2006:V-7). As shown in Figure 1, some researchers believe the reduction in dollars available for modernization, aging equipment, and rising operations and maintenance costs are requiring the DoD to utilize money-saving strategies in order to avoid a decline in future readiness (Anderson, McGuiness, and Spicer 2002:93). As discussed in the 2006 Quadrennial Review Report (QDR), downsizing appears to be one of the ways the DoD is going to realize these

savings to redirect resources for modernization (DoD-b, 2006:V-7). Table 1 shows the expected outlays by appropriation in the DoD for 2006 and 2007 (other specific appropriations by year are not yet available). As shown, there is an expected decrease in personnel outlays from 2006 to 2007, with an accompanying increase in procurement and research, development, test, and evaluation dollars.

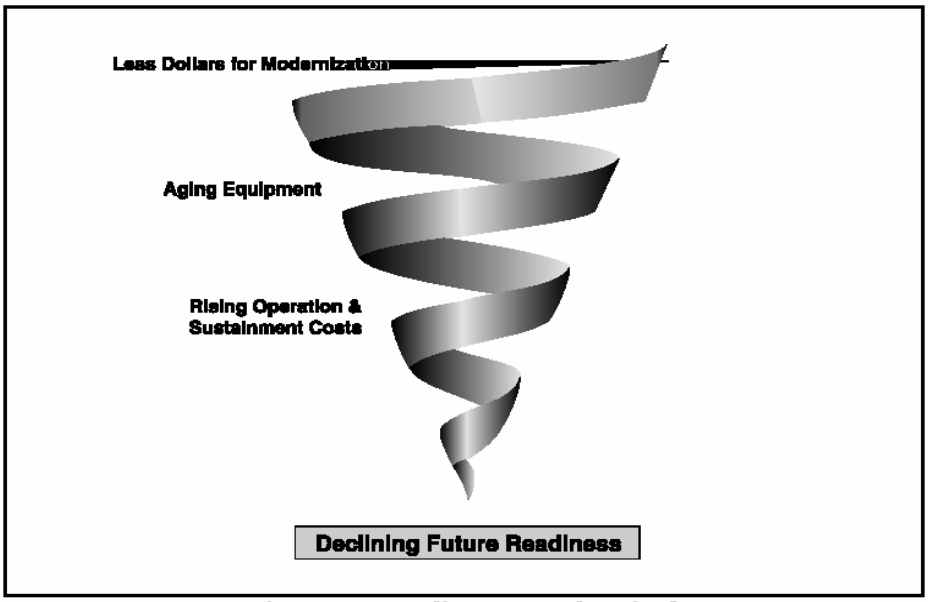

Figure 1. DoD Readiness Death Spiral. (Anderson and others, 2002:93).

Table 1. Outlays by Function and Subfunction

Outlays by Function and Subfunction		
	2006	**2007**
Military Personnel	**116,346**	**109,892**
Operation and Maintenance	192,563	161,514
Procurement	**88,754**	**89,734**
Research, Development, Test, and Evaluation	**70,766**	**72,112**
Military Construction	7,322	8,326
Family Housing	3,824	3,868
Anticipated funding for Global War on Terror	30,058	55,882
Other	2,420	3,526
	514,059	***504,854***
Shown in millions; Estimates of outlays for 2006 and 2007		

Source: Office of Management and Budget, 2007:60

Implications of Downsizing

When coupled with downsizing's inconsistent financial performance results, there may be longer term organizational issues that arise because of the possible negative effects on the survivors left in the organization (Cascio, 1993:99-100; Palmer, Kabanoff, and Dunford, 1997:623-624). These effects have been studied by many researchers and evidence shows that survivors may experience increased anxiety and stress, and decreased organizational commitment, morale, motivation, and productivity (Allen and others, 2001:148-149; Cascio, 1993:99-101; Godkin, Valentine, and St. Pierre, 2002:66; Spreitzer and Mishra, 2002:719-721). Research also shows that these reactions are linked to decreased attachment and an increased intent to turnover (Allen and others, 2001:148-149; Spreitzer and Mishra, 2002:719-721). Furthermore, such turnover can cost an organization thousands per employee (Darmon, 1990:53; Klewer, Shaffer, and Binnig, 1995:12).

Mishra and Spreitzer (1998:572-573) developed a theoretical framework to explain survivor reactions. This framework posits that when survivors appraise downsizing as a threat, where their perceptions indicate the downsizing action is unfair, their reactions are less positive. This can be countered by helping the individuals cope with the downsizing, through empowerment and work redesign initiatives. (Mishra and Spreitzer, 1998:572-573). Spreitzer and Mishra (2002: 710) tested this framework empirically, showing predictors of survivor attachment as trustworthiness of management, empowerment, and justice. These levels of attachment were significantly related to actual turnover (Spreitzer and Mishra, 2002:719-721).

In a similar study, Allen and others applied work role transition theory to explain survivor reactions over time (2001:147). Work role transition can be described as changes in position requirements or context such as job redesign, change of boss or co-workers, or inter and intra-organizational mobility (Allen and others, 2001:147). Though work role transitions such as job redesign can be positive based on the perception of the survivor (Spreitzer and Mishra, 2002:714), role overload and lack of role clarity that may accompany the redesigns in a downsizing setting can have a negative effect (Allen and others, 2001:149). By measuring variables such as role clarity, role overload, job involvement, satisfaction with top management, and satisfaction with job security, Allen and others found that employee attitudes were less favorable and that such attitudes related to a higher intent to turnover in the time immediately following a downsizing (2001:159).

If the employee does in fact decide to leave the firm, turnover costs can be very expensive for the organization. In a study published by Darmon, it was shown that costs related to turnover can include exit interviews, severance pay, recruiting, training, differential operating costs, and differential skill costs (1990:48). Additionally, it was estimated that turnover costs the company $75,000 per employee (inflated to 2005 dollars). Estimates of turnover costs will vary based on factors such as position and skill level required, and other literature suggests that turnover costs can be as high as $186,000 per employee (inflated to 2005 dollars) (Klewer and others, 1995:12).

In sum, the research has suggested that downsizing creates a greater level of disenchantment among employees and these employees consider leaving the organization. Indeed, such intentions to turnover have been shown to be a strong

predictor of actual turnover, though actual intent-behavior relationships vary widely across studies (Griffeth, Hom, and Gaertner, 2000: 465-476). Fortunately, when these intentions are triggered with a downsizing event, they may not persist. Allen and others found that the period of increased turnover usually lasts approximately one year following the downsizing action, at which point survivor attitudes may begin returning to their pre-downsizing levels (2001:159). Still, there is a period where organizations appear to lose quality employees that would otherwise be retained and risk thousands in turnover costs.

Effects in a Military Setting

Based on the theories that have been highlighted, it would be reasonable to think that military members might respond to downsizing experiences in a similar fashion. According to a recent survey, job security is the number two reason, preceded only by benefits, that federal employees plan to stay on their jobs (Gansler and Lucyshyn, 2004:19). With job security as a key prospect for federal employees, it is additional confirmation that similar survivor reactions could be expected.

Other military challenges may alter the effects of downsizing in the DoD. One of these challenges is the increase in the frequency of military deployments. For example, in 1999, an average of 12,000 Airmen were deployed per day as compared to an average of 2,000 per day in 1989 (Zamparelli, 1999:13). The frequency of these deployments increased, while strength levels in the Air Force, for example, decreased by 210,000 during the same time (DoD-a, 2006:1). Intuitively, a reduced force, coupled with more frequent deployments, may serve to complicate mission accomplishment because

commanders may be forced to multi-task their personnel in order to attempt to get the mission accomplished. Thus, survivors are left performing multiple and conflicting roles, often resulting in stress, burnout, and turnover (Rusaw, 2005:482). Such work role transition issues experienced by the survivors that result from downsizing have been related to decreased organizational commitment and increased turnover intentions (Allen and others, 2001:149).

While downsizing in the military has not been studied explicitly, other work role transition events, such as those brought on by outsourcing in the military, have been shown to reduce job satisfaction and ultimately correlate to an increase in turnover intentions (Kennedy, Holt, Ward, and Rehg, 2002:23). Additionally, replenishment of trained personnel could also be a problem in that "legislative constraints often make it difficult to replace employees in a timely manner" (Kennedy and others, 2002:24).

Link to Current Research

The theories presented in the empirical research of civilian firms have been analyzed in the current research with an aggregate quantitative retrospective look at the DoD's downsizing events and comparing those events to aggregate attrition rates in the years following the event. Using the theories presented as a guide, it was expected that DoD reactions to downsizing would closely relate to those in the private sector. It is important to note that besides issues related to replenishing the workforce, the DoD is different than the private sector in that military members incur service commitments. Civilian employees often have far more choices regarding the time they leave an organization. In contrast, military members are obligated to serve a specified period of time where leaving may be prohibited. As discussed previously, Allen and others found

that the increase in turnover following a downsizing lasts approximately one year and if the service member's commitment requirement extends beyond this period, it may skew the results of this analysis by lowering the attrition rates. Still, based on the possibility of the unplanned, or dysfunctional loss of human capital and its possible affects on mission accomplishment, effectiveness, productivity (Abelson and Baysinger, 1984; Rusaw, 2005) and increased turnover costs (Darmon, 1990:53; Klewer and others, 1995:12), this research hopes to offer insight into changes in DoD attrition following downsizing actions.

Chapter Summary

This chapter has focused on the why firms downsize, the implications of downsizing, and the effects of downsizing in the military setting. Since downsizing is expected to continue despite its questionable financial implications and effects on employees (Cascio, 1993:102; Palmer and others, 1997:623-624), the remainder of this paper will focus on answering the research question and attempt to determine the effect of downsizing on attrition rates in the DoD by discussing the methodology and data, the results of the empirical analysis of DoD's past downsizing and attrition, followed by conclusions and recommendations.

III. Data and Methodology

Chapter Overview

This chapter presents the data and methodology used to answer the research question of how downsizing affects attrition rates in the DoD. The discussion includes the sources of the data and how it was used in the analysis, control variables utilized, the pre-estimation stationarity test and model specification, and the limitations of this research.

Data

To complete the proposed research in the DoD setting, end-strengths and attrition rates were retrieved from the Defense Manpower Data Center (DMDC). Data for control variables used in the analysis were retrieved from the Bureau of Labor Statistics (BLS), the Military Officer Association of America (MOAA), and Public Affairs and research offices for the services.

All data were gathered from 1974-2005. Because the draft ended in 1973 (Gullason, 1989:291), the analysis begins with 1974 to avoid skewing the results based on involuntary service and lack of attrition choices. According to the DMDC, actual authorization rates, which more closely fit the definition of downsizing presented in Chapter One, were not available prior to 1996. Attempts were made to collect such data from the services' archives, but the data were also not available from those sources. Though actual authorizations would present more accurate analysis in tune with the definition of downsizing presented in Chapter One, only ten years of data could be analyzed. As a result, end-strength levels from after the end of the draft, which were

available for 31 years, were used to determine downsizing events since they should closely mirror personnel authorizations provided by Congress. Intuitively, the effects of a reduction in manpower would be similar regardless of the source of the reduction. Downsizing, therefore, was characterized in this analysis as the difference in the overall end-strength for the fiscal year in question from the previous fiscal year. Attrition rates were defined as the number of personnel from each category who left the military in one year, divided by the total end strength at the end of the previous fiscal year.

Control Variables

To attempt to isolate the possible causation effects of downsizing on attrition rates, stop-loss, economic conditions, and additional military pay raises were used as control variables in this analysis. This data was gathered from Bureau of Labor Statistics (BLS), the Military Officer Association of America (MOAA), and Public Affairs and research offices for the services.

Stop-loss is a program in the military where persons in specific job classifications (and at times, all job classifications), are prevented from leaving the military even if service commitments have been completed (Burgess, 2004: Para 2). The authority for this program comes from Title 10 of United States Code, Section 12305 (U.S. Code Collection, 2006: Para a). This program was generally implemented across the DoD during Desert Storm in 1990-1991 and shortly after the September 11, 2001 terrorist attacks. It is not until this program is lifted that people can be released from the military.

The second control variable, economic conditions, was used to capture personnel who may choose to leave if they perceive better economic opportunities in the private

sector. A measurement of the economy, called the "Misery Index" is being used in this analysis as a proxy for economic conditions. The Misery Index is the sum of the unemployment and inflation rates as obtained from the Bureau of Labor Statistics. The final control variable, additional military pay raises, represents the delta between the military pay raise and average civilian pay raises as indicated by the Government's annual employment cost index (ECI) for that year (all variables and their descriptions are shown in Table 2).

Table 2. Variable Information

Variable Name	***Definition***	***Variable Value***	***Coefficient Meaning***
ATTR	Attrition rate (ATTR): attrition numbers from the current year divided by the end strength from the previous year	Positive means attrition rate goes up	N/A (Dependent Variable)
DZ	Downsizing rate (DZ): (End strength current yr minus end strength previous yr) / by end strength previous yr	Negative means the service downsized	If negative, means as downsize, attrition rates go up
Raise	The difference between the military pay raise for that year and the Employment Cost Index (ECI)	If positive, means the military got a higher pay raise	If negative, means if military got higher raise, attrition rates go down
SL	Stop Loss (SL) program was implemented for the service for more than one quarter during the fiscal year	Dummy variable-value of 1 if the program was implemented	If negative, means if SL implemented, attrition rates go down
Misery	"Misery Index" : The unemployment rate plus the inflation rate	Unemployment rate is always positive; the overall index could be negative if inflation is more negative than unemployment; for this timeframe, the index was always positive	If negative, means if the misery index goes up, attrition rates go down

Pre-Estimation Test and Model Specification

The data was first tested for stationarity using the Augmented Dicky Fuller (ADF) test. Stationarity exists when the statistical properties of the data do not change over time (Makridakis, Wheelwright, and Hyndman, 1998:324). In time series, interpretation from analysis that uses non-stationary data can lead to spurious results and erroneous conclusions regarding relationships among the variables (Kennedy, 2003:319). All datasets used in this analysis were stationary. The results of the ADF are shown in Appendix B.

A fixed effects panel model was used in the DoD overall analysis. Panel analysis allows analysis to be performed with both cross-sectional units of observation and a temporal dimension (Yaffee, 2003:2). Since the data includes each of the branches of service in the DoD, a fixed effects model was used because this type of model produces results conditional on the cross-sectional units under analysis, and that is what is relevant for this research (Kennedy, 2003:312). Additionally, the fixed effects model was used because it is both effective at dealing with omitted variable bias and is robust to normality (Kennedy, 2003:304-307, 311-312).

The representation of the model for this research is:

$$ATTR_{it} = \alpha_{it} + \beta_1 DZ_{it} + \beta_2 Raise_{it} + \beta_3 SL_i t + \beta_4 Misery_{it} + \varepsilon_{it} \qquad (1)$$

where $i = \{Army, Air Force, Navy, Marine Corps\}$, $t = \{1974, 1975 \ldots 2005\}$, ATTR is attrition rates, DZ is the downsizing rate, Raise is the delta between the military pay raise and the ECI, SL is stop loss, and Misery is the misery index.

The downsizing rate was lagged at periods of one and two years to determine how long the effects, if any, lasted. Downsizing was lagged for one year to determine if the DoD follows the civilian sector in that reactions to downsizing return to normal in approximately one year (Allen and others, 2001:159). A second year of lagged downsizing was used to attempt to capture the effect of a delay in attrition due to service commitments held by members. Lagging the downsizing rate also alleviates the possibility of duplication in counting the loss of members in both the end-strength numbers used in the downsizing calculation and in the attrition rate for the same year.

To further define the appropriate model specification to use in this analysis, the Akaike Information Criteria (AIC) was reviewed for several different preliminary regressions based on varying lag lengths of the variables and autoregressive (AR) specifications. The AIC is a popular way of determining the goodness of fit of the model while maintaining parsimony (Makridakis and others, 1998:360; Kennedy, 2003:117). Smaller AICs indicate better fitting models. The AICs from the analysis are shown below in Tables 3 and 4. Since stop-loss and the military pay raise delta from the EIC would intuitively garner more immediate effects, the AIC was reviewed only when lagging downsizing at one and two years, adding an AR term of one, two, and three, and lagging the misery index for one, two, and three years.

Table 3. Akaike Information Criteria (lagging downsizing on year)

AR	DZ	Raise	SL	Misery	AIC	R2
1	1	0	0	0	-5.156107	0.824497
1	1	0	0	1	-5.199011	0.831868
1	1	0	0	2	-5.287868	0.817273
1	1	0	0	3	-5.196848	0.785961
2	1	0	0	0	-5.422236	0.843125
2	1	0	0	1	-5.413939	0.841671
2	1	0	0	2	-5.320706	0.814242
2	1	0	0	3	-5.225314	0.794796
3	***1***	***0***	***0***	***0***	***-5.50429***	***0.848133***
3	1	0	0	1	-5.491408	0.846164
3	1	0	0	2	-5.315219	0.815881
3	1	0	0	3	-5.282801	0.800377

Table 4. Akaike Information Criteria (lagging downsizing two years)

AR	DZ	Raise	SL	Misery	AIC	R2
1	2	0	0	0	-5.401149	0.836844
1	2	0	0	1	-5.32031	0.823107
1	2	0	0	2	-5.317446	0.822599
1	2	0	0	3	-5.215537	0.789924
2	***2***	***0***	***0***	***0***	***-5.46481***	***0.839171***
2	2	0	0	1	-5.382943	0.825796
2	2	0	0	2	-5.293025	0.809028
2	2	0	0	3	-5.200373	0.789613
3	2	0	0	0	-5.436078	0.836841
3	2	0	0	1	-5.373958	0.826384
3	2	0	0	2	-5.299356	0.812937
3	2	0	0	3	-5.316377	0.806968

Limitations

As discussed in Chapter Two, the theories presented in the empirical research of civilian firms have been analyzed in the current research with an aggregate quantitative retrospective look at the DoD's downsizing events and comparing those events to aggregate attrition rates in the years following the event. By looking at the aggregate results of downsizing and attrition for the past 31 years, along with the control variables

of the military pay raise exceeding the ECI, whether or not stop-loss was implemented, and the economic conditions of the nation using the misery index, it is recognized that this aggregate study is unable to capture specific personal reasons for departing the military and cannot differentiate if the attrition numbers increased or decreased specifically because of downsizing. However, while downsizing in the military and the resulting effect on attrition rates has not been studied explicitly, other work role transition events, such as those brought on by outsourcing in the military, have been empirically shown to reduce job satisfaction and ultimately correlate to an increase in turnover intentions. Together with the empirical research of civilian firms indicating that downsizing appears to be correlated with subsequent attrition rates, it is believed using the selected methodology will offer insight into the effects of downsizing on attrition rates in the DoD.

Chapter Summary

This chapter has provided the methodology and data used in this research. In the following chapters, an interpretation of the results and a conclusion to summarize the findings of the analysis and suggest areas for future research are provided.

IV. Results

Chapter Overview

This chapter discusses the results of the analysis for the overall DoD and each branch of service within the DoD. As stated previously, fixed-effects panel regression analysis was performed. The chapter follows with a discussion of the post-estimation tests and the results for the overall DoD and each of the services.

Post-Estimation Tests

To determine independence of the residuals in each model, the Durbin-Watson test statistic was calculated. Lack of independence of residuals indicates autocorrelation in a model. That is, the model is autocorrelated when the error term in one period is correlated with the error term in the previous time period (Salvatore and Reagle, 2002:208). If the model possesses autocorrelation, the model is subject to downward-biased standard errors and incorrect statistical tests (Salvatore and Reagle, 2002:208). Autocorrelation can be corrected by adding an autoregressive (AR) specification term to the model estimates. In each of the models, if autocorrelation was present, an appropriate AR term was added, as incorporated with the model specification information achieved from the Akaike Information Criteria (AIC) discussed in the previous chapter. The Durbin-Watson results are shown with the model results later in this chapter. The further away from two the Durbin-Watson test statistic is, the less certain that autocorrelation is not present; additionally, the critical values vary based on the number of observations and the number of independent variables used in the analysis. A table indicating the Durbin-Watson critical values and their definitions are shown in Appendix C.

Another important consideration in regression analysis is determining if the model has heteroskedasticity. If a model is heteroskedastic, the assumption of the variance of the error term being constant is violated (Salvatore and Reagle, 2002:207). If the error term is constant, the model is said to be homoscedastistic, which is the desired outcome. If a model is found to be heteroskedastic, this leads to unbiased, but inefficient estimates of the coefficients as well as biased estimates of the standard errors (Salvatore and Reagle, 2002:207). If heteroskedasticity is found, using robust standard errors from White's heteroskedasticity consistent covariance matrix estimator provides correct estimates of the coefficient. Each of the models in this analysis were initially found to have heteroskedasticity, therefore, the estimates were derived using White's heteroskedasticity consistent covariance matrix estimator.

Overall DoD and Service Results

A comparison of the results for the overall DoD model and each of the service models, lagging downsizing for one and two years, is shown in Table 5. As you can see, downsizing is statistically significant in all models, except lagging for one year in the Marine Corps model (USMC). Additionally, the model specification appears to explain a majority of the variation in attrition rates for the overall DoD, the Air Force (USAF), the Navy (USN), and the USMC. The explanation in variation of attrition rates is approximately half for the Army (USA). The R^2 is highest for the USAF and is the lowest for the USA using both model specifications. Furthermore, the downsizing effect is greatest for the USAF and the least for the USMC. In fact, downsizing is not statistically significant when lagging downsizing for one year in the USMC model, and

appears to decrease attrition rates in the USMC when lagging for two years, which is the opposite effect expected. The DoD models and each of the service models is explained in more detail in the following sections.

Table 5. Comparison of Models for Downsizing Effect

Comparison of Models for Effect of Downsizing			
Service	**R^2**	**Coefficient for DZ**	**Statistical Significance**
	DZ lagged One Year		
Overall DoD	0.848133	-0.288043	***
Army	0.531676	-0.279141	***
Air Force	0.730472	-0.378201	***
Navy	0.700271	-0.339068	***
Marine Corps	0.715498	-0.088753	Not significant
	DZ lagged Two Years		
Overall DoD	0.839171	-0.251769	**
Army	0.440903	-0.174512	**
Air Force	0.753328	-0.370313	***
Navy	0.691687	-0.343389	***
Marine Corps	0.720966	0.369769	***
***significant to the 0.001 level, **0.05 level, *0.10 level			

The overall DoD model, lagging downsizing for one and two years (Tables 6 and 7), explain a majority of the variation in attrition rates for the DoD (0.848133 and 0.839171 respectively). Downsizing was a statistically significant variable in lagging one year to the 0.001 level and to the 0.05 level when lagging two years. This indicates that if downsizing occurs, attrition rates will increase for both one and two years following the downsizing action (since the dataset portrays downsizing rates as negative numbers, multiplying the negative coefficient would garner an increase in attrition rates). The control variables sl, raise, and misery are also statistically significant for each overall DoD model and indicate if stop-loss is enacted, the attrition rates will go down; if the

military pay raise is higher than the ECI, attrition will go down; and surprisingly, if the misery index increases, attrition rates will up. The magnitude, however, is very small for each of these control variables. Additionally, there is no autocorrelation present, as evidenced by the Durbin-Watson statistic.

Table 6. DoD Overall Model Results, Lagging One Year

Dependent Variable: ATTR
Sample(adjusted): 1975 2005
Total panel (balanced) observations: 112
White Heteroskedasticity-Consistent Standard Errors & Covariance

Variable	Coefficient	Std. Error	t-Statistic	Prob.
DZ(-1)	-0.288043	0.062932	-4.577052	0.0000
RAISE	-0.001608	0.000660	-2.435672	0.0166
SL	-0.023692	0.005102	-4.643368	0.0000
MISERY	0.003384	0.000405	8.345285	0.0000
AR(1)	-0.124402	0.125055	-0.994779	0.3222
AR(2)	0.109484	0.057022	1.920034	0.0577
AR(3)	0.115962	0.073217	1.583816	0.1164
R-squared	0.848133	Mean dependent var		0.166922
Adjusted R-squared	0.833097	S.D. dependent var		0.036065
S.E. of regression	0.014734	Sum squared resid		0.021926
Log likelihood	319.2402	F-statistic		56.40563
Durbin-Watson stat	2.087875	Prob(F-statistic)		0.000000

Table 7. DoD Overall Model Results, Lagging Two Years

Dependent Variable: ATTR
Sample(adjusted): 1976 2005
Total panel (balanced) observations: 112
White Heteroskedasticity-Consistent Standard Errors & Covariance

Variable	Coefficient	Std. Error	t-Statistic	Prob.
DZ(-2)	-0.251769	0.079863	-3.152503	0.0021
RAISE	-0.002301	0.000731	-3.147853	0.0022
SL	-0.018781	0.005491	-3.420243	0.0009
MISERY	0.003837	0.000401	9.559277	0.0000
AR(1)	0.091605	0.092918	0.985864	0.3265
AR(2)	-0.025173	0.093172	-0.270182	0.7876
R-squared	0.839171	Mean dependent var		0.166922
Adjusted R-squared	0.824980	S.D. dependent var		0.036065
S.E. of regression	0.015088	Sum squared resid		0.023220
Log likelihood	316.0293	F-statistic		59.13487
Durbin-Watson stat	2.089133	Prob(F-statistic)		0.000000

For the Army, where downsizing was lagged one and two years (Tables 8 and 9), the overall model explains 0.531676 and 0.440903 of the variation in attrition rates. The downsizing variable is significant at better than the 0.001 level and has a magnitude of -0.279141 when lagging downsizing for one year, meaning that if the service downsizes, one year later, attrition rates will increase by 0.279141, the second lowest of any of the service models. When lagging downsizing for two years, attrition rates still increase when the service downsizes, but the magnitude decreases. Each of the variables are statistically significant and indicate if the military pay raise were higher than the ECI, attrition rates would go down; if stop-loss were implemented, attrition rates would decrease, and if the economy worsens, attrition rates would go up. As with the overall DoD, the economy proxy results are in the opposite direction expected. Additionally, the coefficient magnitudes for the control variables are small. Finally, the residuals do not indicate autocorrelation.

Table 8. Army Overall Model Results, Lagging One Year

Dependent Variable: ATTR
Sample(adjusted): 1975 2005
Included observations: 31 after adjusting endpoints
White Heteroskedasticity-Consistent Standard Errors & Covariance

Variable	Coefficient	Std. Error	t-Statistic	Prob.
DZ(-1)	-0.279141	0.059370	-4.701745	0.0000
RAISE	-0.003718	0.000430	-8.647175	0.0000
SL	-0.021612	0.007487	-2.886478	0.0048
MISERY	0.002985	0.000382	7.816072	0.0000
AR(1)	-0.367946	0.148338	-2.480458	0.0148
AR(2)	0.018166	0.080002	0.227069	0.8208
AR(3)	0.188818	0.066388	2.844153	0.0054
R-squared	0.531676	Mean dependent var		0.179139
Adjusted R-squared	0.485307	S.D. dependent var		0.023979
S.E. of regression	0.017203	Sum squared resid		0.029890
Log likelihood	301.8876	F-statistic		11.46626
Durbin-Watson stat	2.263870	Prob(F-statistic)		0.000000

Table 9. Army Overall Model Results, Lagging Two Years

Dependent Variable: ATTR
Sample(adjusted): 1976 2005
Included observations: 30 after adjusting endpoints
White Heteroskedasticity-Consistent Standard Errors & Covariance

Variable	Coefficient	Std. Error	t-Statistic	Prob.
DZ_USA(-2)	-0.174512	0.084871	-2.056209	0.0423
RAISE	-0.003793	0.000577	-6.574748	0.0000
SL	-0.020384	0.005807	-3.510104	0.0007
MISERY	0.003423	0.000486	7.044326	0.0000
AR(1)	-0.059845	0.102569	-0.583461	0.5609
AR(2)	-0.046522	0.123930	-0.375387	0.7082
R-squared	0.440903	Mean dependent var		0.179139
Adjusted R-squared	0.391571	S.D. dependent var		0.023979
S.E. of regression	0.018704	Sum squared resid		0.035684
Log likelihood	291.9665	F-statistic		8.937449
Durbin-Watson stat	2.190135	Prob(F-statistic)		0.000000

The USAF models explain the highest amount of the variation in attrition rates of the individual services (Tables 10 and 11). Additionally, the coefficient magnitudes for downsizing are the greatest of any of the service models. As with the overall DoD and the USA already discussed, the control variables each have a small magnitude and each have the same effect. Autocorrelation is not present in either model.

Table 10. Air Force Overall Model Results, Lagging One Year

Dependent Variable: ATTR
Sample(adjusted): 1975 2005
Included observations: 31 after adjusting endpoints
White Heteroskedasticity-Consistent Standard Errors & Covariance

Variable	Coefficient	Std. Error	t-Statistic	Prob.
DZ(-1)	-0.378201	0.023041	-16.41411	0.0000
RAISE	-0.001323	0.000415	-3.190566	0.0019
SL	-0.028672	0.003756	-7.632850	0.0000
MISERY	0.003822	0.000141	27.04195	0.0000
AR(1)	-0.509143	0.081217	-6.268886	0.0000
AR(2)	-0.122168	0.086100	-1.418906	0.1590
AR(3)	-0.071024	0.115804	-0.613317	0.5410
R-squared	0.730472	Mean dependent var		0.125082
Adjusted R-squared	0.703786	S.D. dependent var		0.020517
S.E. of regression	0.011166	Sum squared resid		0.012593
Log likelihood	350.2926	F-statistic		27.37286
Durbin-Watson stat	2.095879	Prob(F-statistic)		0.000000

Table 11. Air Force Overall Model Results, Lagging Two Years

Dependent Variable: ATTR Sample(adjusted): 1976 2005 Included observations: 30 after adjusting endpoints White Heteroskedasticity-Consistent Standard Errors & Covariance				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
DZ(-2)	-0.370313	0.025999	-14.24313	0.0000
RAISE	-0.003004	0.000469	-6.409207	0.0000
SL	-0.024303	0.004033	-6.026603	0.0000
MISERY	0.003647	0.000139	26.27523	0.0000
AR(1)	-0.221376	0.091135	-2.429110	0.0169
AR(2)	-0.452157	0.109837	-4.116629	0.0001
R-squared	0.753328	Mean dependent var		0.125082
Adjusted R-squared	0.731562	S.D. dependent var		0.020517
S.E. of regression	0.010630	Sum squared resid		0.011525
Log likelihood	355.2549	F-statistic		34.61155
Durbin-Watson stat	2.077051	Prob(F-statistic)		0.000000

In the USN models (Tables 12 and 13), the explanatory power of the models are the third highest of any of the service models and the downsizing effect is the second highest, only slightly behind the downsizing effect on attrition rates in the USAF. The misery index and the stop-loss variable react as in each of the previously discussed models; however, the coefficient for the military pay raise variable is not statistically significant when lagging downsizing for one year.

Table 12. Navy Overall Model Results, Lagging One Year

Dependent Variable: ATTR *Sample(adjusted): 1975 2005* *Included observations: 31 after adjusting endpoints* *White Heteroskedasticity-Consistent Standard Errors & Covariance*				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
DZ(-1)	-0.339068	0.047570	-7.127820	0.0000
RAISE	0.000768	0.000588	1.307929	0.1939
SL	-0.024152	0.003288	-7.345464	0.0000
MISERY	0.002521	0.000782	3.221774	0.0017
AR(1)	0.118319	0.117284	1.008826	0.3155
AR(2)	0.207791	0.084774	2.451114	0.0160
AR(3)	0.109329	0.142735	0.765958	0.4455
R-squared	0.700271	Mean dependent var		0.160540
Adjusted R-squared	0.670595	S.D. dependent var		0.020421
S.E. of regression	0.011721	Sum squared resid		0.013875
Log likelihood	344.8660	F-statistic		23.59714
Durbin-Watson stat	1.866991	Prob(F-statistic)		0.000000

Table 13. Navy Overall Model Results, Lagging Two Years

Dependent Variable: ATTR
Sample(adjusted): 1976 2005
Included observations: 30 after adjusting endpoints
White Heteroskedasticity-Consistent Standard Errors & Covariance

Variable	Coefficient	Std. Error	t-Statistic	Prob.
DZ(-2)	-0.343389	0.061282	-5.603387	0.0000
RAISE	-0.001193	0.000684	-1.743969	0.0842
SL	-0.013204	0.003055	-4.321844	0.0000
MISERY	0.003918	0.000374	10.46449	0.0000
AR(1)	0.321531	0.100355	3.203924	0.0018
AR(2)	-0.040033	0.095149	-0.420738	0.6748
R-squared	0.691687	Mean dependent var		0.160540
Adjusted R-squared	0.664483	S.D. dependent var		0.020421
S.E. of regression	0.011829	Sum squared resid		0.014272
Log likelihood	343.2847	F-statistic		25.42582
Durbin-Watson stat	1.908696	Prob(F-statistic)		0.000000

The Marine Corps models (Tables 14 and 15) are much different than the other services. The explanatory power of the models are similar when lagging downsizing for both one and two years (0.715498 versus 0.720966); however, downsizing is not statistically significant when lagging downsizing for one year, and when lagging for two years, attrition rates appear to decrease. Additionally, stop-loss is not statistically significant in either model. Neither model exhibits autocorrelation.

Table 14. Marine Corps Overall Model Results, Lagging One Year

Dependent Variable: ATTR
Sample(adjusted): 1975 2005
Included observations: 31 after adjusting endpoints
White Heteroskedasticity-Consistent Standard Errors & Covariance

Variable	Coefficient	Std. Error	t-Statistic	Prob.
DZ(-1)	-0.088753	0.089864	-0.987626	0.3257
RAISE	-0.001133	0.000539	-2.101747	0.0381
SL	-0.006244	0.005047	-1.237263	0.2189
MISERY	0.001185	0.000679	1.744628	0.0841
AR(1)	0.457836	0.085603	5.348336	0.0000
AR(2)	-0.067265	0.061223	-1.098686	0.2745
AR(3)	0.261464	0.051907	5.037172	0.0000
R-squared	0.715498	Mean dependent var		0.202927
Adjusted R-squared	0.687329	S.D. dependent var		0.022883
S.E. of regression	0.012795	Sum squared resid		0.016536
Log likelihood	335.0386	F-statistic		25.40062
Durbin-Watson stat	2.186606	Prob(F-statistic)		0.000000

Table 15. Marine Corps Overall Model Results, Lagging Two Years

Dependent Variable: ATTR
Sample(adjusted): 1976 2005
Included observations: 30 after adjusting endpoints
White Heteroskedasticity-Consistent Standard Errors & Covariance

Variable	Coefficient	Std. Error	t-Statistic	Prob.
DZ(-2)	0.369769	0.065268	5.665372	0.0000
RAISE	-0.001370	0.000447	-3.064167	0.0028
SL	-0.005699	0.005994	-0.950757	0.3440
MISERY	0.001732	0.000619	2.797006	0.0062
AR(1)	0.580436	0.075418	7.696253	0.0000
AR(2)	0.161774	0.046049	3.513068	0.0007

R-squared	0.720966	Mean dependent var	0.202927
Adjusted R-squared	0.696345	S.D. dependent var	0.022883
S.E. of regression	0.012610	Sum squared resid	0.016218
Log likelihood	336.1253	F-statistic	29.28291
Durbin-Watson stat	2.190547	Prob(F-statistic)	0.000000

Chapter Summary

This chapter presented the results of the analysis in attempting to answer the question of how downsizing affects attrition rates across the DoD. Additionally, post-estimating testing was discussed to offer validity of the results. As noted, downsizing appears to affect attrition rates when lagging downsizing for one year in the overall DoD and in each of the services except the USMC. When lagging downsizing for two years, the USMC is also very different than the other models in that downsizing appears to decrease attrition rates. In the next chapter, the overall findings are discussed further and suggestions for future follow-on research are offered.

V. Conclusions

Chapter Overview

This chapter will address the overall findings of the analysis and provide answers to the questions posed in Chapter One. Additionally, possible implications of the analysis will be offered. Finally, this chapter will offer suggestions for future research in the context of downsizing in the DoD.

Research Questions Answered

At the onset of this research, the question was posed: "How does downsizing affect attrition rates in the DoD?" Additionally, the answer was sought for whether or not these effects mirror the civilian sector as far as increased turnover duration due to downsizing, where civilian affects appear to return to normal after approximately one year, as found by Allen and others in their 2001 study.

Downsizing generally appears to affect attrition rates in the DoD. The overall DoD model indicated the model was a very good fit in explaining attrition rates (see Table 16). The service models, except for the USMC and USA models, indicate similar results. Moreover, the downsizing variable was strongly statistically significant for all models except the USMC one year after the downsizing action and for the overall DoD, the USAF, and the USN, results were strong two years after a downsizing action as well. The effect appears strongest in the USAF for both one and two years following a downsizing action, as the coefficients are the highest. The USN followed a very close second in coefficient magnitude. Interesting to note is that the USMC showed the lowest effect one year following downsizing, though the result was not statistically significant.

Additionally, of the other services where downsizing was statistically significant one year following a downsizing action, the USA had the lowest magnitude of effect in attrition rates based on downsizing. Moreover, the USMC showed that two years following a downsizing action, their attrition rates actually decrease.

Table 16. Summary of Overall Results

Service	R^2	DZ		Raise		SL		Misery	
				DZ lagged One Year					
Overall DoD	0.848	-0.288(0.063)	***	-0.002(0.001)	**	-0.024(0.005)	***	0.003(0.000)	***
Army	0.532	-0.279(0.059)	***	-0.004(0.000)	***	-0.022(0.007)	**	0.003(0.000)	***
Air Force	0.730	-0.378(0.023)	***	-0.001(0.000)	**	-0.029(0.004)	***	0.004(0.000)	***
Navy	0.700	-0.339(0.048)	***	-0.001(0.001)		-0.024(0.003)	***	0.003(0.001)	**
Marine Corps	0.715	-0.088(0.090)		-0.001(0.001)	**	-0.006(0.005)		0.001(0.001)	*
				DZ lagged Two Years					
Overall DoD	0.839	-0.252(0.080)	**	-0.002(0.001)	**	-0.019(0.005)	***	0.004(0.000)	***
Army	0.441	-0.175(0.085)	**	-0.004(0.001)	***	-0.020(0.006)	***	0.003(0.000)	***
Air Force	0.753	-0.370(0.026)	***	-0.003(0.000)	***	-0.024(0.004)	***	0.004(0.000)	***
Navy	0.692	-0.343(0.061)	***	-0.001(0.001)	*	-0.013(0.003)	***	0.004(0.000)	***
Marine Corps	0.721	-0.369(0.065)	***	-0.001(0.000)	**	-0.006(0.006)		0.002(0.001)	**

***significant to the 0.001 level, **0.05 level, *0.10 level

In general, the models showed the economic condition proxy, the misery index, behaving in the opposite direction expected. That is, according to the results, if the economy worsens, attrition rates will increase, though, as with the other control variables, the magnitude is very small. This is perhaps because the data captured aggregate attrition rates and aggregate national economic conditions, not broken down by employment classification/career specialty of individuals or economic conditions in the locality where the service member would relocate (perhaps their original home of record or where they

might have received a job offer). Additionally, individuals may have separated from the service for reasons other than general national economic conditions. Finally, because of the unusually high misery index of the late 1970s and early 1980s, the results of this variable's coefficient could have been affected.

While the military pay raise exceeding the ECI was statistically significant for the overall DoD, the USA, the USAF, and the USMC, the USN results were not for one year following a downsizing action, but increased in statistical significance two years following a downsizing action. This is perhaps due to the special pays USN personnel receive that are different than the other services. For example, submarine pay can range from $75 to $425 per month and sea pay can be as high as $750 per month, each of which can be received in addition to one's basic pay and allowances. Still, after two years, the pay raise for USN personnel becomes statistically significant in line with the other services.

Finally, stop-loss was not statistically significant for the USMC, but was for each of the other services. After speaking with a USMC representative from Public Affairs, this is perhaps because the USMC does not use stop-loss as a policy as widely or extensively as some of the other services. Still, the variable's coefficient, while not statistically significant, was of the correct sign, meaning stop-loss being implemented would slightly reduce attrition rates.

Implications

For the USAF and the USN, downsizing appears to have a much stronger effect that lasts longer than in the USA or the USMC. This is perhaps due to the mission differences among the services. The USAF and USN are more "business-like" in their

organizations and daily environment, whereas the USA and USMC are less like the corporate world in their execution and mission. This is evidenced by the fact that there are more career fields in the USA and the USMC that are combat arms, whereas the USAF and the USN have limited combat arms-related specialties. The results indicate there are institutional differences within each of the services that appear to influence attrition rates differently.

Important to note as a result of this analysis is that the magnitudes of the effect of downsizing, while statistically significant in most cases, are not extremely large, but may have significant longer-term effects. As an example, if overall downsizing for a service is 6% or approximately 20,000 personnel (as in the case of the USAF's present Force Shaping initiative for fiscal year 2007), their attrition rates would increase by 2.23% or approximately 7.9K personnel in fiscal year 2008 and 2.22% or approximately 7.3K personnel in fiscal year 2009 based on the results of this study. However, as discussed previously, unexpected turnover has been estimated to cost between $75,000 and $186,000 per departing employee, perhaps even more in the military due to the extensive training members must complete. For the USAF, based on the results of this study, the effect of the downsizing action in fiscal year 2007 could cost between $592,500,000 and $1,469,400,000 in fiscal year 2008 and $547,500,000 and $1,357,800,000 in fiscal year 2009 due to turnover costs from unexpected turnover. While the DoD's estimated budget for fiscal year 2008 and 2009 are $485B and $505B respectively, and the additional cost of up to $1.469B for the USAF's possible dysfunctional turnover in fiscal year 2008 alone amounts to less than one percent of the entire budget, these are costs the DoD should consider, along with the proposed savings from cutting the positions, since

budgets are dwindling and the need for modernization of weapons systems is upon us (DoD-b, 2006:V-7). Another important issue to consider is that the service could lose some of its "more productive or valued" employees in the 7.9K additional departures because of role overload and lack of role clarity due to additional loss of personnel, which could stifle the mission of many organizations. The assumption that these "more valuable" employees would be retained (to make the restructuring following the downsizing effective), and only those the service terminated or those who volunteered to leave actually departed the organization, would be flawed based on the empirical studies from the civilian sector. In sum, while the magnitudes achieved during this analysis are not extremely large, long term effects could be substantial, as evidenced in the empirical studies discussed previously and in the dollarized cost of possible dysfunctional turnover of military personnel based on the results of this analysis.

Suggestions for Future Research

To enhance the research that was accomplished in this effort, four suggestions are offered. First, a study could be conducted by following military personnel through a downsizing action by conducting an initial survey at the start or during a downsizing action (perhaps of the Air Force in their fiscal year 2007-2011 Force Shaping efforts of a 40,000 personnel reduction) to gauge intent to turnover on an individual basis because of the downsizing action. Furthermore, the results of the survey could be tracked through a review of personnel records at one year and two years following the action to determine if the intent to turnover as collected through the survey related to actual turnover of the individuals surveyed. Because the military has service commitments as discussed

previously, the research would most likely cover a longer time period than is afforded during our tenure at AFIT; however, such a study might offer more insight for the DoD in determining whether or not to downsize, or perhaps, what might be done to mitigate costly dysfunctional, or unplanned, turnover following future and possibly fiscally-required downsizing actions. Second, because the motivation to depart the service may differ for officers and enlisted members, a researcher could look at the effects of downsizing on attrition rates for these categories. Third, because public perception and ultimately the morale of military members has fluctuated over the years from anti-war sediments of the Vietnam era to the patriotic support of the post 9/11 time frame, and back again, another researcher could study the time varying effects of such public perceptions on attrition rates. Finally, as the results showed differences in the effects of downsizing among the services (recall from the results that the USA had a much lower effect than did the USAF or the USN and the USMC result for downsizing being lagged one year was not statistically significant and two years after a downsizing action, attrition was shown to decrease), another researcher could try to determine the reasons for departures from the USA and the USMC and determine why these reasons might be different than in the USAF or the USN.

Chapter Summary

As presented in this study, downsizing generally appears to affect attrition rates in the DoD. The effect lasts longer than in the civilian sector for most services, perhaps due to the service commitment incurred by members. While the magnitude of the effect is not extremely large, implications of the effects could be strong and long-lasting for the

services. Based on the results of this analysis and the dollarized implications of downsizing actions, this research has offered one form of insight to DoD leadership to incorporate into their decision making process when considering downsizing actions across the DoD.

Appendix A – List of Acronyms

AR	Autoregressive
BLS	Bureau of Labor Statistics
DMDC	Defense Manpower Data Center
DoD	Department of Defense
ECI	Employment Cost Index
MOAA	Military Officer Association of America
QDR	Quadrennial Defense Review
USA	United States Army
USAF	United States Air Force
USMC	United States Marine Corps
USN	United States Navy

Appendix B –Stationarity Tests-Augmented Dicky Fuller

As shown below in each of the models, the null hypotheses for unit root were rejected. The data is stationary.

Table 17. DoD Overall

Null Hypothesis: D(ATTR_DoD) has a unit root

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-7.222675	0.0000
Test critical values:	1% level	-3.670170	
	5% level	-2.963972	
	10% level	-2.621007	

Table 18. USA Overall

Null Hypothesis: D(ATTR_USA) has a unit root

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-8.293860	0.0000
Test critical values:	1% level	-3.670170	
	5% level	-2.963972	
	10% level	-2.621007	

Table 19. USAF Overall

Null Hypothesis: D(ATTR_USAF) has a unit root

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-9.534385	0.0000
Test critical values:	1% level	-3.670170	
	5% level	-2.963972	
	10% level	-2.621007	

Table 20. USN Overall

Null Hypothesis: D(ATTR_USN) has a unit root

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-5.931330	0.0000
Test critical values:	1% level	-3.670170	
	5% level	-2.963972	
	10% level	-2.621007	

Table 21. USMC Overall

Null Hypothesis: D(ATTR_USMC) has a unit root

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-6.471194	0.0000
Test critical values:	1% level	-3.670170	
	5% level	-2.963972	
	10% level	-2.621007	

Appendix C – Durbin-Watson Critical Values

To determine autocorrelation, if the Durbin-Watson statistic (d) ranges from zero to the lower limit (L) of d on the chart below, there is positive autocorrelation; if it is between the L and the upper (U) limits, autocorrelation is neither accepted nor rejected; if it is between the U and 4 minus U, there is no autocorrelation; if it is between 4 minus U and 4 minus L, autocorrelation is neither accepted nor rejected; if it is between 4 minus L to 4, there is negative autocorrelation.

Table 22. Durbin-Watson Critical Values (α=5%, n 6-200)

n	***k* = 1**		***k* = 2**		***k* = 3**		***k* = 4**		***k* = 5**	
	d_L	**d_U**	**d_L**	**d_U**	**d_L**	**d_U**	**d_L**	**d_U**	**d_L**	**d_U**
10	0.88	1.32	0.70	1.64	0.53	2.02	0.38	2.41	0.24	2.82
15	1.08	1.36	0.95	1.54	0.82	1.75	0.69	1.97	0.56	2.21
20	1.20	1.41	1.10	1.54	1.00	1.68	0.90	1.83	0.79	1.99
25	1.29	1.45	1.21	1.55	1.12	1.66	1.04	1.77	0.95	1.89
30	1.35	1.49	1.28	1.57	1.21	1.65	1.14	1.74	1.07	1.83
35	1.40	1.52	1.34	1.58	1.28	1.65	1.22	1.73	1.16	1.80
40	1.44	1.54	1.39	1.60	1.34	1.66	1.29	1.72	1.23	1.79
45	1.48	1.57	1,43	1.62	1.38	1.67	1.34	1.72	1.29	1.78
50	1.50	1.59	1.46	1.63	1.42	1.67	1.38	1.72	1.34	1.77
55	1.53	1.60	1.49	1.64	1.45	1.68	1.41	1.72	1.38	1.77
60	1.55	1.62	1.51	1.65	1.48	1.69	1.44	1.73	1.41	1.77
65	1.57	1.63	1.54	1.66	1.50	1.70	1.47	1.73	1.44	1.77
70	1.58	1.64	1.55	1.67	1.52	1.70	1.49	1.74	1.46	1.77
75	1.60	1.65	1.57	1.68	1.54	1.71	1.51	1.74	1.49	1.77
80	1.61	1.66	1.59	1.69	1.56	1.72	1.53	1.74	1.51	1.77
85	1.62	1.67	1.60	1.70	1.57	1.72	1.55	1.75	1.52	1.77
90	1.63	1.68	1.61	1.70	1.59	1.73	1.57	1.75	1.54	1.78
95	1.64	1.69	1.62	1.71	1.60	1.73	1.58	1.75	1.56	1.78
100	1.65	1.69	1.63	1.72	1.61	1.74	1.59	1.76	1.57	1.78

Where ***n*** = number of observations and ***k*** = number of independent variables

Table 23. Durbin-Watson Critical Values (Continued)

n	*k* = 6		*k* = 7		*k* = 8		*k* = 9		*k* = 10	
	d_L	d_U	d_L	d_U	d_L	d_U	d_L	d_U	d_L	d_U
15	0.45	2.47	0.34	2.73	0.25	2.98	0.18	3.22	0.11	3.44
20	0.69	2.16	0.60	2.34	0.50	2.52	0.42	2.70	0.34	2.89
25	0.87	2.01	0.78	2.14	0.70	2.28	0.62	2.42	0.54	2.56
30	1.00	1.93	0.93	2.03	0.85	2.14	0.78	2.25	0.71	2.36
35	1.10	1.88	1.03	1.97	0.97	2.05	0.91	2.14	0.85	2.24
40	1.18	1.85	1.12	1.92	1.06	2.00	1.01	2.07	0.95	2.15
45	1.24	1.84	1.19	1.90	1.14	1.96	1.09	2.02	1.04	2.09
50	1.29	1.82	1.25	1.88	1.20	1.93	1.16	1.99	1.11	2.04
55	1.33	1.81	1.29	1.86	1.25	1.91	1.21	1.96	1.17	2.01
60	1.37	1.81	1.34	1.85	1.30	1.89	1.26	1.94	1.22	1.98
65	1.40	1.81	1.37	1.84	1.34	1.88	1.30	1.92	1.27	1.96
70	1.43	1.80	1.40	1.84	1.37	1.87	1.34	1.91	1.31	1.95
75	1.46	1.80	1.43	1.83	1.40	1.87	1.37	1.90	1.34	1.94
80	1.48	1.80	1.45	1.83	1.43	1.86	1.40	1.89	1.37	1.93
85	1.50	1.80	1.47	1.83	1.49	1.86	1.42	1.89	1.40	1.92
90	1.52	1.80	1.49	1.83	1.47	1.85	1.45	1.88	1.42	1.91
95	1.54	1.80	1.51	1.83	1.49	1.85	1.46	1.88	1.44	1.90
100	1.55	1.80	1.53	1.83	1.50	1.85	1.48	1.87	1.46	1.90

Where ***n*** = number of observations and ***k*** = number of independent variables

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