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DO INCENTIVES MATTER? THE CASE OF NAVY RECRUITERS

BETH J. ASCH*

This study examines how Navy recruiters in April–August 1986 responded to a multiperiod incentive plan that included piece rates, quotas, prizes, and standards. Recruiters generally produced more enlistments as they gained experience and as the date of their eligibility for a prize approached. Those with higher past output (who were thus more likely to win a prize), however, produced less as they approached the prize eligibility date. Recruiters also enlisted markedly fewer recruits immediately after winning a prize. This evidence that recruiters varied their effort over time in response to an incentive system, the author suggests, has implications for such private sector jobs as sales and tenure-track teaching.

In recent years a plethora of articles have addressed problems related to the principal-agent relationship. Although the main motivation behind this literature is to derive compensation structures that elicit desired levels of efforts, few empirical studies have examined the effect of a given compensation structure on worker effort and, therefore, output. Generally, empirical studies are sparse because data are unavailable on worker output and company incentive plans or because worker output is imperfectly measured.

To surmount these data problems, many previous studies have focused on earnings rather than productivity. A large body of empirical work has studied executive compensation and firm performance. (See, for example, Murphy 1986; Antle and Smith 1986; and Coughlin and Schmidt 1985.) Other studies have examined the effects of piece rates and wages on earnings (Seiler 1984; Pencavel 1977). Bull, Schotter, and Wiegert (1987) focused on productivity rather than earnings by using data collected during an experiment, with students as participants, rather than "natural" data on "real" workers. In their study, they examined the effects of piece rates versus tournaments on effort.

The purpose of this study is to examine empirically how workers vary their productivity in response to a given incentive structure. I use data on a group of "real" workers whose output (but not effort) is perfectly observed, and who participate in a multiperiod incentive plan that utilizes piece rates, quotas, fixed prizes, and standards. This group consists of Navy recruiters.

Navy recruiters are military personnel in various occupations who are assigned to recruiting duty, typically for a three-year period. Their purpose is to enlist 17-

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to-21-year-old youths in the Navy. Since recruiters' military pay is independent of their productivity as a recruiter, a moral hazard problem arises. To address this problem, the Navy requires recruiters to participate in an incentive program designed to reward good performance. Under this plan, recruiters earn points for every enlistment they make. At the end of a twelve-month period, they become eligible to win rewards that have monetary value, if their accumulated points exceed predetermined values. Recruiters also face quotas each month, but their compensation is independent of meeting them.

In this study, I examine how recruiters vary productivity over time in an attempt to win prizes. In particular, I examine whether recruiters make intertemporal effort decisions over the twelve-month reward period and over their three-year tour. Although the analysis focuses on workers in the military, it has applications to workers in the private sector. For example, workers who receive bonuses at the end of the year, salesmen who compete over time for fixed prizes, and junior professors striving to make tenure can make intertemporal effort decisions to win a reward.

Institutional Background

The Navy's recruiting system is organized into five operational levels. Below the national level, the country is divided into six recruiting areas, each of which, in turn, is divided into recruiting districts. The national market is divided into 42 recruiting districts. Below the district level are recruiting zones, which are the areas served by individual recruiting stations. Finally, the fifth level is that of the individual recruiter. The number of recruiters assigned to a station varies from one to seven.

Quotas

At the national level, the Navy determines the number and quality[1] level of recruits to meet its military objectives. These requirements are translated into quantity and quality quotas for each month for each recruiting district using a regression model that takes into account the district's share of recruiters, the 17-to-21-year-old population, extent of urbanization, and minority population. Thus, quotas vary geographically. Currently, the national quota calls for 90% of all enlistees to be high school graduates and approximately 60% to be in the upper half of the Armed Forces Qualifying Test score (AFQT) distribution.

Below the district level, goals are set in a highly decentralized and diverse manner. Usually the managers at each level of the hierarchy assign quotas based on some analysis of the size and quality composition of the zone's, station's, and recruiter's market. Some managers use informal observation and others use census data or data on the quality of enlistments made in the past.[2] District, zone, station, and recruiter quotas vary from month to month due to seasonal variations in the supply of potential enlistees.

Recruiters do not receive rewards for meeting or exceeding their quotas. Moreover, recruiters who fail to meet their quota can blame poor performance on poor market conditions, since the supply of enlistees is subject to random fluctuations that allow recruiters to "hide" their true effort levels. As a result, recruiter activity is extensively monitored by station managers. Managers require recruiters to first meet their quotas of high-quality enlistments so that if they underproduce relative to the quantity quota, they underproduce mostly low-quality enlistments. Recruiters who meet or exceed their quotas of high-quality enlistment are free to overproduce low-quality enlistments.

[1] The "quality" of a recruit is determined by whether or not the individual is a high school graduate and by his or her score on the Armed Forces Qualification Test (AFQT). High school graduates scoring in the top 50th percentile on the AFQT are considered high-quality recruits and all others are considered low-quality.

[2] An individual recruiter's quota is generally based on his territory's market and seasonal factors rather than individual performance, thus reducing the likelihood of a ratchet effect.

Although recruiters are monitored, many of their activities, such as visits to local high schools, occur outside the station. Thus, monitoring is imperfect.

The Freeman Plan

The Freeman plan is a national incentive system that designates points and rewards for recruiting success. More points are assigned to higher-quality recruits than to low-quality recruits because the former are thought to be more productive in the military and because they are harder to enlist due to their better private sector opportunities. The point values, which presumably reflect the Navy's valuation of each quality category, are shown in Table 1.

These points are accumulated and averaged over a 12-month production period. After 12 months, if the recruiter's average points per month exceeds 300, a reward is granted and the production period begins again. If the average falls short of this standard, the production cycle becomes a 12-month moving window whereby points in the earliest month are dropped and those in the new month are added until an average of 300 points is achieved. Any distribution of enlistments across quality levels can be used to achieve a reward.

Table 2 presents the rewards and the average accumulated points required to win them. The availability of several levels of reward is intended to induce already successful recruiters to further increase effort. The highest reward is a promotion. The recruiter can win this prize only once during his or her tour. The second reward provides recruiters with an opportunity to extend their tour for one year. An extension of recruiting duty—a shore job—is valuable to Naval personnel, for whom heavy sea duty can mean prolonged separation from their families.

Table 1. Freeman Plan Point Values.

(1) AFQT Category[a]	*(2) High School Graduates*	*(3) Non-High School Graduates*
I (93–100)	116	100
II (65–92)	107	90
IIIA (50–64)	100	85
IIIB (31–49)	90	65
IV (10–30)	70	N/A
V (1–9)	N/A	N/A

[a] AFQT category is based on the recruit's Armed Forces Qualification Test score. The range of scores that define a category is in parentheses.

Table 2. Recruiter Rewards and Required Average Accumulated Points over 12 Months.

(1) Reward[a]	*(2) Required Average Accumulated Points*
1. Promotion	525
2. Voluntary Extension	400
3. Navy Achievement Medal (2 promotion points)	350
4. Certificate of Commendation (1 promotion point)	300

[a] Numbers indicate ranking, 1 being the highest ranking.

The third and fourth rewards have no immediate value to recruiters other than the value of recognition. The promotion points associated with these rewards can, however, increase their chances of a promotion at a later date. When individuals are considered for promotion, they take several proficiency exams in their occupational specialty. If the exam point totals meet a minimum standard, and if other performance indicators are satisfactory, the individual receives a promotion. Promotion points earned as a recruiter are added to the exam point total. Since the variance of exam scores tends to be small, extra points can make a significant difference.

The Interaction Between Quotas and the Freeman Plan

The Navy's first recruiting priority is meeting its quotas, particularly its high-quality quotas. Although the Freeman Plan places a premium on high-quality enlistments, recruiters can win prizes under that plan by enlisting only low-quality recruits, counter to the Navy's high-quality enlistment objectives. The Navy attempts to counteract this potential conflict between its high-quality quotas and the Freeman Plan through monitor-

ing. As noted above, however, monitoring is imperfect.

Economic Implications

Below, I first examine recruiters' enlistment choices at a specific time for a given level of effort and then examine how recruiters choose their level and allocation of effort over time. A formal model is not developed because many factors can affect effort in the same way and a given factor may increase or decrease effort depending on individual preferences. Thus, I simply provide a framework for interpreting the empirical findings.

Enlistments at any given time are affected by random changes in market potential. I analyze the case of perfect certainty by assuming that recruiters make their choices after they have become aware of the random change.

Recruiter Choices at a Point in Time

Given the scarcity of resources available to recruiters and the size and composition of the market they face, they must allocate their effort between high- and low-quality enlistments. The tradeoff they make can be illustrated by a production possibilities curve, shown in Figure 1, which indicates all feasible combinations of high- and low-quality enlistments at a particular time, given the limited amount of recruiting resources.[3] The slope of the curve is negative and concave because recruiters typically first obtain the most visible or most willing high-quality recruits, but thereafter must work harder, sacrificing more low-quality enlistments to obtain an additional high-quality one.

Enlistments increase when recruiters supply more effort, given market potential and resource availability. In Figure 1, the curve bb' can represent not only a larger market but also a greater level of effort than aa'. The outer curve, cc', represents the production possibilities when effort is maximized. The placement of this curve depends on recruiter ability—for more able recruiters, the curve will be farther from the origin.

Point Q in the figure represents a possible quota. Because of monitoring, underproducers—those with the curve aa'—can only choose points to the left of L_q. Those who exceed the quota can overproduce solely low-quality enlistments (points along $\overline{QB}$), Solely high-quality enlistments (points along $\overline{QH}$), or some combination. Alternatively, they can underproduce low-quality enlistments and overproduce high-quality ones (points above $\overline{QH}_q$ but to the left of $\overline{QA}$).

The number of Freeman points earned in a given month is a linear combination of enlistments and the points per enlistment shown in Table 1. If the recruiters' utility equals their monthly Freeman points, their indifference curves are linear and each curve represents all the combinations of high- and low-quality enlistments yielding the same points. Lines mm' and nn' illustrate two indifference curves.

The recruiter's objective is to maximize the number and level of rewards he or she obtains subject to the production possibility curve. To do this, the recruiter must choose, in each month of the 12-month production cycle, the combination of high- and low-quality enlistments that maximizes points for a given level of effort as well as the optimal level of effort.[4] For a given level of effort, the recruiter maximizes points where the marginal benefit, equal to the relative points assigned to each quality type, equals the ratio of the marginal costs. Points C and D in the figure illustrate two such points.

Recruiter Choices Over Time

Given effort, recruiters' optimal enlistment choices will vary over time because of anticipated changes and different out-

[3] For ease of exposition, I assume that there are only two quality categories of enlistments.

[4] To simplify the problem conceptually, I assume recruiters maximize their reward attainment by maximizing the number of points they earn each month. In actuality, recruiters probably care more about maximizing average accumulated points, since rewards are based on these. The assumption, however, does not interfere with the identification of the essential elements affecting recruiters' decisions.

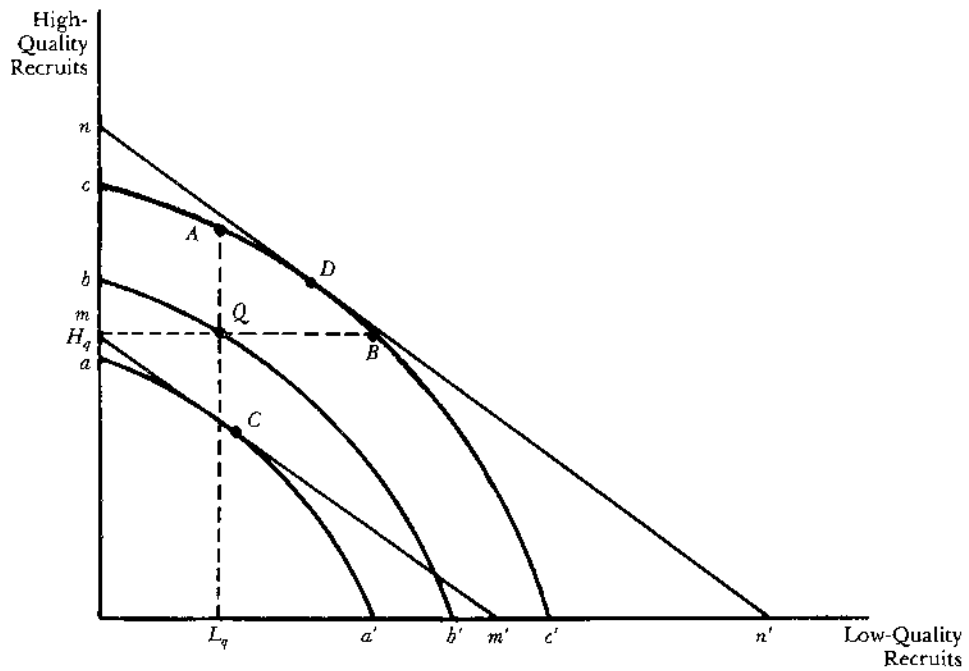

Figure 1. The Tradeoff Facing Recruiters Between High-Quality and Low-Quality Enlistments.

comes of random changes in market potential, recruiting resources, and quotas. These factors change the shape and position of the production possibilities curve as well as the number of over- and underproducers.

Over time, recruiters choose the allocation and type of effort that maximizes their chances of winning a prize.[5] I first examine these choices over the production cycle and then over a recruiter's tour.

Productivity over the 12-month production cycle. Whether recruiters supply more effort at a *particular* time depends on the difficulty of winning rewards, quota levels, and the recruiters' preferences for rewards versus leisure. In turn, the difficulty of winning depends on the Freeman Plan's point structure and reward requirements, recruiter ability, market potential, and resource availability.

Rewards will be harder to win if the number of points that can be earned for any quality category is low, the points required to win are high, recruiter ability is low, and market opportunities are limited. In these cases, the potential for earning points is lower, given effort, and recruiters must supply more effort to earn more points. If the points required to win are too high, winning may be impossible for less able recruiters and those in smaller markets, even when effort is maximized. Such recruiters may supply only sufficient effort to meet their quotas.

If monitoring is effective, higher quotas will induce more effort. Recruiters who value rewards the most relative to leisure will supply more effort. But those who value rewards the least relative to leisure will supply less effort and possibly only enough to meet their monthly quotas.

The allocation of effort *over time* depends on how quotas, market size and

[5] Previous studies of moral hazard in a multiperiod setting have examined the optimal conditions for a one-period versus a multiperiod contract, as well as the optimal compensation structure (Lambert 1983; Rogerson 1985; Malcomson and Spinnewyn 1988; Rubinstein and Yaari 1983; Spear and Srivastava 1987). These studies do not, however, examine intertemporal substitutions in effort when payment is deferred beyond one period.

composition, and resource levels change over the cycle, whether or not these changes are anticipated; recruiters' point accumulation; and recruiters' preferences for allocating time. If market or quota changes are anticipated, recruiters can preplan an effective strategy at the beginning of the cycle for distributing effort over time that capitalizes on available opportunities. If unexpected changes occur, however, the preconceived strategy may no longer be optimal.

For example, recruiters may anticipate that market opportunities will be best at the end of the cycle, when seasonal variations result in a greater supply of potential recruits. Their strategy may be to supply less effort initially and then more effort when the recruiting environment improves. Thus, they plan to increase productivity over the cycle. If, on the contrary, it happens that market opportunities are unexpectedly poor at the end of the cycle, a better strategy, ex post, would have been to supply greater effort initially.

When unanticipated changes occur, recruiters at the end of their cycle may update their strategy when they have insufficient average accumulated points to win a reward. If they increase effort to increase their point accumulation, productivity will rise at the end of the cycle. If they reduce effort because they believe their chances of accumulating sufficient points to win is small, productivity will fall. Thus, it is not clear whether productivity will rise or fall given the past pattern of points collected.

More generally, recruiters may vary effort during the production cycle based on their success to date on the Freeman Plan. Recruiters with more average accumulated points as of the beginning of the month may increase effort during the month to further raise their average points. In this case, current productivity and past average points would be positively related. On the other hand, more successful recruiters may reduce effort, consume more leisure, and "rest" on past achievements. Such recruiters may value leisure more than winning better rewards. In this case, current productivity and past average points would be negatively related.

Recruiters' preferences for the time-path of leisure will also affect the allocation of effort over time. Those who value large blocks of leisure may maximize effort at the beginning or end of the cycle and consume leisure for the remaining months. Alternatively, those who prefer the same amount of leisure each month may supply a constant level of effort each month. In part, these choices depend on their discount rate. Recruiters who discount future costs and benefits more will end-load effort. Because of "procrastination," productivity will rise over the cycle. Whether recruiters can "front-load" or "end-load" enlistments, however, will depend on their quotas.

In addition to varying their level of effort over time, recruiters may vary their type of effort. In the initial months, they may devote considerable time to activities that build their inventory of future recruits, such as visiting job fairs and giving lectures at high schools, rather than working to gain enlistments immediately. Later in the cycle, as they approach the eligibility month for winning a reward, they would deplete their inventory, enlist more recruits, and increase their Freeman point attainment. If their points are insufficient at the end of the cycle to win a reward, they may "steal" future enlistments—deplete their inventory even further—to ensure winning. Such a strategy would result in productivity rising over the first cycle and dropping at the beginning of the second.

Productivity over a recruiter's tour. Past studies have shown that recruiter productivity, in the absence of an incentive plan, rises at a decreasing rate with experience (Carroll, Rao, and Lee 1986; Kostiuk and Follmann 1989). These studies explain the relationship between productivity and experience in terms of learning on the job.

Freeman status may alter how recruiter productivity varies with experience. How recruiters vary their level and type of effort over and between production cycles will affect how productivity varies with

tenure because as recruiters gain months of production, they also gain months of tenure.

Since recruiters' tours are generally 36 months, the opportunities for winning rewards are limited and some recruiters may reduce effort. With a 12-month production cycle, recruiters can win only three rewards at most. Recruiters aiming to win all three must supply sufficient effort to win every twelve months. Those who have the usual three-year tour and who fail to win immediately after the first year become ineligible to win all three rewards. Such recruiters may reduce effort because they have more than twelve months to win each of the two rewards for which they remain eligible.

The timing of rewards can also affect effort at the end of a recruiter's tour. If recruiters have insufficient time remaining to finish their production cycle, they may reduce effort. If enough time does remain, they may increase effort depending on how many months they need to complete their production cycle, their average accumulated points, and the value they place on leisure relative to rewards.

Data

The data for this study cover recruiters in the Chicago Navy Recruiting District for the five-month period from April through August 1986. During that time, the Chicago district was one of the top-performing districts in the country relative to its quotas. Thus, recruiter behavior and the Freeman Plan were examined in an environment in which overall performance was more than satisfactory. These data include information on enlistments, recruit attrition,[6] station and zone affiliation, station size and quotas, time devoted to recruiting, Freeman Plan status including month of production, past rewards, accumulated points, average accumulated points, and points earned each month.

Unfortunately, there are no data on individual quotas, only station quotas. I proxy individual quotas by dividing each recruiter's station quota by the number of recruiters in the station.[7]

The database has a short time series because of the considerable effort required to hand-enter and clean the data. Thus, to examine productivity over time, comparisons across recruiters with different tenures and months of production are made. Below, I discuss the estimation procedure used to eliminate differences in recruiter attributes, such as ability, that may confound the analysis of how a single recruiter varies effort and productivity over time.

The Chicago Navy Recruiting District database has 540 observations representing five complete months of data on 90 recruiters and less than five months of data on an additional 35 recruiters who either joined the District or ended their tour during the sample period or who had incomplete data. Therefore, the sample consists of 125 recruiters.

Table 3 presents the sample means and standard deviations. On average, recruiters made 2.59 gross contracts per month. Net of recruit attrition, recruiters enlisted 2.41 recruits, exceeding the average net contract quota of 2.39 recruits.

Recruiters' average tour length is 36 months, and 80% of the recruiters in this sample had tours between 35 and 37 months. Tour lengths in the sample vary, however, from 11 months to 70 months, and recruiters with abnormal tour lengths have fewer or more opportunities to win rewards.

The majority of the recruiters in the sample (55%) were in their first year of

[6] Enlistments in the military are also referred to as contracts. Recruit attrition equals the number of recruits who enlist but do not enter the military, or the number of unfilled contracts. Net contracts, the Navy's definition of recruiter productivity, equals gross contracts minus the number of unfilled contracts each month.

[7] This proxy is reasonable to the extent that the average station has only two recruiters. If the station includes one junior and one senior recruiter, however, the proxy probably overstates the quota of the junior recruiter (who probably gets assigned a lower quota) and understates the senior recruiter's quota.

Table 3. Means and Standard Deviations of Recruiter Level Variables: Chicago Navy Recruiting District, April–August 1986.
(N = 540)

(1) *Variable*	*(2)* *Mean*	*(3)* *Standard Deviation*
Enlistments		
Gross Contracts	2.59	1.78
Net Contracts	2.41	1.79
Quotas		
Net Contract Quota	2.39	.47
Recruiters Exceeding Quota	.52	.50
Black I–IIIA AFQT Quota	.17	.26
Hispanic I–IIIA AFQT Quota	.12	.20
Recruiter Resources		
Percent of Month on Leave	.12	.20
Station Chief Status	.38	.49
Length of Stay		
Tour of Duty Length	36	5.67
Months of Tenure	13.94	11.17
Freeman Plan Status		
Months on Production Cycle	7.57	4.20
Percent of Sample in Cycle 1	.79	.41
Percent of Sample in Cycle 2	.18	.39
Percent of Sample in Cycle 3	.02	.15
Current Month Points	231	175
Accumulated Points	1840	1182
Ave. Accumulated Points	232	101
Lagged Ave. Accumulated Points	231	99
Tenure When Reward Won	15.1	3.08

recruiting duty, probably because the Navy nationally increased the number of recruiters in 1986. Twenty-six percent of the recruiters were in their second year, 14% were in their third year, and 4% were in their fourth year. Because of the large number of first-year recruiters, few recruiters in the sample had won Freeman rewards, since these recruiters had not reached the reward eligibility month of the production cycle. Twenty-five recruiters, out of a total of 125, had won a reward. Also, because of the small number of senior recruiters, few recruiters were at the end of their tour. As a result, we cannot adequately examine end-of-period patterns using this sample.

Table 3 also presents average Freeman Plan status and performance. One hundred recruiters remained in the first production cycle throughout the sample period, 16 remained in the second cycle, and 2 remained in the third cycle. During the sample period, 7 recruiters won a reward—5 recruiters entered the second cycle and 2 entered the third cycle. Thus, 105 recruiters were in the first cycle for at least part of the sample period, 23 were in the second cycle, and 4 were in the third cycle.[8] Out of the 125 recruiters, 56 were eligible to win a reward by the end of the sample period. Of these, 21 had won one reward and were in cycle two, and 4 had won two rewards and were in cycle three. Recruiters, on average, had 15 months of tenure when they won their reward.

[8] In terms of observations, 428 are attributed to the first cycle, 99 to the second cycle, and 15 to the third cycle.

Estimation

Reduced form regression equations are estimated using Ordinary Least Squares. The dependent variable in these models is enlistments (net contracts), and the independent variables include factors that vary with recruiter and time or simply with recruiter.

Recruiters may differ in ability, an unobserved attribute, and the regression results will be biased if the independent variables are correlated with ability. Moreover, it will not be possible to interpret the results in terms of recruiters' effort decisions. In an attempt to eliminate ability differences empirically, I estimate fixed-effect, or dummy variable, regression models that exclude recruiter attributes that are fixed over time, such as ability, and include attributes that change over time, such as effort.

For example, net contracts made by recruiter i in month t are specified as

$$(1) \qquad C_{it} = Z_i\gamma + Y_{it}\delta + \eta_{it}$$

where Z_i is a vector of observable time invariant recruiter attributes; Y_{it} is a vector of variables that vary with time, recruiter, effort, and ability; and η_{it} is equal to $(\epsilon_{it} + \mu_i)$, where ϵ_{it} is a random error that varies with time and recruiter and has a zero mean and standard deviation equal to σ, and μ_i equals unobservable, time-invariant recruiter attributes, such as ability.

The variable Y_{it} is a function of both observed characteristics, Q_{it}, and unobserved characteristics, ability μ_i and effort v_{it}, or:

$$(2) \qquad Y_{it} = Q_{it}\alpha + \mu_i + v_{it}$$

Thus, the effect of Y_{it} on contracts may be due to ability. Moreover, Y_{it} is correlated with the error term η_{it} implying that estimates of δ will be biased. The objective is to estimate equation (1) net of ability, or:

$$(3) \qquad C_{it} = Z_i\gamma + W_{it}\delta + \eta_{it}$$

where W_{it} is defined as $(Q_{it}\alpha + v_{it})$. To do this, equation (1) is first estimated as a fixed-effect model to derive the parameter estimate for δ. Operationally, the change between t and $t-1$ is computed for each variable in (1). If we assume that effort, v_{it}, is uncorrelated with η_{it}, the estimation results will be unbiased.[9]

To obtain the parameter estimate for γ in (1), we estimate:

$$(4) \qquad \bar{C}_i - \bar{Y}_i\hat{\delta} = Z_i\gamma + \mu_i$$

where $\hat{\delta}$ is obtained from estimating the fixed-effect model, and $\bar{C}_i$ and $\bar{Y}_i$ equal the means of each variable over time for each recruiter. The parameter estimate for δ will be biased by differences in ability. Below, I report the estimation results for the fixed-effect model, denoted Model 1, and for equation (4), denoted Model 2 (or the recruiter attribute model).

Number of Observations

Since few recruiters have won two rewards, the observations for cycle three recruiters are excluded, thereby decreasing the sample size from 540 to 527. To estimate the fixed-effect model, observations are lagged by one month, thereby further decreasing the number of observations to 404.[10] To estimate equation (4), the sample size is 123, which equals the number of recruiters in the sample.[11]

Variable Definitions

Month of production. For estimation purposes, I assume that the production cycle runs from 1 to 13 months. Recruiters whose cycle is a running 12-month average are in the 13th month of production. I distinguish the 13th production month from the other months because, at this month, recruiters do not progress further

[9] Autocorrelation of the error terms is built into the model. To correct for autocorrelation, the sample size is reduced. As a result, time series variations in a five-month period are reduced. The results after correcting for autocorrelation are qualitatively the same as when the sample size is simply reduced without correcting for this problem. Thus, I do not correct for autocorrelation in estimated regressions.

[10] Of the 404 observations, 323 are attributed to cycle one and 81 to cycle two.

[11] The two recruiters who remained in cycle three during the sample period are excluded. Thus, the number of recruiters drops from 125 to 123.

on the cycle and accumulated points become a moving average.

Two spline variables are used to represent months of production. The first variable, denoted PROD, runs from one to twelve. In the 13th production month, PROD equals twelve. The second variable, denoted MONTH13, equals one if the recruiter is in the 13th month and equals zero otherwise.

Other variables. Recruiters' market potential is proxied by dummy variables that indicate their zone affiliation. Also included is a dummy variable that indicates whether recruiters were reassigned to a new station (within their zone) during the sample period. Both this variable and calendar month capture changes in market potential during the sample period.

I define resource availability in terms of each recruiter's time availability. Time available is proxied by a dummy variable indicating whether a recruiter is in command of a station. In smaller stations (the majority of the Chicago Navy Recruitment District stations) a station chief not only has managerial responsibilities but is also a production recruiter. Thus, these recruiters have less time to devote to recruiting than non-managers. The number of weeks excused per month from recruiting duty is excluded, despite its importance, because this variable may be endogenously determined. Recruiters may decide when to take leave time based on their performance on the Freeman Plan and whether they are eligible to win a reward. The regression results are qualitatively the same whether this variable is excluded or not.

The Shape of the Productivity Curve

To ascertain how productivity varies over the production cycle for recruiters in each cycle, I estimate a model that relates net contracts to the recruiter's month of production, where dummy variables represent each of the 13 months. Tenure also increases as months of production increase, and continues to rise when the recruiter reaches the 13th month. To separate the effect of tenure from that of the production cycle for recruiters in their second cycle, variables that capture the change in tenure are also included. Tenure is also included for first-cycle recruiters, although the effects of tenure and month of production are indistinguishable for recruiters whose tenure is less than 12 months. The relationship between tenure and months of production is explored further below.

Results

The key finding of the analysis is that productivity rises over the production cycle. Table 4 shows the regression results. When only month of production is allowed to vary, productivity rises from zero to 4.69 for non-reward winners in the first cycle and from −.35 to 5.94 for those who have won one reward. For reward winners, however, only the last three months of the cycle have statistically significant coefficients.

The shape of the productivity curve when the effect of tenure is allowed to vary and when all other variables are set equal to their mean values is shown in Figure 2 for non-winners and in Figure 3 for reward winners. In Figure 3, it is assumed that recruiters begin their second cycle in their 16th month of tenure (see Table 3). The solid lines in the figures indicate the standard errors.

For recruiters in their first production cycle, Figure 2 shows that net contracts rise by 3 over the cycle. One interpretation of this rise is that recruiters obtain human capital in their first year. For more senior recruiters who have won a reward, however, Figure 3 shows that net contracts rise by 5.36 over the second cycle. Since productivity rises more over the second than the first cycle, especially in the last four months, the attainment of human capital cannot be the only explanation for rising productivity.

The rise in productivity is consistent with two interpretations. First, recruiters may stockpile future recruits initially and deplete their stock at the end of the cycle, when they become eligible to win a reward. Alternatively, recruiters may vary their level of effort over the cycle. They may simply procrastinate until they near

Table 4. Productivity over the Production Cycle.
(Dependent Variable = Net Contracts)

	Cycle 1[a]		*Cycle 2*[a]	
Variable (1)	*Coeff. Estimate* (2)	*t-Stat.* (3)	*Coeff. Estimate* (4)	*t-Stat.* (5)
Model 1[b]				
Tenure	−.116	−.22	.09	.34
Tenure Squared	−.00165	−.11	−.0031	−.25
Month 2	.01	.11	.17	.19
Month 3	.91	1.28	.13	.09
Month 4	.79	.93	.61	.36
Month 5	1.10	.99	1.46	.73
Month 6	2.11	1.66**	.96	.44
Month 7	2.42	1.68**	2.15	.92
Month 8	2.10	1.33	2.56	1.07
Month 9	2.53	1.42*	2.65	1.09
Month 10	3.26	1.63**	2.17	.94
Month 11	3.48	1.58*	3.58	1.66**
Month 12	4.14	1.69**	4.64	2.21***
Month 13	4.69	1.86**	5.94	2.49****
Net Contract Quota	.35	1.52*	−.12	−.27
Black I–IIIA AFQT Quota	−1.36	−2.21***	.37	.29
Hispanic I–IIIA AFQT Quota	−1.81	−2.65****	1.02	.52
Change Station	.65	1.49*	−.54	−.69
May	−.16	−.74	.39	.78
June	.15	.61	.42	.79
July	.43	2.08***	.13	.27
	R^2 = .10, N = 323		R^2 = .21, N = 81	
Model 2[b]				
Intercept	.12	.07	.45	.17
Station Chief	−.70	−2.12***	−.45	−.40
Tour Length	.05	1.04	.06	1.01
Zone 2	−1.30	−2.35***	−4.96	−2.46***
Zone 3	−.56	−1.02	−3.52	−2.17***
Zone 4	−.82	−1.60*	−2.41	−1.37
Zone 5	−1.03	−1.83**	−.73	−.41
Zone 6	−1.22	−2.22***	−1.80	−1.08
Zone 7	−1.34	−2.56****	−1.77	−.84
Zone 8	−1.04	−1.94***	−5.32	−2.10***
	R^2 = .16, N = 105		R^2 = .48, N = 23	

[a] Cycle 1 refers to non-reward winners; Cycle 2 refers to reward winners.
[b] Model 1 is fixed effect model; Model 2 is recruiter attribute model.
* Significant at the .15 level; ** significant at the .10 level; *** significant at the .05 level; **** significant at the .01 level.

the reward month in the cycle, thereby supplying less effort initially and more effort at the end of the cycle. Put differently, rewards far in the future may not adequately elicit current effort. Both interpretations imply that recruiters make intertemporal effort decisions in an attempt to win a reward.

Factors Affecting the Shape of the Productivity Curve

Variations in quotas, past Freeman Plan success, calendar month, and changing recruiting stations may alter the observed rise in productivity over the production cycle. If more experienced recruiters receive higher quotas, quotas will rise over the production cycle. Given that quotas induce greater productivity, the productivity curve will steepen as quotas increase. After controlling for tenure in the equation, however, quotas may have little additional effect on the curve's shape.

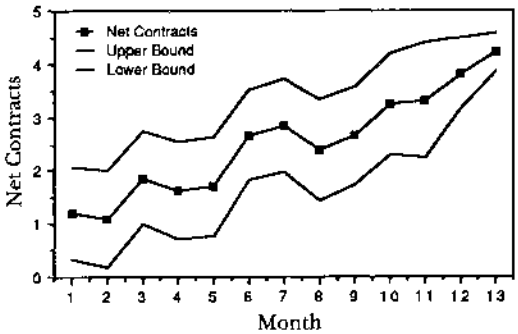

Figure 2. Productivity by Production Month: Non-Winners.

Less productive recruiters may improve their performance when they are reassigned to new stations, implying that their productivity profile will be steeper. On the other hand, if more productive recruiters are reassigned to improve the performance of less productive stations, productivity will rise less over the production cycle.

As shown in Figures 2 and 3, the profiles of reward winners and non-winners are roughly similar in shape—both appear linear—but the profile for reward winners is steeper. Thus, reward status may affect how productivity varies over the production cycle.

Greater success on the Freeman Plan, defined in terms of lagged average accumulated points, may steepen or flatten the productivity profile. If more successful recruiters rest content with their past achievements and decrease effort to consume more leisure, productivity will rise less when (lagged) average points are greater. If, on the other hand, more successful recruiters increase productivity to ensure winning a reward, the curve will steepen as the lagged average points rise.

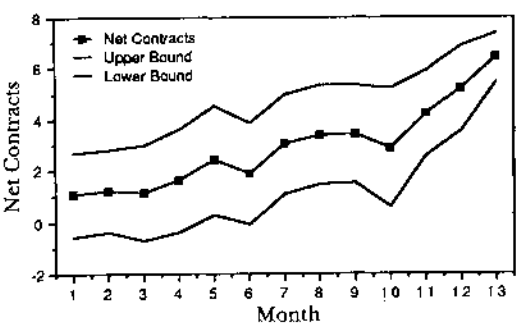

Figure 3. Productivity by Production Month: Winners.

Similarly, it is unclear whether the profile for less successful recruiters will be relatively steep or flat. Such recruiters may have attained fewer average points because they diverted their effort toward building their stock of future recruits rather than making more enlistments; if so, when they draw down their stock in future months their productivity will rise. On the other hand, less successful recruiters may become discouraged and reduce effort in future months, resulting in a flatter profile.

I assume that the productivity curve is linear. As seen in Figures 2 and 3, this assumption is roughly borne out by the observed patterns. Months of production is represented by PROD and MONTH13. To determine how quotas, calendar month, change of station, and performance on the Freeman Plan affect the shape of the curve, each of these variables is interacted with PROD and MONTH13. I also include the levels of each of these variables and control for the effect of tenure by including a linear and quadratic term in tenure.

Results

Table 5 shows the regression results. Tour length and station chief status do not have a statistically significant effect on the position of the curve. In terms of the shape of the curve, quotas and calendar month do not have a statistically significant impact. Ignoring the effects of tenure, which will be investigated below, the effect on net contracts of increasing month of production by one, when production month is less than 13, is [1.99 − (.29 × Change Station) − (.00365 × Lagged Points)]. The effect of a transfer to a different station is statistically significant only at the .10 level, whereas the effect of past average points is significant at the .01 level. The results indicate productivity rises by 1.99 net contracts in each month when lagged points equal zero and recruiters do not change station.

Table 5. Factors Affecting the Shape of the Productivity Curve. (Dependent Variable = Net Contracts)

(1) Variable	(2) Coefficient Estimate	(3) t-Stat.	(1) Variable	(2) Coefficient Estimate	(3) t-Stat.
Model 1[a]			June × MONTH13	−.24	−.47
Tenure	−.99	−2.34****	July × PROD	.05	.73
Tenure Squared	.0124	1.41*	July × MONTH13	−.02	.04
PROD	1.99	4.39****	Change Station	2.01	2.15***
MONTH13	3.69	1.50	Lagged Average Points	.00016	.06
Change Station × PROD	−.29	−2.26***	Cycle 2	11.19	2.48****
Change Station × MONTH13	2.55	2.37****	Net Contract Quota	−.48	−.67
Lagged Average Points × PROD	−.00365	−4.86****	Black I–IIIA AFQT Quota	.28	.18
Lagged Average Points × MONTH13	−.014	−1.62**	Hispanic I–IIIA AFQT Quota	−1.44	−.66
Cycle 2 × PROD	.19	.49	June	−.45	−.91
Cycle 2 × MONTH13	−1.11	−.88	July	−.13	−.27
Net Contract Quota × PROD	.06	.70		R^2 = .30, N = 283	
Net Contract Quota × MONTH13	.15	.24	*Model 2*[a]		
Black I–IIIA AFQT Quota × PROD	−.07	−.37	Intercept	2.60	.93
Black I–IIIA AFQT Quota × MONTH13	−.47	−.37	Station Chief Status	−.60	−.78
Hispanic I–IIIA AFQT Quota × PROD	.07	.27	Tour Length	−.02	−.24
Hispanic I–IIIA AFQT Quota × MONTH13	−.09	−.10	Zone 2	−3.27	−2.26***
June × PROD	.08	1.22	Zone 3	−2.80	−2.13***
			Zone 4	.15	.12
			Zone 5	.95	.65
			Zone 6	.07	.05
			Zone 7	.32	.24
			Zone 8	−.91	−.67
				R^2 = .13, N = 123	

[a] Model 1 is fixed effect model; Model 2 is recruiter attribute model.
* Significant at the .15 level; ** significant at the .10 level; *** significant at the .05 level; **** significant at the .01 level.

Although this result is somewhat tenuous, it suggests that relocated recruiters have a flatter productivity curve; net contracts rise by 1.7 per month. More successful recruiters also have a flatter profile. Lagged average points equal 231, on average. Using this average figure, productivity rises by only 1.15 contracts per month, assuming recruiters did not change stations. When lagged average points are greater than 231, productivity rises even less.

For recruiters at month 13 of the production cycle, lagged points and change of station also affect productivity. The effect of past points, however, is significant only at the .10 level. For recruiters in their last production month, the change in net contracts is [3.69 + (2.25 × Change Station) − (.014 × Lagged Points)]. When lagged points equal zero, net contracts rise by 3.69 at the end of the cycle, but this effect is only marginally statistically significant. Productivity rises more when recruiters are reassigned to a new station and rises less when recruiters have been more successful on the Plan. Given that lagged average points, on average, equal 204, net contracts rise by .83 when recruiters are eligible to win a reward.

The negative effect of relocation when recruiters have less than 13 months of production suggests that recruiters are reassigned to improve the performance of a poorly performing station. Since reassignment significantly improves the performance of recruiters in their 13th month, however, the results can be interpreted as

suggesting, on the contrary, that these recruiters were reassigned because their performance in their former station was poor.

As suggested above, the rise in productivity over the production cycle could be explained by an inventory argument or by variations in recruiter effort. The negative relationship between current productivity and past Freeman Plan success (or past output) in Table 5 lends support to the latter interpretation. For the inventory argument to be consistent with the inverse relationship between current and past output, recruiters would have to deplete their inventory at the beginning of the production cycle (implying greater past output) and make fewer enlistments when they become eligible to win a reward. On the other hand, the effort argument suggests that recruiters modulate their effort over time. In other words, productivity regresses toward the mean. When past performance is good, recruiters reduce effort, implying a flatter productivity profile over time. Conversely, when past performance is poor, recruiters increase effort. When recruiters become eligible to win at the end of the cycle, productivity rises in response to poorer performance.

These results suggest that recruiters are sensitive to the reward structure but that the timing of rewards affects current effort levels. When successful recruiters must wait longer to win a reward, they may reduce effort. Shortening the length of the production cycle could induce greater effort. Linking rewards to short-term output, however, would increase recruiters' risk when random market fluctuations are large.

How Does Productivity Vary with Experience?

I assume that recruiters win one reward during their tour. The estimation includes tenure, tenure squared, and separate variables for the recruiter's month of production by reward status.

In the recruiter's first year, tenure and months of production move in unison. Thus, from an estimation standpoint, the effect on net contracts of tenure and the production cycle in the first twelve months is indistinguishable. After the first year, however, a recruiter in the first cycle is in the 13th production month even though tenure continues to progress. Thus, to represent the relationship between tenure and production month for recruiters in their first cycle, I only include a variable indicating the interaction between MONTH13 and tenure.

For recruiters in their second cycle, the month of production equals one the month after winning a reward. Twelve months later, the production month equals 13. Recruiters remain at month 13 until the end of their tour. To represent the relationship between tenure and the production cycle for second-cycle recruiters, I include interaction variables between month of production and tenure.

Three spline variables, MONTH1–5, MONTH6–12, and MONTH13, are used to represent months of production.[12] By allowing productivity to rise between months one and five at a rate different from that between months six and twelve, two additional effects can be captured. First, for reward winners, we can examine whether there is a difference between how recruiters vary productivity immediately after winning and later in their production cycle. Second, for non-reward winners, we can capture the effect of learning on the job when recruiters begin their tour.[13]

The model to be estimated is:

[12] The conclusions do not depend on the specific month intervals selected. When the intervals are defined as month one to four and five to twelve, or as month one to nine and ten to twelve, for example, the estimated tenure profiles have the same key features as those discussed in the text.

[13] The three variables are defined as follows. When month of production is less than or equal to five, MONTH1–5 equals the month of production, and MONTH6–12 and MONTH13 equal zero. When production month is greater than five but less than or equal to twelve, MONTH1–5 equals five, MONTH6–12 equals the month of production minus five, and MONTH13 equals zero. Finally, when the production month equals thirteen, MONTH1–5 equals five, MONTH6–12 equals seven, and MONTH13 equals one.

(5) Net Contracts =
f(tenure, tenure-squared,
cycle1 × (MONTH1–5, MONTH6–12, MONTH13),
cycle1 × tenure × (MONTH13),
cycle2 × (MONTH1–5, MONTH6–12, MONTH13),
cycle2 × tenure × (MONTH1–5, MONTH6–12, MONTH13),
cycle2, *Z*)

The vector *Z* equals the other variables of the model, which include the quotas, calendar month, change of station, station chief status, tour length, and zone.

Results

Columns 2 and 3 of Table 6 show the estimation results. The lack of statistical significance for most of the variables, despite the relatively high R^2, suggests that the independent variables are highly correlated. Assuming that the model is correctly specified, the equation can still be used to predict the tenure profile. Alternatively, the model can be estimated using a specification that eliminates collinear variables. The solution is to estimate a second specification of the model and compare its prediction for the tenure profile to the predictions generated by the column 2 estimates.

Columns 4 and 5 of Table 6 present the results of an estimation that excludes the interaction variables between tenure and production month and the variables MONTH1–5 and MONTH6–12 for recruiters in their first cycle. The estimated coefficients on the tenure variables are statistically significant (although only marginally for tenure) and confirm the finding of other studies that recruiter productivity rises with tenure but the rise declines as recruiters gain experience. For recruiters in their second cycle, the production cycle variables are all positive and statistically significant. The relative size of the coefficients indicates that productivity rises faster in the first five months of the cycle than in the last seven. At the end of the cycle, recruiter productivity jumps by 1.43 net contracts.

Figure 4 shows the predicted tenure profile based on the estimates in column 4. For comparison, Figure 5 shows the predicted profile generated from the original model's estimates in column 2.[14] The dotted lines indicate the standard errors. Although the profiles differ in shape somewhat, particularly between months 13 and 15 and months 21 to 27, they both have the same key feature—productivity drops sharply after a recruiter wins a reward. The difference in productivity between month 15 and month 16 of tenure is statistically significant. Thus, productivity rises over tenure as the recruiter gains months on the production cycle. After the recruiter wins, productivity falls by 2.4 net contracts (Figure 4). Within five to six months, however, the recruiter's productivity in the second cycle is back to its level prior to winning the reward; and productivity rises dramatically thereafter, reaching 5.7 net contracts when the recruiter is at the 27th month of tenure. Although Figures 4–5 indicate that productivity falls at the end of the tour, no conclusions can be drawn from this result given the lack of observations for recruiters in their final months.

The drop in net contracts after a reward is won is consistent with the notion that recruiters deplete their inventory of potential recruits to win the reward. Put differently, recruiters may "steal" future enlistments to improve their chances of winning a reward in the current month. Once recruiters win their reward, they must divert their effort toward building their inventory rather than making enlistments. As a result, productivity is lower once the reward is won but rises again five months later after the stock is replenished.

An alternative interpretation is simply that recruiters "rest" after exerting effort to achieve the reward. Thus, productivity rises over the first production cycle as recruiters increase effort. When they become eligible to win, they exert the most effort. Once they have won, however, they rest and start the process again.

The estimated relationship between tour

[14] Recruiters are assumed to begin their second cycle at month 16. (See Table 3.)

Table 6. Productivity over Tenure.
(Dependent Variable = Net Contracts)

	Specification 1		*Specification 2*	
Variable (1)	*Coefficient Estimate* (2)	*t-Stat.* (3)	*Coefficient Estimate* (4)	*t-Stat.* (5)
Model 1[a]				
Tenure	−.41	−1.04	.25	1.46*
Tenure Squared	.0059	.75	−.0082	−1.79**
Cycle 2	5.54	1.33	−2.76	−2.61****
MONTH1–5 × Cycle1	.69	1.68**		
MONTH 6–12 × Cycle1	.69	2.10***		
MONTH13 × Cycle1	−1.05	−.81	.42	1.08
MONTH1–5 × Cycle2	2.02	1.87**	.65	1.69**
MONTH6–12 × Cycle2	−.30	−.36	.49	1.96***
MONTH13 × Cycle2	3.80	1.36	1.43	1.61**
Tenure × MONTH1–5 × Cycle2	−.05	−1.30		
Tenure × MONTH6–12 × Cycle2	.03	1.13		
Tenure × MONTH13 × Cycle2	−.07	−.90		
Tenure × MONTH13 × Cycle1	.09	1.28		
Net Contract Quota	.23	1.18	.24	1.24
Black I–IIIA AFQT Quota	−1.36	−2.65****	−1.46	−2.84****
Hispanic I–IIIA AFQT Quota	−1.60	−2.79****	−1.61	−2.80****
Change Station	.26	.75	.32	.93
May	−.12	−.60	−.11	−.59
June	.05	.22	.05	.26
July	.29	1.60*	.36	2.01***
	R^2 = .15, N = 412		R^2 = .12, N = 412	
Model 2[a]				
Intercept	−5.83	−2.92****	−4.04	−3.73****
Station Chief Status	.15	.33	−.67	−1.98***
Tour Length	.18	4.46****	.18	6.00****
Zone 2	−1.58	−1.92***	−1.79	−2.96****
Zone 3	−1.55	−2.03***	−1.08	−1.92***
Zone 4	−.58	−.77	−1.31	−2.35***
Zone 5	−.48	−.57	−1.43	−2.27***
Zone 6	−1.05	−1.35	−1.49	−2.59****
Zone 7	−1.26	−1.61**	−1.11	−1.94***
Zone 8	−1.40	−1.73**	−1.22	−2.05***
	R^2 = .21, N = 119		R^2 = .31, N = 119	

[a] Model 1 is fixed effect model; Model 2 is recruiter attribute model.
* Significant at the .15 level; ** significant at the .10 level; *** significant at the .05 level; **** significant at the .01 level.

length and net contracts suggests that recruiters with more opportunities to win Freeman rewards produce more.

Conclusions

Although the results of this study of how Navy recruiters respond to compensation structure are subject to several interpretations, they do strongly suggest that incentives matter. Recruiters appear to vary effort in an attempt to win rewards, and the timing of the rewards affects the allocation of effort over time. The study's main findings can be summarized as follows.

Recruiter output is greatest in the months immediately prior to becoming eligible to win a prize. In part, this effect could be due to human capital attainment, since recruiters gain experience as they gain months on the 12-month production cycle. Since the same effect is apparent for more senior recruiters, however, it seems likely that individuals vary either their level or type of effort over the 12-month

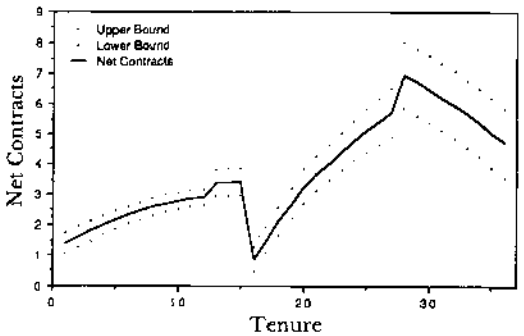

Figure 4. Tenure Profile: Model 2.

period. More specifically, recruiters may "procrastinate" until they approach the reward deadline. Alternatively, recruiters may vary their type of effort by first devoting their time to building an inventory of future recruits rather than making enlistments, and later depleting their inventory when they become eligible to win a reward.

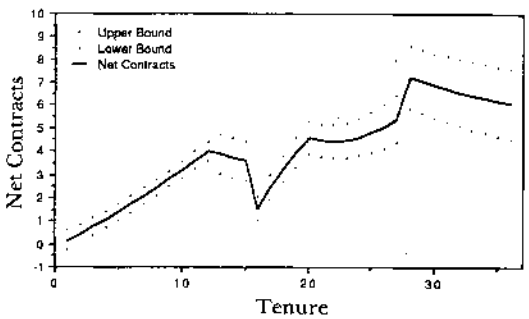

Figure 5. Tenure Profile: Model 1.

The evidence supporting the notion that recruiters vary their level rather than their type of effort is provided by the finding that current productivity is negatively related to past output, defined as success to date on the incentive plan. More successful recruiters have lower productivity, suggesting that recruiters reduce effort when they are already in a good position to win a reward. Thus, rewards that are some distance in the future may have a negative impact on current effort levels.

The analysis also shows that productivity rises with tenure but drops precipitously after an individual has won a prize. This finding is consistent with both the human capital model and the notion that recruiters vary effort between production cycles. Productivity may drop after a reward is won either because individuals "rest" after expending effort to win a reward or because in order to win a reward they pursued enlistments that they otherwise would have made in future months. In following the latter strategy, they increase their chances of winning a reward, but have lower productivity in future months.

Although the Navy recruiter compensation structure does not have a direct counterpart in the private sector, the results are suggestive of the type of behavior one might observe among workers whose compensation structure allows for intertemporal substitutions in effort.

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