A Proposal for an Experiment with Navy Enlistment Contract Lengths

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Motivation

• Navy sets contract length using a “return on investment” (ROI) framework, but the relationship is not exact.
  – Contract length is set at the Military Entrance Processing Stations (MEPS), and Navy can use incentives to guide recruits’ choices of ratings and contract lengths

• Many sailors complete their first contract in the midst of a prescribed sea tour (PST), necessitating removal and replacement while at sea.

• Navy wants to increase contract lengths to align with technical training, sea tour completions and to support enhanced carrier presence.

• As the economy recovers, the Navy will have to use Enlistment Bonuses (EBs) to incentivize longer contracts, and current data do not allow analysis necessary to set EB levels.
More Motivation: Navy Recruiting Budget (in nominal dollars)
Issues related to changing contract length

• The role of obligation length in sea tour incompletions
  – Would longer contracts help the sea tour completion rates?

• Implications of lengthening initial enlistment contracts
  • How does the availability of long contracts correlate with the probability that a given applicant will enter the Navy?
  • How does the availability of an enlistment bonus correlate with the probability that an applicant will sign a “long” contract?
  • Are there side effects?
  • What are the effects of bonuses / longer contracts on attrition?

• Recommendations on how to increase contract length
  – The Navy’s ‘T+X’ pilot
  – A proposal for a new pilot program to continue research on contract lengths
Length of 1st-term Navy enlistment contracts

Initial contracts are getting longer
Sea tour incompletion driven by contract length

<table>
<thead>
<tr>
<th>Observation Years</th>
<th>Length of PST</th>
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<tbody>
<tr>
<td></td>
<td>48 months</td>
<td>54 months</td>
<td>60 months</td>
</tr>
<tr>
<td>1994-2006</td>
<td>57%</td>
<td>40%</td>
<td>56%</td>
</tr>
<tr>
<td>2007-2011</td>
<td>49%</td>
<td>39%</td>
<td>46%</td>
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</tbody>
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* These rates describe sea tour incompletions for men, whose PST did not change during their sea tour. The data come from a CNA study “Analysis of Sea Tour Incompletion Rates and Reasons” by Molly McIntosh and David Gregory.

Sea tour incompletions are largely due to the mismatch between initial obligation and prescribed sea tour (PST) length.
Using Enlistment Bonuses to change contract lengths

- We analyzed various aspects of several Enlistment Bonuses (EBs)
- We estimate that the cost of an initial extension compares favorably to the cost of additional recruits
- Our estimates also show that bonuses are less expensive than most other methods of increasing obligation/man-years.
- EB appears to draw high-quality sailors into ratings from similar ratings, while low-quality sailors get “pushed out” of the rating.
- We found no significant change in attrition due to contract extension coupled with EB.
- Our estimates suggest minimal impacts of lengthening initial contracts on recruiting.
- Because bonuses are flexible, targeted, and cost-effective, we recommend them as a lever in changing contract lengths
The Navy’s T+X program

- Started in FY11 with 4 ratings, has been expanded to 18

- The pilot program increases obligation and, in some cases, decreases the PST so that the two align

- The program is too young and sample sizes are too small for thorough analyses but so far:
  
  - T+X ratings are as or more diverse as other ratings.
  - The quality of recruits in T+X ratings hasn’t changed beyond overall improvement in sailor quality in the Navy and remains slightly lower than that in other ratings.
  - Early attrition indicators for T+X ratings appear similar to other ratings.

- We anticipate an annual savings of $7.35 to $11.67 million, depending on the economy, but we’ll have to subtract the costs of recruiting to longer contract lengths to get the full picture.
Cost estimation: no statistical fix for bad data!

- *Observational data rather than controlled experiments*
  - Endogeneity problems (simultaneity bias)
    - Previous across-the-board changes reflect a queue of qualified people
    - Incentives often given as a result of poor recruiting conditions
  - Interdependence of incentives

- Problems with missing data / process variability
  - Options offered to sailors are not available (ratings, contract lengths, ship dates, incentives)
  - Classifier effects are not measured / modeled
  - Omitted variable bias, measurement errors

- We can take advantage of changing economic conditions to create external validity through a randomized experiment.
Most effective pilot: a controlled experiment

- *Randomization is key to straightforward and unbiased analysis*
  - Endogeneity / independence

- *Quality / process control would resolve the rest*
  - Randomization of options offered to sailors
    - Ratings
    - Contract lengths
    - Incentives
    - Classifiers would follow a streamlined process in offering these options
    - Options presented to each recruit would be recorded
    - Measurement error would decrease

- What would have to be randomized?
  - Matched sets of ratings
  - Matched sets of MEPS
  - Incentives / order of offering

- We need to ensure a wide range of options offered to have better informed estimates of the taste distribution
Proposed pilot program

• Experiment with EB menus for various obligation lengths
  – $X for 4YO
  – $X+Y for 5YO
  – $X+Y+Z for 6YO, etc.

• Develop a taste distribution
  – Push obligation to the limit
    • Especially in the face of increased carrier presence
  – Shorten obligation length
    • Wouldn’t cost anything up front

• Experiment with extensions
  – Offer extensions after 2 years in the Navy instead of an EB to those who qualify
  – Can use our knowledge about Selective Reenlistment Bonuses (SRBs)

• Neither of these options can seriously damage the Navy’s recruiting / retention practice because all the options are voluntary
Randomization

• Main goals:
  – Random assignment to treatment
  – Balance on key variables

• Covariates to balance:
  – Previous enlistment rates / other market information
  – Proximity to colleges and universities
  – Distances to military installations, recruiting stations
  – Measures of geographic locations and dispersion
  – Veteran population
  – Civilian economic conditions, relative to military pay
  – Measures of recruiting resources
  – Navy recruiting goals
Data to be collected

- Options offered to the sailors
- Covariates mentioned above
- Recruiter effort
- Economic conditions
- Recruiting climate

Outcomes
- Term of enlistment shifts
- Market expansion (increases of total people joining)
- Specific interest in high quality and diversity groups
- Skill channeling effects – shifts in enlistments towards skills eligible for the test bonuses
Analytical strategy

- Previous analysis used multivariate simultaneous equation model
- We propose a matched approach borrowed from observational studies
  - Random assignment of MEPS and ratings would have to happen within their matched sets, resembling a block-randomized experiment
- We’ll need to check balance on observed covariates and their most important combinations
  - Can set calipers for variables particularly important to analysis
  - Can set minimum balance value for omnibus balance test
  - Can do 1:k matching
  - Hansen and Bowers (2008) proposes a permutation-based approach
- Difference-in-difference estimation after matching adjustments
Challenges

• Entering the military is not a single decision made by a recruit at one point in time, it’s a *process*.

• Interference in the way Navy does business is unlikely to be well-received

• Leadership persuasion

• Costs
  – Start-up
  – Computing
  – Advertising
  – Data collection
  – Data analysis

• Classifier cooperation

• Heterogeneous treatment effects and changes in observed and unobserved covariates

• Effects of recruiter responses
  – Somewhat measured by recruit quality, but not necessarily in this economy
Time is now (as seen in Cox (2003))

• Navy needs sailors to enlist for longer initial terms
  – For ROI
  – For sea tour completion
  – In support of enhanced carrier presence

• Recruiting budget has been substantially decreased

• We are competing for recruits with other services and higher education institutions

• Civilian economy will recover causing recruiting difficulties

➢ Optimal resource allocation is key to sustaining a quality force of sailors who enlist for long-enough contracts in critical ratings
Conclusions

- Aligning contract length with sea tour length could result in substantial efficiency gains.
  - There is substantial loss due to the mismatch between initial obligation lengths and prescribed sea tour lengths.

- We propose that contract length changes be made with bonuses because of their flexibility, targeting and cost-effectiveness.
  - We estimate the negative responses to increases in first-term contract lengths to be minimal, given proper incentives.

- To properly examine the potential recruits’ taste distribution for longer obligations, we propose a new pilot program to be implemented while the economy recovers.

- The experiment would help us reduce biases in estimating how much an extra year of obligation costs to the Navy.