Reserve Supply in the Post–Desert Storm Recruiting Environment

Beth J. Asch
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Beth J. Asch

Prepared for the
Assistant Secretary of Defense
(Force Management and Personnel)

National Defense Research Institute

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Preface

This report presents an exploratory analysis of reserve recruiting in the new post-Desert Storm environment. Focusing on supply-side factors, the paper reviews current reserve recruiting issues, develops a conceptual framework for analyzing these issues, and discusses policy alternatives and their potential impact on supply. Therefore, the analysis should be of interest to policymakers and manpower researchers concerned with the supply of reservists in the future.

Two other RAND studies focus on related topics. In the first of these, Stanley Besen and David Grissmer have examined whether income replacement insurance for mobilized reservists would be available from the private sector and on what terms. They also consider possible roles for the Federal government in the provision of such insurance. In the second, David Grissmer, Sheila Kirby, Man-bing Sze, and David Adamson present preliminary results from an ongoing study of the economic losses of reservists upon mobilization and the feasibility of offering insurance to them.

This research was conducted for the Assistant Secretary of Defense (Force Management and Personnel) within the Defense Manpower Research Center in RAND's National Defense Research Institute, a federally funded research and development center sponsored by the Office of the Secretary of Defense and the Joint Staff.
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Summary

Recent military actions, budgetary restrictions, changes in the structure of the Armed Forces, and increasing reliance on flexible manpower capacity are making reserve issues increasingly important. While previous econometric estimates and inventory projection models for the reserves provide useful insights, they may not be sufficient for guiding future policy. Attitudes and expectations concerning the reserve commitment are likely to be different in the era after Operations Desert Shield and Storm (ODS). Moreover, changes in the size and structure of the active force and recruiting programs are likely to have profound implications for the flow of personnel into the reserves. These changes, coupled with the escalating requirement for innovative and cost-effective reserve manpower policies, suggest the need for new research. In an exploratory effort focusing on supply-side reserve issues, the research presented in this paper reviews current reserve recruiting issues, develops a basic framework to guide future analyses of these issues, and outlines alternative policy options for manpower managers in the post-ODS era.

The research approach consists of four primary tasks. First, the recent events and policies that have contributed to the creation of the new reserve recruiting environment are reviewed. Second, the post-Desert Storm recruiting experience is examined using available data to develop some preliminary insights into the effects of recent events and personnel policies on reserve supply. Third, a basic conceptual framework for guiding future research on the reserves is developed. For the fourth task, the research discusses policy alternatives and establishes the basis for a continuing research agenda.

For insights into how ODS affected reserve recruiting (task 2), we analyzed data on recent reserve recruiting experience, through fiscal year 1991, as well as on the reserve recruiting experience in previous fiscal years (1985 through 1990) to use as a comparison. To better interpret these data, we discussed the analytical results with knowledgeable individuals in the various recruiting commands. The analysis of the preliminary reserve recruiting data and the input of knowledgeable officials indicates that the number of reserve accessions fell during ODS but that the fall in reserve recruiting was short lived. According to reserve recruiting officials, supply fell because many prospective non-prior-service reservists were less willing to join at a time when reservists were being called up. The supply of prior-service reservists also fell because active-duty
policy during the conflict prevented personnel nearing the end of their enlistment term from separating from active service, which therefore reduced the flow of veterans into the reserves. Offsetting these effects were, according to officials, the positive supply response to the popularity of the war, the rise in patriotism, and the rise in unemployment during the current recession. On the demand side, offsetting adjustments were made in the fiscal year 1991 reserve missions and recruiting goals to ensure that the accessions lost during ODS would be made up later in the year. According to the recruiting commands, the active-force drawdown has reduced the difficulty of meeting prior-service missions and thus the marginal recruiting cost of prior-service recruits.

Because mobilization risk has traditionally been small, most previous studies have been able to neglect its effects on reserve supply. However, as a result of ODS, potential reservists are likely to revise their estimates of this risk upward. Building on previous research, we use economic theory to outline a basic theoretical framework that examines how individuals’ reserve participation decisions will change in the new environment (task 3). The framework also suggests how reserve supply will respond to various policy instruments in the future. This new model is the first part of the basic framework for analyzing reserve recruiting in the future.

The model predicts that if individuals view mobilization as a costly event, they will be less likely to affiliate with the reserves. The possibility of mobilization subjects individuals to the possibilities of death or injury in or out of battle, family hardships, financial loss, and declines in net income and benefits. It is hypothesized that the greater the financial loss or the family hardship or the greater the probability of a call-up, the less likely an eligible individual will join the reserves. Therefore, if post–Desert Storm reservists anticipate greater mobilization losses than they did previously, they must be paid more if the reserve components are to obtain their past levels of reserve supply. The model also predicts that individuals with greater civilian income opportunities will be even more averse to reserve duty in the future that they were in the past, because their losses are greater during a call-up of the reserves. As a result, the expected cost of reserve duty will increase in the future for high-income individuals. For similar reasons, those individuals whose families are negatively disposed toward the members’ reserve duty will be even less likely to join in the future.

The second part of our basic framework formulates several hypotheses about the effect of the active-force drawdown on reserve supply. It is hypothesized that, during the drawdown, the pool of eligible reserve recruits will increase, because the number of available prior-service and non–prior-service individuals will increase. The pool of prior-service personnel is hypothesized to increase, because
more individuals will be leaving active duty. The pool of non-prior-service personnel is hypothesized to increase, because some of the individuals who are unable to enlist into active duty during the drawdown will be willing to join the reserves. Following the completion of the drawdown, the pool of eligible non-prior-service individuals is likely to continue to increase. However, the pool of prior-service individuals is hypothesized to fall as the opportunities to gain prior-service decline with the smaller active force. Thus, to meet current prior-service requirements, reserve recruiting costs will probably rise; as a result, the "peace dividend" of the drawdown will be reduced.

Using the conceptual framework, we hypothesize how reserve supply will respond to various policy alternatives, such as bonuses and other incentives and mobilization insurance (task 4). The framework predicts that pay increases and policies that increase the amenities of reserve service and/or reduce the costs of reserve duty will increase reserve supply by increasing the probability that an eligible individual will join the reserve. Further, it is hypothesized that, while an increase in the amenities (or a decrease in the disamenities) increases reserve supply, the size of the positive impact depends on whether the probability of mobilization is viewed as high and on whether the increased amenity is targeted to wartime or peacetime service. For example, it is hypothesized that potential reservists who view the chances of mobilization as low will be more responsive to increases in peacetime incentives (that do not also raise wartime incentives) than those who view the chances as higher. On the other hand, those who view mobilization risk as high are hypothesized to be more responsive to increased wartime-related benefits than those who view it has small. Insofar as ODS has caused more people to view mobilization risk as higher in the future, the model predicts that after ODS individuals on average will be more responsive to benefits that reduce the costs associated with a mobilization and less responsive to benefits that increase the amenities associated with peacetime service.

A related implication of the model is that a rise in the peacetime benefits associated with reserve service will increase reserve supply less after ODS than it would have before ODS. Thus, policies that make weekend drills more attractive (say a reduction in transportation cost to the reserve center) will continue to have a positive impact after ODS, but the size of the impact is hypothesized to be smaller.

Mobilization insurance also increases the probability that an individual will join the reserve. However, the model predicts that insurance will blunt the effects of the other determinants of supply in the post-ODS recruiting environment. For example, the model implies that insurance lessens the negative effect of civilian income on the reserve-participation decision, because those who have more to
lose by a mobilization can always buy more insurance and thereby significantly reduce the risk of lost income. Similarly, the model predicts that the positive effect of reducing the cost of mobilization, such as through imminent-danger pay and family-separation allowances, will be reduced when reservists can buy insurance. The model suggests that when individuals can insure against these losses, the gain received via incentive pay and allowances has less of an impact when individuals can insure against these losses. Of course, such bonuses may also be less necessary when reservists can buy insurance, because, all else being equal, individuals are more likely to join when they can buy insurance.¹

In outlining policy options, we also illustrate how a total-force manpower policy can be designed to minimize the future increase in reserve recruiting costs and thus maximize the cost savings to downsizing the active force. Specifically, we show that the cost savings that are due to cutting active-duty accessions in support of the drawdown will be greater if the cut is accomplished via a reduction in active-duty enlistment bonuses or pay rather than via a cut in educational benefits. The reason is that educational benefits have a more salutary effect on the flow of prior-service personnel into the reserves. Reducing educational benefits would reduce this flow, and, as a result, increase reserve recruiting costs by more than a reduction in active-duty bonuses or pay would.

The conceptual model and the analysis of recent reserve recruiting experience provide a basic framework to guide future research. Critical to the analysis are the assumptions that future reservists prefer peacetime service to wartime service and that they anticipate mobilization losses. Since these assumptions are empirical issues, a key future research step should be to determine whether future reservists view mobilization costs as large.

Our analysis of recent reserve recruiting experience indicates that the reserve components were able to compensate at the end of fiscal year 1991 for the adverse effects of ODS on reserve accessions. However, we cannot conclude from this analysis that reserve supply was not hurt in the long term by ODS, because missions and goals for reserve accessions were altered after ODS. Further, the recession and the drawdown would have had a salutary effect on supply even without the occurrence of ODS. To identify whether supply has been adversely affected in the long term, an econometric model of reserve supply must be estimated. This model must not only account for demand and economic changes but must also include estimates of the lost income and the impact of

¹The degree to which insurance lessens the impact of other incentives is an important empirical question.
family separations during mobilization. Sufficient time must pass for there to be sufficient data to disentangle the effects of the recent recession from the effects of ODS. Therefore, we recommend that estimation be postponed until data are available for analysis.
Acknowledgments

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A number of individuals provided information on survey results, as well as on surveys in the field that pertain to Desert Shield/Storm. Timothy Elig of the Army Research Institute, Bette Mahoney of the Defense Manpower Data Center, and Michael Fischl of the Department of the Army were very helpful in providing information on surveys of reservists. For information on employer policy toward activated reservists, I would like to thank David Grassagna of Hewit Associates and Steven Kane of Baxter International.

I am grateful to the two RAND reviewers, Stanley Besen and Harry Thie, for their helpful suggestions and thoughtful reviews. James Dertouzos deserves special thanks for his input in formulating the research approach and tasks. I am especially grateful to Courtland Reichman who provided invaluable research assistance.
1. Introduction

The military’s future reserve recruiting environment is likely to differ markedly from the past as a result of recent military actions and the enormous changes that have taken place in the United States’ national security posture. These actions and events include the reserve mobilization during Operations Desert Shield and Storm (ODS), the virtual end of the Cold War and the Soviet Union, a downsizing and restructuring of the active force, and increased DoD budgetary restrictions. On the demand side of reserve recruiting, much uncertainty still exists as to the size and structure of the future reserve force. However, several events suggest that the future demand for reservists may increase at least relative to active-duty personnel demand. For one, recent Congressional appropriation decisions support an increase in the number of reservists relative to the number of active-duty personnel, at least over the next few years. Expectations about future threats to national security in the post-Cold War era may increase the military’s reliance on the flexible manpower capacity that the reserves provide. Reduced DoD budgets may increase the relative demand for reservists to the extent that such personnel provide a cost-effective means of meeting DoD’s total force requirements.

However, even if no changes occurred in reserve personnel demand, recent events and policies have also created the potential for a change in the future supply of reservists. The continued downsizing and restructuring of the active force during the 1990s is likely to impact the supply of prior-service and non-prior-service personnel to the reserves both during and after the drawdown is complete. Further, expectations and attitudes concerning the reserve commitment, including patriotic duty, combat risk, family hardships, and financial losses during a mobilization, are likely to become more important in the reserve participation decision in the 1990s due to ODS, the largest mobilization of the reserves in forty years.

The potential for such major changes in reserve recruiting implies that previous studies on reserve supply based on historical experiences may be insufficient for conducting future policy. Although still providing useful guidelines for future

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1A congressionally mandated study conducted by RAND assessing the structure and mix of the future active and reserve forces was completed in December 1992 (National Defense Research Institute, 1992).
research, previous econometric estimates of reserve supply may not be reliable in estimating future supply.

The purpose of this report is to lay the groundwork for formulating future reserve recruiting policy in the "new" environment. This report represents an exploratory effort focusing on supply-side reserve issues. The research approach includes four primary tasks. First, it reviews the recent events and policies that have contributed to the creation of the new reserve recruiting environment. Second, it examines the limited data available on reserve recruiting since ODS to develop preliminary insights into whether or not recent events and policies have significantly altered reserve recruiting success. Third, a basic conceptual framework for guiding future research on reserve supply is developed. This paradigm is firmly grounded in the underlying behavioral and economic decisionmaking process of individuals whose decisions affect recruiting outcomes, including families and employers. In addition, it maintains a broad perspective by considering the total-force implications of alternative policies. Fourth, the research discusses policy alternatives for the future based on the analysis and establishes the basis for a continuing research agenda.

The paper is organized as follows: Section 2 gives a brief overview of the drawdown of the active and reserve forces, based on information to date, and on the mobilization of the reserves during ODS. This section corresponds to the first task above. In Section 3, two models of reserve supply are presented, corresponding to the third task. The first model is based on previous research, which has tended to ignore the issues raised by mobilization, and the second, which expands upon the first, provides a framework for understanding the reserve participation decision when mobilization risk is taken into account. Section 4 presents the analysis of the recent, post-ODS reserve recruiting experience (task two above). In Section 5, we outline policy alternatives for the new reserve recruiting environment, including an analysis of the effect of mobilization insurance on reserve supply and analysis of total force policy (the fourth task). Section 6 summarizes the main results and discusses areas worthy of future research.
2. Background

The Drawdown

The 1980s saw an enormous peacetime buildup of the reserve components and a simultaneous increase in the active-duty force, with the exception of the Army’s active force (Tables 1 and 2). The Selected Reserve grew by 35 percent between 1980 and 1989, because the DoD’s total-force policy placed an increasing emphasis on the reserve force. In the Army Reserve, Selected Reserve strength rose by 50 percent; in the Naval Reserve, the size of the Selected Reserve rose by over 55 percent. Total active-duty personnel rose by 6 percent between 1980 and 1987. Navy and Air Force active-duty strength rose by 11.3 percent and 8.8 percent, respectively, while Army strength remained relatively stable.

In contrast to the previous decade, the first half of the 1990s, if not the latter half as well, will see a decline in the size of both the active and reserve force. The bulk of the drop will come from the active force, at least as currently authorized by Congress for the early drawdown years. Active-duty end strength will drop from a FY 1990 level of over 2 million individuals to a level of 1.6 million or lower in FY 1995, a decline of at least 22 percent. These cuts will hit the Army

Table 1

<table>
<thead>
<tr>
<th>Fiscal Year</th>
<th>Army National Guard</th>
<th>Army Reserve</th>
<th>Naval Reserve</th>
<th>Marine Corps Reserve</th>
<th>Air National Guard</th>
<th>Air Force Reserve</th>
<th>DoD Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>1980</td>
<td>366,585</td>
<td>213,185</td>
<td>97,185</td>
<td>35,662</td>
<td>96,283</td>
<td>59,817</td>
<td>868,717</td>
</tr>
<tr>
<td>1981</td>
<td>389,009</td>
<td>232,031</td>
<td>98,297</td>
<td>37,304</td>
<td>98,293</td>
<td>62,255</td>
<td>917,189</td>
</tr>
<tr>
<td>1982</td>
<td>407,601</td>
<td>256,659</td>
<td>104,757</td>
<td>40,461</td>
<td>100,657</td>
<td>64,443</td>
<td>974,578</td>
</tr>
<tr>
<td>1983</td>
<td>417,178</td>
<td>266,188</td>
<td>109,094</td>
<td>42,690</td>
<td>102,170</td>
<td>67,227</td>
<td>1,004,547</td>
</tr>
<tr>
<td>1984</td>
<td>434,259</td>
<td>275,062</td>
<td>120,558</td>
<td>40,619</td>
<td>105,012</td>
<td>70,318</td>
<td>1,045,828</td>
</tr>
<tr>
<td>1985</td>
<td>439,952</td>
<td>292,080</td>
<td>129,832</td>
<td>41,586</td>
<td>109,398</td>
<td>75,214</td>
<td>1,088,062</td>
</tr>
<tr>
<td>1986</td>
<td>446,194</td>
<td>309,709</td>
<td>141,504</td>
<td>41,582</td>
<td>112,592</td>
<td>78,519</td>
<td>1,130,100</td>
</tr>
<tr>
<td>1987</td>
<td>451,858</td>
<td>313,638</td>
<td>148,096</td>
<td>42,253</td>
<td>114,595</td>
<td>80,415</td>
<td>1,150,855</td>
</tr>
<tr>
<td>1988</td>
<td>455,182</td>
<td>312,825</td>
<td>149,457</td>
<td>43,556</td>
<td>115,221</td>
<td>82,116</td>
<td>1,158,357</td>
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<tr>
<td>1989</td>
<td>456,960</td>
<td>319,244</td>
<td>151,505</td>
<td>43,576</td>
<td>116,061</td>
<td>83,214</td>
<td>1,170,560</td>
</tr>
</tbody>
</table>

SOURCE: Department of Defense Selected Manpower Statistics, Fiscal Year 1990, Directorate for Information Operations and Reports, Table 5.3.
Table 2
Active Duty Personnel During the 1980s

<table>
<thead>
<tr>
<th>Fiscal Year</th>
<th>Army</th>
<th>Navy</th>
<th>Marine Corps</th>
<th>Air Force</th>
<th>Total DoD</th>
</tr>
</thead>
<tbody>
<tr>
<td>1980</td>
<td>777,036</td>
<td>527,153</td>
<td>185,250</td>
<td>557,969</td>
<td>2,050,627</td>
</tr>
<tr>
<td>1981</td>
<td>781,419</td>
<td>540,219</td>
<td>188,469</td>
<td>570,302</td>
<td>2,082,560</td>
</tr>
<tr>
<td>1982</td>
<td>780,391</td>
<td>552,996</td>
<td>190,620</td>
<td>582,845</td>
<td>2,108,612</td>
</tr>
<tr>
<td>1983</td>
<td>779,643</td>
<td>557,573</td>
<td>192,380</td>
<td>592,044</td>
<td>2,123,349</td>
</tr>
<tr>
<td>1984</td>
<td>780,180</td>
<td>564,638</td>
<td>194,089</td>
<td>597,125</td>
<td>2,138,157</td>
</tr>
<tr>
<td>1985</td>
<td>780,787</td>
<td>570,705</td>
<td>196,214</td>
<td>601,125</td>
<td>2,151,032</td>
</tr>
<tr>
<td>1986</td>
<td>780,980</td>
<td>581,119</td>
<td>198,025</td>
<td>608,199</td>
<td>2,169,112</td>
</tr>
<tr>
<td>1987</td>
<td>780,815</td>
<td>586,842</td>
<td>198,814</td>
<td>607,035</td>
<td>2,174,217</td>
</tr>
<tr>
<td>1988</td>
<td>771,847</td>
<td>592,570</td>
<td>199,525</td>
<td>576,446</td>
<td>2,138,213</td>
</tr>
<tr>
<td>1989</td>
<td>769,741</td>
<td>592,652</td>
<td>196,956</td>
<td>570,880</td>
<td>2,130,229</td>
</tr>
</tbody>
</table>

SOURCE: Department of Defense Selected Manpower Statistics, Fiscal Year 1990, Directorate for Information Operations and Reports, Table 2.11.

and the Air Force the hardest, with the Army experiencing at least a 27 percent drop and the Air Force nearly a 20 percent drop in active-duty personnel between fiscal years 1991 and 1995.

The cuts in reserve end strength over the next two years will be less severe than the cuts in active-duty end strength, at least as currently authorized by Congress. Table 3 shows the maximum end strengths allowed by service and by Selected Reserve component for FY 1992 and FY 1993, as stated by the 1992 Defense Authorization Bill. The FY 1991 figures are provided for the sake of comparison. While the number of active-duty personnel will fall by 9.6 percent, the number of reservists will fall by only 5.6 percent. These cuts vary by service. In the Army, active-duty end strength will fall by roughly 13 percent over these years, and the Army Reserve and Army National Guard will drop by 7 percent each. In contrast, the Marine Corps active-duty end strength will only fall by 6.1 percent, and the Marine Corps Reserve end strength will drop by 3.8 percent. The degree to which the reserve forces will change during the drawdown is subject to controversy. As the last column in Table 3 shows, the President’s FY 1993 budget figures would have resulted in a more severe cut in Selected Reserve end strength in FY 1993 relative to FY 1991, with great differences across components in the size of the cuts. Thus, the President’s budget would have called for a 20-percent drop in Army National Guard end strength and in Army Reserve end strength rather than a 7-percent fall in each of these components.

Operation Desert Shield/Storm

While the possibility of a reserve mobilization has always been assumed, the probability of such an event appears to have been judged as low by a number of
Table 3
End Strength by Component, FYs 1991 Through 1993

<table>
<thead>
<tr>
<th>Service/Component</th>
<th>Authorized by Congress</th>
<th>President's Budget: 1993</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1991(^a)</td>
<td>1992(^b)</td>
</tr>
<tr>
<td>Active Personnel</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Army</td>
<td>710,233</td>
<td>660,200</td>
</tr>
<tr>
<td>Navy</td>
<td>570,238</td>
<td>551,400</td>
</tr>
<tr>
<td>Marine Corps</td>
<td>194,040</td>
<td>188,000</td>
</tr>
<tr>
<td>Air Force</td>
<td>510,442</td>
<td>486,800</td>
</tr>
<tr>
<td>Total</td>
<td>1,984,953</td>
<td>1,886,400</td>
</tr>
<tr>
<td>Selected Reserve</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Army Guard</td>
<td>457,300</td>
<td>440,000</td>
</tr>
<tr>
<td>Army Reserve</td>
<td>318,700</td>
<td>308,000</td>
</tr>
<tr>
<td>Naval Reserve</td>
<td>153,300</td>
<td>144,000</td>
</tr>
<tr>
<td>Marine Corps Reserve</td>
<td>43,900</td>
<td>42,400</td>
</tr>
<tr>
<td>Air Guard</td>
<td>117,035</td>
<td>118,100</td>
</tr>
<tr>
<td>Air Force Reserve</td>
<td>85,591</td>
<td>83,390</td>
</tr>
<tr>
<td>Coast Guard Reserve</td>
<td>12,700</td>
<td>15,150</td>
</tr>
<tr>
<td>Total</td>
<td>1,188,626</td>
<td>1,151,040</td>
</tr>
</tbody>
</table>

\(^a\)SOURCE: Maze, p. 8.  

reservists, probably because the reserve forces had not been mobilized in large numbers in 40 years. Preliminary analyses of data on Army National Guard and Army Reserve personnel activated during ODS by the U.S. Army Research Institute (ARI) show that 33 percent of the individuals surveyed never expected to be called to active duty before ODS (Elig et al., 1991). Thus, from the perspective of reserve supply, one of the likely effects of ODS has been to cause many prospective reservists to revise upward their estimates of the probability of a call-up. Preliminary evidence from ARI also indicates that 75 percent of the surveyed mobilized reservists believed that operations like ODS were likely to occur in the next 10 years and 54 percent thought that they would be in a combat zone if they stayed in the Army (Elig et al., 1991). Future reserve recruits are likely to consider this risk, the costs and benefits associated with it, and the likelihood that security threats in the future will differ from those in the past in their decisions to join or remain in the reserves. The discussion below describes the extent of the reserve mobilization.

Almost 250,000 reservists were activated during ODS (Table 4). Of these, roughly 60 percent were from the Army Reserve and National Guard. These activated reservists included both members of the Selected Reserve and members of the Individual Ready Reserve. Over half of the activated reservists—138,000—served in the Gulf, while the other half filled European units that were previously filled by active-duty members who had been deployed to the Gulf
Table 4
Reserve Forces in ODS

<table>
<thead>
<tr>
<th>Reserve Component</th>
<th>Activated&lt;sup&gt;a&lt;/sup&gt;</th>
<th>Deployed to SW Asia&lt;sup&gt;b&lt;/sup&gt;</th>
<th>Total Selected Reserve Manpower&lt;sup&gt;b&lt;/sup&gt;</th>
<th>Total Ready Reserve Manpower&lt;sup&gt;b&lt;/sup&gt;</th>
<th>Activated as a Percentage of Total Selected Reserve Manpower</th>
</tr>
</thead>
<tbody>
<tr>
<td>Army Nat. Guard</td>
<td>61,402</td>
<td></td>
<td>444,224</td>
<td>455,260</td>
<td>13.8</td>
</tr>
<tr>
<td>Army Reserve</td>
<td>85,530</td>
<td>310,071</td>
<td>594,319</td>
<td>1,049,579</td>
<td>27.5</td>
</tr>
<tr>
<td>Army Total</td>
<td>146,732</td>
<td>73,473</td>
<td>754,295</td>
<td>1,049,579</td>
<td>19.5</td>
</tr>
<tr>
<td>Naval Reserve</td>
<td>19,297</td>
<td>7,096</td>
<td>152,789</td>
<td>240,228</td>
<td>12.7</td>
</tr>
<tr>
<td>Marine Corps Reserve</td>
<td>30,633</td>
<td>14,379</td>
<td>81,355</td>
<td>152,527</td>
<td>68.8</td>
</tr>
<tr>
<td>Air Force Res.</td>
<td>16,155</td>
<td>83,813</td>
<td>152,527</td>
<td></td>
<td>19.3</td>
</tr>
<tr>
<td>Air Force Nat. Guard</td>
<td>31,877</td>
<td></td>
<td>117,786</td>
<td></td>
<td>27.1</td>
</tr>
<tr>
<td>Air Force Total</td>
<td>48,032</td>
<td>11,123</td>
<td>201,599</td>
<td>270,313</td>
<td>23.8</td>
</tr>
<tr>
<td>Coast Guard Reserve</td>
<td>1,347</td>
<td>376</td>
<td>12,123</td>
<td>17,232</td>
<td>11.1</td>
</tr>
<tr>
<td>Total</td>
<td>246,141</td>
<td>1,165,336</td>
<td>1,165,336</td>
<td>1,658,707</td>
<td>21.3</td>
</tr>
</tbody>
</table>

<sup>a</sup>SOURCE: OASD (Reserve Affairs).


region or who had provided support in the continental United States. Those activated constituted about 21 percent of all Selected Reservists or about one-fifth of those who could be activated in the Selected Reserves. However, those activated as a part of the Selected Reserve varied significantly across components, from about 13 percent in the Naval Reserve to roughly 69 percent in the Marine Corps Reserve.

Reservists performed a wide variety of missions in many functional areas. Roughly 16 percent of individuals in all services served in combat (Eitelberg, 1991, p. 4). Across services, this percentage ranged from 82 percent in the Marine Corps to 2 percent in the Air Force.

Large numbers of medical personnel were activated. In the Army Reserve, nearly a quarter of the medical force was activated (Sandler, 1991). In the Naval Reserve, about 10,000 medical personnel were called up, about half of the total Naval Reserve personnel activated. The Army deployed 11 reserve component

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<sup>1</sup>The 21 percent is an overestimate of the percentage that could have been activated, because some of those who were activated were in the Individual Ready Reserve (IRR) and not in the Selected Reserve. The activated IRR members were primarily in the Army Reserve and Marine Corps Reserve. In these components, activated IRR members were about 20 percent of the total activated (OASD, Reserve Affairs). Of the total Ready Reserve manpower (which includes both the Selected Reserve and the IRR), about 15 percent were activated.

<sup>2</sup>The definition of combat and support services differ across the services. As Eitelberg notes, these differences reflect the separate missions of the armed forces and the different definitions of combat.
mail units, with a total of 900 postal workers. As Table 5 shows, the Army Reserve provided over half of the Total Army’s capability in a number of functional areas. In addition to these functions, Army Reserve units also included transportation, maintenance and engineering, medical, chemical decontamination, and military police.

Table 5

<table>
<thead>
<tr>
<th>Unit Type</th>
<th>Proportion of Services Supplied by USAR (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Civil affairs</td>
<td>94</td>
</tr>
<tr>
<td>POW handling</td>
<td>89</td>
</tr>
<tr>
<td>Postal</td>
<td>69</td>
</tr>
<tr>
<td>Petroleum handling</td>
<td>65</td>
</tr>
<tr>
<td>Psychological operations</td>
<td>64</td>
</tr>
<tr>
<td>Water handling</td>
<td>59</td>
</tr>
</tbody>
</table>

3. Modeling Reserve Supply in the Post-ODS Recruiting Environment

From a theoretical standpoint, reserve supply has two basic determinants: the number of eligible individuals available to join the reserve components and the affiliation decision of each individual in that group. In the new recruiting environment, the drawdown will alter the first determinant to the extent that it changes the available number and mix of prior-service and non-prior-service individuals who meet the services’ eligibility requirements for affiliation to join the reserves. The mobilization of the reserves during ODS will affect the second determinant to the extent that it introduces additional factors into each individual’s reserve participation decision. The discussion below examines each of these reserve-supply determinants. First, it considers the reserve participation decision (the second determinant) in the pre-ODS environment, then expands the analysis to consider this decision when mobilization is taken into account.\(^1\) We then examine how the drawdown will affect the available pool (the first determinant).

Based on economic theory, an individual decides to join the reserves by systematically weighing, in terms of his or her preferences, the present and expected future pecuniary and nonpecuniary benefits and costs of reserve service. This theoretical modeling framework is quite general to the extent that the benefits of reserve service can be always be defined in terms of such variables as patriotism and monetary compensation, and the costs can be always defined in terms of such variables as lost civilian opportunities and family time, as well as financial losses during a mobilization.

While this framework underlies most of the previous research on reserve recruiting (such as Tan, 1991; Marquis and Kirby, 1989; and Grissmer et al., 1989), most past studies generally ignore the costs or losses and benefits associated with a reserve mobilization,\(^2\) because the probability of mobilization and thus the probability of realizing any losses or gains with the mobilization has been considered small (Elig et al., 1991). Rather, previous studies generally view the

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\(^1\)The formal model that draws from and builds upon Rostker (1974) is presented in Appendix A.

\(^2\)Rostker (1974) includes the possibility of mobilization in his model, but its effect on reserve supply drops out because the probability was negligible.
reserve participation decision as a decision to take a part-time or secondary job during peacetime, i.e., as a moonlighting decision.\textsuperscript{3} Since the costs and benefits associated with reserve service are defined in terms of peacetime costs and benefits, the peacetime moonlighting model is a subset of a more general model of reserve supply that accounts for both the peacetime and wartime natures of reserve service. Such a general model is outlined below. To better show the effect of the probability of mobilization, or mobilization risk, on reserve supply, the discussion first overviews the main hypotheses of the moonlighting model and then presents the more general framework.\textsuperscript{4}

**Moonlighting Model**

Individuals join the reserves if they perceive that the benefits of doing so exceed the costs. What are some of the costs and benefits of peacetime reserve duty? Table 6 lists the most prominent costs of reserve duty during peacetime. For example, peacetime costs include forgone civilian income during annual training and alternative moonlighting jobs, transportation costs, family conflicts arising from reserve duty, and forgone leisure.

In terms of benefits, clearly one of the key benefits of reserve duty is the monetary compensation associated with reserve service, including drill pay and military compensation during annual training. Reserve compensation during peacetime (i.e., inactive duty for weekend drills and active duty for training) also includes limited medical care, facility use, and future retirement benefits. In addition, reservists get the nonmonetary benefits associated with reserve service, including camaraderie and the pride associated with service to country.

Out of a fixed pool of eligible individuals,\textsuperscript{5} those who join the reserves view reserve duty as a better option than all other opportunities. An individual's reservation wage is defined as the amount of reserve or military compensation

\textsuperscript{3}Shahko and Rostker (1976) present a theoretical and empirical model of the moonlighting decision. As Mehay (1991) discusses, reserve duty differs in several important respects from a civilian moonlighting job. Still, Mehay finds empirically that the reserve participation decision is a labor-force decision strongly influenced by the variables predicted by the moonlighting model. Thus, the moonlighting model represents a good starting point for analyzing the reserve participation decision.

\textsuperscript{4}Technically speaking, mobilization risk refers to the probability of being mobilized. If mobilization entails losses to the individual, mobilization risk can also mean the probability of suffering a loss due to mobilization. Here, the term means simply the probability of being mobilized.

\textsuperscript{5}The pool of individuals eligible to join the reserves is not fixed in reality but varies with demographic factors, active duty and reserve personnel policy. We abstract from the size of the pool temporarily (the first determinant mentioned earlier) to focus specifically on the reserve participation decision. Later in the section, we focus on factors affecting the size of the available pool of eligible individuals.
Table 6
Costs of Reserve Participation During Peacetime

<table>
<thead>
<tr>
<th>Element</th>
<th>Description</th>
</tr>
</thead>
</table>
| Federal, state, and FICA taxes               | Reserve pay is taxed at a higher marginal rate because it is generally over and above civilian pay.  
|                                              | a.                                                                 |
| Forgone civilian income                      | From three components:                                         |
|                                              | 1. Employer policies for annual training (AT) attendance may   |
|                                              | a. pay only the difference between civilian and reserve wages for all or some period of time (forgone income = AT pay) |
|                                              | b. pay no civilian income (forgone income = civilian income)   |
|                                              | 2. Lost overtime during AT or drills or forgone wages during drills |
|                                              | 3. Alternative moonlight jobs                                  |
| Transportation costs                         | From two components:                                           |
|                                              | 1. Actual out-of-pocket costs                                  |
|                                              | 2. Opportunity cost of driving time equal to value of time if spent in alternative activity |
| Other costs related to the civilian job, both monetary and nonmonetary | From several interrelated aspects:                             |
|                                              | 1. Loss of or reduced chance of promotion                      |
|                                              | 2. Unfavorable supervisor attitudes                            |
|                                              | 3. Conflicts with time demands                                 |
|                                              | 4. Increased perceived chance of dismissal                     |
| Other nonmonetary costs                      | From two components:                                           |
|                                              | 1. Family conflicts, because of extended time spent at AT, weekend drills, forgone income, etc. |
|                                              | 2. Decrease in own leisure                                    |

SOURCE: Grissmer et al. (1989), Table 3.25, p. 58.

Note that FICA also helps build the reservist's Social Security base and thus is a benefit of reserve participation.

that makes him or her indifferent between joining the reserves and pursuing his or her next best opportunity. The supply of reservists at a given level of military pay is equal to the number of individuals for whom the military wage exceeds their reservation wage. Thus, among the pool of eligibles, reserve recruits have the lowest reservation wage. Not surprisingly, then, surveys of reservists and new reserve recruits will tend to show a group that is generally satisfied with its participation and that is particularly patriotic and for which service to country is important. For the marginal recruit who is indifferent between reserve service and another alternative, the military wage equals his or her reservation wage. Although the marginal recruit likes reserve duty more than those who do not join, the marginal recruit likes the reserves the least among those who do join.
As individuals’ reservation wages rise, the probability that military compensation exceeds the higher reservation wages falls, and individuals are less likely to affiliate with the reserves. Supply falls, and only the most avid individuals in the fixed pool join the reserves. Thus, reserve supply will respond to changes in individual characteristics, recruiting market characteristics, and the costs and benefits of reserve service, according to how the reservists’ reservation wages respond.

The moonlighting model predicts that the reservation wage will increase when civilian earnings and/or nonlabor income increase; out of a fixed available pool of eligible individuals, those with higher civilian earnings in their primary job, such as physicians, or who are in an alternative civilian moonlighting job are less likely to join the reserves, all else held constant. Further, as civilian income opportunities increase, such as promotion opportunities, reserve supply falls because individuals’ reservation wages rise. Out of the fixed pool of available personnel, those who join the reserves will value civilian income the least, all else being equal. Therefore, the military must offer higher compensation (or nonmonetary benefits) to those who earn more in the civilian sector, because they are less likely to join the reserves without higher remuneration in some form.

On the other hand, when the disamenities associated with work in the civilian section increase, such as unemployment, the reservation wage falls, and reserve supply increases. All else being equal, those who are unemployed or have the highest expectation of (uninsured) unemployment are also the most likely to join the reserves. Thus, in a recession, one would expect the reserve supply to increase, all else being equal.

The reservation wage falls and reserve supply rises when the benefits associated with reserve duty increase. Further, those who particularly value the nonmonetary aspects of reserve duty, such as the most patriotic individuals, are most likely to affiliate. Conversely, all else being equal, reserve supply falls when the disamenities associated with reserve service rise because individuals’ reservation wages increase. Thus, when the amount of time that must be taken away from family and leisure activities increases, reserve supply will fall. And, those who value leisure and family time the most are the least likely to join the reserves.

The above hypotheses are the same whether they are stated within the context of the peacetime moonlighting model or within a more general model that explicitly accounts for the uncertainties associated with mobilization. However, the introduction of mobilization and the potential for losses associated with mobilization adds some elements that can have an important effect on reserve
supply. An expanded model is required not only to account for these elements but also to examine the various policy options available in light of these elements. Such a model is outlined next.

Model Accounting for the Probability of Mobilization

The model described below is a prototype for examining the effects of mobilization—the probability of mobilization as well as the gains and losses associated with that probability—and policy alternatives on the participation decision. The theoretical model’s main results are first, that individuals are less likely to join the reserves when they anticipate call-up losses and view the probability of mobilization as nonnegligible. On the other hand, the model hypothesized that if no losses are anticipated, then reserve supply will be unchanged by the possibility of mobilization. Second, if individuals are less likely to join, reserve pay or benefits must increase to induce the same number of reservists to join. Third, the probability of mobilization changes how reserve supply responds to its various determinants, such as civilian income. Past empirical estimates of reserve supply that are based on the assumption that mobilization risk is negligible may be of limited use in the new recruiting environment. The model and results are discussed in more detail below.

Like the moonlighting model, this version of the model posits that individuals join the reserves if they anticipate that they will be better off by doing so, after accounting for the expected costs and benefits of reserve service. The model’s key additional feature is that potential reservists now face a nonnegligible probability of being called up.

Once the probability of a mobilization is introduced, several additional factors must be recognized. First, individuals now weigh the costs and benefits of reserve service in every possible mobilization or risk situation, as well as the probability that the situation will occur. The costs and benefits will vary between peacetime and wartime and according to the type and length of mobilization. Relative to peacetime, reservists who are called to active duty may lose civilian income, depending, in part, on employer policies toward reserve duty during a mobilization. For the self-employed, the costs will depend on the type of fixed business expenses that must be met, such as employee payroll, while activated. Some reservists may actually have greater total income than they did during peacetime. For others, the financial losses during a mobilization may be negligible. Another cost is related to family hardships created by the absence of the reservist during a mobilization. On the other hand, one of the key benefits during a call-up is the extra reserve earnings relative to peacetime received by a
full-time active-duty member of the armed forces. The benefits also include any additional military benefits for which individuals and their families are eligible, including combat pay and medical care for dependents. The amenities and disamenities of reserve duty will vary across risk situations. For example, the chances of being injured in combat can be greater in wartime than in peacetime and in some combat scenarios more than in others. The positive aspects of reserve service, such as service to one’s country and pride in such service, are probably greater in popular wars than in unpopular ones. Finally, because individuals may be injured during a call-up, or may value consumption and job amenities and disamenities differently in some mobilization risk situations than in others, there will be some scenarios where individuals are worse off during wartime than in peacetime even for the same level of monetary and nonmonetary benefits and costs.

To impart meaning to the term mobilization risk (or probability of mobilization), we analyze below the case where reservists face losses on net during/after being mobilization, either in terms of lost civilian income, family hardships, or injury. Put differently, we assume that individuals prefer peacetime to wartime service and that the possibility of mobilization implies the possibility of losses. Whether or not post-ODS reservists will view mobilization in such a way is an important empirical question that should be addressed in future research. We also assume that individuals are averse to risk. For the same expected income, they prefer less to more income variability. This assumption does not affect our results in this section, and, in fact, we could drop it and still arrive at the same theoretical conclusions. The model in Appendix A is general enough to allow for situations in which individuals are not risk averse or in which they do not anticipate losses during a mobilization. We make the assumption to enable us to explicitly examine how mobilization insurance—discussed in Section 5—will alter the moonlighting model.

As before, individuals will join the reserves if they view reserve duty, even after accounting for the losses associated with the probability of being mobilized, as the most preferred option among those available. The supply of reservists from a fixed pool of eligibles is equal to the number for whom reserve compensation exceeds their reservation wage. And, for the marginal recruit, reserve compensation equals the reservation wage. Those who join the reserves are the

---

6If we assumed, to the contrary, that reservists view mobilization as a benefit or as a negligible cost, then reserve supply would differ little from that implied by the moonlighting model.

7The assumption that individuals are risk averse is probably not far from reality. However, individuals may differ drastically in their degree of risk aversion and in the types of risky situations to which they are averse.
most avid and enthusiastic about reserve duty among the eligible pool. Also as stated before, an increase in individuals' reservation wages reduces the probability that military compensation will exceed the reservation wage and thus the supply of reservists.

The model's first main conclusion is that reserve supply will be lower, all else being equal, after ODS if reservists view mobilization as resulting in losses relative to peacetime. A costly mobilization means that expected income or the expected benefits of reserve duty are lower. The probability of affiliating with the reserves falls because the reservation wage is higher in the expanded model than in the basic moonlighting model. The difference in the reservation wage between the two models equals the extra amount of reserve earnings that individuals must receive to just induce them to join the reserves when the losses associated with mobilization are viewed as nonnegligible. This differential is called the compensating differential for mobilization loss. The hypothesis that, all else being equal, reserve supply will be lower following ODS forms the theoretical basis for the concerns about reserve supply after ODS.

The model predicts that if individuals do not anticipate losses during a mobilization, reserve supply will remain unchanged. Whether or not this will be the case in the post-ODS recruiting environment is an important empirical question. Appendix B discusses what little is known about the costs experienced by reservists during ODS.

Assuming that wartime service does impose a financial or utility loss, the adverse effect of mobilization on reserve recruiting will vary across individuals because of differences in preferences, perceptions regarding the amenities and disamenities of reserve service, civilian earnings, and local labor-market characteristics. Further, recruiting policies will also influence the degree to which mobilization loss has a negative effect on recruit supply.

Although individuals are less likely to affiliate with the reserves, their predicted response to various exogenous changes, such as a rise in the civilian unemployment rate, is in the same direction as in the basic moonlighting model. Thus, like the basic model, the theory predicts that a rise in (nonlabor) income will reduce the chance an individual will join, while a rise in the unemployment rate will increase it, because the first change increases the reservation wage and the latter change reduces it.

However, the sizes of these effects differ when the chance of a mobilization (which involves financial losses relative to peacetime) is nonnegligible. For example, those who earn more or have the potential to earn more in a civilian moonlighting job will require an even greater increase in military pay after ODS.
than those who earn less. Figure 1 shows the hypothesized effect of civilian earnings on the reservation wage when mobilization is viewed to be a costly event. The horizontal axis measures the probability of mobilization (and thus the probability of a loss), as viewed by potential reservists, and the vertical axis shows the reservation wage. Thus, the period before ODS lies on the left of the horizontal axis and the period after ODS lies to the right. Before ODS, those with greater civilian income had a higher reservation wage of A, and those with less income had a lower reservation wage of B. Low-income individuals are more likely to try to affiliate with the reserves. After ODS, those who earn more now have a reservation wage of D, and those who earn less now have a reservation wage of C. The reservation wages of both high- and low-income individuals are greater after ODS because a given individual who faces a loss when mobilized has a higher reservation wage and is less likely to affiliate regardless of income. As Figure 1 shows, the difference between the reservation wages before and after ODS is greater for the individual who earns more civilian income, i.e., the difference D–B is greater than C–A. Thus, the model predicts that such individuals are even less likely to join the reserves now than they were before ODS. The reason is that those who earn more in the civilian sector have more to lose during a mobilization. As the chances of a mobilization increase (as perceived by the potential reservist), this loss increases. Thus, higher-earning individuals will require a greater inducement to join than lower-earning individuals after ODS, and they will require a greater inducement than they did prior to ODS.

For similar reasons, the model predicts that a recession is likely to have a less beneficial effect on reserve supply after ODS than before it. This effect is shown in Figure 2. Before the Gulf Crisis, an increase in the civilian unemployment rate reduced the reservation wage from point A to point B, and thus increased the probability of reserve affiliation. After ODS, an increase in the unemployment rate will reduce the reservation wage from point C to point D. The difference between C and D is smaller than the difference between A and B. Thus, an increase in the unemployment rate will increase reserve supply by a smaller amount in the future. Those who are unemployed are less likely to join after than before ODS because, relative to being unemployed, joining the reserves—which involves potential losses during mobilization—is viewed as a less preferred employment option.

The model also suggests that policy variables will also affect the number of people who join the reserves after ODS. For example, offering bonuses or any other increase in the amenities associated with reserve service, such as
Figure 1—Hypothesized Effect of a Civilian Income Increase on Reserve Supply Before and After ODS

Figure 2—Hypothesized Effect of an Increase in the Civilian Unemployment Rate on Reserve Supply Before and After ODS
educational benefits, or reducing the disamenities will decrease the individual’s reservation wage and increase the supply of reservists.

These theoretical hypotheses imply that estimated supply relationships based on pre-ODS data may be misleading. Specifically, the analysis suggests that previous estimates of the effect of the civilian unemployment rate on reserve supply may underestimate the effect in the new environment. Previous estimates of the effect of civilan earnings and opportunities on reserve supply may also be underestimated. Whether the future supply of reservists will fall after ODS will depend on whether individuals view mobilization as involving net costs. Empirical work must determine whether post-ODS reservists anticipate losses during a future mobilization. In addition, to the extent that individuals anticipate losses, reserve supply relationships must be reestimated to take into account the changes in the new reserve recruiting environment. In Section 5, we will apply the above model to examine alternative future policies, such as offering insurance to reservists for protection against mobilization losses and risk.

**Hypothesized Effects of the Active Force Drawdown on the Available Pool of Eligibles**

We hypothesize that the drawdown of the active force will affect the supply of reservists into both the short term and long run by changing the sizes of the pools of prior service and non-prior-service personnel eligible to join the reserves. In the short run, as more personnel are lost from active duty, the pool of prior-service personnel who are available to join the reserves will increase. Whether or not they will be able to join the reserves will depend on the character of their discharge from active duty, as well as the availability of a billet in a reserve or National Guard unit. Demand constraints in higher paygrades limit the reserve participation of some prior-service individuals. In addition, experience shows that only about half of those leaving active duty will be eligible to enlist in the reserves. The other half will be ineligible, primarily because of substandard performance while on active duty (Marquis and Kirby, 1989, p. 7).

During the drawdown, the supply of prior-service personnel to the reserves is likely to increase not only because of the increased number of active-duty veterans, but also because the drawdown is likely to affect the availability of personnel with substantial service experience and thus with a proven interest in

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8 Appendix B briefly overviews preliminary information on the financial losses and family hardships suffered by ODS reservists.
military service. Therefore, we hypothesize that more of those separating from active duty are probably interested in and eligible for reserve duty during the drawdown than were interested and eligible before it. Historical experience indicates that the propensity of prior-service individuals to join the reserves declines with age and years of service (Marquis and Kirby, 1989). In part, demand constraints in higher paygrades have limited the reserve participation of prior-service individuals. However, another reason is that those who separate from active duty with more years of service are more likely to be individuals dissatisfied with military service. To the extent that some of those affected by the drawdown are not dissatisfied with military service, individuals leaving active duty with more years of service may be just as likely to affiliate with the reserves as their younger counterparts. Using our own terminology, prior-service personnel leaving active duty during the drawdown may be more likely to have a lower reservation wage than those who left active duty before the drawdown. If so, we predict that the eligible pool will increase and the propensity of a given individual to affiliate with the reserves will increase as well. Of course, these are only hypotheses, and their validity must be examined empirically.

We also hypothesize that the drawdown will also be likely to affect the supply of non-prior-service personnel to the reserve components. Some if not most of the cuts in active-duty personnel have been accomplished to date by reducing active-duty non-prior-service accessions. Thus, within a given pool of military-eligible youth, fewer have been accepted into the active force. The implication is that the pool of non-prior-service youth eligible to join the reserves will be growing substantially over the early 1990s. To the extent that many of the youths who are unable to join the active force will want to join the reserves, the supply of non-prior-service reservists will increase during the drawdown. Thus, we hypothesize that the size of the eligible pool will increase, and the fraction who want to join will increase as well. Again, these hypotheses can be tested empirically. Of particular empirical importance is the “switch rate” of individuals, i.e., the extent to which those who would have joined active duty are willing to join the reserves.

For in the longer term, once the drawdown of the active force is complete and the size of the force has reached a steady state, we hypothesize that the number of prior-service personnel available to join the reserves is likely to fall as the opportunity for an individual to acquire active-duty experience diminishes. In addition, with a smaller active duty force to maintain, non-prior-service active-duty accessions are likely to decline. Just as during the drawdown, it would appear that the post-drawdown supply of non-prior-service individuals to the
reserves will increase if both the available pool and the propensity of individuals within the pool to affiliate increase.

These hypotheses suggest that the supply of reservists will be greatest during the drawdown if both the available pools of prior-service and non-prior-service increase in size and if the probability of an individual joining increases. After the drawdown, we predict that the pool of individuals available to join the reserves will continue to grow, but its composition will shift toward non-prior-service and more junior personnel and away from more experienced prior-service individuals. Thus, we hypothesize that, all else being equal, the difficulty or marginal cost of filling more senior reserve-unit billets will increase, and the difficulty of filling more junior positions will fall after the drawdown. Section 5 discusses total-force policy alternatives that could ameliorate these possible costs of recruiting prior-service personnel after the drawdown.
4. Recent Reserve Recruiting Experience

A review of reserve recruiting data before and after Operation Desert Storm/Shield suggests that reserve supply fell during the Gulf Crisis. However, the data indicate that, shortly following the conflict, recruiting resumed to the point that reserve recruiters were generally meeting or exceeding their recruiting missions by the end of fiscal year 1991. The discussion below presents a review of the data on the recent recruiting outcomes of the three largest reserve components; the Army Reserve, the Army National Guard, and the Naval Reserve (NR).¹ This data overview is intended to provide some initial insights into how Desert Storm affected reserve accessions.²

Information was obtained on reserve recruiting outcomes from three sources. For the Army Reserve, we obtained monthly, battalion level, accession, and mission data from the U.S. Army Recruiting Command (USAREC) for prior-service and non-prior-service personnel for October 1984 through September 1991. For the Naval Reserve and Army National Guard, monthly accession data for prior-service and non-prior-service personnel for the same period, FY 1985 through FY 1991, were obtained from the Defense Manpower Data Center. Seven years of data were collected to ensure a long enough data series to detect any pre-ODS trends. Finally, we contacted knowledgeable officials in each reserve component recruiting area to aid interpretation of the data, especially for the NR and Guard, for which we did not have reserve mission data.

Monthly accessions for each component were plotted against time (in months): month 1 equals October 1984 and month 84 equals September 1991, and months 71 to 77 correspond to the ODS period of August 1990 to March 1991. For the Army Reserve, three types of graphs were plotted: monthly average battalion-level accessions against time, monthly average battalion-level missions against time, and the monthly average battalion difference between accessions and missions. The latter plot shows the extent to which the average battalion made, exceeded, or fell short of its mission.

¹These three components accounted for over 80 percent of total reserve accessions in FY 1990.
²The focus of the analysis is on overall accession trends. The trends for individual subgroups, such as for specific occupational groups and for high-quality recruits (high school graduates in the upper half of the Armed Forces Qualification Test score distribution) may differ from the overall trend. The general patterns may mask the trends for specific populations. Future work should explore these trends more fully by relevant subgroup.
We then contacted the various national recruiting headquarters for each reserve component for insights into the results, particularly with regard to the pattern of accession missions. A changing pattern in accessions during or after ODS cannot be interpreted as a change in reserve supply without further information on the pattern of demand-side factors including recruiter missions and unit requirements. Substantial research has shown that recruiters are highly responsive to management methods that include monthly missions,\(^3\) annual targets, and incentive plans (Dertouzos, 1985; Polich et al., 1986; and Asch, 1990). Changing accession patterns may exclusively reflect changes in missions and recruiter effort. They may also reflect other policies that restrict the flow. During the Gulf conflict, demand constraints were placed on the recruitment of reservists to fill mobilized units. Declines in accessions during ODS could have been due to this constraint rather than to insufficient supply.

Figure 3 shows the average number of battalion-level Army Reserve non–prior-service and prior-service accessions made in each month from October 1984 to September 1991. To take into account the pattern of demand, the mean battalion mission data are shown in Figure 4. Figure 5 shows the trends in the differences between Army Reserve accessions and missions. In Figure 6, total monthly National Guard non–prior-service and prior-service accessions are shown from October 1984 to September 1991. The enlisted accession patterns for the Naval Reserve are shown in Figure 7 for both total accessions (prior service plus non–prior-service).\(^4\)

The figures suggest that a short-lived fall occurred in the number of enlisted reserve accessions during and after ODS. In each component, non–prior-service reserve accessions dropped significantly between August 1990 and March 1991. The large shortfall during ODS in non–prior-service accessions relative to missions is seen clearly for the Army Reserve in Figure 5. In December 1990, the average battalion fell short of its non–prior-service mission by over 20 recruits. Both Army Guard and Naval Reserve recruiting officials reported a similar decline in the number of non–prior-service reserve accessions relative to mission during the Gulf Crisis.

\(^3\) Generally speaking, the monthly mission is the number and quality of enlistments that the recruiter or group of recruiters is asked to recruit each month. These goals are assigned by the recruiting command. The mission might also be broken down by type of recruit, such as prior service and non–prior service.

\(^4\) In the case of the Naval Reserve, the Defense Manpower Data Center data count veterans of the other services as non–prior-service Naval Reserve accessions rather than prior-service accessions. Because of this practice, total accessions are shown instead of accessions broken down by prior service status.
According to officials, the drop in accessions during ODS was not exclusively a result of the demand constraints put on the recruitment of personnel for mobilized units. Another important reason officials cite is the same for each component: NPS supply fell during ODS because parents were reluctant to sign the forms necessary or to otherwise support the affiliation decisions of their sons or daughters.

In the case of prior-service personnel, officials reported a more modest decline in the number of accessions during ODS. The effect is clearly detected in Figure 6b, which shows the pattern of prior-service accessions for the Army National Guard. However, it is less clear for the Army Reserve (Figure 5b) and for the Naval Reserve (Figure 7, which shows total accessions). The decline in prior-service supply, according to officials, was a direct result of active-duty policy rather than a new reluctance of active-duty veterans to join the reserves. During ODS, a "stop-loss" policy was adopted in various stages. Under this policy, those on active-duty who were nearing or who had reached the end of their enlistment term were generally not permitted to separate, thereby reducing the flow of veterans leaving active duty and joining the reserves.

The figures show that the number of reserve accessions rose dramatically after the Gulf conflict. This rise is particularly evident in Figure 5 for the Army Reserve and in Figure 6b for National Guard prior-service accessions. Both Guard and Naval Reserve officials report a post-war rise in non-prior-service accessions in each of their respective components. In the case of the Army Reserve, reserve accessions rose to such a degree that by the end of the fiscal year the average battalion was exceeding its monthly prior-service mission by 20 recruits (Figure 5b). Naval Reserve officials state that Naval Reserve recruiters vastly exceeded their July 1991 mission.

According to the reserve recruiting officials, the fall in the number of reservists recruited during and after ODS was short-lived in part because of the offsetting effects of the popularity of the war, the rise in patriotism, and the rise in unemployment during the current recession. The popularity of the war and the rise in patriotism are well known. The average monthly civilian unemployment rate after ODS (i.e., between March 1991 and September 1991) was 6.3 percent, about 9 percent higher than the 5.8 percent average during the Gulf crisis (September 1990 through February 1991), (Bureau of Labor Statistics, 1991). Using an elasticity of 0.3 (Tan, 1991), reserve accessions would have risen after ODS by around 3 percent even if the war had not occurred.
Figure 3—Army Reserve Mean Battalion Accessions
Figure 4—Army Reserve Mean Battalion Missions
Figure 5—Army Reserve: Difference in Mean Battalion Accessions and Missions
Figure 6—Army National Guard Accessions
The short-lived fall after ODS in the number of reserve accession might also be due to demand-side factors. The reserve components adjusted their FY 1991 accession missions to ensure that the deficits that occurred during ODS would be made up by the end of the year. In all three components, recruiters were either given higher monthly accession missions or were strongly encouraged to overproduce in the months following the war. For example, the Army Reserve reduced its annual FY 1991 mission following the war (in March 1991) and, at the same time, increased the monthly missions for April through September 1991. The reduction in the annual mission clearly increased the likelihood that the overall annual mission would be made for a given level of supply, while the increase in the monthly post-ODS missions would increase monthly recruiter effort to ensure that the shortfall from the first half of the year would be made up.

The Naval Reserve followed an almost identical strategy in setting the mission for its non-prior-service accessions, according to Naval Reserve officials. Naval Reserve non-prior-service missions were increased after the war. However, unlike the Army Reserve, the Naval Reserve did not cut its FY 1991 annual mission midyear. The FY 1991 target had already been cut from its FY 1990 level, from 25,758 to 19,165. The Army National Guard method was almost identical to the Navy method. While missions were not increased following ODS, Guard recruiters were strongly encouraged to overproduce relative to mission in the
latter half of FY 1991. However, unlike the Naval Reserve, the Army National Guard had increased its annual mission for FY 1991 (relative to FY 1990) in anticipation of a larger, drawdown-induced flow of prior-service personnel.

This analysis suggests that the reserve components were most likely adversely affected by ODS but that reserve recruiters were able to compensate at the end of FY 1991 for these probable adverse effects. However, these are only preliminary insights. We cannot conclude, however, from this analysis that reserve supply was not hurt in the long term by ODS. First, any negative supply responses to the war may have been hidden by the positive effects of increased missions and recruiter effort on accessions. Second, the recession and the drawdown would have had a salutary effect on supply, even without the occurrence of ODS. Therefore, to identify whether supply has been adversely affected in the long term, an econometric model of reserve supply that accounts explicitly for these factors must be estimated once more data are available on the post-ODS experience.
5. Policy Alternatives

As hypothesized in Section 3, reserve supply will be lower in the new reserve recruiting environment if future reservists view mobilization as costly. The discussion also suggested that this problem will be compounded if, as hypothesized, the eligible pool of prior-service personnel will decline after the active-force drawdown is complete. The model also predicts another exacerbating factor: some recruits, such as those with higher civilian earnings, will be even more disinclined to join the reserve in the future than in the past. In light of these issues, new and innovative policies may be necessary in the future.

This section outlines three types of policy alternatives. First, we consider alternative ways of increasing the benefits and reducing the costs of a mobilization to reservists.\(^1\) Second, mobilization insurance and its effect on the reserve participation decision are considered. This analysis is a prototype of how to introduce insurance into the model of reserve supply.\(^2\) Finally, we illustrate how total-force policy can reduce the negative impact of the drawdown on the flow of prior-service personnel into the reserve.

Policies that Change the Costs and Benefits of Mobilization

As hypothesized in Section 3, pay increases and policies that increase the amenities of reserve service and/or reduce the costs of reserve duty will increase reserve supply by increasing the probability that an eligible individual will join the reserve. One question of interest is whether policies that increase the amenities of reserve service (or reduce the disamenities) will be more or less effective after ODS. Our theoretical model (presented in Appendix A) indicates that, while an increase in the amenities (or a decrease in the disamenities) increases reserve supply, the size of the positive impact depends on whether the probability of mobilization is viewed as high and on whether the increased

\(^1\)To indicate the general implications of mobilization risk for reserve supply, we assume in what follows that individuals view mobilization as an adverse event. If this is not the case, then future supply relationships will be similar to those of the past. Whether future reservists view mobilization as costly is an important empirical question.

\(^2\)Appendix A presents the formal version of the model.
amenity is targeted to wartime or peacetime service. For example, we hypothesize that those who view the chances of mobilization as low will be more responsive to increased peacetime incentives than those who view the chances as high. On the other hand, those who view mobilization risk as high will be more responsive to increased wartime related benefits than those who view it as low. Insofar as ODS has caused more people to view mobilization risk as higher in the future, the model predicts that, after ODS, individuals will on average be more responsive to benefits that reduce the costs associated with a mobilization and less responsive to benefits that increase the amenities associated with peacetime service.

A related implication of the model is that a rise in the peacetime benefits associated with reserve service will increase reserve supply less after ODS. Thus, policies that make weekend drills more attractive (say a reduction in transportation cost to the reserve center) will continue to have a positive impact after ODS, but the size of the impact will be smaller. The model predicts that, when the probability of a mobilization is greater (and thus the chance for loss is greater), individuals weigh the benefits associated with peacetime duty less heavily in their reserve participation decision.

These hypotheses have implications for the direction (but not the magnitude) of the response of reserve supply to the benefit increases that were enacted following ODS in April 1991. The analysis implies that the $30 per month increase in GI Bill benefits for reservists will raise reserve supply. It also suggests that the $40 per month increase in imminent-danger pay in 1991 and that the increase in the family-separation allowance will be more effective today in increasing reserve supply than they were in the past if individuals anticipate net mobilization losses. On the other hand, the model predicts that the authorized prorated peacetime bonuses for the health-care professions will be less effective in generating affiliations in the new reserve recruiting environment than they would have been in the pre-ODS environment. To attain the pre-ODS impact on reserve supply, the model predicts that increases in peacetime benefits must be larger if reservists anticipate call-up losses.

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3To distinguish meaningfully between an increase in the amenities associated with peacetime or wartime service and an increase in pay or bonuses (which would affect both peacetime and wartime service), this analysis assumes that individuals do not realize the peacetime benefits during wartime, and vice versa. An example would be a change in medical benefits eligibility for members on inactive duty for training, which could increase the amenities of peacetime duty) without creating a change in what members receive while on active duty (during wartime duty).

4Evidence based on pre-ODS experience on how changes in educational benefits and other benefits (other than pay) affect the reserve affiliation decision is limited. Grissmer, Buddha, and Kirby (1989) found that, for junior personnel, the existence of the educational benefits (rather than the changes) influences their reserve participation decision. Marquis and Kirby (1989) found that
Increasing the family-separation allowance and increasing the imminent-danger pay are only two ways of increasing the net benefits of reserve duty during wartime. Other policies could obviously include increasing other types of wartime benefits and allowances. More generally, any policy that "insures" reservists by increasing wartime benefits and therefore reducing mobilization losses will improve reserve supply. Below, we consider mobilization insurance more explicitly.

Mobilization Insurance and the Reserve Participation Decision

The model presented in Section 3 hypothesized that individuals who view mobilization as costly require extra pay or a compensating differential to be willing to join the reserve. Although we assumed individuals were risk averse, the result holds regardless of individuals attitudes toward risk. To examine the role of mobilization insurance in the reserve participation decision, we consider explicitly the case where individuals are risk averse. Risk-averse individuals would rather receive an income stream with certainty than with uncertainty. They would be willing to give up some of their income in the "good" state of nature (i.e., during peacetime) to increase their income in the "bad" state (i.e., during a wartime mobilization). In other words, such individuals would be better off if they could purchase an actuarially (and sometimes a nonactuarially) fair insurance policy.

Below, we extend the model to include insurance. As a prototype, it illustrates a basic framework for introducing various types of insurance schemes into the theoretical model. We assume the simplest type of insurance plan. However, as discussed below, even this simple extension provides some useful policy insights.

The prototype model assumes that individuals can purchase an actuarially fair insurance policy that will provide a supplemental income in the event of mobilization in an amount the individuals have themselves selected. By affiliation bonuses have a positive impact on the reserve-affiliation decision of individuals with prior service.

5 Most of the results below follow even in the case of risk neutrality. If individuals are risk neutral, they are indifferent between no insurance and actuarially fair insurance and would only strictly prefer to buy insurance skewed in their favor. Since individuals do in fact buy insurance that is not actuarially fair, the assumption of risk aversion does not seem overly restrictive.

6 A related RAND study is currently investigating alternative structures of mobilization insurance, as well as whether such insurance would be available in the private sector.

7 Besen and Grissmer (1992) have examined whether alternative structures of insurance could allow actuarially fair insurance premiums.
actuarially fair, we mean that individuals receive the same expected income when insured as when they are not insured. However, when insured, the variance of their income between peacetime and wartime is reduced. In peacetime, individuals pay an insurance premium; in wartime, if mobilized, they receive the amount of insurance bought.

The individual now has two decisions to make, whether or not to join the reserve and how much insurance to purchase. We first consider the insurance coverage decision given that he or she joins the reserve. Then, conditional on the optimal insurance coverage, we consider the reserve participation decision and how the optimal insurance affects this decision.\(^8\)

The individual chooses the amount of insurance that maximizes his or her perceived net benefits of reserve duty, where the net benefits incorporate the insurance premiums paid and the insurance coverage purchased. Given our assumption that the insurance policy is fair, the model predicts that the optimal amount of insurance purchased will be such that the individual equalizes, at the margin, the value he or she gives to income in each risk situation (including the “no risk” situation of peacetime). Since individuals may value income differently in peacetime and wartime and will consider the nonmonetary costs and benefits of reserve service in their decisionmaking, they do not necessarily equalize their income in all states of nature through their purchase of insurance.

Individuals join the reserve, given their (optimal) choice of insurance coverage, if they perceive that the benefits outweigh the costs. Defining the reservation wage as the amount of reserve earnings that makes the individual just indifferent between joining and not joining the reserve, the individual will affiliate if actual reserve compensation exceeds his or her reservation wage. The model predicts that, as the reservation wage increases, the probability of joining the reserve declines.

The model’s key implication is that mobilization insurance increases the probability that an individual will join the reserve, given the individual’s optimal choice of insurance coverage. With insurance, reservists can protect themselves against the income losses associated with a mobilization. As a result, their reservation wages decline, and the compensating wage differential they require to induce them to face mobilization risk is reduced. This hypothesized reservation wage effect is shown in Figure 8. As discussed in Section 3, the

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\(^8\)This approach is used by Thaler and Rosen (1975).
model predicts that mobilization losses increase the reservation wage and reduce the probability that the individual will join the reserve, represented by the difference D–A in Figure 8. The model also predicts that insurance will mitigate but not necessarily eliminate this effect, as shown by the difference C–A relative to D–A. The effect would be entirely eliminated, and the compensating differential would equal zero, only if individuals could completely insure themselves against all the losses that they would incur if mobilized (including the nonmonetary losses) and if they valued income and the other amenities and disamenities of reserve service the same in wartime and in peacetime. However, in the more general case, the theory suggests that the military would still be required to offer an extra pay premium for mobilization losses, even when individuals can buy their optimal amount of insurance coverage at actuarially fair rates.

Just as in the basic moonlighting model and in our expanded model that accounts for mobilization, the model implies that the effect of an affiliation bonus on reserve supply is positive, even when individuals can purchase insurance. Similarly, those with better civilian opportunities are less likely to affiliate, while a rise in the unemployment rate increases reserve supply.
However, just as the model predicts that insurance will mitigate the negative effects of mobilization risk on the reserve participation decision, so too does it predict that insurance will mitigate the effects of the other determinants of supply in the post-ODS recruiting environment. For example, the model implies that insurance lessens the negative effect of civilian income on the reserve participation decision when reservists view mobilization as costly on net. As noted earlier, the model implies that those with greater civilian earnings will be even less willing to join the reserve in the new recruiting environment than they were in the old one, as was shown in Figure 1. As illustrated in Figure 9, this exaggerated negative effect will be offset (but not completely offset) by insurance, because those who have more to lose by a mobilization can always buy more insurance and thereby significantly reduce the risk of lost income. Thus, with insurance coverage, those with higher incomes have a reservation wage equal to point E in Figure 9 in the new environment rather than point D. Individuals who would have opted out of reserve duty after ODS will now join the reserve if they can also buy insurance. This effect is seen by comparing the difference between C–A and E–B to the differences between the C–A and D–B in Figure 9.

Figure 9—Hypothesized Effect of Civilian Income on Reserve Supply with Mobilization Insurance
A similar logic explains why the positive effect of an increase in the amenities associated with wartime service, such as imminent-danger pay and family-separation allowances, will be reduced when reservists can buy insurance. The model suggests that one reason incentive pay during wartime is effective in increasing reserve supply is that such pay reduces the losses associated with a mobilization. However, when individuals can insure against these losses, the model predicts that this aspect of wartime incentive pay is less important. This effect is shown in Figure 10, where the reservation wage is now given by point E rather than point D when the bonus is increased. Thus, one hypothesis is that wartime bonuses will be less effective when reservists can buy insurance. Of course, such bonuses may also be less necessary when reservists can buy insurance, because, all else being equal, individuals are more likely to join when they can buy insurance.

The above analysis assumes a policy whereby individuals can explicitly purchase mobilization insurance. However, other “insurance-like” approaches are
possible. Specifically, one alternative is to encourage employers to restore reservist's civilian income during a mobilization. To the extent that employers spread the cost of this benefit across all employees, regardless of their participation in the reserve, reservists only pay a fraction of the (actuarial) cost of this employee benefit. Put differently, reservists would only pay a fraction of the insurance premium, while the employer and other employees cross-subsidize the reservists by paying for the remaining portion. These employees and employers would also subsidize DoD to the extent DoD would need to increase other recruiting resources to meet reserve requirements in the absence of such subsidies. On the other hand, reservists may not be able to insure fully against all losses during a mobilization, especially when employers only allow partial replacement of civilian income. Further, self-employed individuals would not have the option of employer/employee-subsidized insurance.

Total-Force Policy Alternatives

As hypothesized earlier, the drawdown of the active force is likely to result in a relatively lower supply of prior-service individuals to the reserve in the future. Therefore, to meet today's reserve requirements for senior personnel, additional reserve recruiting resources are likely to be required to increase reserve supply and to overcome the likely future dearth of active-duty veterans. The cost savings associated with downsizing the active force is likely to therefore be mitigated somewhat by the additional reserve recruiting costs.

The extent to which reserve recruiting costs will rise and the drawdown "dividend" will fall depends crucially on how the drawdown is accomplished and on which resources are cut in support of it. We illustrate this impact of active-duty policy below in the context of active-duty enlistments for the Army. More specifically, the discussion highlights how the rise in reserve recruiting costs and the cost savings from the drawdown will be affected not only by the cuts in active-duty enlistments but also by the way in which these cuts are made. The analysis shows, as a prototype, how and why a total-force perspective must be taken in developing active-force policy. This discussion overviews the cost-savings issues associated with recruiting resource mix.\(^{10}\)

\(^9\) Appendix B discusses employer policies during ODS.

\(^{10}\) This subsection draws heavily on recent work by Beth Asch and Jim Dertouzos on the relative cost-effectiveness of two key recruiting options, educational benefits and enlistment bonuses.
Active-Duty Enlistment Bonuses Versus Educational Benefits

DoD can reduce reserve recruiting costs in the new environment and increase the cost savings associated with the drawdown via a pay or enlistment-bonus cut rather than via a cut in educational benefits. The reason is that educational benefits have a more salutary effect on reserve supply than do bonuses. Table 7 compares the simulated effects on active-duty and reserve manpower of cutting active-duty enlistment bonuses and cutting educational benefits. These simulated results are based on an analysis that compared the service histories of active-duty recruits who either enlisted under the Army College Fund (ACF) or a control program, or under an enhanced bonus program or a control program. The simulated results illustrate the total-force effects of each recruiting program. The simulation assumes that a representative baseline group consists of 100 recruits before the drawdown, as shown in Table 7. If cuts in recruiting costs are accomplished by reducing enlistment bonuses, enlistments fall to 95. If, instead, the cuts are accomplished by reducing educational benefits, active-duty enlistments fall to 91 recruits. The reason for this difference is that educational benefits have a greater market expansion (or contraction) effect than do bonuses.

First-term losses from active duty also fall by a greater amount (over 20 percent instead of 7 percent) when educational benefits rather than bonuses are cut, for two reasons. First, active-duty enlistments fall by more. As a result, the pool of individuals who will leave active duty, regardless of the timing, will be smaller. Second, to use educational benefits, an individual must leave active duty. Because educational benefits increase the incentive to leave active duty more than enlistment bonuses do, cutting these benefits will diminish first-term losses by a greater extent.

Cutting educational benefits also has a more detrimental impact on reserve supply. The number of prior-service individuals who join the reserve falls by

<table>
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<tr>
<th>Output Category</th>
<th>Bonus Program</th>
<th>ACF Program</th>
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<tbody>
<tr>
<td></td>
<td>Pre-Drawdown</td>
<td>Cut in</td>
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<tr>
<td>Active-duty enlistments</td>
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<td>95</td>
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<tr>
<td>Active-duty losses</td>
<td>41</td>
<td>38</td>
</tr>
<tr>
<td>Reserve accessions</td>
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<td>24</td>
</tr>
<tr>
<td>First term total man-years</td>
<td>219</td>
<td>198</td>
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</table>
21 percent when educational benefits are cut but only by 4 percent when bonuses are cut.

Table 8 presents the cost savings associated with the simulated cuts in educational benefits and in enlistment bonuses. More active-duty recruiting resources are saved when bonuses are cut. Educational benefits are a less expensive benefit to offer, because not all recruits who take the benefit will use it and because of discounting. Thus, the savings from cutting educational benefits—$62,900 in the simulation—are smaller than $93,300. On a per-recruit basis, reducing the bonus program saves $18,600 per recruit (Table 9) whereas reducing the educational benefits program saves only $7,000 per recruit.

Educational benefits are generally associated with shorter enlistment terms, while bonuses are usually associated with longer ones. As a result, more recruits must be trained under the educational-benefits program to generate the same number of first-term active-duty man-years as under the bonus program. Therefore, training costs are greater under the educational-benefits program, implying that the training cost savings is greater when these benefits are cut, as shown in Table 9. Once training costs are accounted for, the total cost savings (benefits plus training) is greater when educational benefits are cut. On a per-recruit basis, the cost savings is $4,700 versus $4,600 for a cut in bonuses (Table 9).

However, we must also account for the effects of these active-duty policy options on reserve recruiting costs. Once we incorporate the effects on reserve recruiting, we find that cutting enlistment bonuses is a more cost-effective method of downsizing the active force and of meeting reserve force-size requirements. As

<table>
<thead>
<tr>
<th>Incremental Cost Savings</th>
<th>Cut in Bonus Program</th>
<th>Cut in Educational Benefits Program</th>
</tr>
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<tbody>
<tr>
<td>Benefits program cost savings</td>
<td>$ 93,300</td>
<td>$ 62,900</td>
</tr>
<tr>
<td>Training cost savings</td>
<td>43,500</td>
<td>93,600</td>
</tr>
<tr>
<td>Total active duty savings</td>
<td>136,800</td>
<td>156,500</td>
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<tr>
<td>Reserve recruiting cost</td>
<td>-11,300</td>
<td>-75,600</td>
</tr>
<tr>
<td>Total net cost savings</td>
<td>125,500</td>
<td>80,900</td>
</tr>
</tbody>
</table>

11The results in the following figures are based on the cost figures derived in Asch and Dertouzos (1991).
Table 9
Comparing the Marginal Cost Savings from Cutting Bonuses or Educational Benefits

<table>
<thead>
<tr>
<th></th>
<th>Cut in Bonus Program</th>
<th>Cut in Educational Benefits Program</th>
</tr>
</thead>
<tbody>
<tr>
<td>Benefits cost savings per enlistment</td>
<td>$18,600</td>
<td>$7,000</td>
</tr>
<tr>
<td>Benefits cost savings per active-duty man-year</td>
<td>3,100</td>
<td>1,900</td>
</tr>
<tr>
<td>Total cost savings per active-duty man-year</td>
<td>4,600</td>
<td>4,700</td>
</tr>
<tr>
<td>(benefits plus training)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Net marginal cost savings per man-year</td>
<td>4,300</td>
<td>2,500</td>
</tr>
<tr>
<td>(Total cost savings minus reserve costs)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 8 illustrates, cutting educational benefits increases reserve recruiting costs more than does cutting active-duty bonuses, because cutting educational benefits reduces the flow of prior-service individuals into the reserve by a greater extent. Consequently, the costs savings from the drawdown are smaller, net of the reserve recruiting costs, when DoD cuts active-duty enlistments via a cut in educational benefits—$80,900 versus $127,500 in the simulation. On a per-man-year basis, cutting educational benefits only saves $2,500, while cutting the bonus program saves $4,300 per man-year (Table 9).

Maintaining educational benefits in the new environment while cutting active duty enlistment bonuses is a cost-effective way of enhancing the flow of prior-service individuals into the reserve. Further, from a total-force perspective, cutting bonuses is a more cost-effective way of reducing active-duty enlistments in the new environment. The above discussion also shows why a total-force perspective must be maintained when conducting active-force policy.
6. Conclusions

This report lays a foundation for a reserve recruiting research agenda and a policy agenda that address the potential changes in the future supply of reservists. Below, we summarize the main conclusions of our analysis and outline areas worthy of future research.

The report presents several hypotheses concerning the effects on reserve supply of the active-force drawdown and of the reserve mobilization during ODS. The analysis hypothesizes that, during the drawdown, the pool of eligible prior-service personnel will increase as the number of individuals and the proportion of them with an interest in reserve service leave active duty. The pool of non-prior-service personnel available to the reserves is hypothesized also to increase as active-duty accessions fall in support of the drawdown. Following the drawdown, the pool of prior-service personnel is predicted to fall, because the smaller active force will afford fewer opportunities to gain prior service. However, the pool of non-prior-service personnel will continue to increase.

Future research should track these flows to determine the size of the cross flows and whether the propensity of individuals to join has changed as a result of the drawdown. Future work should also investigate the “switch rate”—the extent to which those who would have joined active duty are willing to join the reserves in the new environment.

Because of ODS, reservists are likely to increase their estimates of the probability of a mobilization significantly. Economic theory predicts that, to the extent that individuals view mobilization as a costly event on net, they will be less likely to join the reserves in the future. An important step for future research is to determine whether or not reservists in the post-ODS recruiting environment view mobilization as an adverse event.

The conceptual framework predicts that individuals with greater civilian income opportunities will be even less likely to join in the future than they were in the past, because the financial losses associated with a mobilization make reserve duty an even less attractive option for these individuals. The model also predicts that a rise in the unemployment rate, such as during the current recession, will have a less beneficial effect on reserve supply in the future if potential reservists view mobilization as entailing losses. Because the theory suggests that the future impact of civilian income opportunities, the unemployment rate, reserve
recruiting policy, and the other determinants of reserve supply will differ from that of the past, previous estimates of reserve supply relationships based on pre-ods data may be misleading when applied to the new recruiting environment.

Although estimation of an econometric model that explicitly accounts for mobilization risk is required to account for changed supply relationships in the new environment, we examined preliminary data on the post-ods reserve accessions for initial insights into the effects of ods on reserve supply. These data, together with the input of knowledgeable recruiting personnel, suggest that the reserve supply fell during ods. Non-prior-service personnel seemed less willing to join (or were less able to get their parents’ permission), while somewhat fewer prior-service personnel were available because of the “stop-loss” provision for active-duty personnel during the conflict. This provision generally did not permit those at or near the end of their enlistment term to separate.

Following ods, the number of reservists supplied rose. Instead of struggling to meet mission, reserve recruiters were often exceeding their monthly accession missions by the end of fiscal year 1991. Recruiting officials attribute this increase in part to a supply response to the popularity of the war, which would increase individuals’ willingness to enter the reserves. The drawdown, which is hypothesized to have the effect of increasing the number of available prior-service veterans, and increased unemployment, which makes military service more attractive relative to alternative opportunities, would also tend to shift the post-ods supply schedule forward. However, demand also changed after ods. To ensure that the annual recruiting missions were achieved, reserve recruiters faced increased reserve accession missions and/or were strongly encouraged to overproduce. By changing recruiter incentives, the reserve components hoped to make up the deficits in supply that occurred during the conflict.

Whether or not ods will have a long-term impact on reserve supply, the extent of this impact, as well as the individual contributions of demand and supply factors, remains an open question. An econometric model of reserve supply that controls for the effects of the recession and of the drawdown is required.

We also used the theoretical framework to formulate hypotheses about the effect of alternative reserve recruiting policies in the new environment. To the extent that mobilization is costly, economic theory predicts that future reserve compensation should increase if the reserve components are to attain their past levels of reserve supply. To induce individuals to face any costs associated with mobilization, including the risks of injury or death, financial loss, and family hardships, it is hypothesized that future reservists will require extra pay.
However, the theory also predicts that, while an increase in the amenities (or a decrease in the disamenities) will increase reserve supply, the size of this effect depends on whether potential reservists view the probability of mobilization as high or low and on whether the amenity is targeted to wartime or peacetime service. If potential reservists view the chances of mobilization as low, it is hypothesized that they will be more responsive to benefits associated with their peacetime service than those who view the chances as higher. On the other hand, those who view mobilization risk as high are hypothesized to be more responsive to wartime-related benefits than those who view it as small. If more people view mobilization risk as higher in the future, the model predicts that individuals on average will be more responsive to benefits that reduce the costs associated with a mobilization and less responsive to benefits that increase the amenities associated with peacetime service after ODS. A related hypothesis is that policies that make weekend drills more attractive will continue to have a positive impact after ODS, but the size of the impact will be smaller.

Mobilization insurance is another policy alternative considered. The model predicts that mobilization insurance will increase the probability that an individual will affiliate with the reserves. However, it also predicts that insurance will tend to offset both the positive and negative effects of the other determinants of supply after ODS, because insurance reduces both the losses and the gains associated with reserve service (insofar as reservists, instead of the government, incur the cost of their insurance premiums). Thus, the model predicts that insurance lessens the negative effect of civilian income on the reserve participation decision; those who have better civilian opportunities will be more likely to join the reserves when they can insure against losses than when they cannot.⁴

Finally, the report shows, by way of example, why and how a total-force perspective is necessary for not only maximizing the “peace dividend” of the active force drawdown but also ensuring the required supply of reservists at the least cost. Future reserve recruiting resource expenditures will increase if the flow of prior-service individuals falls after the drawdown (holding demand for prior service constant). However, the extent of this resource increase will depend on how the drawdown is accomplished. To the extent that reserve recruiting costs rise considerably, the cost savings of the drawdown will fall. The report shows that the method by which active-duty accessions are reduced during the drawdown will alter reserve recruiting costs and thus the net cost savings of the

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⁴A recent RAND study (Besen and Grissmer, 1992) examined whether mobilization insurance could be made available and whether and why limits might be imposed on the amount of insurance purchased. This study has added more realism to the basic model presented in this paper.
drawdown. We find that a policy that cuts active-duty enlistment bonuses will result in a greater drawdown cost savings than a policy that cuts educational benefits, because cuts in educational benefits will have a more adverse effect on the flow of prior service personnel into the reserves and thus will increase reserve recruiting costs by a greater extent.

The above conclusions are based on the contributions from economic theory, an analysis of preliminary reserve recruiting data, and previous estimates of the total-force impact of active-duty accession programs. For a more complete analysis, estimation of an econometric model based on pre- and post-ODS data is recommended. Such a model would provide estimates, relevant to the new environment, on the effects of individual and local labor-market characteristics, recruiter management methods, and policy levers on reserve supply. Also, more information is required on whether and which reservists anticipate large losses during a mobilization.

However, before such analyses can occur, data that allow the identification and estimation of supply relationships must be available. The currently available data are insufficient. First, more needs to be known about the costs and benefits of mobilization to reservists. Many surveys have been undertaken to determine these costs and benefits during ODS. For the survey data to be useful in the estimation of reserve supply, the survey designs must allow the integration of these data with other data sources, such as those on reserve accessions. Second, to distinguish the effects of Desert Shield/Storm on supply from the effects of the current recession and local labor market conditions, more time must pass to permit a time series on reserve accessions and missions in the new recruiting environment that extends beyond the recessionary period.

However, even with a sufficiently long time series and with information on the costs and benefits of mobilization, policy evaluation may still be hampered by insufficient data. First, because the national security environment and personnel policy have changed so rapidly in the past few years, many key events have occurred simultaneously. For example, several aspects of reserve compensation were simultaneously changed in April 1991, and many other policies affecting reserve supply changed shortly thereafter. Policy evaluation and estimation of supply relationships are hampered when the independent effects of various policies and reserve supply determinants cannot be disentangled. Some time must pass to allow enough variation in the data. Second, policies that have heretofore never been used, such as mobilization insurance, cannot be

\[2\] A preliminary analysis of the economic losses to reservists associated with mobilization has already been conducted by Grisemer et al. (1992) based on recent survey data.
empirically evaluated fully if no data exist on them. In such cases, experimental
data or data on similar policies (such as on insurance for risks other than
mobilization) must be obtained. Recent survey data from ODS personnel
provide information on their interest in insurance coverage and offer an
opportunity to explore the demand for insurance by reservists (Grissmer et al.

Because empirical analyses of reserve supply in the new recruiting environment
will be limited by data availability, we recommend near-term research efforts
oriented toward estimating the costs to reservists of mobilization and toward
identifying potential data sources. In the longer term, once post-ODS data are
available, reserve supply relationships should be reestimated.
Appendix A

Formal Model of the Reserve Participation Decision

This appendix presents the formal version of the theoretical model discussed in Sections 3 and 5.

The Basic Moonlighting Model

In the basic model, we assume that individuals decide to join the reserves if the value or utility of reserve service exceeds the value of the individual’s next best alternative. For simplicity, we assume that the next best alternative is to refrain from moonlighting and to work only in their primary job during their working hours and to take leisure during their nonworking hours. No generality is lost by ignoring the possibility of taking a civilian moonlighting job. However, simplicity is gained, because we reduce the participation decision to a choice between two alternatives instead of among three. We also assume in the basic model that there is no risk of a mobilization. Thus, the value of reserve service depends only on peacetime benefits and costs.

More formally, we define the representative individual’s utility if he or she does not join the reserves and simply works on a primary job as $u^p(w_f + y, 0, d_p)$. We assume that the individual is risk averse. In other words, he or she prefers income that is received with certainty rather than an uncertain amount with the same expected value as the certain income. Formally, we therefore assume that $u^p$ is a concave twice-differentiable von Neumann utility function defined over three variables.\(^1\) The first variable is the individual’s consumption, which equals total income $l$. Total income in turn equals the sum of $w_f$, the individual’s earnings in his or her primary job, and $y$, nonlabor income. The second variable is the nonmonetary benefits or amenities associated with the primary job, which, for simplicity, we assume are zero. The third variable is the nonmonetary costs or disamenities associated with the primary job, $d_p$. These costs include the

\(^1\)The basic moonlighting model does not require the assumption of risk aversion, since there is no mobilization risk. All of the results discussed below for this model follow even without the risk-aversion assumption. We introduce it for the sake of discussing mobilization insurance later in the section.
leisure time the individual sacrifices by working. We assume that \( u'_f > 0\), and \( u'_{d_p} < 0\).

If the individual instead joins the reserves, his or her utility is
\[
  u'(w_f + y + w_r, a, d_r) \quad \text{where } w_f \text{ and } y \text{ are defined as before; } w, \text{ is the}
\]
individual's earnings as a reservist; \( a \) is the nonmonetary job amenities of reserve duty, such as patriotism and the positive feeling of serving one's country; and \( d_r \)
is the sum of the nonmonetary costs associated with both the primary job and
reserve service and is thus larger than \( d_p \). Thus, \( d_r \) includes the forgone leisure
of working two jobs. We assume that \( u'_r \) and \( u'_a \) are positive and that \( u'_{d_r} \) is
negative. Since income is larger when the individual is also a reservist, \( u'_r \) is
smaller than \( u'_f \) due to the concavity of \( u() \). Similarly, \( u'_{d_p} < u'_{d_r} \).

The individual joins the reserves if his or her utility from participating exceeds
his or utility from not participating in the reserves, or if \( u' > u^p \). We define the
reservation wage, \( w^* \), for reserve duty as the wage that leaves the individual
indifferent between joining and not joining the reserves, i.e.,
\[
  u'(w_f + y + w^*, a, d_r) = u^p(w_f + y, 0, d_p) \quad (1)
\]

If actual reserve earnings, \( w_r \), exceed the reservation wage, the individual
maximizes utility by joining the reserves. Conversely, if actual reserve earnings
fall short of \( w^* \), the individual is better off by not joining. Thus, the higher \( w^* \) is,
the less likely it is that reserve earnings exceed \( w^* \) and the less likely it is that the
individual will affiliate with the reserves. And the smaller \( w^* \) is, the more likely
it is that the individual will affiliate.

By totally differentiating the identity (1) and rearranging terms, we can determine
how the reservation wage changes and thus how the reserve participation decision
changes when various parameters change. Totally differentiating (1), we get
\[
  u'_f (dw_f + dy + dw^*) + u'_a da + u'_{d_r} dd_r - u'_f (dw_f + dy) - u'_{d_p} dd_p = 0 \quad (2)
\]

Thus,
\[
  \frac{d w^*}{d w_f} = \frac{dw^*}{dy} = \frac{(u^p - u'_f)}{u'_f} > 0 \quad (3)
\]

\[
  \frac{d w^*}{da} = \frac{-u'_a}{u'_f} < 0 \quad (4)
\]

\[
  \frac{d w^*}{dd_r} = \frac{-u'_{d_r}}{u'_f} > 0 \quad (5)
\]
\[
\frac{dw^*}{dd_p} = \frac{u_p^e}{u_f^e} < 0. 
\] (6)

From Equation (3), the reservation wage increases when earnings on the primary job or nonlabor income increases. Thus, individuals who earn more in their primary job are less likely to join the reserves, all else held constant. The interpretations of the other equations are presented in Section 3. None of the results depend on the assumption of risk aversion.

**Basic Model with Mobilization Risk**

Reserve duty encompasses a number of risks, including the probability of being called up during a mobilization and facing a loss. Below, we modify the moonlighting model to account for the additional features that mobilization risk introduces.

We assume, for simplicity, that there are only two possible outcomes associated with reserve duty, peacetime and wartime, and that individuals know the probabilities attached to these events. While the model could be easily modified to incorporate more situations, such as a short war, a long war, a short war with few risks of injuries, and so forth, few additional insights are gained for the extensive computations that are required by their introduction. In what follows, \( \pi \) is the probability that a representative reservist is mobilized and \( 1 - \pi \) is the probability of peacetime duty.

We assume that utility in each state of nature is given by a von Neumann utility function that is concave and twice-differentiable, as before. To account for the possibility that individuals may be injured during a call-up, may face pain and suffering, or may otherwise value consumption and job amenities and disamenities differently during wartime, we assume that the utility function during wartime differs from that in peacetime. Denoting peacetime as event 1 and wartime event 2, we assume that \( u_p^f \) is the utility function of a reservist during peacetime and that \( u_f^e \) is the function during wartime. To the extent that most reservists probably prefer peacetime to wartime in general, we assume that \( u_p^f > u_f^e \) for the same values of income and job amenities and disamenities. As before, we assume the representative individual's next best alternative to reserve duty is forgoing reserve duty and simply working on his or her primary job only and receiving utility \( u_p^e (w_f + y, 0, d_p) \).
Given our assumptions, the individual's expected utility if he or she joins the reserves is
\[
(1 - \pi)u_1^I(w_f + y_1 + w_r, a_1, d_{r1}) + \pi u_2^I\left[w_r(1 + z) + y_2, a_2, d_{r2}\right],
\]  
where income during peacetime, $l_1$, equals the sum of earnings in the primary job, peacetime reserve earnings, and nonlabor income, $y_1$. $a_1$ is the reserve duty job amenities during peacetime, and $d_{r1}$ is the total job disamenities faced by the individual during peacetime. During wartime, the determinants of utility differ. Assuming (temporarily) that reservists receive no civilian income replacement during wartime, income during wartime, $l_2$, equals the sum of active duty earnings, $w_r(1 + z)$, and nonlabor income, $y_2$. The growth factor $z$ captures both the increase in earnings associated with serving in the military for more hours than during peacetime and any increase in pay per hour resulting from hazardous duty pay and the like. During wartime, job amenities and disamenities equal $a_2$ and $d_{r2}$, respectively. We assume that $u_{11}^I$, $u_{21}^I$, $u_p^I$, $u_{1a}^I$, and $u_{2a}^I$ are positive and $u_{1d}^I$ and $u_{2d}^I$ are negative.

As before, individuals join the reserves if their expected utility associated with reserve duty is greater than their utility if they do not join. Also, as before, we define the reservation wage, denoted by $w^{**}$, as the amount of earnings that makes the representative individual just indifferent between joining and not joining, i.e., where
\[
(1 - \pi)u_1^I(w_f + y_1 + w^{**}, a_1, d_{r1}) + 
\pi u_2^I[w^{**}(1 + z) + y_2, a_2, d_{r2}] = u_p(w_f + y, 0, 0).
\]  

Totally differentiating this equation gives:
\[
(1 - \pi)\left[u_{11}^I(dw_f + dy_1 + dw^{**}) + u_{1a}^I da_1 + u_{1d}^I dd_{r1}\right] + 
\pi\left[u_{21}^I \left(dy_2 + (1 + z)dw^{**} + w^{**}dz\right) + u_{2a}^I da_2 + u_{2d}^I dd_{r2}\right] 
- u_p^I (dw_f + dy) - u_p^I dd_p + (u_2^I - u_1^I) d\pi = 0.
\]

From this equation, we can determine how the reservation wage and thus the decision to affiliate in the reserves changes, as various parameters change. Specifically, we get
\[
\frac{dw^{**}}{d\pi} = \frac{u_1^I - u_2^I}{(1 - \pi)u_{11}^I + \pi u_{21}^I(1 + z)} > 0
\]  
and
\[
\frac{dw^{**}}{dw_f} = \frac{u_p^I - (1 - \pi)u_{11}^I}{(1 - \pi)u_{11}^I + \pi u_{21}^I(1 + z)} > 0
\]
\[
\frac{dw^{**}}{dy_1} = -\frac{(1 - \pi)u^e_{2L}}{(1 - \pi)u^e_{1L} + \pi u^e_{2L}(1 + z)} < 0
\]  
(12)

\[
\frac{dw^{**}}{dy_2} = -\frac{\pi u^e_{2L}}{(1 - \pi)u^e_{1L} + \pi u^e_{2L}(1 + z)} < 0
\]  
(13)

\[
\frac{dw^{**}}{dz} = -\frac{\pi u^e_{2L}w^{**}}{(1 - \pi)u^e_{1L} + \pi u^e_{2L}(1 + z)} < 0
\]  
(14)

\[
\frac{dw^{**}}{da_1} = -\frac{(1 - \pi)u^e_{1a}}{(1 - \pi)u^e_{1L} + \pi u^e_{2L}(1 + z)} < 0
\]  
(15)

\[
\frac{dw^{**}}{da_2} = -\frac{\pi u^e_{2d}}{(1 - \pi)u^e_{1L} + \pi u^e_{2L}(1 + z)} < 0
\]  
(16)

\[
\frac{dw^{**}}{dd_{r1}} = -\frac{(1 - \pi)u^e_{1d}}{(1 - \pi)u^e_{1L} + \pi u^e_{2L}(1 + z)} > 0
\]  
(17)

\[
\frac{dw^{**}}{dd_{r2}} = -\frac{\pi u^e_{2d}}{(1 - \pi)u^e_{1L} + \pi u^e_{2L}(1 + z)} > 0
\]  
(18)

\[
\frac{dw^{**}}{dd_p} = -\frac{u^e_{dp}}{(1 - \pi)u^e_{1L} + \pi u^e_{2L}(1 + z)} < 0
\]  
(19)

The derivative in Equation (10) is positive if reservists are better off in peacetime than in wartime. The effect of losses associated with mobilization on reserve recruiting will vary across individuals because of differences in preferences (i.e., the functional form of the utility functions), differences in perceptions regarding the amenities and disamenities of reserve service, differences in civilian earnings, and differences in local labor-market characteristics. Further, the impact of different variables, including recruiting policies, on recruit supply will be affected by the risk of loss. To examine the effects of mobilization risk on the impact of these variables on the reservation wage, we examine the effect of changes in \( \pi \) on some of the “regression coefficients” represented by Equations (11) through (19). Since the following second derivatives are not equal to zero, past estimates will be inaccurate in predicting future reserve recruiting outcomes. The impact of increasing mobilization risk on the relationship between civilian earnings and the reservation wage is given by
\[
\frac{d^2 w^{**}}{dw_1 d\pi} = \frac{u'_{11}'}{(1-\pi)u'_{11} + \pi u'_{21}(1+z)} - \frac{\pi u'_{11}[u'_{21}(1+z) - u'_{11}]}{((1-\pi)u'_{11} + \pi u'_{21}(1+z))^2} > 0 .
\]

(20)

This derivative is positive if income during wartime is less than income in the civilian job (i.e., if mobilization involves a loss of income, all else being equal). When mobilization risk is high, the negative impact of disamenities associated with the civilian sector (such as the unemployment rate) on the reservation wage falls (becomes less negative). Thus, the unemployment rate has less of an impact on reserve supply when mobilization risk is higher. This is shown by the derivative

\[
\frac{d^2 w^{**}}{d\pi d\pi} = -\frac{u'_{11}[u'_{21}(1+z) - u'_{11}]}{((1-\pi)u'_{11} + \pi u'_{21}(1+z))^2} > 0 .
\]

(21)

Therefore, the model predicts that estimates of the impact of the unemployment rate of reserve supply based on pre-ODS data will be biased if individuals view mobilization as a costly event and view the probability of a mobilization as non-negligible.

The effect of increasing mobilization risk on the relationship between peacetime bonuses (or any reserve duty job amenity) and the reservation wage is

\[
\frac{d^2 w^{**}}{d\eta_1 d\pi} = \frac{u'_{11}}{(1-\pi)u'_{11} + \pi u'_{21}(1+z)} + \frac{(1-\pi)u'_{11}[u'_{21}(1+z) - u'_{11}]}{((1-\pi)u'_{11} + \pi u'_{21}(1+z))^2} > 0 .
\]

(22)

The effect of increasing mobilization risk on the relationship between wartime bonuses (or any wartime duty job amenity) and the reservation wage is

\[
\frac{d^2 w^{**}}{d\eta_2 d\pi} = -\frac{u'_{11}}{(1-\pi)u'_{11} + \pi u'_{21}(1+z)} + \frac{\pi u'_{11}[u'_{21}(1+z) - u'_{11}]}{((1-\pi)u'_{11} + \pi u'_{21}(1+z))^2} < 0 .
\]

(23)

It can be easily shown that the effects of risk on the other regression coefficients from Equations (11) through (19) are also nonzero, in general. The interpretations of these derivatives are given in Section 3.

**The Basic Model with Insurance**

Individuals in our model require a compensating differential to be willing to join the reserves. Because risk-adverse individuals prefer a certain to an uncertain
income stream, they are willing to give up some income in the "good" state of nature to increase their income in the "bad" state. In other words, such individuals would be better off if they could purchase an actuarially (and sometimes nonactuarially) fair insurance policy.

Below, we extend our model to include insurance. Our intention is to present a basic framework for introducing various types of insurance schemes into the theoretical model. The prototype model includes the simplest type of insurance. However, as discussed below, even this simple extension provides some useful policy insights.

Formally, we assume that the representative individual can purchase an actuarially fair insurance policy. Let \( x \) be the amount of insurance bought. By actuarially fair, we mean that the individual's expected income when insured equals his or her expected income without insurance. If \( p \) equals the insurance premium he or she must pay in peacetime, then \( p \) is defined by

\[
(1 - \pi)(w_f + w_r + y_1 - p) + \pi[w_r(1 + z) + y_2 + x] = \\
(1 - \pi)(w_f + w_r + y_1) + \pi[w_r(1 + z) + y_2].
\]

(24)

Thus, \( p = \frac{\pi}{(1 - \pi)} x \). Given our definitions of \( p \) and \( x \), the individual's expected utility if he or she joins the reserves now becomes

\[
Eu' = (1 - \pi)u'_f(w_f + w_r + y_1 - \frac{\pi}{(1 - \pi)} x, a_1, d_{e1}) + \\
\pi u'_e(w_r(1 + z) + y_2 + x, a_2, d_{e2}) \\
u^p(w_f + y_1, 0, d_e).
\]

(25)

The individual pays the insurance premium in peacetime and receives the amount of insurance bought during wartime. If the individual does not join the reserves, he or she receives \( u^p(w_f + y_1, 0, d_e) \), the utility from the primary job.

Unlike before, the individual now has two decisions to make: whether to join the reserves and how much insurance to purchase. Consider the optimal insurance coverage first, given that he or she joins the reserves. The individual chooses \( x \) to maximize \( Eu' \). The first order condition is

\[-(1 - \pi)u'_f \frac{\pi}{(1 - \pi)} + \pi u'_e = 0 \quad \text{or,} \quad u'_f = u'_e. \]

(26)

The individual chooses the amount of insurance coverage that equalizes the marginal utility of income in each state. Since the utility function differs in wartime and peacetime, condition (26) does not imply that the individual buys
insurance so as to equalize utility or income across the two states of nature. Let \( x^* \) be the amount of insurance that satisfies (26), i.e., the optimal amount of insurance given reserve participation.

We define \( w' \) as the amount of reserve earnings that makes the individual just indifferent between joining and not joining the reserves, given that if he or she joins the reserves, the optimal amount of insurance \( x^* \) is purchased. Thus, the reservation wage \( w' \) is given by

\[
(1 - \pi) u_1' (w_f + w' + y_1 - \frac{\pi}{1 - \pi} x^*, a_1, d_{r1}) + \\
\pi u_2' [w'(1 + z) + y_2 + x, a_2, d_{r2}] = u^p (w_f + y_1, 0, d_0).
\]  

(27)

Totally differentiating this equation and rearranging terms gives

\[
(1 - \pi) \left\{ u_{11} \left[ dw_f + dy_1 + dw' - \frac{x^*}{(1 - \pi)^2} d\pi \right] + u_{12} \left[ dx'^* \right] \right\} + \\
\pi \left\{ u_{21} \left[ dy_2 + (1 + z) dw' + w' dz + dx^* \right] + u_{22} \left[ d\pi \right] \right\} - \\
u_1^p (dw_f + dy_1) - u_{1p}^p d\pi + (u^*_1 - u_1^p) d\pi = 0.
\]  

(28)

By rearranging terms we can show the effect of each variable on the reservation wage, given optimal insurance coverage:

\[
\frac{dw'}{d\pi} = \frac{(u^*_1 - u_2^*) + \frac{u_{11}^p x^*}{(1 - \pi)}}{(1 - \pi) u_{11} + \pi u_{21} (1 + z)} = \frac{(u^*_1 - u_2^*) + \frac{u_{11}^p x^*}{(1 - \pi)}}{u_{11}^p (1 + \pi z)} > 0
\]  

(29)

\[
\frac{dw'}{dw_f} = \frac{u^p_1 - (1 - \pi) u_{21}^p}{u_{11}^p (1 + \pi z)} > 0
\]  

(30)

\[
\frac{dw'}{dd_p} = \frac{u_2^p}{u_{11}^p (1 + \pi z)} < 0
\]  

(31)

\[
\frac{dw'}{dz} = -\frac{\pi u_{21}^p w'}{u_{11}^p (1 + \pi z)} < 0
\]  

(32)

\[
\frac{dw'}{da_1} = -\frac{(1 - \pi) u_{22}^p}{u_{11}^p (1 + \pi z)} < 0
\]  

(33)

\[
\frac{dw'}{da_2} = -\frac{\pi u_{22}^p}{u_{11}^p (1 + \pi z)} < 0.
\]  

(34)
Although the magnitude of these derivatives will differ in general from the case of no insurance, the signs of the derivatives are the same. It should be noted that, despite the optimal insurance coverage, individuals still require a compensating differential for risk, as seen by the positive derivative in (29). Insurance will also affect how each variable alters the reservation wage (equations 35 through 40).

For example, when individuals can not buy insurance, those with higher earnings are even less likely to join the reserves when faced by mobilization risk. However, when individuals can buy mobilization insurance, the negative effect of higher income in the new environment is reduced, as indicated by the sign of the derivative in equation (35).

\[
\frac{d^2 w'}{d\pi d x^*} = \frac{(u''_l - u''_s)}{[u''_l (1 + \pi z)]^2} \left\{ u''_l [\pi/(1 - \pi)](1 + \pi z) \right\} < 0 \tag{35}
\]

\[
\frac{d^2 w'}{du_p d x^*} = \frac{\pi u''_{ll}}{u''_l (1 + \pi z)} - \frac{u''_l - (1 - \pi)u''_{ls}}{[u''_l (1 + \pi z)]^2} \left\{ u''_l [\pi/(1 - \pi)](1 + \pi z) \right\} < 0 \tag{36}
\]

\[
\frac{d^2 w'}{dd_p d x^*} = \frac{u''_{lp}}{[u''_l (1 + \pi z)]^2} \left\{ u''_l [\pi/(1 - \pi)](1 + \pi z > 0) \right\} . \tag{37}
\]

In general, mobilization insurance mitigates the adverse effects of the new, more risky environment described in Section 5.

\[
\frac{d^2 w'}{dz d x^*} = -\frac{\pi u''_{ll}w'}{u''_l (1 + \pi z)} - \frac{\pi u''_{ls}w'}{[u''_l (1 + \pi z)]^2} \left\{ u''_l [\pi/(1 - \pi)](1 + \pi z) \right\} > 0 \tag{38}
\]

\[
\frac{d^2 w'}{du_z d x^*} = \frac{\pi u''_{lz}}{(1 - \pi)u''_d} - \frac{(1 - \pi)u''_{ld}}{[u''_l (1 + \pi z)]^2} \left\{ u''_l [\pi/(1 - \pi)](1 + \pi z) \right\} \tag{39}
\]

\[
\frac{d^2 w'}{du_x d x^*} = -\frac{\pi u''_{lux}}{u''_l (1 + \pi z)} - \frac{\pi u''_{lx}}{[u''_l (1 + \pi z)]^2} \left\{ u''_l [\pi/(1 - \pi)](1 + \pi z) \right\} > 0 . \tag{40}
\]
Appendix B

Preliminary Survey Results on the Costs to Reservists of ODS

Little is known to date about the costs and benefits realized by reservists who were mobilized during Operation Desert Storm. Yet, as the discussion in Section 3 suggests, these costs and benefits are likely to affect the reserve participation decisions of potential reserve recruits in the future reserve recruiting environment. The discussion below presents some of the preliminary information on the costs to reservists of the reserve mobilization during ODS. This information is based primarily on survey responses. While a variety of surveys are currently being analyzed to better ascertain the experiences of Desert Storm personnel, most of the survey results are still regarded as preliminary.

Family Hardships During ODS

Family hardships during ODS were a widespread concern. Over half of all personnel (both active and reserve) deployed during ODS were married—49 percent of all enlisted members and 71 percent of all officers (Eitelberg, 1991, p. 26). Duty-related family problems could have several negative effects. First, even rare but well-publicized stories of family hardships could hurt public support for a war effort. Further, family hardships can adversely affect personnel readiness to the extent that soldiers worrying about their family members may not perform their duties up to standard. In terms of the reserve recruiting environment of the future, family hardships during a mobilization can hurt future reserve retention and recruiting.

Survey results from the 1980s indicate that the family hardships reported in connection with the reserve mobilization during ODS are not a new experience for reserve personnel (Grissmer et al., 1989). A 1986 survey of reserve personnel indicated that one third of the officers surveyed and about one quarter of the enlisted personnel surveyed reported that their absence during annual (two-week) training posed a serious problem or somewhat of a problem for their family. About 12 percent of both the officers and enlisted personnel said that their spouses' attitudes toward their reserve service were either somewhat or very unfavorable (Grissmer et al., 1989). Thus, any family hardships experienced by reservist families during ODS must be measured relative to the amount of
family stress being experienced by a significant portion of reserve personnel even before ODS.

Other than the anecdotal evidence presented in newspaper reports, little is known to date about the type and extent of hardships experienced by the families of activated reservists. Preliminary analyses of data collected by ARI on the family concerns of Army National Guard and Army Reserve members activated during the crisis indicate that while 57 percent of the respondents felt very worried about their families, 63 percent felt that their families were well taken care of during the deployment (Elig et al., 1991).

Survey responses from 1,274 spouses of active-duty Army personnel who were deployed during ODS show a similar but more detailed picture of the impact on families (Westhuis et al., 1991, and Teitelbaum, 1991). Preliminary analysis suggests that the primary sources of spouse psychological stress during ODS were (1) concern about their soldier’s safety or well-being (71 percent of spouses), (2) uncertainty about the length of deployment (66 percent), and (3) problems communicating with the soldiers (27 percent). The spouses of active-duty members also reported a number of financial problems in connection with the absence of their soldiers during the conflict. These included (1) problems paying bills because of the deployment (13.8 percent), (2) extra expenses (70.8 percent), (3) problems with banks and creditors (19.4 percent), (4) problems using their powers of attorney (14.3 percent), (5) confusion about Army entitlements (33 percent), and (6) transportation problems caused by not having driver’s licenses or by cars being inoperable (16.7 percent).

Although these responses suggest that some spouses faced considerable problems, most reported that the problems were not insurmountable. More specifically, about 90 percent of the active-duty spouses thought that they were coping about average or better in their normal household activities, and over 90 percent said they were coping about average or better in their jobs.

These survey results suggest that active-duty families coped fairly well during ODS. However, whether these results are applicable to the families of reservists is still an open question. The study found that those spouses who coped the best were located on posts and participated in military family support. Reserve families do not live on posts in general and can take advantage of mail services and family support services less readily. Thus, these results provide only a general indication of the impact of mobilization on reserve families. Additional information must be collected to estimate the type and extent of family hardships experienced by activated reservist families. Further, these experiences must be compared to the pre-ODS experiences of reservist families.
Financial Losses During Operation Desert Shield/Storm

Reservists called up during ODS clearly faced the potential for severe economic losses while they were away from their civilian pursuits. Such losses could include lost pay and benefits, employment, promotion opportunities, operational expenses for the self-employed, and lost tuition for those in school. Although employers are required by law to reemploy reservists upon their return and to reinstate them to their position or a comparable position, employers are not required to pay reservists their civilian salary during their absence.\(^1\) Further, self-employed individuals, such as physicians and attorneys, must continue to incur the fixed costs associated with their practices, such as employee pay and benefits, and rent.

Table B.1 shows the distribution of reservists across employer types as indicated by the 1986 reserve components survey. Over a quarter of the enlisted reservists and over a third of the officers work in the public sector. Among reservists working in the private sector, a greater percentage of enlisted personnel work for relatively small employers (less than 500 employees), while a greater percent of the officers work for larger ones. Slightly over 10 percent are self-employed or work in a family-owned business.

Little is known to date about the number of reservists who faced economic losses and the type and extent of these losses. However, based on what is known about employer policies toward reservists before and during ODS, it appears that

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<th>Employer by Type and Size: Part-Time Reserve Members, 1985</th>
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<td>Type of Employer</td>
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<td>Self-employed/family business</td>
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Source: 1986 Reserve Component Survey, Question 3, 97 (Grissmer et al., 1989, Table 3.9, p. 24).

\(^1\)However, employers are required to credit service for benefits that depend on length of service (such as defined-benefit pensions) just as if the employee had never left for Reserve duty.
federal civil-service employees might have been hurt financially by the mobilization, as were those who were self-employed. On the other hand, those reservists employed by large companies were probably less likely to suffer large financial losses as a result of ODS.

Federal civil-service employees retain their job rights if they are mobilized and continue to receive medical and life insurance coverage. However, they do not receive any of their civilian pay unless they choose to use military or vacation leave. Clearly, self-employed individuals receive no income from their “employer” during a call-up. To the extent that physicians and other self-employed individuals earn significantly more in their civilian employment than in the reserves, such individuals would suffer major losses during a call-up. A report by the American Medical Association during the Gulf crisis indicated that the average doctor activated during ODS could lose $1,500 to $2,000 a month in salary, and those who were specialists could lose at least an additional $1,000. (Army Times, April 15, 1991).

Very limited survey results indicate that, because of the popularity of the war, many large companies increased the generosity of their pay policies toward the activated reservists by partially replacing, fully replacing, or extending the length of time that they would replace the civilian earnings lost by reservists (i.e., their civilian minus their military pay). A survey of 37 large companies in August 1990 and in January 1991 by Hewitt Associates, a benefits consulting firm, revealed that two-thirds of the companies had lengthened the amount of time they would replace reservists’ lost income (i.e., offset their military income). And about half of the companies increased the duration of medical and dental insurance coverage. The January survey revealed that 70 percent of the companies surveyed planned to replace reservists’ lost income either for the duration or some fraction of the duration of their absence.

Survey results from a sample of 49 companies interviewed in August 1990 and January 1991 indicate similar results. In the August survey, nearly half (48 percent) of the companies said that compensation for activated reservists would not continue. However, in January 1991, only 27 percent had discontinued compensation for reservists called to active duty. Further, 57 percent of the companies interviewed in January said they would continue compensation for a specified period of time and coordinate it with the reservist’s

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2 Eligible full-time civil service employees accrue 15 calendar days of military leave each fiscal year. Individuals also receive five extra leave days upon return.

3 Data provided to the author by TPF&C.
military pay, and 16 percent said they would continue full pay without any reductions made for the member's military pay.

Limited information is actually available on the financial losses suffered by activated reservists, particularly the self-employed. An ARI survey, based on a sample of 618 Army Guard and Reserve personnel called up during ODS, indicates that the reservists did indeed suffer losses. Specifically, ARI finds that, while 87 percent of the deployed reservists surveyed expected that their job would be held for them during their call-up, 29 percent of the self-employed expected to lose their job. About 40 percent of the respondents had jobs with small companies. ARI also finds that only 25 percent of the respondents were fully compensated for the gap in pay between their military and civilian income while 15 percent were partially compensated for the gap.

Much more information is needed on the financial losses associated with reserve duty, including the losses that occur during a mobilization.
Bibliography


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