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ALLOCATION OF RECRUITING RESOURCES ACROSS NAVY RECRUITING STATIONS AND METROPOLITAN AREAS

by

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March 1999

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ABSTRACT ***(maximum 200 words)*** The purpose of this thesis is to explore the effects of the geographic location of recruiters and recruiting facilities on Navy enlistment supply. Recent shortfalls in goal attainment have spurred the call for additional recruiting resources, especially recruiters, at the national level. Past research which has been conducted at the Navy Recruiting District level has shown this to be cost effective as a means of achieving recruiting goals. However, the allocation of these resources across the 31 Navy recruiting districts must be made based on the characteristics of each district, and recruiters must be placed in geographic locations where their contributions to goal attainment are the greatest. This research constructs Navy recruiting station and metropolitan area-level contract production models to estimate the effect of the geographic placement of recruiters and facilities. In addition, we address the issue of competition between Army and Navy recruiters. By estimating production models at lower levels of aggregation we are able to examine the relative effects of recruiters and facilities and to predict the most efficient allocation of these scarce resources.

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ALLOCATION OF RECRUITING RESOURCES ACROSS NAVY RECRUITING STATIONS AND METROPOLITAN AREAS

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ABSTRACT

The purpose of this thesis is to explore the effects of the geographic location of recruiters and recruiting facilities on Navy enlistment supply. Recent shortfalls in goal attainment have spurred the call for additional recruiting resources, especially recruiters, at the national level. Past research which has been conducted at the Navy Recruiting District level has shown this to be cost effective as a means of achieving recruiting goals. However, the allocation of these resources across the 31 Navy recruiting districts must be made based on the characteristics of each district, and recruiters must be placed in locations where their contributions to goal attainment are the greatest. This research constructs Navy recruiting station and metropolitan area-level contract production models to estimate the effect of the geographic placement of recruiters and facilities. By estimating production models at lower levels of aggregation we are able to examine the relative effects of recruiters and facilities and to predict the most efficient allocation of these scarce resources.

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I. INTRODUCTION

> [I have advised] Commanders, Commanding Officers and Officers in Charge of the challenges we are facing in recruiting and the need for additional recruiters.... Concurrent with the assignment of more recruiters, we expanded the Navy College Fund and also increased enlistment bonuses. The Navy advertising budget was also increased to attract more applicants and to improve public awareness of our mission. Despite our efforts, the recruiting environment remains challenging. It appears we will not attain our FY98 accession goal of 55,321, and this expected shortfall further increases the need for additional recruiters.
>
> VADM D. T. Oliver, USN
> Chief of Naval Personnel (N1)
> NAVADMIN 19 Jun 1998

"The U. S. armed forces are facing a very challenging recruiting time, perhaps the most challenging since the inception of the all-volunteer force in 1973."[1] The Navy fell short of its FY98 recruiting goals by 6,900 sailors while the Army missed by 800 soldiers. Both services continue to struggle in FY99. The implications of "missing goal" are far reaching and have gained the attention of the highest levels in the Department of Defense (DOD) and the U. S. Congress. The FY1999 Defense Authorization Act authorized $2.3 billion for recruiter advertising, recruiter salaries and benefits, and educational incentives. An additional $113 million was added in a supplemental authorization to enhance enlistment and reenlistment bonuses.[2]

Many policies have been enacted in an attempt to meet mission requirements as mentioned in the Admiral's message above. One of these policies is the addition of recruiters. Between FY97 and the end of FY99, approximately 1000 Navy recruiters and 62 Navy recruiting stations will be added. Past research has shown that as the number of

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[1] Borlik, Alicia K., "$113M Booster Shot Raises Recruit Bonuses, Incentives," USA American Forces Press Service, Feb 1999. <http://www.defenselink.mil/news/Feb1999/n02011999_9902014.html
[2] Borlik, Alicia K., 1999.

recruiters increases, the number of enlistments also increases. Other factors such as increases in relative pay and additional funding of educational benefits and advertising also affect enlistment supply. However, of these options, increasing the number of recruiters and advertising has been shown to be the most cost effective.

A sizeable increase in the number of production recruiters nearly always entails an increase in the number of recruiting facilities, or stations. However, the geographic location of these recruiting resources is critical in the drive to maximize production. Contract production in any area is a function of the underlying characteristics of that particular area. However, given these characteristics, the geographic proximity of recruiters and facilities to the prime market can determine how much production is achieved for a given area. Thus, identifying the characteristics of the recruiting stations and metropolitan areas will allow Commander, Navy Recruiting Command (CNRC) to determine which areas are the most productive and where additional recruiters and facilities should be located to have the greatest impact on production.

A. PURPOSE

The nature of the recruiting business involves using the available policy weapons to respond to rapidly changing market conditions. Asch and Warner assert that the recruiting establishment can affect enlistment outcomes through managing recruiting resources such as selecting recruiters, training them, and allocating them to recruiting stations throughout the country.[3]

The purpose of this thesis is to develop contract production models for several

[3] Warner, John T., and Beth J. Asch, 1995. "The Economics of Military Manpower," in Keith Hartley and Todd Sandler (eds.) *Handbook of Defense Economics.* Amsterdam: Elsevier.

different geographic areas of the U. S. Past research has focused on analyzing enlistment supply at the Navy Recruiting District (NRD) level. Such analyses can be helpful in resource allocation decisions at a highly aggregated regional level. They provide very little assistance, however, at the local level in terms of making specific decisions regarding station location or station size. In this thesis, production models are developed to analyze the relationship between production and demographic and other area characteristics for two different geographic levels: recruiting station and metropolitan area. In addition, cross service effects at the different aggregation levels will be analyzed. It is hoped that these models will assist CNRC in efficiently allocating scarce recruiter resources. For example, the estimated production effects of additional recruiters at these geographic levels can be used in optimization models to facilitate the allocation process at the DOD level.[4] The Chief of Naval Personnel has agreed that recruiting is a priority and has promised additional recruiting resources. CNRC must maximize these resources in order to maintain fleet readiness.

[4] Gue, Kevin, *"Locating Recruiting Stations for Competing Services,"* Military Operations Research Society Symposium, Monterey, CA, June 24, 1998.

II. BACKGROUND

The mission of the Navy Recruiting Command is "To recruit high quality men and women to meet the Navy's quantitative, qualitative, and program needs as specified by the Bureau of Naval Personnel."[5] To do this, CNRC leads a force in excess of 4,000 personnel designated as Navy recruiters. CNRC is organized into four regions- Area 1 in the Northeast; Area 3 in the Southeast; Area 5 in the Midwest; and Area 8 in the West. These four areas consist of 31 Navy Recruiting Districts (NRD), each of which contains an average of 30 recruiting stations (facilities). These stations are located throughout the nation in prominent locations in the community. Recruiters use these centrally located stations as their offices to conduct routine business such as making phone calls, meeting delayed entry program participants, and meeting potential enlistees. Typically, recruiting facilities are located near high schools and other popular attractions for the 17-21 year old target population.

A. INCREASING RECRUITERS AS A POLICY TOOL

Past enlistment supply research has determined that the addition of recruiters and increasing advertising expenditures are cost effective policy tools to increase the number of enlistments. They are the most immediately variable and have the lowest marginal costs per additional high quality recruit.[6] Other policy tools include increases in educational benefits and military pay. However, these latter tools have high marginal costs and are considered inefficient because they are paid to all individuals, including those who would have enlisted without them. Thus, they generate economic rents for

[5] CNRC mission statement.
[6] Warner, John T., "Military Recruiting Programs During the 1980's: Their Success and Policy Issues," *Contemporary Policy Issues,* Vol. VIII, October 1990, 47-67.

some groups.[7] Although increases in military pay and educational benefits might reduce the demand for new recruits by increasing retention, these tools remain less efficient ways to increase enlistments.[8] They are not as flexible as other policy weapons and are more difficult to sell to Congress.

Recruiters are also marketing resources.[9] By making contacts, they provide information about enlistment and reduce the "cost" of acquiring information about the armed forces for potential recruits. Thus, as the number of recruiters increases, more contacts will be made and, as a result, there will be more enlistments. Recruiting facilities also play a role in attracting recruits. They may serve as a "billboard" and help to advertise the armed forces. They are also useful for facilitating "walk-in" traffic that may be interested in the military. Finally, they serve as the office for the recruiters. All three of these functions are enhanced by the strategic location of facilities near the prime market.

B. COSTS OF ADDITIONAL RECRUITERS

In previous enlistment supply research, Warner [10] used estimated production elasticities and an assumed cost per recruiter of $35,000 to calculate the marginal costs per high quality contract of additional recruiters. He compared these costs to the marginal costs per contract of the other policy tools.[11] For example, to increase high quality enlistments for the Army by two percent required a recruiter increase of four

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[7] Ehrenberg, R.G. and Smith, R.S., Modern Labor Economics: Theory and Public Policy, Sixth Edition, Addison-Wesley, 1997.
[8] Brown, Charles, "Military Enlistments: What Can We Learn From Geographic Variation?," *American Economic Review,* Volume 75, March 1985, 228-233.
[9] Gilroy, Curtis, Army Manpower Economics. Westview Press, Boulder, CO, 1986, p.105.
[10] Warner, John T., p.61.
[11] Warner, John T., p.61.

percent, or 213 recruiters (during the period of his research). This would cost $7.5 million or $7,500 per high quality contract.[12] The estimates for pay raises and other policy tools showed much higher marginal costs per additional high quality recruit.

C. COMPLEMENTARITY OF RECRUITING RESOURCES ACROSS SERVICES

In addition to estimating the marginal costs of additional recruiters, Warner estimated the relationship between other services' recruiters and production and found that Army and Navy recruiting resources tend to be complementary.[13] Contrary to what other analysts have thought,[14] expanding one service's recruiter force actually increased the number of contracts for the other services, although the results were not symmetrical. Expanding Air Force recruiters did not have the same effect on Army enlistments as expanding Army recruiters had on Air Force enlistments. This result indicates that interservice competition may not be as serious a problem as some have indicated. Instead, by increasing recruiting efforts, more contacts are made and more information promulgated about the military way of life, which tends to increase enlistments across the board. This assumes, however, that one service's recruiters increase their effort as other services increase their recruiting resources.[15]

D. FIXED EFFECTS ENLISTMENT SUPPLY MODELS

Warner's[16] enlistment supply models, as well as Brown's,[17] were estimated using fixed effects techniques. Fixed effect methods attempt to control for time-invariant

[12] Warner, John T., p.61.
[13] Warner, John T., p.53.
[14] Gilroy, Curtis, p.105.
[15] Warner, John T., p.64.
[16] Warner, John T., p.64.
[17] Brown, Charles, p.229.

unobservable factors associated with a particular geographic area such as a recruiting station market area, a recruiting district, or a metropolitan area. This eliminates any potential bias caused by the unobservable factors.[18] An example of an unobservable factor might be propensity to enlist. The fixed effect method requires pooled cross-section time-series data for estimation. Although these type of data are more difficult to acquire, the area-specific intercepts allow the variation around the area means for each variable to identify the coefficients of primary interest.[19] This method also analyzes area-specific differences that vary across areas but not over time. Also, fixed effect methods remove the influence of the size of the recruiting station, recruiting district, or metropolitan area.[20] The fixed-effects estimation method captures the movements over time in the recruiting resources within different geographic areas to provide less biased estimates of the effects of recruiters and other policy weapons. In addition, Warner used time trend variables in the form of fiscal year dummy variables to control for the otherwise unobservable factors that may cause enlistments to change over time, such as pay and unemployment.[21]

E. HIGH QUALITY MALES USED AS MEASURE OF SUPPLY

Finally, Asch and Warner[22] explain in detail the need to examine only high quality enlistments in enlistment supply models. For purposes of this thesis, a high quality contract is considered a high school senior, high school diploma graduate, or someone with some college scoring in category I, II, III, or IIIA on the Armed Forces Qualification

[18] Kostiuk, Peter F., "Issues In Estimating Enlistment Supply," Center for Naval Analyses, August 1987.
[19] Brown, Charles, p.229.
[20] Warner, John T., p.64.
[21] Warner, John T., p.56.
[22] Asch, B. and Warner, J.T., p.359.

Test (AFQT). The number of high quality enlistees is assumed to be supply determined.[23] Because the Navy would like to fill all of its vacancies with high quality personnel, low quality enlistments are demand constrained at no more than 35 percent. The Navy could potentially recruit only low quality enlistees. However, past research has implied that high quality enlistees are four times more difficult to recruit as lower quality ones.[24] Because the opportunity costs of joining are lower for lower quality enlistees, the effects of pay and other factors would be underestimated.[25] Furthermore, due to training constraints, the number of females is also demand constrained. By using these two groups in analysis, demand constraints may cause biased estimates of the coefficients of variables such as recruiters.[26] Thus, most enlistment supply models use only high quality male enlistments as the dependent variable.

Because the purpose of this thesis is to help determine the effect of recruiter and station location on supply, we also use total males in some of our estimations. Although CNRC's goal is to minimize the number of low quality individuals accessed, some low quality contracts are written, especially during tough recruiting times. Thus, to discount this group entirely may not suit the purposes of an optimization project. In this thesis, however, we will only report the results for the models using high quality males as the dependent variable.

[23] Brown, Charles, p.232.
[24] Asch and Warner, p.359.
[25] Asch and Warner, p.356.
[26] Brown, Charles, p.232.

III. MODEL SPECIFICATION ISSUES

The decision to enlist in the Navy is one of individual "occupational choice." An individual will choose to join the Navy if he believes the marginal benefits are greater than the marginal costs. The benefits include the military pay, fringe benefits, training, travel, and other non-pecuniary aspects of naval service. Costs include foregone civilian pay, training, and other benefits that may be available from civilian employers. Also considered a cost is the process of gaining information about and applying to join the Navy. Assuming that individuals will behave in ways that maximize their utility, an individual will choose the Navy if the expected utility from joining the Navy is greater than the expected utility of the next best alternative.

A. EXPLANATORY VARIABLES

Measures of military pay and the opportunity costs of civilian pay and benefits should be included in any enlistment supply model. A measure of per capita income in each geographic region is used in this thesis to capture civilian pay. Other factors that affect enlistment supply are the availability of alternate employment, measured by the unemployment rate, and the number of potential applicants represented by the target population of 17-21 year olds eligible to enlist.

Recruiters, in theory, reduce the cost of obtaining information regarding the Navy. Thus, by increasing the number of recruiters and recruiting stations, the Navy should be able to contact more individuals regarding the benefits of naval service and to lower the costs even further for potential recruits. Thus, as recruiter density increases, enlistments should also increase. Similarly, as recruiters are located in closer proximity to the target market, the cost of making individual contacts should drop. Closer market proximity can

be achieved by locating stations in central locations and by increasing the number of stations.

B. MODEL SPECIFICATION

The purpose of these models is to estimate the effect of additional recruiters and recruiting stations using data based on the demographic characteristics of the station's territory and the metropolitan area. The data contain quarterly observations by zip code for twelve quarters from FY95 through FY97. By controlling for characteristics unique to each area, such as the unemployment rate, population, and income, the effect of additional recruiters can be estimated. Because there are many unobserved differences across stations, recruiting districts and MSA's, fixed effects models are also estimated. This will take advantage of the time-series variation in the data to control for these unobserved differences.[27] In addition, military pay is constant across geographic areas, so that this effect will fall out in these types of models.[28] Thus, only civilian pay, as measured by income, should be included in the models. Finally, because recruiting tends to be seasonal, with the most new contracts written during the summer months, and because military pay is correlated with time, yearly and seasonal time trends are included.[29]

C. HYPOTHESES

The following hypotheses are made regarding the effects of the independent variables on enlistments:

- controlling for other factors, an increase in the number of recruiters and

[27] Warner, John T., p.64.
[27] Brown, Charles, p.228.
[29] Brown, Charles.

stations will have a positive effect on enlistments, all else equal;

- an increase in the number of Army recruiters will increase the number of Navy enlistments if recruiting is complementary and decrease the number of enlistments if it is competitive;

- the effect of recruiters and recruiting stations will be greater in areas with higher unemployment rates, larger populations, more high schools, lower per capita income, and during certain times of the year.

D. THE ESTIMATED MODELS

Based on these theoretical considerations, linear, log-log and fixed effects models are estimated using the following generic specification:

Navy High Quality Production = f {
Navy Recruiters
Navy Stations
Army Recruiters
Army Stations
Collocated Stations
Population
Unemployment Rate
Per Capita Income
Average Distance
Area
Seasonal Trends
Fiscal Year
}

The total number Navy high quality contracts produced is the dependent variable. Production is a function of the independent variables which are the number of Navy recruiters and stations, the number of Army recruiters and stations, collocated Army and Navy stations, population, the local area unemployment rate, per capita income, average travel distance, area, seasonal time trends, and fiscal year dummy variables. All of these variables will be measured at the appropriate local geographic level. See Appendix A for a glossary of variables.

IV. DATA

We constructed the data set used in this analysis by combining of over thirty separate data files which were obtained in various formats from numerous providers. The sources include the services' recruiting headquarters, the Bureau of Labor Statistics, and the Census Bureau among others. In addition, we used some data elements from a file (COMBNAV3) provided to the Naval Postgraduate School by the U. S. Army Recruiting Command (USAREC) and by CNRC.[30]

Two separate data files were constructed. The first file combines quarterly recruiting information for fiscal years 1995 through 1997. The initial file contained recruiting information by zip code. This file was used for enlistment supply model estimation. See Appendix B for a more in depth description.

A. ARMY DATA

Historical recruiting data at the zip code level were based on USAREC's "Automated Territory Alignment System" (ATAS) database. ATAS contains quarterly observations by zip code for the first quarter of FY95 through fourth quarter FY97. The data included the number of Army recruiters assigned to the responsible station for each quarter, the zip codes belonging to each station, the battalion alignment for each zip code, and whether or not there was an Army station in a given zip code. The battalion alignment data was a series of dummy variables indicating the battalion for each Army station. From this battalion alignment data, army station alignment was derived which provided continuity with the other data files for future merging purposes.

[30] See Paul Hogan, et al. "Enlistment Supply At The Local Market Level," June, 1998.

B. NAVY DATA

The historical Navy data were received from CNRC. They contained recruiting information at the zip code level for FY95 through FY97 maintained in the "Standardized Territory Evaluation and Analysis for Management" (STEAM) database. Variables such as the number of Navy recruiters at each station, the zip code location of each station, the NRD to which each station reports, and the station to which each zip code was assigned were included. As with the Army data a dummy variable (NSTAZIP) was created representing the existence of a Navy station in a zip code.

C. POPULATION DATA

Two estimates of the 17-21 year old population were available. The first file was obtained from CNRC and contained population estimates (provided by Woods and Poole) of the 17-21 year old, male, high school seniors, high school graduates and Associate Degree holders by zip code. The Woods and Poole estimates were developed from the 1990 Census data. However, 570 new zip codes have been created between 1998 and 1990. Thus, population estimates on these new zip codes were not available from this source. The COMBNAV3 file contained total estimates of the total population of 17-21 year olds but also had many missing observations.

Because of the large number of missing values for the population variable, techniques were used to fill in missing observations. A comparison of the means of the two population data sources revealed a ratio of .27 for those zip codes for which both population series were available. That is, the Woods and Poole estimate was, on average, 27 percent of the COMBNAV3 zip code population estimate. Thus, to fill in the population data for the missing zip codes, the Woods and Poole estimates were used as

the base and the population of zip codes with missing information were assumed to equal 27 percent of the COMBNAV3 population value. This allowed us to generate a file with complete population data for each zip code.

D. CONTRACT PRODUCTION DATA

Contract production data were obtained from the Military Entrancing Processing Command (MEPCOM) data files provided by the Defense Manpower Data Center. This data contained records of all contracts by month for fiscal years 1995 through 1998 and the home of record zip code, with each record representing a contract. This file was aggregated to report quarterly accessions for the Army, Navy, Air Force and Marines by zip code. The file is called DODTOTAL. Another file named HQDODTOT was created that restricted the contract information to high quality recruits only, as defined previously.

E. ZIP CODE AND STATE ALIGNMENT VALIDATION

To verify the state to which each zip code corresponded, a simple validation file was created. The master file was derived from the Census Bureau's Geographic Correlation Engine, MABLE,[31] which generated a report of all zip codes in the U. S. and their corresponding state abbreviation. We compared this alignment algorithm to our files and corrected all erroneous zip code and state alignments.

F. UNEMPLOYMENT DATA

Time series data on metropolitan area unemployment rates were retrieved from

[31] This geographic correlation engine is available from the Census Bureau's web page. <http://www.census.gov/plue/geocorr/htmls

the Bureau of Labor Statistics "Most Requested Series" web site.[32] This site reported monthly MSA unemployment information from which we computed quarterly averages by metropolitan area by calendar year for each year from 1994 through 1998. (The files are named URATE94 through URATE98.)

Unemployment rates for NRD's were obtained from CNRC. Although the data is times series in format the NRD alignment used was the alignment in effect in 1998. Therefore any NRDs that were newly established between 1995 and 1997 contained limited unemployment information and all disestablished NRD's contained no unemployment data. For station level models the county level unemployment rates found in COMBNAV3 were used. The county level data in COMBNAV3 that were provided by USAREC were incomplete and caused a large number of missing values in the zip code file. The number of missing values may create misleading estimates of the effect of unemployment, for example in the supply models estimated at the station level.

G. CONSTRUCTION OF THE HISTORICAL RECRUITING DATA FILE (FY95 TO FY97)

To create the historical data file, three separate years of data had to be created and merged. For each year, FY95, FY96, and FY97, the Navy recruiter, station, and zip code information was merged by recruiting station identification number. Then, population estimates and the extract from COMBNAV3 containing the Army data and the demographic information were added by merging the files by zip code. Once these yearly files were constructed, they were stacked, and the zip code-to-state alignment

[32] This data is available from the Bureau of Labor Statistics web page; <http://146.142.4.24/cgi-bin/srgate

verified. The resulting file, HIST9597, will be used as the base for the aggregation of historical data to the three main geographic levels- stations, metropolitan areas, and recruiting districts. It contains 300,743 observations (zip codes) and 117 variables.

H. CONSTRUCTION OF RECRUITING STATION DATA FILE

To create the recruiting station data file, HIST9597 was merged with DODTOTAL by zip code and quarter of year and aggregated by the recruiting station identifier to create the STADATA file. This aggregated file contains 13,266 observations (stations) and 53 variables sorted by station identification number and quarter of year.

I. CREATING A METROPOLITAN AREA DATA FILE

We used the standard definition of a Metropolitan Statistical Area which is issued by the Office of Management and Budget. They establish geographic definitions that follow detailed technical criteria. An MSA is defined in terms of counties. The requirements for one or more counties to be considered a MSA are as follows:[33]

- includes a city of at least 50,000 people
- includes a Census Bureau defined urbanized area of at least 50,000 people with a total population of at least 100,000. (75,000 in New England)
- may include outlying counties that meet commuting requirements, population density and are mainly urban.
- can contain more than one city of 50,000 and may cross state lines.

An area that meets these requirements as an MSA and also has a population of one million or more may be recognized as a Consolidated Metropolitan Statistical Area (CMSA) if:

[33] U.S. Census Bureau; "About Metropolitan Areas;" published 11 December 1998; <http://www.census.gov/population/www/estimates/aboutmetro.html

- separate component areas can be identified within the area by meeting statistical criteria specified in the standards, and

- local opinion indicates there is support for the component areas.[34]

As of June 30, 1998, OMB reported 256 MSA's and 18 CMSA's in the United States as well as three MSA's and 1 CMSA in Puerto Rico.[35]

Aggregation to the metropolitan area level required the use of MABLE to aggregate data elements from zip codes to Metropolitan Statistical Areas (MSA's). This zip code-to-MSA alignment was downloaded and merged with the HIST9597 file to create HISTMSAS. The same alignment was used to aggregate the production files, DODTOTAL and HQDODTOT, to create PRODMSA and HQPRODMA. These two files were merged with the unemployment files, URATE94 through URATE97, by MSA to create the two final files used for analysis: REALDEAL and HQREALDL. These files are used for all metropolitan area enlistment supply model estimation.

[34] U.S. Census Bureau; "About Metropolitan Areas;" published 11 December 1998; <http://www.census.gov/population/www/estimates/aboutmetro.html

[35] U.S. Census Bureau, 1998. <http://www.census.gov/

V. STATION LEVEL MODEL RESULTS

Past research has used data aggregated to the NRD level to estimate the effects of the basic determinants of enlistment. However, a recruiter does not recruit throughout the entire recruiting district to which he or she is assigned. They recruit out of the assigned recruiting station. Thus, station models were estimated to look at the effects of Navy recruiters at a more appropriate level of aggregation. Models estimated at this level should provide a more accurate estimate of the effects of recruiting resources.

The data file used to estimate the station level models consisted of observations for an average of 1,100 recruiting stations per year for 12 quarters for a total of 13,053 observations. The dependent variable is the number of high quality contracts that were written in each station's territory during each quarter between FY95 and FY97. Each of the approximately 1,100 Navy stations consisted of an average of 27 zip codes. The average station encompassed an area of 2,619 square miles with those in urban areas covering fewer than those in rural areas. High quality contracts refer to enlistees who are either high school seniors, or high school graduates, or Associate Degree holders, and who score in the top half of the AFQT. Linear and Log-Log models were specified and estimated. The results of the log-log models are discussed in the text; the results of the linear models are presented in Appendix B.

Table 1 provides descriptive statistics for the variables used in the station models. The average station contained 3.14 recruiters and produced 5.81 high quality contracts per quarter, or approximately 24 per year. Thus, each recruiter generated about eight high quality contracts per year. Each Navy station's territory contains an average of 1.4 Army stations and approximately 75 percent of Navy recruiting stations are collocated

with an Army station. In addition, Table 1 also shows that the linear distance between the average station and the centroid of the zip codes it serves is about 22 miles. Table 2 is a glossary of variables used in the station models.

Table 1. DESCRIPTIVE STATISTICS FOR VARIABLES IN STATION MODELS

Variable	Mean	Std Dev
SN_TOTAL	5.81	4.152
S_ASTAZP	1.42	0.9780
S_QMATOT	3055.31	1968.53
S_NRECS	3.14	2.367
S_URATE	0.059	0.0213
S_CAPIN	13684.35	4082.61
COLOCATE	0.725	0.446
S_ARECS	4.925	3.617
S_AREA	2619.08	8818.59
S_NSTAZP	0.978	0.4879
AVGDISTA	22.381	24.876
SUMDISTN	1138.47	3035.54

Table 2. GLOSSARY OF VARIABLES USED IN STATION MODELS

TOTAL ARMY PRODUCTION	SA_TOTAL
TOTAL AREA IN SQUARE MILES	S_AREA
ARMY RECRUITERS PER POPULATION	ARECSPPOP
ARMY PRODUCTION PER POPULATION (ARMY TOTAL/TOTAL POP)	APRPP
NUMBER OF ARMY RECRUITERS SQUARED	S_ARECS2
NUMBER OF ARMY RECRUITERS	S_ARECS
NUMBER OF ARMY STATIONS	S_ASTAZP
ZIPCODE LEVEL VAR-DUMMY VAR FOR ARMY STATION IN ZIP	ASTATZIP
AVG DISTANCE FROM ARMY STATION TO CENTER ASSIGNED ZIPS	AVGDISTA
AVG DISTANCE FROM NAVY STATION TO CENTER ASSIGNED ZIPS	AVGDISTN
NUMBER OF COLOCATED STATIONS	COLOCATE
DISTANCE FROM ARMY STATION TO CENTER OF ASSIGNED ZIPS	DISTAR2
DISTANCE FROM NAVY STATION TO CENTER OF ASSIGNED ZIPS	DISTNAV
TOTAL DOD PRODUCTION	S_DODTOT
TOTAL AIR FORCE PRODUCTION	SF_TOTAL
DUMMY VARIABLE FOR FY 1ST QUARTER RECRUIT (QYR=2,6,10)	FALL
TREND VARIABLE FOR 1995 OBSERVATION	FY95
TREND VARIABLE FOR 1996 OBSERVATION	FY96
TREND VARIABLE FOR 1997 OBSERVATION	FY97
INTERACTION OF ARMY RECRUITERS AND HIGH (ARECS*TOTHS)	S_HSAREC
INTERACTION OF NAVY RECRUITERS AND HIGH (NRECS*TOTHS)	S_HSNREC
INTERACTION OF ARMY STATIONS AND HIGH SC	S_HSASTA
INTERACTION OF NAVY STATIONS AND HIGH SC	S_HSNSTA
LOG NUMBER OF ARMY STATIONS IN MSA/CMSA	LN_APRPP
LOG OF TOTAL AREA	LN_SAREA
LOG OF ARECPPOP	LNARECPP
LOG NUMBER OF ARMY RECRUITERS	LN_SAREC
LOG OF ARMY PRODUCTION PER POP	LN_ASTZP
LOG ARMY TOTAL PRODUCTION	LN_SATOT
LOG AVG DISTANCE FROM ARMY STATION TO CENTROID OF ZIPS	LNAVDSTA
LOG AVG DISTANCE FROM NAVY STATION TO CENTROID OF ZIPS	LNAVDSTN
LOG DOD TOTAL PRODUCTION	LN_SDOD
LOG AIR FORCE TOTAL PRODUCTION	LN_SFTOT
LOG MARINE TOTAL PRODUCTION	LN_SMTOT
LOG OF UNEMPLOYMENT RATE	LN_URATE
LOG OF NRECPPOP	LNNRECPP
LOG NUMBER OF NAVY STATIONS	LN_NSTZP
LOG NAVY TOTAL PRODUCTION	LN_SNTOT
LOG OF NAVY PRODUCTION PER POP	LN_NPRPP
LOG NUMBER OF NAVY RECRUITERS	LN_SNREC
LOG OF OTHER SERVICE PRODUCTION-ARMY (DOD-ARMY PROD)	LNOSPRA
LOG OF OTHER SERVICE PRODUCTION-NAVY (DOD-NAVY PROD)	LNOSPRN
LOG OTHER SERVICE PROD/POP-ARMY	LNOSPPPA
LOG OTHER SERVICE PROD/POP-NAVY	LNOSPPPN
LOG OF PERCAPITA INCOME	LN_CAPIN
LOG OF POPULATION DENSITY	LN_POPDEN
LOG TOTAL 17-21 POPULATION	LN_QMTOT
LOG SUM DIST FROM ARMY STATION TO CENTER ASSIGNED ZIPS	LNSMDSTA
LOG SUM DIST FROM NAVY STATION TO CENTER ASSIGNED ZIPS	LNSMDSTN
LOG OF TOTAL NUMBER OF HIGH SCHOOLS	LN_TOTHS
TOTAL MARINE CORPS PRODUCTION	SM_TOTAL
UNEMPLOYMENT RATE	S_URATE
TOTAL NAVY PRODUCTION	SN_TOTAL

NAVY PRODUCTION PER POPULATION (NAVY TOTAL/TOTAL POP)	NPRPP
NUMBER OF NAVY RECRUITERS SQUARED	S_NRECS2
NUMBER OF NAVY RECRUITERS	S_NRECS
NAVY STATION IDENTIFICATION NUMBER	NEWSTAID
NAVY RECRUITERS PER POPULATION	NRECPPOP
NUMBER OF NAVY STATIONS	S_NSTAZP
ZIPCODE LEVEL VAR-DUMMY VAR FOR NAVY STATION IN ZIP	NSTAZIP
OTHER SERVICE PRODUCTION-ARMY (DOD-ARMY PROD)	OTSVCPRA
OTHER SERVICE PRODUCTION-NAVY (DOD-NAVY PROD)	OTSVCPRN
OTHER SERVICE PRODUCTION/POP-ARMY	OTPRPOPA
OTHER SERVICE PRODUCTION/POP-NAVY	OTPRPOPN
PER CAPITA INCOME	S_CAPIN
POPULATION DENSITY	S_POPDEN
POPULATION 17-21 Y/O FROM QMA DATA	S_QMATOT
ORDINAL NUMBER OF QUARTER AND FY	QYR
DUMMY VARIABLE FOR FY 3RD QUARTER RECRUIT (QYR=4,8,12)	SPRING
SUM OF DIST FROM ARMY STATION TO CENTER OF ASSIGNED ZIPS	SUMDISTA
SUM DISTANCE FROM NAVY STATION TO CENTER ASSIGNED ZIPS	SUMDISTN
DUMMY VARIABLE FOR FY 4TH QUARTER RECRUIT (QYR=3,7,11)	SUMMER
TOTAL NO. HIGH SCHOOLS	S_TOTHS
DUMMY VARIABLE FOR FY 2ND QUARTER RECRUIT (QYR=5,9,13)	WINTER

Six different model specifications were estimated. By doing this, we are able to examine the robustness of the effects for the variables of interest, such as Navy recruiters. In addition, we are able to look at the impact of adding Navy stations, Army stations, and collocated stations on the estimated effects of the main variables. All model specifications include dummy variables for NRD's, seasons of the year, and fiscal year.

Table 3 summarizes our estimates for the effect of Navy recruiters. The models proceed from specifications that include only the base model to those with a more inclusive set of determinants. The parameter estimates in column 1 report the percentage change in high quality contract production (SN_TOTAL) for a one percent increase in the independent variable, in those cases where the explanatory variable is continuous. When the explanatory variable is binary, the parameter estimate gives the percentage effect of increasing the variable from 0 to 1.

Table 3. SUMMARY EFFECTS OF NAVY RECRUITERS

Model	Description	Navy Recruiter Elasticity
Base	Army and Navy Recruiters without Unemployment	.2163
2	Base Model Plus Army Recruiting Stations	.2155
3	Base Model Plus Army and Collocated Stations	.2024
4	Base with Unemployment	.2125
5	Model 2 with Unemployment	.2120
6	Model 3 with Unemployment	.2103

* All models also include NRD Dummy Variables, demographic and trend variables.

Our results are very robust. The estimated elasticity of Navy recruiters (LN_SNREC) on high quality Navy production falls between .20 and .22. Thus, a 10 percent increase in Navy recruiters at the station level increases production by about 2 percent. The effect of Army recruiters (LN_SAREC) on Navy enlistments is small, but positive and statistically significant. Across the various specifications, a 10 percent increase in Army recruiters results in a 1.3 to 1.8 percent increase in Navy male high quality enlistments per quarter, which suggests some complementarity between Army recruiters and Navy contracts.

The full estimates of the station models are presented in Tables 4 through 9 at the end of this chapter. According to these results, when a Navy station and an Army station are collocated (COLOCATE), Navy high quality production will increase. The effect,

however, is fairly small. On the other hand, the presence of a single-service Army station (S_ASTAZP) in a Navy station's territory tends to decrease Navy high quality contract production. However, the net effect of Army stations is statistically significant in only two of the seven model specifications with the magnitude of the effect ranging between .13 and .18. Because some of the factors that lead the Navy to locate a station in a particular area, such as historically good Army production, are correlated, there may be omitted variable bias or selection bias. Because the effect of Army stations ranges from a small positive effect to no effect at all and because there is no evidence of negative substitution effects, our results support the Navy's (and OSD's) recent policy of collocating recruiting stations. Furthermore, the potential cost savings of collocated recruiting facilities strengthens the argument for collocating recruiting stations.

The average distance traveled (LNAVDSTN) has a negative effect on Navy production. A 10 percent increase in the average travel distance of a recruiter decreases production by 2.5 to 6.2 percent. These results are statistically significant. Although recruiters do not necessarily travel these linear routes, travel time should be positively correlated with the distance variables. Thus, increasing the size of the station's territory, which increases travel distances, tends to lower production. Conversely, since more stations in a given area reduce distances, an increase in the number of stations has a positive recruiting effect by reducing time and distance costs.

An unexpected result is that higher per capita income (LN_CAPIN) is associated with an increase in high quality production. Several explanations could apply.[36] First, per capita income may not be an accurate indicator of the target population. Second, and

[36] We estimated models using total production. Using production not qualified by educational achievement revealed a different effect of per capita income. Thus, we believe the effect to be a non-linear relationship.

more arguably so, there is a high correlation between education and income. Because the dependent variable is qualified by higher educational achievement, per capita income could be absorbing the effects of other factors associated with this higher educational achievement.

The unemployment rate should be included in enlistment supply models. However, due to missing county-level unemployment information, approximately 2,800 observations (or 21 percent) have missing unemployment data. Thus, to examine whether the decrease in the sample size caused by including this variable had an effect on the results. We estimate models with and without unemployment rates (LN_URATE) (See Tables 7-9). The estimated elasticity of Navy recruiters when unemployment is included ranges from .2103 to .2125. The coefficient of the unemployment rate itself is positive and statistically significant with an elasticity of .04 in all models. A 10 percent increase in unemployment increases high quality production by almost .4 percent per quarter. The estimated elasticity of Navy recruiters without unemployment ranges from .2024 to .2163. With or without unemployment in the model, the estimated effects of Navy recruiters are approximately the same.

The effect of population (LN_QMATOT) on Navy high quality production is positive and statistically significant in all model specifications. The range of estimates falls between .39 and .43. A 10 percent increase in the population of 17-21 year old high school seniors, high school diploma graduates, and Associate Degree holders increases production by approximately 4 percent per quarter.

Finally, we included seasonal time trends (FALL, WINTER, SPRING) and fiscal year dummy variables (FY96, FY97) to account for the seasonal nature of recruiting and

to control for unobservable factors that may cause high quality production to change over time, such as military pay. The results show the summer months between July and September to be the most productive, and that FY96 and FY97 were more productive than FY95. The seasonal trends were significant in all specifications. The fiscal year dummies were significant in all but one specification.

The effect of Navy recruiters on Navy enlistments implies an elasticity of about .22. This is consistent with Hogan, et al[37] who estimated an effect of .23. In Warner's work, the effect of Navy recruiters was estimated to be much higher at .46.[38] However, Warner's models were estimated at a much higher level of aggregation (NRD). The cross service effects of Army recruiters on Navy production in our station models are also consistently about half of the effect of a Navy recruiter on Navy enlistments. This is comparable to the findings in Hogan, et al.[39] The estimated effect of unemployment is between the estimate by Hogan et al (.10) and Warner (.46). However, because of the large number of stations with missing data, the results from our analysis should be viewed with caution.

The linear models in Appendix B allow us to convert the estimated elasticities to actual contracts per quarter at the station level. In the linear model, the parameter estimates range between .28 and .33 for Navy recruiters (S_NREC). Thus, controlling for other factors, an additional recruiter increases high quality contract production by 1.2 contracts per year.[40]

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[37] Hogan, et al.
[38] Warner, John T. p. 57.
[39] Hogan, et al.
[40] The estimated coefficients range between .28 and .30 in the linear models. To compute the elasticity at the mean we used the following formula: An average of 3.14 recruiters/ Average of 5.81 contracts per quarter * parameter estimate * 4 quarters per year.

The estimated effects indicate that recruiting stations do make a difference. They directly affect production by reducing unproductive travel distance and time. In addition, the results show that Army recruiters do not harm Navy production and that collocated recruiting stations are not harmful to Navy recruiting, although single-service Army stations that are located in a Navy station's territory do have a small negative effect on Navy recruiting. The results are consistent with past research and support the Navy's recent policy move to more collocated recruiting stations in light of potential monetary cost savings. The estimated Navy recruiter elasticities are very robust and in the range of .20 to .22. Army recruiters appear to have a positive effect on Navy production, while the effect of collocated stations has a small positive effect to no effect at all. Thus, there is little evidence of competition between Navy and Army recruiting efforts at the station level. Recruiting may not be a zero sum game.

Table 4. STATION LEVEL LOG LOG MODEL WITH ARMY AND NAVY RECRUITERS, DEMOGRAPHIC AND TREND VARIABLES

Variable	Parameter Estimate	Standard Error	Prob > |T|
INTERCEP	-4.3037	0.2664	0.0001
LN_SNREC	0.2163	0.0107	0.0001
LN_SAREC	0.1692	0.0110	0.0001
LN_CAPIN	0.2370	0.0260	0.0001
LN_QMTOT	0.3936	0.0101	0.0001
LN_SAREA	0.0434	0.0063	0.0001
LNAVDSTN	-0.0501	0.0140	0.0003
FALL	-0.1747	0.0142	0.0001
WINTER	-0.0724	0.0141	0.0001
SPRING	-0.1224	0.0142	0.0001
FY96	0.0122	0.0123	0.3227
FY97	0.0105	0.0127	0.4091

R-square = 0.5161
F-statistic = 318.416
Mean Dependent Variable = 1.4936

Note: Model includes NRD dummies

Table 5. STATION LEVEL LOG LOG MODEL WITH ARMY AND NAVY RECRUITERS, ARMY STATIONS, DEMOGRAPHIC AND TREND VARIABLES

Variable	Parameter Estimate	Standard Error	Prob > |T|
INTERCEP	-4.3218	0.2667	0.0001
LN_SNREC	0.2155	0.0108	0.0001
LN_SAREC	0.1827	0.0150	0.0001
S_ASTAZP	-0.0128	0.0096	0.183
LN_CAPIN	0.2387	0.0260	0.0001
LN_QMTOT	0.3929	0.0101	0.0001
LN_SAREA	0.0450	0.0064	0.0001
LNAVDSTN	-0.0517	0.0140	0.0002
FALL	-0.1748	0.0142	0.0001
WINTER	-0.0727	0.0141	0.0001
SPRING	-0.1224	0.0142	0.0001
FY96	0.0131	0.0123	0.2904
FY97	0.0112	0.0127	0.3809

R-square = 0.4026
F-statistic = 311.072
Mean Dependent Variable = 1.6048

Note: Model includes NRD dummies

Table 6. STATION LEVEL LOG LOG MODEL WITH ARMY AND NAVY RECRUITERS, ARMY STATIONS, COLOCATED STATIONS, DEMOGRAPHIC AND TREND VARIABLES

Variable	Parameter Estimate	Standard Error	Prob > |T|
INTERCEP	-5.4354	0.2972	0.0001
LN_SNREC	0.2024	0.0123	0.0001
LN_SAREC	0.1359	0.0161	0.0001
S_ASTAZP	-0.0224	0.0101	0.0262
COLOCATE	0.0212	0.0126	0.0917
LN_CAPIN	0.2777	0.0281	0.0001
LN_QMTOT	0.4971	0.0146	0.0001
LN_SAREA	0.0652	0.0077	0.0001
LNAVDSTN	-0.0620	0.0167	0.0002
FALL	-0.1825	0.0150	0.0001
WINTER	-0.0806	0.0150	0.0001
SPRING	-0.1270	0.0149	0.0001
FY96	0.0241	0.0131	0.0648
FY97	0.0263	0.0136	0.0532

R-square = 0.5161
F-statistic = 0.5145
Mean Dependent Variable = 1.4936

Note: Model includes NRD dummies

Table 7. STATION LEVEL LOG LOG MODEL WITH ARMY AND NAVY RECRUITERS, DEMOGRAPHIC, TREND AND UNEMPLOYMENT RATE VARIABLES

Variable	Parameter Estimate	Standard Error	Prob > |T|
INTERCEP	-5.1994	0.3103	0.0001
LN_SNREC	0.2125	0.0123	0.0001
LN_SAREC	0.1542	0.0124	0.0001
LN_CAPIN	0.3188	0.0309	0.0001
LN_QMTOT	0.4273	0.0129	0.0001
LN_SAREA	0.0405	0.0076	0.0001
LNAVDSTN	-0.0252	0.0169	0.137
LN_URATE	0.0386	0.0195	0.0476
FALL	-0.2181	0.0176	0.0001
WINTER	-0.0904	0.0154	0.0001
SPRING	-0.1281	0.0153	0.0001
FY96	0.0437	0.0148	0.0033
FY97	0.0428	0.0154	0.0053

R-square = 0.4535
F-statistic = 193.558
Mean Dependent Variable = 1.5615

Note: Model includes NRD dummies

Table 8. STATION LEVEL LOG LOG MODEL WITH ARMY AND NAVY RECRUITERS, ARMY STATIONS, DEMOGRAPHIC, TREND AND UNEMPLOYMENT RATE VARIABLE

Variable	Parameter Estimate	Standard Error	Prob > |T|
INTERCEP	-5.2097	0.3108	0.0001
LN_SNREC	0.2120	0.0123	0.0001
LN_SAREC	0.1607	0.0168	0.0001
S_ASTAZP	-0.0060	0.0105	0.5646
LN_URATE	0.0387	0.0195	0.0469
LN_CAPIN	0.3195	0.0309	0.0001
LN_QMTOT	0.4271	0.0129	0.0001
LN_SAREA	0.0414	0.0077	0.0001
LNAVDSTN	-0.0263	0.0170	0.1233
FALL	-0.2182	0.0176	0.0001
WINTER	-0.0905	0.0154	0.0001
SPRING	-0.1281	0.0153	0.0001
FY96	0.0441	0.0149	0.003
FY97	0.0431	0.0154	0.0051

R-square = 0.4535
F-statistic = 189.154
Mean Dependent Variable = 1.5615

Note: Model includes NRD dummies

Table 9. STATION LEVEL LOG LOG MODEL WITH ARMY AND NAVY RECRUITERS, ARMY STATIONS, COLOCATED STATIONS, DEMOGRAPHIC, TREND AND UNEMPLOYMENT RATE VARIABLES

Variable	Parameter Estimate	Standard Error	Prob > |T|
INTERCEP	-6.0409	0.3345	0.0001
LN_SNREC	0.2103	0.0138	0.0001
LN_SAREC	0.1323	0.0176	0.0001
S_ASTAZP	-0.0158	0.0109	0.1468
COLOCATE	0.0254	0.0137	0.0641
LN_CAPIN	0.3503	0.0326	0.0001
LN_QMTOT	0.4951	0.0167	0.0001
LN_SAREA	0.0588	0.0089	0.0001
LNAVDSTN	-0.0336	0.0189	0.0755
LN_URATE	0.0403	0.0203	0.0475
FALL	-0.2164	0.0181	0.0001
WINTER	-0.0916	0.0158	0.0001
SPRING	-0.1299	0.0157	0.0001
FY96	0.0543	0.0153	0.0004
FY97	0.0585	0.0159	0.0002

R-square = 0.4025
F-statistic = 141.113
Mean Dependent Variable = 1.6128

Note: Model includes NRD dummies

VI. METROPOLITAN AREA LEVEL MODEL RESULTS

A. LOG-LOG MODEL RESULTS

Because most of the target population is located in metropolitan areas, we estimated models at this level to examine the relative effects of recruiters and other key variables. The data file used to estimate the metropolitan area models consisted of approximately 272 metropolitan areas for 12 quarters for a total of 3,248 observations. The dependent variable is the number of high quality contracts that were written in each metropolitan area during each quarter between FY95 and FY97. Each metropolitan area consisted on average of 50 zip codes. The average metropolitan area encompassed an area of 2,813 square miles. High quality contracts are characterized as they were in the station models. Linear, log-log, and fixed effects models were specified and estimated. The results of the log-log and fixed effects models are discussed in the text and presented in Tables 13-18; the results of the linear models are presented in Appendix C.

Table 10 provides descriptive statistics for the variables used in the metropolitan area models. It shows that the average metropolitan area contained 9.85 recruiters and produced 19.37 high quality contracts per quarter, or 80 per year. Thus, each recruiter generated about 8 high quality contracts per year. This is, of course, identical to the averages seen in the station models. Each metropolitan area contains an average of 2.8 Navy recruiting stations and an average of 3.9 Army recruiting stations. Thus, about 69 percent of all Navy stations are located in metropolitan areas. Of these stations, approximately 70 percent are collocated Army and Navy recruiting stations. Table 11 presents a glossary of the variables used in the metropolitan area models.

Table 10. DESCRIPTIVE STATISTICS FOR VARIABLES IN METROPOLITAN AREA MODELS

Variable	Mean	Std Dev
NSTATS	2.79	4.83
QMATOT	9359.60	18492.21
NAVYRECS	9.85	16.71
ASTATS	3.93	6.51
ARMYRECS	14.90	23.49
TOTHS	34.11	57.88
COLSTATS	1.92	3.39
AREA	2813.07	3707.55
PERCAPIN	12985.66	2403.82
A_TOTAL	27.13	45.92
N_TOTAL	19.37	37.01
F_TOTAL	13.91	21.64
M_TOTAL	16.67	31.48
DODTOTAL	77.07	133.36
MURATE	5.43	3.04

Table 11. GLOSSARY OF VARIABLES IN METROPOLITAN AREA MODELS

TOTAL ARMY PRODUCTION	A_TOTAL
TOTAL AREA IN SQUARE MILES	AREA
ARMY RECRUITERS PER POPULATION	ARECSPOPP
ARMY PRODUCTION PER POPULATION (ARMY TOTAL/TOTAL POP)	ARMYPRPP
NUMBER OF ARMY RECRUITERS SQUARED	ARMYREC2
NUMBER OF ARMY RECRUITERS	ARMYRECS
NUMBER OF ARMY STATIONS	ASTATS
NUMBER OF COLOCATED STATIONS	COLSTATS
TOTAL DOD PRODUCTION	DODTOTAL
TOTAL AIR FORCE PRODUCTION	F_TOTAL
DUMMY VARIABLE FOR FY 1ST QUARTER RECRUIT (QYR=2,6,10)	FALL
TREND VARIABLE FOR 1995 OBSERVATION	FY95
TREND VARIABLE FOR 1996 OBSERVATION	FY96
TREND VARIABLE FOR 1997 OBSERVATION	FY97
INTERACTION OF ARMY RECRUITERS AND HIGH (ARECS*TOTHS)	HSRECA
INTERACTION OF NAVY RECRUITERS AND HIGH (NRECS*TOTHS)	HSRECN
INTERACTION OF ARMY STATIONS AND HIGH SC	HSSTATA
INTERACTION OF NAVY STATIONS AND HIGH SC	HSSTATN
LOG NUMBER OF ARMY STATIONS IN MSA/CMSA	LNARPRPP
LOG OF TOTAL AREA	LNAREA
LOG OF ARECPPOP	LNARECPP
LOG NUMBER OF ARMY RECRUITERS	LNARMREC
LOG OF ARMY PRODUCTION PER POP	LNASTATS
LOG ARMY TOTAL PRODUCTION	LNATOTAL
LOG NUMBER OF COLOCATED ARMY/NAVY STATIONS	LNCOSTAT
LOG DOD TOTAL PRODUCTION	LNDODTOT
LOG AIR FORCE TOTAL PRODUCTION	LNFTOTAL
LOG MARINE TOTAL PRODUCTION	LNMTOTAL
LOG OF UNEMPLOYMENT RATE	LNMURATE
LOG OF NRECPPOP	LNNRECPP
LOG NUMBER OF NAVY STATIONS	LNNSTATS
LOG NAVY TOTAL PRODUCTION	LNNTOTAL
LOG OF NAVY PRODUCTION PER POP	LNNVPRPP
LOG NUMBER OF NAVY RECRUITERS	LNNVYREC
LOG OF OTHER SERVICE PRODUCTION-ARMY (DOD-ARMY PROD)	LNOSEPRA
LOG OF OTHER SERVICE PRODUCTION-NAVY (DOD-NAVY PROD)	LNOSEPRN
LOG OTHER SERVICE PROD/POP-ARMY	LNOSPPPA
LOG OTHER SERVICE PROD/POP-NAVY	LNOSPPPN
LOG OF PERCAPITA INCOME	LNPERCAP
LOG OF POPULATION DENSITY	LNPOPDEN
LOG TOTAL 17-21 POPULATION	LNQMATOT
LOG OF TOTAL NUMBER OF HIGH SCHOOLS	LNTOTHS
TOTAL MARINE CORPS PRODUCTION	M_TOTAL
METRO STATISTCAL AREA/CONSOLIDATED MSA	TRUEMSA
UNEMPLOYMENT RATE	MURATE
TOTAL NAVY PRODUCTION	N_TOTAL
CITY NAME	NAME
NAVY PRODUCTION PER POPULATION (NAVY TOTAL/TOTAL POP)	NAVYPRPP
NUMBER OF NAVY RECRUITERS SQUARED	NAVYREC2
NUMBER OF NAVY RECRUITERS	NAVYRECS
NAVY RECRUITERS PER POPULATION	NRECPPOP
NUMBER OF NAVY STATIONS	NSTATS

OTHER SERVICE PRODUCTION-ARMY (DOD-ARMY PROD)	OSERPROA
OTHER SERVICE PRODUCTION-NAVY (DOD-NAVY PROD)	OSERPRON
OTHER SERVICE PRODUCTION/POP-ARMY	OSPRPPPA
OTHER SERVICE PRODUCTION/POP-NAVY	OSPRPPPN
PER CAPITA INCOME	PERCAPIN
POPULATION DENSITY	POPDENSY
POPULATION 17-21 Y/O FROM QMA DATA	QMATOT
ORDINAL NUMBER OF QUARTER AND FY	QYR
DUMMY VARIABLE FOR FY 3RD QUARTER RECRUIT (QYR=4,8,12)	SPRING
STATE ABBREVIATION	STATE
DUMMY VARIABLE FOR FY 4TH QUARTER RECRUIT (QYR=3,7,11)	SUMMER
TOTAL NO. HIGH SCHOOLS	TOTHS
DUMMY VARIABLE FOR FY 2ND QUARTER RECRUIT (QYR=5,9,13)	WINTER
CALENDAR YEAR	YEAR

Six different model specifications were estimated. By doing this, we are able to examine the sensitivity of the effects for the variables of interest as we did in the station models. We looked at the impact of adding Navy stations, Army stations, and collocated stations on the estimated effects of Navy recruiters and recruiting stations. Table 12 summarizes the estimated elasticities of Navy recruiters. Once again, the models proceed from specifications that include only the recruiter variables and other basic demographic variables to those models that include numbers of Army, Navy and Collocated recruiting stations. The estimated elasticities of Navy recruiters (LNNVYREC) on high quality Navy production range between .34 and .42. Thus, a ten percent increase in the number of Navy recruiters at the metropolitan area level increases production by as much as 4.2 percent per quarter.

Table 12. SUMMARY EFFECTS OF NAVY RECRUITERS

Model	Description	Navy Recruiter Elasticity
Base	Army and Navy Recruiters with Unemployment	.4039
2	Base plus Navy recruiting stations	.3394
3	Base plus Army, Navy, and Collocated Stations	.3807
4	Base Less Unemployment	.4185
5	Model 2 Less Unemployment	.3445
6	Model 3 Less Unemployment	.3792

* All models included demographic, seasonal trend, and fiscal year dummy variables

As with the station model results, the metropolitan area estimates are also very robust. The range of estimates is quite small and insensitive to model specification. The estimated effect is approximately twice the effect of the station level models. This indicates that the level of aggregation does matter in estimating the effect of Navy recruiters.

Tables 11 through 16 at the end of this chapter present the results for all model specifications. The parameter estimates in column 1 report the percentage change in high quality contract production (LNNTOTAL) for a one percent change in the independent

variables, in those cases where the explanatory variable is continuous. For the variables such as the number of Navy recruiting stations (NSTATS), the number of Army recruiting stations (ASTATS), and the number of collocated recruiting stations (COLSTATS) the percentage recruiting effect of adding one additional station is reported.

As in the station models, the results indicate that additional Army recruiters (LNARMREC) increase high quality Navy production, although the effect is smaller than that for Navy recruiters. Across the various specifications, a 10 percent increase in Army recruiters results in a 2.0 to 3.2 percent increase in Navy male high quality enlistments per quarter. This further implies a degree of complementarity between Army recruiters and Navy contracts. Once again, the effect is almost twice the effect estimated in the station models.

The effects of collocated recruiting stations (COLSTATS) and single-service Army stations (ASTATS) are inconsistent at this level of aggregation. However, it appears that collocated recruiting stations and single-service Army recruiting stations do not harm Navy recruiting efforts. In addition, the results show that increasing the number of Navy recruiting stations (NSTATS) in a metropolitan area does improve recruiting, which mirrors the effect at the station level. More stations reduce the time and distance costs of canvassing an assigned territory. Once again, the factors that lead to the geographic placement of stations are highly correlated with the dependent variable, which may lead to imprecise and possibly biased results. However, as in the station models, the estimated effects do support the Navy's recent policy action to collocate recruiting stations, especially in light of the cost savings from doing so.

As the area (LNAREA) of a metropolitan area increases production decreases. A 10 percent increase in the area, holding other factors constant, decreases production by 8.2 to 9.9 percent per quarter. These results are statistically significant. The further recruiters must travel to canvass their assigned territory, the larger is the negative effect on production. Once again, increasing the number of Navy stations in a metropolitan area should increase production by decreasing the time and distance costs.

Again, per capita income (LNPERCAP) had an unexpected sign and extremely large estimated elasticities. This variable was calculated by averaging county per capita income figures, which may result in aggregation bias. However, the reasons for the unexpected sign may be the same as in the station models. Higher educational achievement is positively correlated with income. Because the dependent variable is qualified by educational attainment, the results are absorbing this effect.[41]

We estimate models with and without unemployment rates (LNMURATE) in order to examine the sensitivity of the results. Unlike the station level unemployment rates, rather "clean" metropolitan area unemployment rates were included in the data. When unemployment is included, the estimated elasticity of Navy recruiters ranges from .34 to .40. The coefficient of the unemployment rate is positive and statistically significant with an elasticity of .23 to .25. A 10 percent increase in unemployment increases high quality production by 2.3 to 2.5 percent per quarter. Although these results are not as high as those estimated by Warner, the consistency of the effects versus those in the station models indicates that the metropolitan area unemployment rate may contribute more than the county unemployment rate to an individual's decision to enlist.

[41] As in the station models, the effect of per capita income was negative when all production was used as the dependent variable.

The effect of population (LNQMATOT) on Navy high quality production is positive and statistically significant in all specifications. The estimated elasticity is equal to .15 in all specifications as well. Thus, a ten percent increase in the target population increases production by approximately 1.5 percent per quarter.

The seasonal time trends (FALL, WINTER, SPRING) and fiscal year dummy variables (FY96, FY97) were also included. Winter was insignificant in three specifications. However, as in the station models, Summer was shown to be the most productive season. The fiscal year dummies showed effects not statistically different from zero.

The effect of Navy recruiters on Navy enlistments implies an elasticity of about .34 to .40. This is larger than in the station models, but not quite as high as that estimated by Warner. The differences are most likely due to subsequently higher levels of aggregation. The cross service effects of Army recruiters on Navy production in the metropolitan area models is larger than the effects in the station models. The results still indicate that Navy recruiters have a larger effect on high quality Navy production than Army recruiters do. The estimated effect of unemployment is consistent, although it is less than that estimated by Warner. However, since the results show little sensitivity to model specification, the results provide plausible estimates.

The linear models in Appendix C allow us to convert the estimated elasticities to actual contracts per quarter per metropolitan area. In the linear model, the parameter estimate for Navy recruiters (NAVYRECS) reports the additional portion of a contract produced by adding one additional recruiter. An estimate of .69 is interpreted as one

additional recruiter at the metropolitan area level will produce an additional 3 high quality contracts per year.

B. FIXED EFFECTS MODEL RESULTS

In addition to the log-log and linear models, fixed effects models were estimated to control for the heterogeneity between the cross-sectional units, i.e. metropolitan areas. The results are presented in Appendix D.

The purpose of fixed effects models is to control for both observable and unobservable factors within metropolitan areas. Although metropolitan areas have many common characteristics, each one is inherently different than the others. Fixed effects use a dummy variable for each metropolitan area to control for these differences. Thus, fixed effects estimation techniques identify the effect of Navy recruiters and Navy recruiting stations by looking at the variation over time within a particular metropolitan area rather than across many.

Our results are very inconsistent and sensitive to model specification. Specifically, we find unexpected signs for the effect of Navy recruiting stations and the results oscillate between significant and insignificant with small changes in specification.

The results for the fixed effects models seemed surprising at first. However, understanding how Navy policy is made makes our inconsistent results more understandable. Navy policy makers look at past production in a metropolitan area when making policy decisions. For example, if recruiting was exceptionally poor during one quarter, CNRC could decide to put more recruiters there or to remove all of them entirely. Because of this, any attempt to identify recruiter or station effects with fixed effects is obscured by these rapid policy changes.

Theoretically, fixed effects models should be used because of their ability to control for the inherent differences between metropolitan areas. However, because of the rapid policy changes made in the recruiting environment, the results are not consistent. Without controlling in some way for these policy actions, the estimates suffer from bias and inconsistency and may not capture the true effect of these resources.

Table 13. METROPOLITAN AREA LOG-LOG MODEL WITH NAVY RECRUITERS, ARMY RECRUITERS, UNEMPLOYMENT, DEMOGRAPHIC AND TREND VARIABLES

Variable	Parameter Estimate	Standard Error	Prob > |T|
INTERCEP	-13.202683	0.73453808	0.0001
LNNVYREC	0.403891	0.02404331	0.0001
LNARMREC	0.324306	0.02642966	0.0001
LNMURATE	0.250834	0.0286785	0.0001
LNPERCAP	1.390414	0.07585366	0.0001
LNAREA	-0.098701	0.01501457	0.0001
LNQMATOT	0.154161	0.02172451	0.0001
FALL	-0.136326	0.03365643	0.0001
WINTER	-0.069744	0.03384559	0.0394
SPRING	-0.119261	0.03367307	0.0004
FY96	0.009672	0.02920753	0.7405
FY97	0.073439	0.02950143	0.0128

R-square = 0.6735
F-statistic = 602.000
Mean Dependent Variable = 2.15866

Table 14 . METROPOLITAN AREA LOG-LOG MODEL WITH NAVY RECRUITERS, ARMY RECRUITERS, DEMOGRAPHIC AND TREND VARIABLES

Variable	Parameter Estimate	Standard Error	Prob > |T|
INTERCEP	-11.712579	0.71603798	0.0001
LNNVYREC	0.418486	0.02416633	0.0001
LNARMREC	0.320925	0.02661646	0.0001
LNPERCAP	1.274049	0.07490862	0.0001
LNAREA	-0.096816	0.015141	0.0001
LNQMATOT	0.151492	0.02186474	0.0001
FALL	-0.13104	0.03388059	0.0001
WINTER	-0.035147	0.03385856	0.2993
SPRING	-0.111099	0.03389522	0.0011
FY96	-0.001947	0.0294043	0.9472
FY97	0.046084	0.02956879	0.1192

R-square = 0.6734
F-statistic = 665.707
Mean Dependent Variable = 2.16761

Table 15. METROPOLITAN AREA LOG-LOG MODEL WITH NAVY RECRUITERS, ARMY RECRUITERS, NAVY STATIONS, UNEMPLOYMENT, DEMOGRAPHIC AND TREND VARIABLES

Variable	Parameter Estimate	Standard Error	Prob > |T|
INTERCEP	-11.835523	0.75652091	0.0001
LNNVYREC	0.33944	0.02568235	0.0001
LNARMREC	0.303159	0.02642784	0.0001
NSTATS	0.02637	0.00387201	0.0001
LNMURATE	0.227289	0.02868699	0.0001
LNPERCAP	1.254687	0.07791501	0.0001
LNAREA	-0.094265	0.01492376	0.0001
LNQMATOT	0.153779	0.02157262	0.0001
FALL	-0.137218	0.03342127	0.0001
WINTER	-0.06727	0.03361082	0.0454
SPRING	-0.117387	0.03343867	0.0005
FY96	0.015673	0.02901661	0.5891
FY97	0.070848	0.02929754	0.0157

R-square = 0.6782
F-statistic = 563.500
Mean Dependent Variable = 2.15866

Table 16. METROPOLITAN AREA LOG-LOG MODEL WITH NAVY RECRUITERS, ARMY RECRUITERS, NAVY STATIONS, DEMOGRAPHIC AND TREND VARIABLES

Variable	Parameter Estimate	Standard Error	Prob > |T|
INTERCEP	-10.28529	0.7343615	0.0001
LNNVYREC	0.344516	0.02586585	0.0001
LNARMREC	0.296569	0.02658105	0.0001
NSTATS	0.028862	0.00380471	0.0001
LNPERCAP	1.128061	0.07671429	0.0001
LNAREA	-0.092284	0.01502203	0.0001
LNQMATOT	0.152691	0.02167635	0.0001
FALL	-0.132047	0.03358803	0.0001
WINTER	-0.03603	0.03356613	0.2832
SPRING	-0.109974	0.0336026	0.0011
FY96	0.005918	0.0291686	0.8392
FY97	0.045667	0.02931329	0.1194

R-square = 0.6791
F-statistic = 621.018
Mean Dependent Variable = 2.16761

Table 17. METROPOLITAN AREA LOG-LOG MODEL WITH NAVY RECRUITERS, ARMY RECRUITERS, NAVY STATIONS, ARMY STATIONS, COLLOCATED STATIONS, UNEMPLOYMENT, DEMOGRAPHIC AND TREND VARIABLE

Variable	Parameter Estimate	Standard Error	Prob > |T|
INTERCEP	-11.2958	0.75479378	0.0001
LNNVYREC	0.380674	0.02607321	0.0001
LNARMREC	0.205415	0.02908615	0.0001
NSTATS	-0.018131	0.01177729	0.1238
LNMURATE	0.232029	0.02849228	0.0001
LNPERCAP	1.197152	0.07775388	0.0001
LNAREA	-0.082308	0.01489219	0.0001
LNQMATOT	0.154025	0.02141198	0.0001
FALL	-0.133214	0.03310547	0.0001
WINTER	-0.063625	0.03329329	0.0561
SPRING	-0.117151	0.03311885	0.0004
ASTATS	0.070079	0.00873677	0.0001
COLSTATS	-0.052291	0.01595308	0.0011
FY96	-0.002494	0.02883953	0.9311
FY97	0.054724	0.02909229	0.0601

R-square = 0.6845
F-statistic = 496.984
Mean Dependent Variable = 2.15866

Table 18. METROPOLITAN AREA LOG-LOG MODEL WITH NAVY RECRUITERS, ARMY RECRUITERS, NAVY STATIONS, ARMY STATIONS, COLLOCATED STATIONS, DEMOGRAPHIC AND TREND VARIABLES

Variable	Parameter Estimate	Standard Error	Prob > |T|
INTERCEP	-9.724563	0.73555639	0.0001
LNNVYREC	0.379235	0.02631251	0.0001
LNARMREC	0.21931	0.0290303	0.0001
NSTATS	-0.017595	0.01185615	0.1379
LNPERCAP	1.068363	0.07686557	0.0001
LNAREA	-0.08561	0.01500663	0.0001
LNQMATOT	0.156326	0.02158723	0.0001
FALL	-0.128831	0.03338393	0.0001
WINTER	-0.032576	0.03336253	0.3289
SPRING	-0.109254	0.03339511	0.0011
ASTATS	0.051263	0.0079591	0.0001
COLSTATS	-0.020248	0.01522531	0.1836
FY96	-0.009148	0.0290845	0.7531
FY97	0.03231	0.02920402	0.2687

R-square = 0.6833
F-statistic = 535.302
Mean Dependent Variable = 2.16761

VII. SUMMARY AND CONCLUSIONS

In this thesis we have attempted to estimate enlistment supply models for the Navy at the Navy recruiting station and metropolitan area levels using quarterly zip code level data from FY95 to FY97. Our work focuses on the effect of Navy and Army recruiters and recruiting stations on Navy high quality contract production. Specifically, we address the issue of competition between the Army and Navy recruiting efforts by including information concerning collocated Army and Navy recruiting stations and Army recruiters as two of the independent variables. The unique nature of our research allows us to compare the relative effects of these resources at two separate levels of aggregation.

Our results show reasonably consistent effects at the station level and at the metropolitan area level. The small range of estimated effects is a robust measurement of the effect of Navy recruiters at the different aggregation levels. In the station models, the range of estimates was .20 to .22. In the metropolitan area models, the range was between .34 and .42. Thus, we conclude that the true range of effects is between these two estimates and that the level of aggregation matters in trying to estimate the effects of recruiting resources.

In addition, the results show econometric evidence that Army recruiters have a positive effect on Navy recruiting and that collocated recruiting stations are not harmful to the Navy's recruiting efforts at the station and metropolitan area level. In fact, we found that Army recruiters actually increase Navy production in the range of .13 to .32. The estimated effects of single-service Army recruiting stations did show a small negative effect in two of the station level specifications, but had no effect at all in four

other specifications. However, the estimates for station effects at the metropolitan area level showed great sensitivity.

Other results are generally as expected. Increasing the distance between recruiting stations has a negative effect on recruiting by increasing the travel distance and costs incurred by recruiters to canvass their assigned territories. By increasing the number of stations in a given area, these costs are reduced. Finally, per capita income was found to positively affect high quality contract production most likely due to the high correlation between education and income. Higher unemployment rates did, however, significantly increase the number of high quality contracts at both levels of aggregation.

By estimating models at lower levels of aggregation than has historically been examined, we have been able to estimate, reasonably precisely, the effect of Navy recruiters and the effect of collocated Army and Navy recruiting stations at the recruiting station and metropolitan area levels. We found two different effects of Navy recruiters at the two aggregation levels studied in our analysis. The results suggest that allocation decisions should be made at the lower levels of aggregation rather than at the district level in order to capture the true effects of these scarce recruiting resources. The results do support the Navy's recent policy actions of adding additional Navy recruiters and collocated recruiting stations.

We have quantified the impact of Navy recruiters and recruiting stations. In the future, these results can be used in optimization models to help the Navy maximize the effects of each additional recruiter and facility by placing them in the most productive areas.

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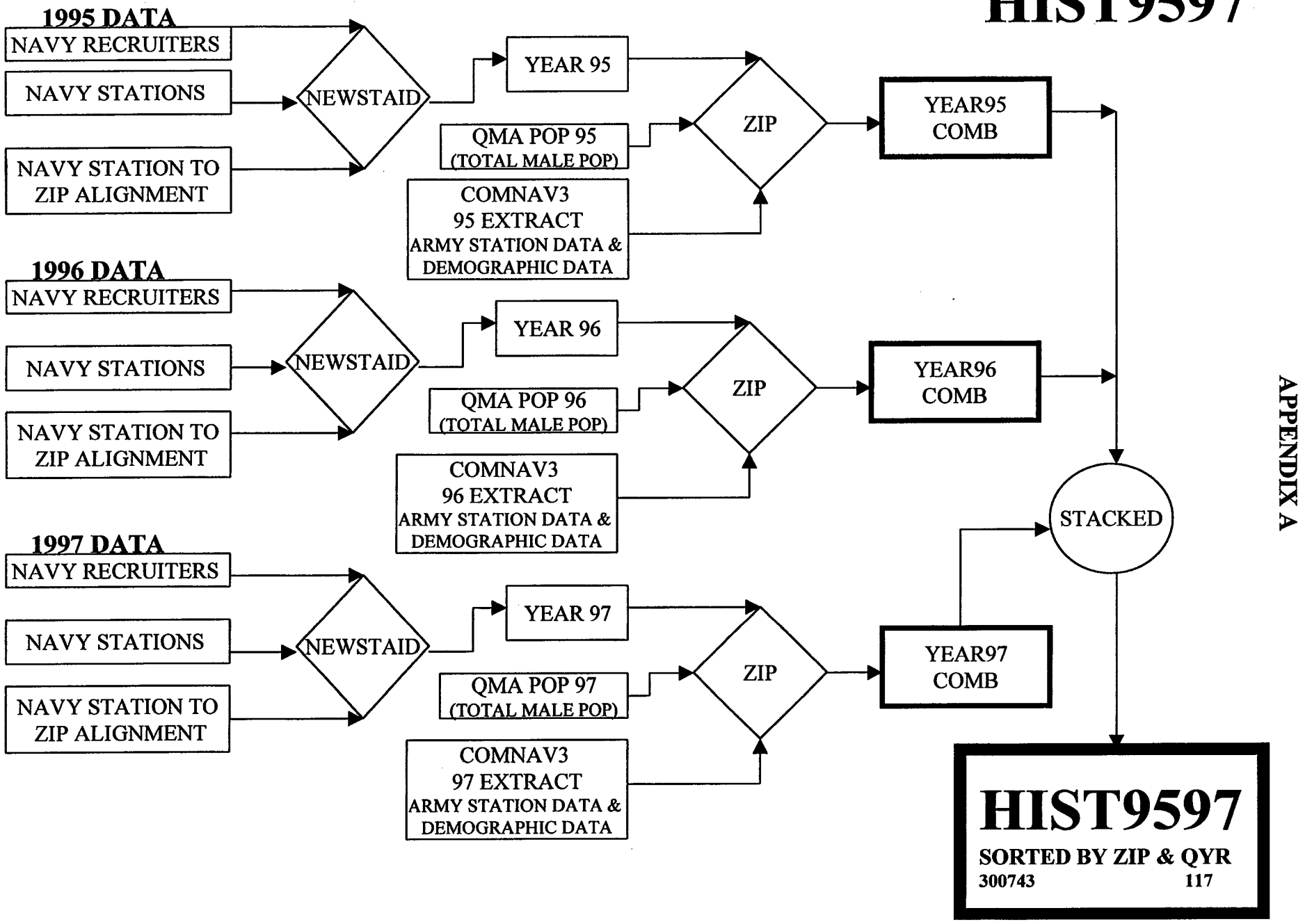
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NAVY RECRUITERS
NAVY STATIONS
NAVY STATION TO ZIP ALIGNMENT
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YEAR 95
QMA POP 95 (TOTAL MALE POP)
COMNAV3 95 EXTRACT ARMY STATION DATA & DEMOGRAPHIC DATA
ZIP
YEAR95 COMB
1996 DATA
NAVY RECRUITERS
NAVY STATIONS
NAVY STATION TO ZIP ALIGNMENT
NEWSTAID
YEAR 96
QMA POP 96 (TOTAL MALE POP)
COMNAV3 96 EXTRACT ARMY STATION DATA & DEMOGRAPHIC DATA
ZIP
YEAR96 COMB
1997 DATA
NAVY RECRUITERS
NAVY STATIONS
NAVY STATION TO ZIP ALIGNMENT
NEWSTAID
YEAR 97
QMA POP 97 (TOTAL MALE POP)
COMNAV3 97 EXTRACT ARMY STATION DATA & DEMOGRAPHIC DATA
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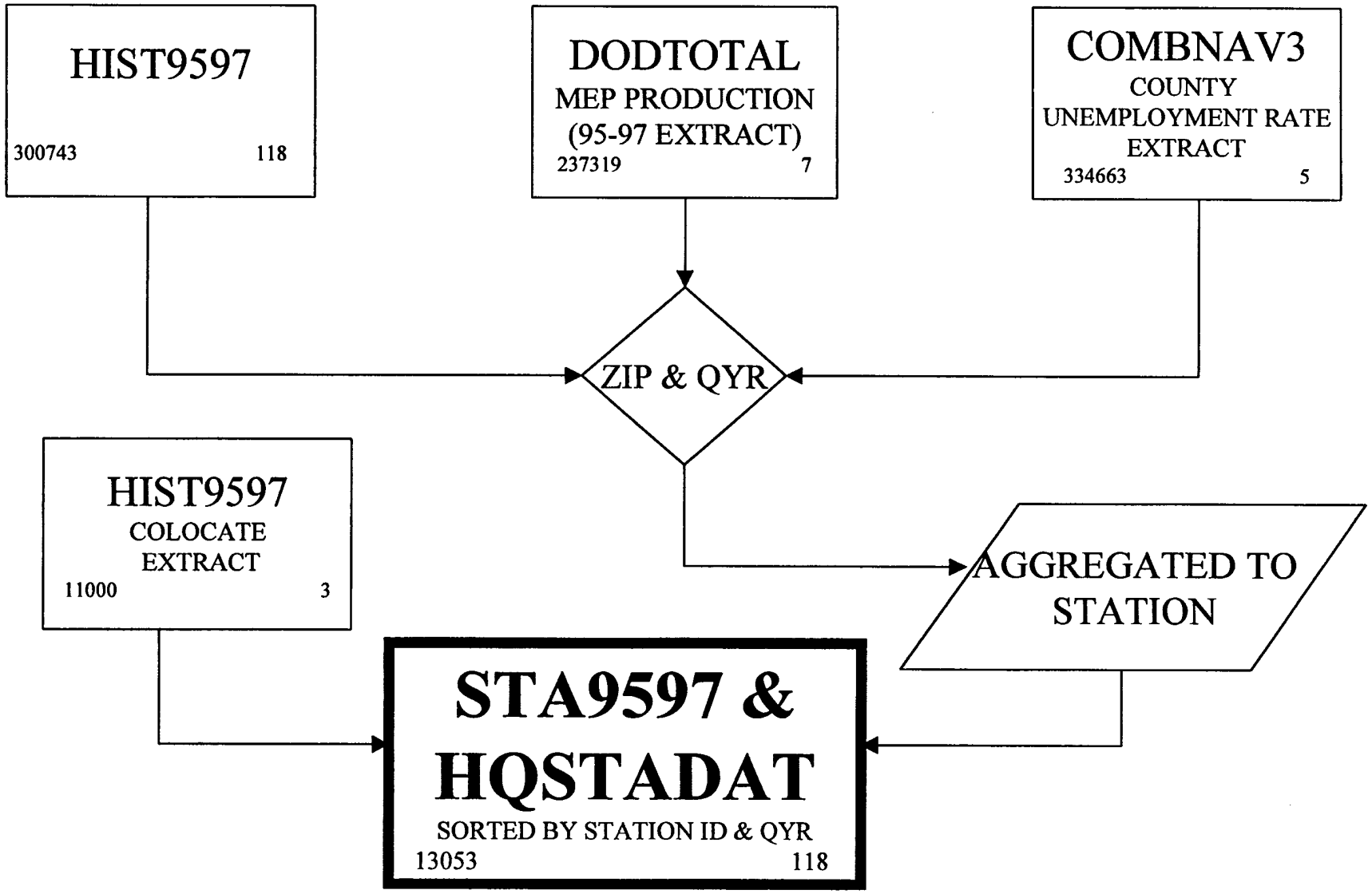
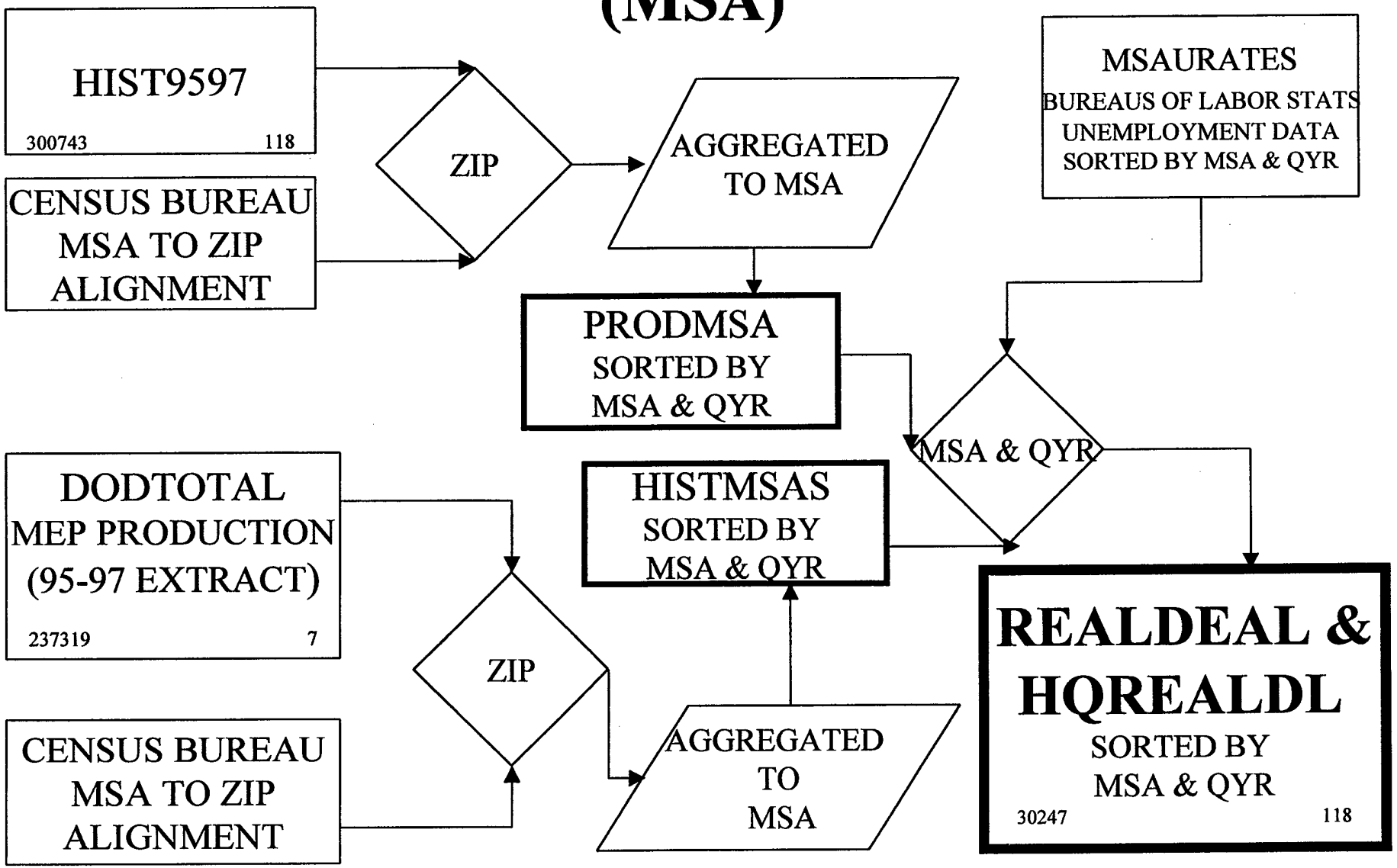
NAVY RECRUITING STATION



METROPOLITAN STATISTICAL AREA (MSA)



APPENDIX B

Table 1. STATION LEVEL LINEAR MODEL WITH ARMY AND NAVY RECRUITERS, DEMOGRAPHIC AND TREND VARIABLES

Variable	Parameter Estimate	Standard Error	Prob > |T|
INTERCEP	1.3410	0.2010	0.0001
S_ARECS	0.2234	0.0106	0.0001
S_NRECS	0.3057	0.0153	0.0001
S_CAPIN	0.0000	0.0000	0.0382
S_QMATOT	0.0008	0.0000	0.0001
AVGDISTN	-0.0039	0.0022	0.0697
S_AREA	0.0000	0.0000	0.0001
FALL	-1.0990	0.0770	0.0001
WINTER	-0.5085	0.0769	0.0001
SPRING	-0.8270	0.0770	0.0001
FY96	0.1304	0.0671	0.0521
FY97	0.0342	0.0694	0.6218

R-square = 0.4616
F-statistic = 256.011
Mean Dependent Variable = 5.8095

Note: Model includes NRD dummies

Table 2. STATION LEVEL LINEAR MODEL WITH ARMY AND NAVY RECRUITERS, ARMY STATIONS, DEMOGRAPHIC AND TREND VARIABLES

Variable	Parameter Estimate	Standard Error	Prob > |T|
INTERCEP	1.3865	0.2011	0.0001
S_ARECS	0.2824	0.0170	0.0001
S_NRECS	0.2999	0.0154	0.0001
S_ASTAZP	-0.2692	0.0607	0.0001
S_CAPIN	0.0000	0.0000	0.0859
S_QMATOT	0.0008	0.0000	0.0001
AVGDISTN	-0.0043	0.0022	0.0477
S_AREA	0.0000	0.0000	0.0001
FALL	-1.0997	0.0770	0.0001
WINTER	-0.5096	0.0769	0.0001
SPRING	-0.8275	0.0769	0.0001
FY96	0.1447	0.0672	0.0313
FY97	0.0437	0.0694	0.5284

R-square = 0.4625
F-statistic = 250.886
Mean Dependent Variable = 5.8095

Note: Model includes NRD dummies

Table 3. STATION LEVEL LINEAR MODEL WITH ARMY AND NAVY RECRUITERS, ARMY STATIONS, COLOCATED STATIONS, DEMOGRAPHIC AND TREND VARIABLES

Variable	Parameter Estimate	Standard Error	Prob > |T|
INTERCEP	2.0237	0.2614	0.0001
S_ARECS	0.2735	0.0177	0.0001
S_NRECS	0.3223	0.0171	0.0001
S_ASTAZP	-0.3084	0.0640	0.0001
COLOCATE	0.2617	0.0683	0.0001
S_CAPIN	0.0000	0.0000	0.0001
S_QMATOT	0.0008	0.0000	0.0001
AVGDISTN	-0.0056	0.0023	0.0169
S_AREA	0.0000	0.0000	0.0001
FALL	-1.1747	0.0825	0.0001
WINTER	-0.5677	0.0823	0.0001
SPRING	-0.8765	0.0822	0.0001
FY96	0.1811	0.0718	0.0117
FY97	0.1126	0.0748	0.1321

R-square = 0.4069
F-statistic = 0.4046
Mean Dependent Variable = 6.2205

Table 4. STATION LEVEL LINEAR MODEL WITH ARMY AND NAVY RECRUITERS, ARMY STATIONS, COLOCATED STATONS, DEMOGRAPHIC, TREND AND INTERACTION VARIABLES

Variable	Parameter Estimate	Standard Error	Prob > |T|
INTERCEP	2.0682	0.3266	0.0001
S_ARECS	0.2649	0.0178	0.0001
S_NRECS	0.2989	0.0593	0.0001
S_ASTAZP	-0.2785	0.0641	0.0001
COLOCATE	0.2640	0.0682	0.0001
S_CAPIN	0.0000	0.0000	0.6786
S_QMATOT	0.0009	0.0000	0.0001
AVGDISTN	-0.0031	0.0024	0.2017
S_AREA	0.0000	0.0000	0.6969
FALL	-1.1743	0.0823	0.0001
WINTER	-0.5661	0.0821	0.0001
SPRING	-0.8793	0.0821	0.0001
FY96	0.1820	0.0717	0.0111
FY97	0.1157	0.0747	0.1214
NRECAPIN	0.0000	0.0000	0.0002
NRECQMA	0.0000	0.0000	0.0001
NRECAREA	0.0000	0.0000	0.0258

R-square = 0.4094
F-statistic = 0.4070
Mean Dependent Variable = 6.2205

Note: Model includes NRD dummies

Table 5. STATION LEVEL LINEAR MODEL WITH ARMY AND NAVY RECRUITERS, DEMOGRAPHIC, TREND AND UNEMPLOYMENT RATE VARIABLES

Variable	Parameter Estimate	Standard Error	Prob > |T|
INTERCEP	1.7674	0.2860	0.0001
S_ARECS	0.2159	0.0117	0.0001
S_NRECS	0.3213	0.0173	0.0001
S_CAPIN	0.0000	0.0000	0.0001
S_QMATOT	0.0008	0.0000	0.0001
AVGDISTN	-0.0033	0.0024	0.1805
S_AREA	0.0000	0.0000	0.0001
S_URATE	-1.3908	1.6877	0.4099
FALL	-1.2564	0.0964	0.0001
WINTER	-0.5439	0.0841	0.0001
SPRING	-0.8438	0.0837	0.0001
FY96	0.2450	0.0814	0.0026
FY97	0.1213	0.0842	0.1494

R-square = 0.4328
F-statistic = 0.4304
Mean Dependent Variable = 6.0710

Note: Model includes NRD dummies

Table 6. STATION LEVEL LINEAR MODEL WITH ARMY AND NAVY RECRUITERS, ARMY STATIONS, DEMOGRAPHIC, TREND AND UNEMPLOYMENT RATE VARIABLES

Variable	Parameter Estimate	Standard Error	Prob > T
INTERCEP	1.8088	0.2862	0.0001
S_ARECS	0.2604	0.0188	0.0001
S_NRECS	0.3166	0.0174	0.0001
S_ASTAZP	-0.2024	0.0666	0.0024
S_CAPIN	0.0000	0.0000	0.0001
S_QMATOT	0.0008	0.0000	0.0001
AVGDISTN	-0.0036	0.0024	0.1418
S_AREA	0.0000	0.0000	0.0001
S_URATE	-1.4408	1.6871	0.3931
FALL	-1.2554	0.0964	0.0001
WINTER	-0.5441	0.0841	0.0001
SPRING	-0.8440	0.0836	0.0001
FY96	0.2565	0.0814	0.0016
FY97	0.1289	0.0842	0.1256

R-square = 0.4333
F-statistic = 4309
Mean Dependent Variable = 6.0710

Note: Model includes NRD dummies

Table 7. STATION LEVEL LINEAR MODEL WITH ARMY AND NAVY RECRUITERS, ARMY STATIONS, COLOCATED STATIONS, DEMOGRAPHIC, TREND AND UNEMPLOYMENT RATE VARIABLES

Variable	Parameter Estimate	Standard Error	Prob > |T|
INTERCEP	1.6236	0.3235	0.0001
S_ARECS	0.2586	0.0192	0.0001
S_NRECS	0.3321	0.0190	0.0001
S_ASTAZP	-0.2554	0.0692	0.0002
COLOCATE	0.2797	0.0751	0.0002
S_CAPIN	0.0001	0.0000	0.0001
S_QMATOT	0.0007	0.0000	0.0001
AVGDISTN	-0.0041	0.0026	0.1084
S_AREA	0.0000	0.0000	0.0001
S_URATE	0.5928	1.7773	0.7387
FALL	-1.3041	0.1000	0.0001
WINTER	-0.5844	0.0873	0.0001
SPRING	-0.8752	0.0867	0.0001
FY96	0.3014	0.0843	0.0004
FY97	0.2122	0.0876	0.0154

R-square = 0.4114
F-statistic = 0.4086
Mean Dependent Variable 6.2698

Note: Model includes NRD dummies

Table 8. STATION LEVEL LINEAR MODEL WITH ARMY AND NAVY RECRUITERS, ARMY STATIONS, COLOCATED STATIONS, DEMOGRAPHIC, TREND, INTERACTION AND UNEMPLOYMENT RATE VARIABLES

Variable	Parameter Estimate	Standard Error	Prob > |T|
INTERCEP	1.7425	0.4001	0.0001
S_ARECS	0.2497	0.0193	0.0001
S_NRECS	0.2868	0.0668	0.0001
S_ASTAZP	-0.2258	0.0693	0.0011
COLOCATE	0.2809	0.0750	0.0002
S_CAPIN	0.0000	0.0000	0.799
S_QMATOT	0.0010	0.0000	0.0001
AVGDISTN	-0.0014	0.0027	0.6049
S_AREA	0.0000	0.0000	0.7192
S_URATE	0.3951	1.7739	0.8238
FALL	-1.2989	0.0997	0.0001
WINTER	-0.5832	0.0871	0.0001
SPRING	-0.8757	0.0865	0.0001
FY96	0.3024	0.0842	0.0003
FY97	0.2120	0.0874	0.0153
NRECAPIN	0.0000	0.0000	0.0001
NRECQMA	-0.0001	0.0000	0.0001
NRECAREA	0.0000	0.0000	0.0346

R-square = 0.4145
F-statistic = 0.4116
Mean Dependent Variable = 6.2698

Note: Model includes NRD dummies

APPENDIX C

Table 1. METROPOLITAN AREA LINEAR FIXED EFFECTS MODEL WITH NAVY RECRUITERS, ARMY RECRUITERS, NAVY STATIONS, ARMY STATIONS, COLLOCATED STATIONS, DEMOGRAPHIC AND TREND VARIABLES

Variable	Parameter Estimate	Standard Error	Prob > |T|
INTERCEP	1.437002	3.09286026	0.6422
NAVYRECS	0.311345	0.05892875	0.0001
ARMYRECS	-0.227697	0.09314598	0.0146
NSTATS	-1.880402	0.30350227	0.0001
PERCAPIN	0.000255	0.0001596	0.1109
AREA	-0.00059	0.00033455	0.078
QMATOT	0.000979	0.00010385	0.0001
FALL	-3.356092	0.34744533	0.0001
WINTER	-1.475855	0.3469648	0.0001
SPRING	-2.698176	0.34598838	0.0001
FY96	0.159188	0.31278145	0.6108
FY97	-0.418015	0.31032257	0.1781
ASTATS	2.166781	0.34162264	0.0001
COLSTATS	1.683773	0.35142011	0.0001

R-square = 0.9679
F-statistic = 312.262
Mean Dependent Variable = 19.36852

Note: Model Includes Metropolitan Area Dummy Variables

Table 2. METROPOLITAN AREA LOG-LOG FIXED EFFECTS MODEL WITH NAVY RECRUITERS, ARMY RECRUITERS, NAVY STATIONS, ARMY STATIONS, COLLOCATED STATIONS, DEMOGRAPHIC AND TREND VARIABLES

Variable	Parameter Estimate	Standard Error	Prob > |T|
INTERCEP	-6.337878	1.44501884	0.0001
LNNVYREC	0.028245	0.03137718	0.3681
LNARMREC	-0.09121	0.03909813	0.0197
NSTATS	0.037195	0.01589575	0.0194
LNPERCAP	0.733218	0.14774246	0.0001
LNAREA	0.041413	0.02533986	0.1023
LNQMATOT	0.010762	0.02575033	0.676
FALL	-0.144999	0.02307152	0.0001
WINTER	-0.049909	0.02301661	0.0302
SPRING	-0.102031	0.02301852	0.0001
FY96	0.052294	0.0204679	0.0107
FY97	0.05158	0.0205482	0.0121
ASTATS	0.060954	0.00930292	0.0001
COLSTATS	0.036704	0.02325935	0.1147

R-square = 0.8628
F-statistic = 65.157
Mean Dependent Variable = 2.16761

Note: Model Includes Metropolitan Area Dummy Variables

Table 3. METROPOLITAN AREA LINEAR MODEL WITH NAVY RECRUITERS, ARMY RECRUITERS, UNEMPLOYMENT, DEMOGRAPHIC AND TREND VARIABLES

Variable	Parameter Estimate	Standard Error	Prob > |T|
INTERCEP	-10.873952	1.37524838	0.0001
NAVYRECS	0.694449	0.04514611	0.0001
ARMYRECS	0.269704	0.03709752	0.0001
MURATE	0.272466	0.06703108	0.0001
PERCAPIN	0.00084	0.00009278	0.0001
AREA	0.000005054	0.00006691	0.9398
QMATOT	0.000943	0.00003739	0.0001
FALL	-3.3773	0.55835937	0.0001
WINTER	-1.696126	0.55993664	0.0025
SPRING	-2.848782	0.5581932	0.0001
FY96	0.242532	0.48588203	0.6177
FY97	0.346027	0.49150785	0.4815

R-square = 0.9050
F- statistics = 2780.787
Mean Dependent Variable = 18.90627

Table 4. METROPOLITAN AREA LINEAR MODEL WITH NAVY RECRUITERS, ARMY RECRUITERS, NAVY STATIONS, UNEMPLOYMENT, DEMOGRAPHIC AND TREND VARIABLES

Variable	Parameter Estimate	Standard Error	Prob > |T|
INTERCEP	-10.873952	1.37524838	0.0001
NAVYRECS	0.694449	0.04514611	0.0001
ARMYRECS	0.269704	0.03709752	0.0001
NSTATS	-3.786192	.22695027	0.0001
MURATE	0.272466	0.06703108	0.0001
PERCAPIN	0.00084	0.00009278	0.0001
AREA	0.000005054	0.00006691	0.9398
QMATOT	0.000943	0.00003739	0.0001
FALL	-3.3773	0.55835937	0.0001
WINTER	-1.696126	0.55993664	0.0025
SPRING	-2.848782	0.5581932	0.0001
FY96	0.242532	0.48588203	0.6177
FY97	0.346027	0.49150785	0.4815

R-square = 0.9126
F- statistics = 2792.467
Mean Dependent Variable = 18.90627

Table 5. METROPOLITAN AREA LINEAR MODEL WITH NAVY RECRUITERS, ARMY RECRUITERS, DEMOGRAPHIC AND TREND VARIABLES

Variable	Parameter Estimate	Standard Error	Prob > |T|
INTERCEP	-7.780457	1.26541636	0.0001
NAVYRECS	0.707085	0.04557661	0.0001
ARMYRECS	0.201373	0.03677379	0.0001
PERCAPIN	0.000733	0.00009224	0.0001
AREA	0.000059649	0.00006751	0.377
QMATOT	0.000991	0.00003757	0.0001
FALL	-3.443488	0.56543308	0.0001
WINTER	-1.557259	0.56529158	0.0059
SPRING	-2.834354	0.56537495	0.0001
FY96	0.201901	0.49239774	0.6818
FY97	0.214226	0.4965436	0.6662

R-square = 0.9059
F-statistic = 3108.194
Mean Dependent Variable = 19.36852

Table 6. METROPOLITAN AREA LINEAR MODEL WITH NAVY RECRUITERS, ARMY RECRUITERS, NAVY STATIONS, DEMOGRAPHIC AND TREND VARIABLES

Variable	Parameter Estimate	Standard Error	Prob > |T|
INTERCEP	-6.066485	1.22478216	0.0001
NAVYRECS	1.263804	0.05646461	0.0001
ARMYRECS	0.224077	0.03548071	0.0001
NSTATS	-3.602121	0.22946661	0.0001
PERCAPIN	0.000611	0.00008926	0.0001
AREA	0.000199	0.00006568	0.0025
QMATOT	0.001393	0.00004433	0.0001
FALL	-3.447864	0.54509736	0.0001
WINTER	-1.58965	0.54496478	0.0036
SPRING	-2.796645	0.54504654	0.0001
FY96	-0.089945	0.47505259	0.8498
FY97	0.349414	0.47876288	0.4655

R-square = 0.9126
F-statistic = 3062.795
Mean Dependent Variable = 19.36852

Table 7. METROPOLITAN AREA LINEAR MODEL WITH NAVY RECRUITERS, ARMY RECRUITERS, NAVY STATIONS, ARMY STATIONS, COLLOCATED STATIONS, UNEMPLOYMENT, DEMOGRAPHIC AND TREND VARIABLES

Variable	Parameter Estimate	Standard Error	Prob > |T|
INTERCEP	-7.924825	1.31670582	0.0001
NAVYRECS	1.218822	0.05594171	0.0001
ARMYRECS	0.0913	0.05506071	0.0974
NSTATS	-4.359231	0.24047565	0.0001
MURATE	0.200817	0.06399881	0.0017
PERCAPIN	0.000667	0.00008865	0.0001
AREA	0.000071619	0.00006505	0.271
QMATOT	0.001277	0.00004956	0.0001
FALL	-3.361238	0.53055114	0.0001
WINTER	-1.690035	0.53202505	0.0015
SPRING	-2.778182	0.53037819	0.0001
ASTATS	0.66223	0.22512318	0.0033
COLSTATS	1.821145	0.26184999	0.0001
FY96	-0.109891	0.46305596	0.8124
FY97	0.414148	0.46765962	0.3759

R-square = 0.9143
F-statistic = 2445.221
Mean Dependent Variable = 18.90627

Table 8. METROPOLITAN AREA LINEAR MODEL WITH NAVY RECRUITERS, ARMY RECRUITERS, NAVY STATIONS, ARMY STATIONS, COLLOCATED STATIONS, DEMOGRAPHIC AND TREND VARIABLES

Variable	Parameter Estimate	Standard Error	Prob > |T|
INTERCEP	-5.625649	1.20901754	0.0001
NAVYRECS	1.180604	0.05620955	0.0001
ARMYRECS	0.126816	0.05553232	0.0225
NSTATS	-4.465223	0.24181511	0.0001
PERCAPIN	0.000596	0.00008805	0.0001
AREA	0.000105	0.00006557	0.1081
QMATOT	0.001364	0.00004897	0.0001
FALL	-3.440773	0.53679731	0.0001
WINTER	-1.601089	0.53666456	0.0029
SPRING	-2.762897	0.53674814	0.0001
ASTATS	0.011586	0.21543169	0.9571
COLSTATS	2.550358	0.25223438	0.0001
FY96	-0.076593	0.46861943	0.8702
FY97	0.335877	0.47185485	0.4766

R-square = 0.9153
F-statistic = 2680.469
Mean Dependent Variable = 19.36852

APPENDIX D

Table 1. METROPOLITAN AREA LINEAR FIXED EFFECTS MODEL WITH NAVY RECRUITERS, ARMY RECRUITERS, UNEMPLOYMENT, DEMOGRAPHIC AND TREND VARIABLES

Variable	Parameter Estimate	Standard Error	Prob > |T|
INTERCEP	8.969025	3.23364583	0.0056
NAVYRECS	0.211577	0.04819464	0.0001
ARMYRECS	0.321337	0.05024477	0.0001
MURATE	0.211979	0.14807044	0.1524
PERCAPIN	0.000090782	0.00016322	0.5781
AREA	-0.00032	0.0003379	0.3439
QMATOT	0.000961	0.00010481	0.0001
FALL	-3.283977	0.35562153	0.0001
WINTER	-1.605411	0.37032692	0.0001
SPRING	-2.783563	0.35456574	0.0001
FY96	0.473509	0.31997896	0.139
FY97	-0.110821	0.32710099	0.7348

R-square = 0.9652
F-statistic = 288.881
Mean Dependent Variable = 18.90627

Note: Model Includes Metropolitan Area Dummy Variables

Table 2. METROPOLITAN AREA LOG-LOG FIXED EFFECTS MODEL WITH NAVY RECRUITERS, ARMY RECRUITERS, UNEMPLOYMENT, DEMOGRAPHIC AND TREND VARIABLES

Variable	Parameter Estimate	Standard Error	Prob > |T|
INTERCEP	-5.332349	1.50534357	0.0004
LNNVYREC	0.170292	0.02805869	0.0001
LNARMREC	0.106036	0.03591781	0.0032
LNMURATE	0.250351	0.07181183	0.0005
LNPERCAP	0.64601	0.15320294	0.0001
LNAREA	0.007962	0.0261104	0.7604
LNQMATOT	0.067277	0.02632089	0.0106
FALL	-0.145556	0.02392798	0.0001
WINTER	-0.083167	0.02569085	0.0012
SPRING	-0.113575	0.02398298	0.0001
FY96	0.057818	0.02114208	0.0063
FY97	0.089833	0.02240442	0.0001

R-square = 0.8504
F-statistic = 59.254
Mean Dependent Variable = 2.15866

Note: Model Includes Metropolitan Area Dummy Variables

Table 3. METROPOLITAN AREA LINEAR FIXED EFFECTS MODEL WITH NAVY RECRUITERS, ARMY RECRUITERS, NAVY STATIONS, UNEMPLOYMENT, DEMOGRAPHIC AND TREND VARIABLES

Variable	Parameter Estimate	Standard Error	Prob > |T|
INTERCEP	-1.46533	3.1325701	0.64
NAVYRECS	0.313045	0.05873921	0.0001
ARMYRECS	0.224215	0.04795296	0.0001
NSTATS	-1.756618	0.28584244	0.0001
MURATE	0.181956	0.14044685	0.1952
PERCAPIN	0.0003	0.00015523	0.0536
AREA	0.000477	0.00032379	0.1411
QMATOT	-0.000266	0.0001372	0.0527
FALL	-3.469371	0.3374382	0.0001
WINTER	-1.68484	0.35128589	0.0001
SPRING	-2.853186	0.33631955	0.0001
FY96	0.78273	0.30445933	0.0102
FY97	0.482991	0.31194994	0.1217

R-square = 0.9687
F-statistic = 320.049
Mean Dependent Variable = 18.90627

Note: Model Includes Metropolitan Area Dummy Variables

Table 4. METROPOLITAN AREA LOG-LOG FIXED EFFECTS MODEL WITH NAVY RECRUITERS, ARMY RECRUITERS, NAVY STATIONS, UNEMPLOYMENT, DEMOGRAPHIC AND TREND VARIABLES

Variable	Parameter Estimate	Standard Error	Prob > |T|
INTERCEP	-6.516306	1.44257465	0.0001
LNNVYREC	0.062421	0.03132755	0.0464
LNARMREC	-0.025617	0.03531603	0.4683
NSTATS	-0.013168	0.01594132	0.4088
LNMURATE	0.265303	0.06868794	0.0001
LNPERCAP	0.704861	0.14669235	0.0001
LNAREA	0.046238	0.02506924	0.0652
LNQMATOT	-0.003037	0.02553674	0.9053
FALL	-0.157964	0.02288906	0.0001
WINTER	-0.093947	0.02457144	0.0001
SPRING	-0.113181	0.02293005	0.0001
FY96	0.089602	0.02031923	0.0001
FY97	0.104719	0.02143898	0.0001

R-square = 0.8634
F-statistic = 65.347
Mean Dependent Variable = 2.15866

Note: Model Includes Metropolitan Area Dummy Variables

Table 5. METROPOLITAN AREA LINEAR FIXED EFFECTS MODEL WITH NAVY RECRUITERS, ARMY RECRUITERS, NAVY STATIONS, ARMY STATIONS, COLLOCATED STATIONS, UNEMPLOYMENT, DEMOGRAPHIC AND TREND VARIABLES

Variable	Parameter Estimate	Standard Error	Prob > |T|
INTERCEP	-2.323489	3.11423391	0.4557
NAVYRECS	0.301981	0.05838739	0.0001
ARMYRECS	-0.142817	0.09087501	0.1162
NSTATS	-2.119128	0.29574556	0.0001
MURATE	0.192622	0.13961873	0.1678
PERCAPIN	0.000301	0.00015424	0.0509
AREA	0.000118	0.00032658	0.7187
QMATOT	-0.000349	0.00013692	0.0109
FALL	-3.47269	0.33516794	0.0001
WINTER	-1.698244	0.34894431	0.0001
SPRING	-2.814197	0.33409761	0.0001
FY96	0.656539	0.3032952	0.0305
FY97	0.413432	0.31034213	0.1829
ASTATS	1.336911	0.33559625	0.0001
COLSTATS	1.711869	0.353329	0.0001

R-square = 0.9691
F-statistic = 322.307
Mean Dependent Variable = 18.90627

Note: Model Includes Metropolitan Area Dummy Variables

Table 6. METROPOLITAN AREA LOG-LOG FIXED EFFECTS MODEL WITH NAVY RECRUITERS, ARMY RECRUITERS, NAVY STATIONS, ARMY STATIONS, COLLOCATED STATIONS, UNEMPLOYMENT, DEMOGRAPHIC AND TREND VARIABLES

Variable	Parameter Estimate	Standard Error	Prob > |T|
INTERCEP	-6.572461	1.44425474	0.0001
LNNVYREC	0.063202	0.03135853	0.0439
LNARMREC	-0.023281	0.04017071	0.5623
NSTATS	-0.020142	0.0174427	0.2483
LNMURATE	0.262321	0.06890309	0.0001
LNPERCAP	0.711901	0.14692948	0.0001
LNAREA	0.044222	0.02514098	0.0787
LNQMATOT	-0.003455	0.02554939	0.8924
FALL	-0.158337	0.02291728	0.0001
WINTER	-0.094105	0.02457683	0.0001
SPRING	-0.112967	0.02293401	0.0001
FY96	0.090618	0.02069458	0.0001
FY97	0.106235	0.0216956	0.0001
ASTATS	-0.007495	0.01310874	0.5676
COLSTATS	0.025778	0.02397913	0.2825

R-square = 0.8634
F-statistic = 64.879
Mean Dependent Variable = 2.15866

Note: Model Includes Metropolitan Area Dummy Variables

Table 7. METROPOLITAN AREA LINEAR FIXED EFFECTS MODEL WITH NAVY RECRUITERS, ARMY RECRUITERS, DEMOGRAPHIC AND TREND VARIABLES

Variable	Parameter Estimate	Standard Error	Prob > |T|
INTERCEP	9.576806	3.02522373	0.0016
NAVYRECS	0.183963	0.04747699	0.0001
ARMYRECS	0.307981	0.04855895	0.0001
PERCAPIN	0.000090978	0.00016245	0.5755
AREA	-0.000315	0.00033787	0.3508
QMATOT	0.001001	0.00009316	0.0001
FALL	-3.3297	0.35632924	0.0001
WINTER	-1.449147	0.35583008	0.0001
SPRING	-2.745861	0.35484977	0.0001
FY96	0.412806	0.31989794	0.197
FY97	-0.311536	0.3176414	0.3268

R-square = 0.9661
F-statistic = 300.448
Mean Dependent Variable = 19.36852

Note: Model Includes Metropolitan Area Dummy Variables

Table 8. METROPOLITAN AREA LOG-LOG FIXED EFFECTS MODEL WITH NAVY RECRUITERS, ARMY RECRUITERS, DEMOGRAPHIC AND TREND VARIABLES

Variable	Parameter Estimate	Standard Error	Prob > |T|
INTERCEP	-7.46709	1.4903218	0.0001
LNNVYREC	0.204457	0.02803638	0.0001
LNARMREC	0.181307	0.03547125	0.0001
LNPERCAP	0.900654	0.15225441	0.0001
LNAREA	-0.000255	0.02634666	0.9923
LNQMATOT	0.087445	0.02652302	0.001
FALL	-0.136648	0.02414751	0.0001
WINTER	-0.044125	0.02409202	0.0671
SPRING	-0.105035	0.02410402	0.0001
FY96	0.035005	0.02116051	0.0982
FY97	0.053117	0.021376	0.013

R-square = 0.8493
F-statistic = 59.315
Mean Dependent Variable = 2.16761

Note: Model Includes Metropolitan Area Dummy Variables

Table 9. METROPOLITAN AREA LINEAR FIXED EFFECTS MODEL WITH NAVY RECRUITERS, ARMY RECRUITERS, DEMOGRAPHIC AND TREND VARIABLES

Variable	Parameter Estimate	Standard Error	Prob > |T|
INTERCEP	2.499243	3.12476258	0.4239
NAVYRECS	0.312211	0.0595932	0.0001
ARMYRECS	0.335165	0.04822859	0.0001
NSTATS	-1.45492	0.29180313	0.0001
PERCAPIN	0.000258	0.00016134	0.1092
AREA	-0.000238	0.00033435	0.4773
QMATOT	0.00119	0.00010109	0.0001
FALL	-3.339081	0.35132765	0.0001
WINTER	-1.458807	0.35086927	0.0001
SPRING	-2.744107	0.3498498	0.0001
FY96	0.331851	0.31557871	0.2931
FY97	-0.366691	0.31353223	0.2423

R-square = 0.9671
F-statistic = 307.246
Mean Dependent Variable = 19.36852

Note: Model Includes Metropolitan Area Dummy Variables

Table 10. METROPOLITAN AREA LOG-LOG FIXED EFFECTS MODEL WITH NAVY RECRUITERS, ARMY RECRUITERS, NAVY STATIONS, DEMOGRAPHIC AND TREND VARIABLES

Variable	Parameter Estimate	Standard Error	Prob > |T|
INTERCEP	-6.789949	1.45709533	0.0001
LNNVYREC	-0.014505	0.03118766	0.6419
LNARMREC	0.038964	0.03566132	0.2747
NSTATS	0.125177	0.00988557	0.0001
LNPERCAP	0.789499	0.14888315	0.0001
LNAREA	0.031134	0.0254906	0.222
LNQMATOT	0.018668	0.02598218	0.4725
FALL	-0.147427	0.02329512	0.0001
WINTER	-0.052693	0.02323764	0.0234
SPRING	-0.103546	0.02324255	0.0001
FY96	0.069534	0.02054283	0.0007
FY97	0.065405	0.02063011	0.0015

R-square = 0.8600
F-statistic = 64.142
Mean Dependent Variable = 2.16761

Note: Model Includes Metropolitan Area Dummy Variables

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