Chapter 2

The Effect of the Civilian Economy on Recruiting and Retention

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Staffing a volunteer military force of the size and geographic distribution of the volunteer U.S. military is a daunting challenge. The U.S. military currently maintains an active duty force of about 1.4 million personnel and a selected reserve force of 826,000. Successful recruitment and retention in these forces require attracting the requisite number and quality of individuals away from competing civilian alternatives. To do so, military service must offer sufficiently attractive remuneration in the form of (1) current and deferred cash compensation and (2) in-kind benefits such as health care, bearing in mind that factors such as conditions of service and the pride that personnel derive from military service affect the requisite remuneration. Much past research has been conducted on the subject of military recruiting and retention and how external market factors, cash and in-kind compensation, and other policies affect them. This section reviews the existing literature on military recruiting and retention, identifying the key factors that drive them and how they are affected by alternative policies relating to compensation, recruiting resources, and recruiting effort.[1] It begins with recruiting and then examines retention.

The review reaches the following conclusions:

- Military recruiting and retention are responsive to the level of military pay relative to civilian sector wage opportunities. Holding constant civilian sector wage opportunities, a 10 percent increase in overall current and future military compensation is estimated to increase the supply of high-quality enlisted recruits by between 6 and 11 percent. Such an increase is estimated to raise first-term enlisted retention (3–6 years of service) by 15–20 percent, second-term retention (7–10 years of service) by about

1. Three recent surveys of the literature on military recruiting and retention already exist. Warner and Asch (1995) survey the all-volunteer force (AVF) period literature up to 1994. Asch et al. (2007) focus on research contributions made over the 1995 2007 period. Bicksler and Nolan (2009) provide a detailed analysis of the market for enlisted recruits and implications of research findings for recruiting policy. This report draws heavily on these surveys.

The views expressed in this paper represent those of the author and are not necessarily those of the Department of Defense.

10–13 percent, and third-term retention (11–14 years of service) by about 5 percent.

- Recruiting and retention are responsive to enlistment and reenlistment bonuses that are targeted to specific groups of personnel. Enlistment and reenlistment bonuses are cost-effective tools for achieving manpower targets in hard-to-fill skills.
- Recruiting and retention are sensitive to the state of the economy. Studies indicate that a 10 percent decrease in the civilian unemployment rate will reduce high-quality enlisted recruiting by 2–4 percent. Retention also declines when unemployment decreases, but appears to be less sensitive to the state of the economy than recruiting. The recent economic downturn has improved recruiting and retention and has allowed the services to reduce use of enlistment and reenlistment bonuses. However, this improvement is expected to diminish as civilian economic conditions improve.
- Education benefit programs attract high-quality recruits, but may also induce them to leave to use those benefits. Because it represents a substantial increase in educational benefits over past programs, the Post 9/11 GI Bill program is expected to attract significantly more high-quality recruits into service, especially into the Army. However, this program has not been in effect long enough to discern its effects.
- Recruiting outcomes depend on the resources devoted to recruiting, including the stock of production recruiters and the amount of advertising. Recruiters appear to be the most cost-effective recruiting resource. Some evidence suggests that, in the short run, reductions in the recruiter force have a larger negative effect on recruiting than recruiter expansions have a positive effect; consequently large cyclical swings in the recruiter force should be avoided.

Recruiting

Overview and Trends

Since the downsizing of U.S. forces that occurred in the early 1990s, U.S. military services have had to recruit about 180,000 new enlisted personnel each year to maintain an enlisted force of 1.2 million.[2] The services not only want to

2. To put a recruiting goal of 180,000 in perspective, note that throughout the 1980s the services recruited about 280,000 youth per year for the enlisted ranks. The 2009 goal was reduced to 164,000 due to higher than normal retention and lower turnover.

meet quantity targets for enlisted recruiting, they also want to meet certain quality targets. The Department of Defense (DOD) has identified two primary quality measures for enlisted recruits—possession of a high school diploma and a score on the Armed Forces Qualification Test (AFQT) that exceeds the youth population average score of 50.[3] These quality measures are used because much past research has shown that recruits possessing these characteristics are more likely to complete an enlistment and are more productive in their jobs than recruits who do not have these characteristics.

Researchers have combined these two quality measures into a single indicator for high-quality (HQ). HQ recruits are thus defined to be recruits who possess both a high school diploma and score above 50 on the AFQT. HQ youth are the prime DOD recruiting target. Figure 1 shows the percentage of new enlistment contracts each year over the period 1990–2010 that were high quality. The figure also plots the civilian unemployment rate over time. Recruit quality jumped at the start of the 1990s; this jump reflects the end of the Cold War and the reduction in recruiting goals during the downsizing period. Recruit quality trended downward throughout

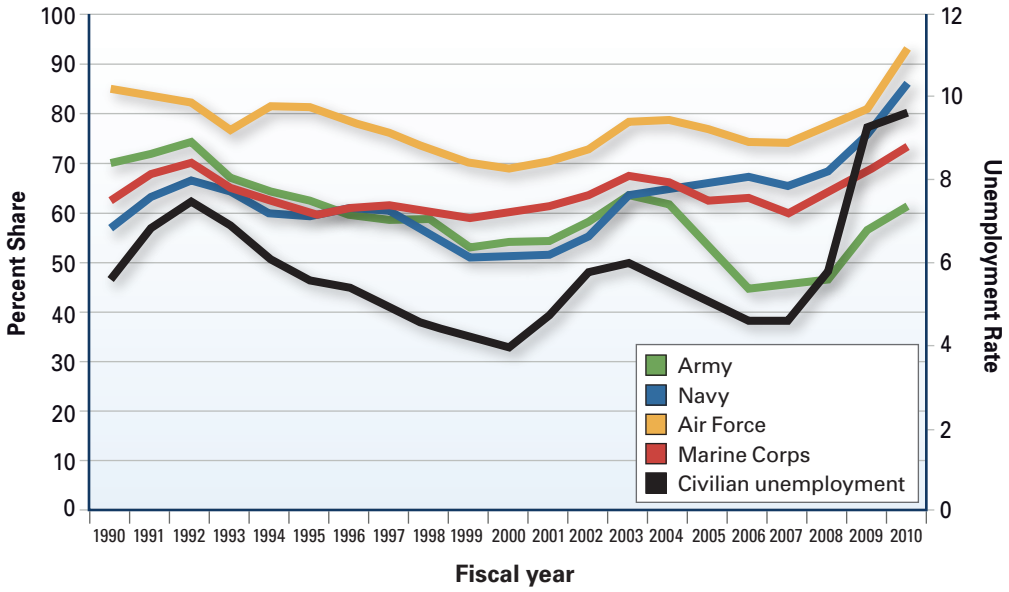

Figure 1. High-Quality Enlistments by Service and Unemployment, Fiscal Year 1990–2010

3. The AFQT test score is derived from subcomponents of the Armed Services Vocational Test Battery (ASVAB), a test battery administered to all applicants for enlisted service. The AFQT was normed in July 2004 to the 1997 youth population and has a median of 50. A score of 50 or above indicates that the applicant is above the average ability level in the youth population.

the 1990s and then jumped in the early 2000s before dropping again after 2003 in all services other than the Navy. The decline in the Army HQ share was especially precipitous after 2003.

Over the period of the all-volunteer force (AVF), even in periods of recruiting difficulty, the services have rarely failed to meet total recruiting targets. This is due to the fact that low-quality (LQ) recruits make up a small percentage of the military-eligible LQ population (around 2 percent) and can usually be found regardless of the state of the youth labor market. In periods of difficult recruiting, the services have avoided overall recruiting shortfalls by enlisting more LQ recruits. HQ recruits are sometimes said to be "supply-constrained" while LQ recruits are said to be "demand-constrained."

Research has identified key variables driving the HQ enlistment trends observed in Figure 1. Included among the factors explaining the observed cyclical swings are two key external market factors: the level of military pay relative to civilian wage opportunities for youth and the civilian unemployment rate. Figure 1 indicates a strong relationship between the percentage of recruits who are high quality and the civilian unemployment rate.

Although much cyclical variation in HQ enlistment is apparent in Figure 1, a longer term downward trend is apparent, especially in the Army. Research has identified several factors that may be related to this downward trend: (1) a rise in college attendance, (2) a decline in the population of veteran influencers of youth enlistment decisions, and (3) a decline in the percentage of the youth population that meets military enlistment standards.

Research has shown that enlistment outcomes are keenly influenced by DOD recruiting resource outlays and enlistment incentives. The key DOD recruiting resource inputs are military recruiters and advertising (both amount and type). The services also use individually-targeted enlistment incentives such as bonuses, college benefits, and college loan repayment to induce enlistment. We now review the evidence about the effects of various factors on recruiting.

Empirical Evidence

A number of studies of HQ enlistment have been conducted with post-drawdown data, the most recent of which is Asch et al. (2010). Table 1, Table 2, and Table 3 below summarize key estimates from the post-drawdown studies and means of estimates from the pre-drawdown studies. The numbers in the tables are elasticities of HQ enlistment with respect to the given factor—the percentage change in HQ

enlistment relative to a given percentage change in the factor. Thus, an elasticity of 1.0 implies that a 10 percent increase in the factor leads to a 10 percent increase in HQ enlistment; an elasticity of -0.5 means that a 10 percent increase in the factor leads to a 5 percent decrease in HQ enlistment.

Relative Military Pay and Unemployment

Table 1 shows elasticity estimates relating to the two principal external drivers of HQ enlistment—military pay and civilian unemployment. The most recent study of HQ enlistment is provided by Asch et al. (2010). This study analyzed Army and Navy HQ enlistment using fiscal year (FY) 2000–2008 data. For the Army, they estimate an elasticity of HQ enlistment with respect to relative military pay of 1.15. This means that if the level of military pay were to rise by 10 percent relative to civilian wage opportunities, enlistment of HQ youth would rise by 11.5 percent. They estimate a somewhat smaller elasticity, 0.73, for the Navy.

Table 1. External Market Factor Elasticities

Study	Service	Data Type and Time Period	Relative Pay	Unemployment
Asch et al. (2010)	Army	Quarterly by state, 2000–2008	1.15	0.11
	Navy	Quarterly by state, 2000–2008	0.73	0.12
Simon & Warner (2007)	Army	Quarterly by state, 1996–2005	0.70	0.42
Warner & Simon (2004)	Army	Quarterly by state, 1989–2003	0.71–0.81	0.25–0.31
	Navy	Quarterly by state, 1989–2003	0.62	0.29
	AF	Quarterly by state, 1989–2003	0.40	0.24
	MC	Quarterly by state, 1989–2003	0.64	0.15
Warner et al. (2003)	Army	Monthly by state, 1989–1997	0.78	0.22
	Navy	Monthly by state, 1989–1997	0.95	0.26
	AF	Monthly by state, 1989–1997	0.47	0.19
	MC	Monthly by state, 1989–1997	0.23	0.28
Hogan et al. (1996)	Navy		0.55	0.18
WSP Literature Review Mean[1]	Various	Various, Pre-Drawdown	0.75	0.62

1. From: Warner et al. (2001).

Many other past studies of HQ enlistment based on post-drawdown data have also estimated the effect of military pay on enlistment. Included among these are Simon and Warner (2007), Warner et al. (2003), and Hogan et al. (1996). Using Army data over the period 1996–2005, Simon and Warner (2007) obtain an Army HQ pay elasticity of 0.70. Using data spanning the period FY 1988–2003, Warner and Simon (2004) obtained Army HQ pay elasticity estimates in the range of 0.71–0.81 depending on model specification and estimation method. In the Warner et al. (2003) study, which used data over the FY 1988–1997 period, Army and Navy HQ enlistment elasticities were estimated to be 0.78 and 0.95, respectively. Importantly, over a time period that does not overlap the period used by Asch et al. (2010), the estimates of the effect of relative pay on HQ enlistment are broadly similar to one another.

Much research conducted with pre-drawdown data provides estimates that are consistent with those just described. The studies are too numerous and varied in method and data to list individually here. Table 1 simply shows the mean estimates of relative pay and unemployment elasticities from the Warner et al. (2001) survey of pre-drawdown research. That survey computed a mean pay elasticity estimate of 0.75 from these studies, a number in the general range of studies conducted since the drawdown.

Most studies find that HQ enlistment is strongly related to the civilian unemployment rate. Asch et al. (2010) estimated the elasticity of HQ enlistment with respect to the civilian unemployment rate to be about 0.1, implying that a doubling of the civilian unemployment rate (from 5 to 10 percent, say) would raise HQ enlistment by 10 percent. On a base of 50,000 HQ enlistments annually, that would mean about 5,000 more. According to the various estimates from other studies conducted with post-drawdown data, this estimate is likely to be the lower bound on the effect of unemployment.

Table 1 indicates that the average estimated unemployment elasticity in the pre-drawdown studies was 0.62, a generally larger value than the ones estimated with post-drawdown era data. The reason for this decline in the estimated sensitivity of HQ enlistment to unemployment is unclear. But despite the fact that more recent estimates of the sensitivity of HQ enlistment to unemployment are smaller, it should be kept in mind that the more recent estimates still imply a strong influence of the business cycle on military enlistment.

Recruiters and Advertising

Table 2 summarizes estimated effects of the sensitivity of HQ enlistment to changes in the number of recruiters and changes in the amount of advertising. Asch et al. (2010) estimate that a 10 percent increase in the stock of Army recruiters would

Table 2. Recruiting Resource Elasticities

Study	Service	Data Type and Time Period	Recruiters	Advertising
Asch et al. (2010)	Army	Quarterly by state, 2000–2008	0.57–0.63	
	Navy	Quarterly by state, 2000–2008	0.22–0.41	
Simon & Warner (2007)	Army	Quarterly by state, 1996–2005	0.47(+), 0.62(-)	
Warner & Simon (2004)	Army	Quarterly by state, 1989–2003	0.53	0.05
	Navy	Quarterly by state, 1989–2003	0.53	0.05
	AF	Quarterly by state, 1989–2003	0.57	0.01
	MC	Quarterly by state, 1989–2003	0.59	0.03
Warner et al. (2003)	Army	Monthly by state, 1989–1997	0.41	0.14
	Navy	Monthly by state, 1989–1997	0.64	0.08
	AF	Monthly by state, 1989–1997	0.48	0.01
	MC	Monthly by state, 1989–1997	0.47	-0.05
Hogan et al. (1996)	Navy	Monthly by NRD, 1990–1994	0.29	0.021 (Radio) 0.03 (TV)
WSP Literature Review Mean[1]	Various	Various, Pre-Drawdown	0.76	0.10

1. From: Warner et al. (2001).

expand Army enlistment by between 5.7 and 6.2 percent, depending upon model specification.[4] These estimates of Army recruiter elasticities are not much different from those obtained by Warner and Simon (2004, 2007) and Warner et al. (2003). Simon and Warner (2007) used a method that allowed them to permit the recruiter elasticity to differ depending upon whether the recruiter stock is increasing or decreasing. They estimate a 0.47 Army recruiter elasticity if recruiters are increasing but 0.62 if they are decreasing.[5]

Changes in the Army's recruiter stocks may explain some of the Army's HQ recruiting swings since FY 2000. The Army permitted its recruiter stock to decline from 6,500 in 2002 to 5,100 in 2004, a decline of roughly 30 percent. Other things

4. The larger estimate is from the model with time effects. See Table 4.1 of Asch et al. (2010).

5. This makes intuitive sense. The services increase their recruiter stocks by adding personnel who are inexperienced in recruiting and who require learning on-the-job before they become fully productive. When the services reduce their recruiter inventories, they typically do so by rotating off of recruiting duty the most experienced, and the most productive, recruiters.

the same, a recruiter elasticity of 0.6 predicts that Army HQ enlistments would decline by 18 percent. After 2004, the Army began dramatically increasing its recruiter stock; by FY 2009 it had grown to almost 7,700, an increase of roughly 50 percent over the FY 2004 level.

Asch et al. (2010) estimate that changes in the recruiter stock have smaller effects on Navy HQ enlistment than Army HQ enlistment. In a model that includes time effects, they estimate that a 10 percent increase in Navy recruiters increases Navy HQ enlistment by only 2.2 percent. This study uses the obtained estimates to calculate the cost of extra recruits brought about by additional recruiters. Despite the fact that their Navy recruiter elasticity estimates are much smaller than their Army estimates, the calculated marginal cost of the HQ enlistments induced by a larger recruiter stock is about $33,000 per additional HQ recruit in both services (see pp. 33–34 of the Asch et al. study).

Advertising is the other key input into the recruiting process. However, estimation of the effects of advertising has been plagued with lack of data, problems of measurement, conceptual problems related to model specification, and statistical problems relating to estimation. As a result, despite the fact that in FY 2009 the services spent over $600 million in advertising, its effects have not been well estimated.[6] The few post-drawdown studies that have attempted to do so include Warner and Simon (2004), Warner et al. (2003), Hogan et al. (1996), and Dertouzos and Garber (2003). Warner and Simon (2004) estimate an overall advertising elasticity of 0.05 for the Army and Navy using FY 1988–2003 data. Warner et al. (2001) obtained larger values (0.14 and 0.08, respectively) using FY 1988–1997 data. Hogan et al. (1996) estimate advertising elasticities by media type using data from the early-to-mid 1990s. They estimate an elasticity of 0.021 for radio advertising and 0.03 for TV advertising. The mean estimate of the advertising elasticity from pre-drawdown studies was 0.1. Needless to say, the estimated effects of advertising on HQ enlistment have been much more variable and imprecise than the estimated effects of recruiters.

Dertouzos and Garber (2003) argue that advertising was considerably different in type and content in the 1990s than it has been in the 2000s, and they call into question both past as well as recent studies of military advertising. They argue that

6. Data for most studies of the enlistment effects of military advertising were supplied by PEP, Incorporated, a New York-based advertising research firm. For many years, PEP collected advertising expenditure and impressions data for DOD from the advertising agencies handling the services advertising campaigns. Unfortunately for the analysis of service advertising programs, no advertising data have been collected since FY 2001. Warner and Simon (2004) estimate the effect of advertising on HQ enlistment using data over the period FY 1988 2003. To do so, they use actual PEP data by state and quarter over the FY 1988 2001 period. They estimate FY 2002–2003 advertising by state and quarter based on changes in the overall service advertising programs relative to FY 2001. Their approach assumes no geographic change in the allocation of advertising over the FY 2002–2003 period.

past estimates of advertising effectiveness are flawed because they are overly restrictive in key respects. First, researchers have assumed functional relationships that embed the assumption that the advertising elasticity is invariant to the baseline level of advertising. They argue that a small advertising campaign will be ineffective because insufficient advertising impressions are made to influence youths' attitudes about military service. Likewise, after some saturation point, advertising expenditures are ineffective because youth have received the same advertising message many times. Second, advertising is likely to have dynamic effects beyond the time period when an ad is first placed, but the effects are likely to diminish over time as the target audience forgets the initial advertising impression.

Dertouzos and Garber modify the basic enlistment supply model. They use a flexible functional form in the specification of the potential effects of advertising to allow the elasticity of different media to vary with the scale of advertising, permitting thresholds and saturation points that vary with media type and month. Their model permits an S-shaped (logistic) relationship between enlistments and advertising with effects that are spread out over the course of several months and depend on the combination of parameters estimated for the given media type. Dertouzos and Garber estimate their model using data from the mid-1980s and data over the 1993–1997 period and distinguish among television, radio, and magazine advertising. They find that when advertising budgets are small, magazine advertising is the most cost-effective medium. For larger budgets a mix of magazine and radio advertising is the best choice. Only for large budgets is TV advertising cost effective. They find that at the budget levels that prevailed in the 1980s, advertising was cost effective; but the budget levels in the period 1993 to 1997 were too low to be in the part of the S-curve where expenditures would have their maximum effect at the margin. The policy implication is that the services should not cut their advertising budgets too deeply during periods of low demand for recruits, lest they operate in the least efficient part of the S-curve.

Enlistment Incentives

Table 3 shows estimates of the effects of enlistment incentives that have been obtained in recent studies and compares them with estimates from pre-drawdown studies. Consider first the effects of enlistment bonuses. Asch et al. (2010) show that, in response to the recruiting challenges that arose after FY 2003, the Army substantially increased its enlistment bonuses. The percentage of HQ recruits receiving bonuses rose from about 40 percent to 70 percent in the FY 2003–2008 period, and the average bonus amount increased from $3,000 to $14,000. Asch et al. (2010) estimate that the bonus expansion did in fact improve HQ recruiting. Depending on model specification, they estimate an elasticity of HQ enlistment with respect to

Table 3. Enlistment Incentive Elasticities

Study	Service	Data Type and Time Period	Enlistment Bonus	Education Benefit
Asch et al. (2010)	Army	Quarterly by state, 2000–2008	0.06–0.17	0
	Navy	Quarterly by state, 2000–2008	-0.02–0.065	0
Warner & Simon (2004)	Army	Quarterly by state, 1989–2003		
	Navy	Quarterly by state, 1989–2003		
Warner et al. (2003)	Army	Monthly by state, 1989–1997	0.12	0.312
	Navy	Monthly by state, 1989–1997	0.02	0.202
WSP Literature Review Mean[1]	Various	Various, Pre-Drawdown	0.06	0.09

1. From: Warner et al. (2001).
Note: Estimates based on percentage of HQ recruits receiving educational benefits.

expected bonus amount of between 0.06 and 0.17. These estimates, in fact, seem to span the range of Army estimates obtained in past studies (Table 3). Estimates in this range are reasonably consistent with pay elasticity estimates.

Using the larger estimated elasticity, Asch et al. (2010) simulate how many HQ contracts the Army would have lost if the Army's enlistment bonus budget had not increased after FY 2003. They estimate that over the FY 2004–2008 period, the Army would have obtained 20 percent fewer HQ contacts had bonuses not been expanded. These extra contracts did not come cheaply, however. The estimated marginal cost of the HQ contracts brought about by the expanded bonus program is $44,000 (a per person-year marginal cost of roughly $11,000). If the simulation had been based on the smaller estimate of the bonus elasticity, the predicted HQ contract loss due to the bonus program expansion would have only been about 8 percent. The implied marginal cost of the HQ enlistments obtained with the larger program would have been almost $100,000 (with implied person-year marginal cost of $25,000). Recall that this study estimated the marginal cost of HQ enlistment via recruiters to be about $33,000.

Unlike their findings for the Army, Asch et al. (2010) do not find a market effect from Navy enlistment bonuses (a result similar to Warner et al. (2003)). The lack of market expansion for the Navy may be due to the fact that the Navy uses bonuses as an inducement to longer enlistment (and generally in high-tech skills) and does not give them to recruits who join for 3- or 4-year terms, as does the Army. But even

if they do not expand HQ enlistment, inducing a fixed number of HQ recruits to sign for longer terms can be cost effective. The Air Force, for example, attempts to induce longer enlistment by offering larger bonuses for 6-year contracts than for 4-year contracts. Simon and Warner (2009) studied the Air Force program and found it to be highly cost effective. A $5,000 spread between 4- and 6-year bonuses was estimated to increase 6-year contracts by 30 percentage points. Furthermore, the cost per additional person-year induced by a larger bonus for 6-year enlistments was estimated at about $11,000, making the marginal cost per person-year much lower than through other methods for expanding HQ person-years.

Educational benefits are the other main incentive for HQ enlistment. In fact, throughout the 1980s and 1990s, the Army used educational incentives more intensively than enlistment bonuses to attract HQ recruits. It did so by adding Army College Fund (ACF) "kickers" to the amounts to which all recruits were entitled if they participated in the Montgomery GI Bill program. Depending on year, military occupation, and term of enlistment, the kicker amounts could run as much as $50,000. The Navy introduced its own college fund program in 1990. The Marine Corps operated a very limited college fund program in the mid-to-late 1990s, but the Air Force has never had a college fund program.

In 1997, about 30 percent of Army HQ recruits were receiving ACF kickers and about 20 percent of Navy HQ recruits were receiving Navy College Fund (NCF) kickers. Estimates by Warner et al. (2003) indicated that elimination of these kicker programs would have reduced Army HQ enlistment by about 6 percent and Navy HQ enlistment by about 4 percent. That is, about one-third of Army ACF enlistments would not have enlisted in the absence of the program and about 20 percent of Navy NCF recipients would not have enlisted. Other studies have not estimated HQ enlistment to be as responsive to educational incentives as Warner et al. did. But even assuming HQ enlistment to be only half as responsive to educational benefits as they estimated, Warner et al. (2003) concluded that educational benefits are a reasonably cost-effective recruiting tool compared with other recruiting resources.

Due to the implementation of the Post 9/11 GI Bill program in August of 2009, educational benefits have been dramatically increased for all military recruits and not just college fund recipients. In fact, the Post 9/11 GI Bill program has roughly doubled real educational benefits in comparison to what they were under the Montgomery GI Bill program (Simon et al. (2010)). Since this program only recently went into effect, it will take some time for its effects to become apparent. Past research indicates that its effects will be non-negligible and could be sizeable.

Other Trend Effects in Recruiting

Despite the services' best efforts, other long-term trends are hampering HQ recruiting. Two trends identified by past research are the decline in the veteran population and the rise in college attendance. Bicksler and Nolan (2009) discuss the trends in veteran population and college attendance and provide a more detailed discussion of their estimated effects on HQ recruiting.

Asch et al. (2010) and Simon and Warner (2007) estimate that the conflicts in Iraq and Afghanistan have taken a sizable toll on Army recruiting. Because the variation in these factors is largely time related and therefore strongly correlated with other time-related factors, identification of their precise effects is difficult. But estimates in these studies imply that HQ enlistment could have fallen as much as 30–40 percent relative to peacetime enlistment. Deterioration in the external labor market (as evidenced by a much higher unemployment rate), more recruiting resources, and larger enlistment incentives have neutralized some of the war-related decline in HQ enlistment but not all of it.

Retention

This section discusses stylized facts regarding retention, briefly highlights economic models of retention decision-making, and reviews evidence about the retention effects of pay and other factors.

Stylized Facts

The important stylized facts about military retention can be illustrated with the aid of Figure 2, which shows aggregate Army enlisted continuation rates by year of service (YOS) for three fiscal years—FY 2001, FY 2005, and FY 2009.[7] The first stylized fact is that retention rates are lowest in the initial term of service, which typically includes personnel who have 3–6 years of service. The second stylized fact is that retention rates increase thereafter up to the 20-year point, where personnel become eligible for immediate military retirement benefits. The rise in retention between the initial enlistment period and the 20-year point reflects two factors: (1) a natural tendency for retention to rise as those who intend to make the military a career stay and those who do not leave and (2) the increased incentive to stay as personnel get

7. Due to data availability, Figure 2 uses continuation rates in lieu of voluntary retention rates. The total continuation rate at a given year of service is a weighted average of the retention rate of personnel in the last year of their current enlistment contract (and therefore eligible to leave) and the continuation rate of personnel who have more than 12 months left on their current contract (and are therefore not eligible to leave). Beyond the initial enlistment period, the continuation rate of those who are not eligible to leave is typically in excess of 95 percent. Except for level, the YOS pattern for voluntary retention is the same as the YOS pattern of overall continuation.

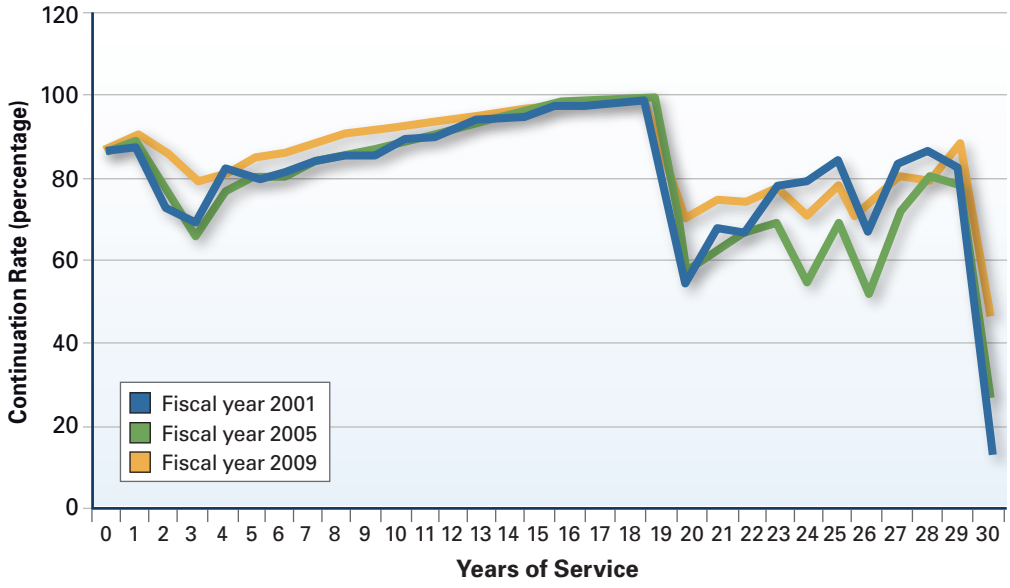

Figure 2. Army Overall Continuation Rates

closer to the retirement benefits available at the 20-year point. (Personnel in the YOS 10–20 range are sometimes said to be "in golden handcuffs" due to the increasing pull of the retirement system.)

The third stylized fact is that retention drops significantly once personnel become eligible for retirement benefits. While some of the decline may be attributed to the increased incentive because of the immediate availability of retirement benefits, at least part of the decline reflects the operation of High Year of Tenure (HYT) rules (also known as Up-or-Out rules), which force personnel to leave if they have not achieved a certain rank by a certain YOS. Though the rates vary, the same YOS pattern of continuation is evident across different occupations within the Army and across the different services. The same pattern is also evident for officers in different occupations and services.

Models and Retention Decisions

Economists have developed two general models of retention decision-making and used these models to guide empirical analysis of retention. It is clear from Figure 2 that the military retirement system, with its 20-year cliff vesting, has a powerful effect on retention decisions prior to the 20-year point. The models therefore attempt to account for the fact that individuals do not make retention decisions based just on current pay, but on the whole sequence of expected future military pays including retirement pay.

The models can be placed into two broad categories—models that are based on a dominant time horizon (e.g., one that typically includes the 20-year point) and models that are based on a weighted average of future time horizons. The first class of models is illustrated by the Annualized Cost of Leaving (ACOL) model. The ACOL model is discussed at some length in Warner and Asch (1995). In the ACOL model, individuals evaluate the financial returns to staying and leaving over all possible future periods of service and choose to stay or leave based on the period with highest annualized return (maximum value of ACOL). The choice is determined in part by an unobserved, non-pecuniary taste-for-service factor. In the simplest version of the ACOL model, the retention rate is the fraction of decision-makers for whom the sum of the pecuniary incentive (ACOL) and the non-pecuniary taste factor is a positive number. Simply put, individuals prefer to remain in service if the maximum net payoff is positive.

The simple version of the ACOL model implies that after the initial decision point, retention rates would jump to 100 percent as long as ACOL is increasing from one term to the next. Since retention rates do not do this (Figure 2), the simple ACOL model needed to be generalized in order to be applicable to panel data (data incorporating more than one decision point). The ACOL-2 model did so by assuming that random, transitory shocks as well as permanent tastes influence retention decisions at each decision point. Introduction of random shocks at each decision point allows low-taste individuals to remain in service if they draw a "good" shock and high-taste individuals to leave if they draw a "bad" shock. But high-taste individuals are more likely to remain in service than low-taste individuals; the ACOL-2 model accounts for this self-selection process without the unfortunate implication that retention beyond the initial decision point will be 100 percent as long as ACOL is increasing in YOS.

The ACOL and ACOL-2 models are dominant horizon models. The alternative approach is a model with multiple horizons that are derived within the model (i.e., endogenous). Gotz and McCall (1984) first developed this approach, which they called the Dynamic Retention Model (DRM). In the DRM, an individual with a given (permanent) taste for service evaluates the payoff to all possible future stay-leave sequences and makes a retention decision based on a weighted average of these payoffs compared to the payoff from immediate separation. The weights are based on the individual's taste-for-service factor as well as on (the distribution of) random shocks which individuals anticipate may induce them to separate at each future decision point. Individuals with a low taste for military service will anticipate that they are not likely to stay for a long career and will therefore not place a high weight on long-term payoffs compared to the weight they place on short-term payoffs. High-taste individuals, on the other hand, anticipate long careers and therefore place

more weight on long-term pays compared to short-term pays. Due to the fact that high-taste individuals are more likely to stay at each retention decision point (the sorting effect), more experienced groups of personnel have a higher average taste for service, and higher retention, than less experienced groups. Retention rates rise with experience and independently of compensation due to this sorting effect.

The theoretical advantage of the DRM is that it avoids an unfortunate implication of the ACOL (or ACOL-2) model, namely that pay changes that occur beyond the dominant time horizon do not change ACOL and, therefore, have no effect on retention. In the DRM, any future pay change has some effect on retention, with the magnitude determined by individuals' perceived likelihoods of remaining in service long enough to be influenced by the pay change (which in turn depends on tastes). The DRM is especially useful when applied to significant structural changes to military compensation, for example military retirement system reform.

The ACOL and ACOL-2 models have been frequently used in empirical studies of retention for two reasons: (1) the models are relatively easy to estimate with commonly available software and (2) they can accommodate a large number of explanatory variables including the unemployment rate and controls for other factors such as pay grade, occupational specialty, AFQT, education level, race, ethnicity, gender, and marital status.

Despite its theoretical advantages, the DRM is mathematically more complicated and more difficult to estimate. This added complexity has limited its empirical application to a handful of studies including Gotz and McCall (1984), Daula and Moffitt (1995), Asch and Warner (2001), Asch et al. (2008), and Mattock at al. (2010). The last two studies are noteworthy for the use of recently developed econometric techniques for estimation of non-linear models.[8]

Empirical Evidence

Empirical studies of enlisted retention have focused on first-term reenlistment, and second-term reenlistment, and those of officers have focused on retention at the initial service obligation (6 to 10 years of service). Some of these studies have applied one of the structural models of retention described in the previous section. Structural

8. These models have been used for compensation policy analysis. Asch and Warner (2001) calibrated the DRM to Army enlisted data (by manually adjusting three key parameters in the model) and used the calibrated model to simulate the effects of various structural changes to the enlisted basic pay table. Asch et al. (2008) used the Method of Simulated Likelihood (MSL) to estimate the model with data on both officers and enlisted personnel. They then used the estimated models to predict the effects of changes to the retirement system being considered by the 10th Quadrennial Review of Military Compensation (QRMC). Mattock et al. (2010) re-estimated the model by MSL using data on officers and used it to predict the effects of changes to various special and incentive (S&I) pays for officers.

models aggregate the various elements of military compensation received in a given time period into a single measure of compensation. But the focus of some studies has been the retention effect of a specific element of compensation such as the Selective Reenlistment Bonus (SRB). These studies tend to adopt a "reduced form" approach and include the specific pay measure as a separate variable along with controls for as many other observable factors as possible to isolate the effect of the specific pay measure being studied. With these comments as background, the estimated effects of compensation and other factors are now summarized.

General Pay Elasticities

By general pay elasticities, we mean the percentage effect of an overall increase in military pay. Warner and Asch (1995) and Goldberg (2001) summarize overall pay elasticity estimates from 10 studies of enlisted retention and two studies of officer retention that used pre-drawdown data. They found overall pay elasticities for enlisted personnel ranging from 1.0 to 3.0 at the initial reenlistment decision point, with a central tendency of around 2.0. Simply interpreted, if all elements of future military compensation were to rise by 10 percent, and civilian compensation remained unchanged, first-term retention would be predicted to rise by about 20 percent. Hence, if the first-term retention rate were 40 percent and real military compensation rose by 10 percent, the first-term retention rate would be predicted to rise by 8 percentage points (20 percent of the base retention rate). The predicted rise in the second-term retention rate due to a 10 percent overall pay increase is also around 8 percentage points, though such an increase implies a smaller elasticity.[9] Retention changes beyond the second term are much smaller (as would be expected due to the relatively high base retention rate beyond that point).[10]

Some studies conducted with post-drawdown data on enlisted personnel have estimated lower pay elasticities at the initial decision point than those based on pre-drawdown data, in the range of 0.5 to 1.5. Hansen and Wenger (2005) addressed the question of whether the pay elasticity has in fact declined in recent years. Ultimately, they found no evidence in support of a decrease, and they discovered that the apparent differences in pre- and post-drawdown estimates could be laid to differences in methodology. Hansen and Wenger estimate a baseline model which yielded a pay elasticity of 1.6, which is in the middle of the range of previous estimates.

9. An 8 percentage point retention increase on a base retention rate of 60 percent, for example, is an increase of 13.3 percent, implying an overall pay elasticity at the second reenlistment point of 1.33.

10. The estimates discussed in the text were all obtained with econometric estimation using the ACOL model. Asch and Warner (2001) use their calibrated DRM to simulate the effect of a 10 percent increase in overall compensation on Army enlisted retention. Their model predicts that a 10 percent real pay increase would raise retention by 21 percent at the first-term point, 13 percent at the second-term point, and 5 percent at the third-term point. These predictions are consistent with econometric evidence from other studies.

Studies of the effects of compensation on officer retention are fewer in number. The Warner and Asch (1995) survey of such studies found estimates of officer elasticities at the end of initial obligation in the range of 0.8 to 1.5, implying that a 10 percent increase in military pay would raise officer retention by between 8 percent and 15 percent. The two recent studies of officer retention that apply the DRM (Asch et al. (2008) and Mattock et al. (2010)) suggest that officer retention is in fact more sensitive to changes in compensation than the estimates from earlier studies of officer retention might indicate.

Reenlistment Bonuses

A number of past studies have used the reduced form approach to directly estimate the effects of SRBs on enlisted retention.[11] The most recent to do so is Asch et al. (2010). Chapter 7 of that study examines first- and second-term retention in selected Army enlisted occupations in the FY 2003–2007 period. In both terms of service, a one-level increase in the SRB multiplier (which represents one month of basic pay per year of reenlistment) was estimated to increase the reenlistment rate by about 3–4 percentage points (Table 7.6 in Asch et al.). Chapter 8 of that study provides alternative estimates using different data. Estimates available in that chapter suggest that a one multiple SRB increase will raise Army reenlistment by 2.5 percentage points (Table 8.1 in Asch et al.). Chapter 8 also provides estimates of SRB effects for the other services. Similarly to the Army, Navy first-term reenlistment was also estimated to rise by 2.5 percentage points per unit increase in the SRB multiplier; Marine Corps reenlistments were predicted to rise by 3.5 percentage points.

The Asch et al. (2010) estimates of the reenlistment effects of SRBs are consistent with a number of past studies of SRB effects on enlisted retention cited in the review articles by Warner and Asch (1995) and Goldberg (2001). Collectively, these studies indicate that SRBs have strong effects on enlisted retention and they furthermore suggest that SRBs are a very cost-effective tool in force management.

Incentive Effects of Sea Pay

In addition to SRBs, the services provide military members with a variety of special and incentive pays for various purposes. One of these is Career Sea Pay. Golding and Gregory (2002) analyzed the relationship between Career Sea Pay and the willingness of sailors to remain on or extend sea duty. They showed that sea pay had a positive effect on completing a year of an obligated sea tour and on encouraging extensions on sea duty. An increase of $50 per month in sea pay

11. Reenlistment bonuses are paid in selected military specialties, and the amount of the bonus equals the individual s basic pay times the number of years of reenlistment times a bonus multiplier (integer values from one to six).

increased the predicted completion rate of a 48-month sea tour by 3.3 percentage points, or 11 percent, and increased extensions of 48-month tours by 2.9 percentage points, or 5.8 percent. Career Sea Pay was found to be a cost-effective way to increase ship manning.

Educational Benefits

Educational benefits are a powerful recruiting incentive, as discussed above. But when educational benefits are used to increase enlistment, they also create an incentive to leave military service in order to use the benefit. Studies conducted with data from the 1980s found that Army personnel who received the ACF reenlisted at a lower rate than non-ACF recipients (Smith, Sylwester, and Villa (1991) and Hogan, Smith, and Sylwester (1991)). More recently, Simon et al. (2010) study the effects of educational incentives on reenlistment in the FY 1993–2003 period. Consistent with the earlier studies, Simon et al. (2010) estimate the higher educational benefits will reduce Army first-term retention. However, this study did not find an adverse impact of educational benefits on retention in the other services. Thus, while increased generosity of the Post 9/11 GI Bill program has raised concern within DOD about its effects on enlisted retention, past studies do not offer clear-cut evidence about what its retention effects will be. Adverse retention effects of the program may be mitigated by a feature that permits service members who have served 10 or more years in the Post 9/11 period to transfer benefits to dependents.

Business Cycle Influences on Retention

The state of the economy has a strong influence on recruiting. Evidence that retention may also depend on the state of the economy is indicated in Figure 2. Army enlisted continuation prior to the 20-year point was generally higher in FY 2009, when the civilian unemployment rate averaged 8.5 percent, than either FY 2001 or FY 2005, with unemployment rates of 4.3 and 5.2 percent, respectively.

Civilian unemployment roughly doubled between FY 2001 and FY 2009. How much do studies predict retention to have increased as a result? Unfortunately, Simon et al. (2010) provide the only estimates of the retention effects of civilian unemployment based on post-drawdown data. The unemployment rate measure in this study is the unemployment rate in an individual's home state at the time of reenlistment. This study estimates that a 1 percentage point rise in the civilian unemployment rate increases Army first-term retention by 0.5 percentage points, Navy retention by 0.8 percentage points, Air Force retention by 0.9 percentage points, and Marine Corps retention by 0.7 percentage points. These estimates imply that the approximate doubling of civilian unemployment between FY 2001 and

FY 2009 would increase first-term retention by somewhere between 2 percentage points (Army) and 3.6 percentage points (Air Force). These effects are modest and may be due to the fact that the study included year effects along with the unemployment rate in the individual's home state to control for other time-related effects on retention. These time effects no doubt capture in part effects of economy-wide movements in unemployment.

Goldberg and Warner (1982) provide a study of the retention effects of civilian unemployment based on Navy data from the FY 1974–1980 period. They estimate larger unemployment effects that are roughly double those estimated by Simon et al. (2010).[12] Based on these estimates, the observed rise in civilian unemployment between FY 2001 and FY 2009 would raise first- and second-term retention rates by about 8 percentage points. The larger estimates of unemployment effects obtained in this study may be due to the fact that it did not include time effects in the estimated models.

Summary

The evidence found in numerous empirical studies suggests that both recruiting and retention are significantly influenced by the state of the civilian economy. The civilian economy affects recruiting and retention in at least two ways: through the availability of civilian employment, as measured by the civilian unemployment rate; and by the potential earnings offered by the civilian sector, as measured by average civilian earnings. As the U.S. economy improves we can expect that the declining civilian unemployment rate and rising civilian real earnings will pose challenges for recruiting and for retention.

The 9th Quadrennial Review of Military Compensation found that military compensation hovered around the 60th percentile of civilian earnings based on comparisons with comparable groups of civilian workers, and it recommended that military pay be raised over time to the 70th percentile of earnings. Over the course of the last decade, a series of annual pay increases following from this recommendation, as well as the severe economic downturn that began in 2007, have transpired to raise military compensation above the 70th percentile, as work reported elsewhere for the 11th Quadrennial Review of Military Compensation indicates. Military compensation has risen to the point, in comparison with civilian compensation, that generalized pay hikes are a costly means of inducing desired retention changes in specific communities that may be experiencing recruiting and retention difficulty

12. They estimate models by occupation group. The weighted average estimate of their first-term estimates is a 2 percentage point rise in retention per percentage point rise in unemployment; the second-term weighted average effect is almost the same, 1.8 percentage points.

and a time when overall recruiting and retention are healthy. The research reviewed here indicates that changes in bonuses and other special and incentive pays have sizeable impacts on recruiting and retention, and furthermore, are cost effective in comparison with other policy alternatives.

References

Asch, B., P. Heaton, J. Hosek, F. Martorell, C. Simon, and J. Warner. 2010. *Cash incentives, and military enlistment, attrition, and reenlistment*. MG-950-OSD. Santa Monica, Calif.: RAND Corporation.

Asch, B., J. Hosek, M. Mattock, and C. Panis. 2008. *Assessing compensation reform: research in support of the 10th Quadrennial Review of Military Compensation*. Santa Monica, Calif.: RAND Corporation.

Asch, B., J. Hosek, and J. Warner. 2007. The new economics of manpower in the post-Cold War era. In: *Handbook of defense economics* Volume 2. Edited by T. Sandler and K. Hartley, 1075–1138. Amsterdam: Elsevier.

Asch, B. and J. Warner. 2001. A theory of compensation and personnel policy in hierarchical organizations with application to the U.S. military. *Journal of Labor Economics* 19: 523–562.

Bicksler, B. and L. Nolan. 2009. *Recruiting an all-volunteer force: The need for sustained investment in recruiting resources—an update*. Arlington, Va.: Strategic Analysis.

Daula, T. and R. Moffit. 1995. Estimating dynamic models of quit behavior: The case of military reenlistment. *Journal of Labor Economics* 13: 449–523.

Dertouzos, J. and S. Garber. 2003. *Is military advertising effective? An estimation methodology and applications to recruiting in the 1980s and 1990s*. MR-1591-OSD. Santa Monica, Calif.: RAND Corporation.

Goldberg, M. 2001. *A survey of enlisted retention: Models and findings*. CRM D0004085.A2/Final. Alexandria, Va.: Center for Naval Analyses.

Goldberg, M. and J. Warner. 1982. *Determinants of Navy reenlistment and extension rates*. CRC 476. Alexandria, Va.: Center for Naval Analyses.

Golding, H. and D. Gregory. 2002. *Sailors' willingness to complete sea tours: Does money matter?* CRM D0006886.A2/Final. Alexandria, Va.: Center for Naval Analyses.

Gotz, G. and J. McCall. 1984. *A dynamic model retention model of Air Force officer retention: theory and estimation*. R-03028-AF. Santa Monica, Calif.: RAND Corporation.

Hansen, M. and J. Wenger. 2005. Is the pay responsiveness of enlisted personnel decreasing? *Defense and Peace Economics*. 16: 29–43.

Hogan, P., D. Smith, and S. Sylwester. 1991. The Army College Fund: Effects on attrition, reenlistment and cost. In: *Military compensation and personnel retention*. Edited by C. Gilroy, D. Horne, and D. Smith, 317–354. Alexandria, Va.: U.S. Army Research Institute.

Hogan, P., T. Dall, P. Mackin, and C. Mackie. 1996. *An econometric analysis of Navy television advertising effectiveness*. Falls Church, Va.: Systems Analytic Group.

Mattock, M., B. Asch, J. Hosek, C. Whaley, and C. Panis. 2010. *Towards improved management of officer retention: A new capability for assessing officer retention*. DRR-5184-OSD. Santa Monica, Calif.: RAND Corporation.

Simon, C. and J. Warner. 2007. Managing the all-volunteer force in a time of war. *Economics of Peace and Security Journal* 2(1), 20–29.

Simon, C. and J. Warner. 2009. The supply price of commitment: Evidence from the Air Force bonus program, *Defence and Peace Economics* 20(4): 269–286.

Simon, C., S. Negrusa, and J. Warner. 2010. Educational benefits and military service: An analysis of enlistment, reenlistment, and veterans' benefit usage 1991 2005. *Economic Inquiry* 48(4): 1008–1031.

Smith, D., S. Sylwester, and C. Villa. 1991. Army reenlistment models. In: *Military compensation and personnel retention*. Edited by C. Gilroy, D. Horne, and D. Smith, 317–354. Alexandria, Va.: U.S. Army Research Institute.

Warner, J. and B. Asch. 1995. The economics of military manpower. In: *Handbook of defense economics* Volume 1. Edited by K. Hartley and T. Sandler, 347–398. Amsterdam: Elsevier.

Warner, J. and C. Simon. 2004. *Updated estimates of enlistment supply: A report prepared for Office of the Undersecretary of Defense for Personnel and Readiness*. Accession Policy Directorate. Clemson University: Department of Economics.

Warner, J., C. Simon, and D. Payne. 2001. *Enlistment supply in the 1990s: A study of the Navy College Fund and other enlistment incentive programs*. DMDC Report No. 2000-015. Arlington, Va.: Defense Manpower Data Center.

Warner, J., C. Simon, and D. Payne. 2003. The military recruiting productivity slowdown: The roles of resources, opportunity cost, and tastes of youth. *Defense and Peace Economics* 14: 329–342.