INSTITUTE FOR DEFENSE ANALYSES

Analysis of Army National Guard Non-prior Service Enlisted Accessions

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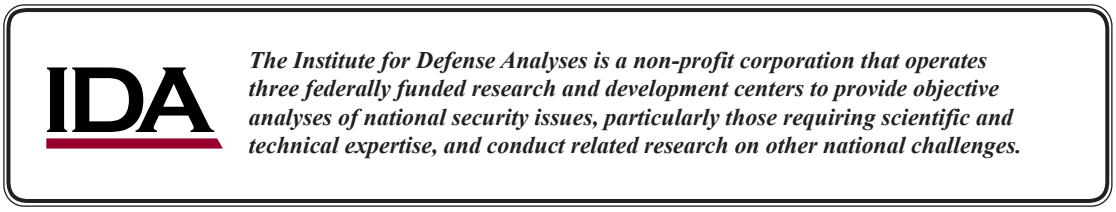

About this Publication
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Final Briefing to the Army National Guard

Susan L. Rose (Project Leader)
Lawrence Goldberg
Dennis Kimko
Maggie Li
Liam O'Farrell

September 2018

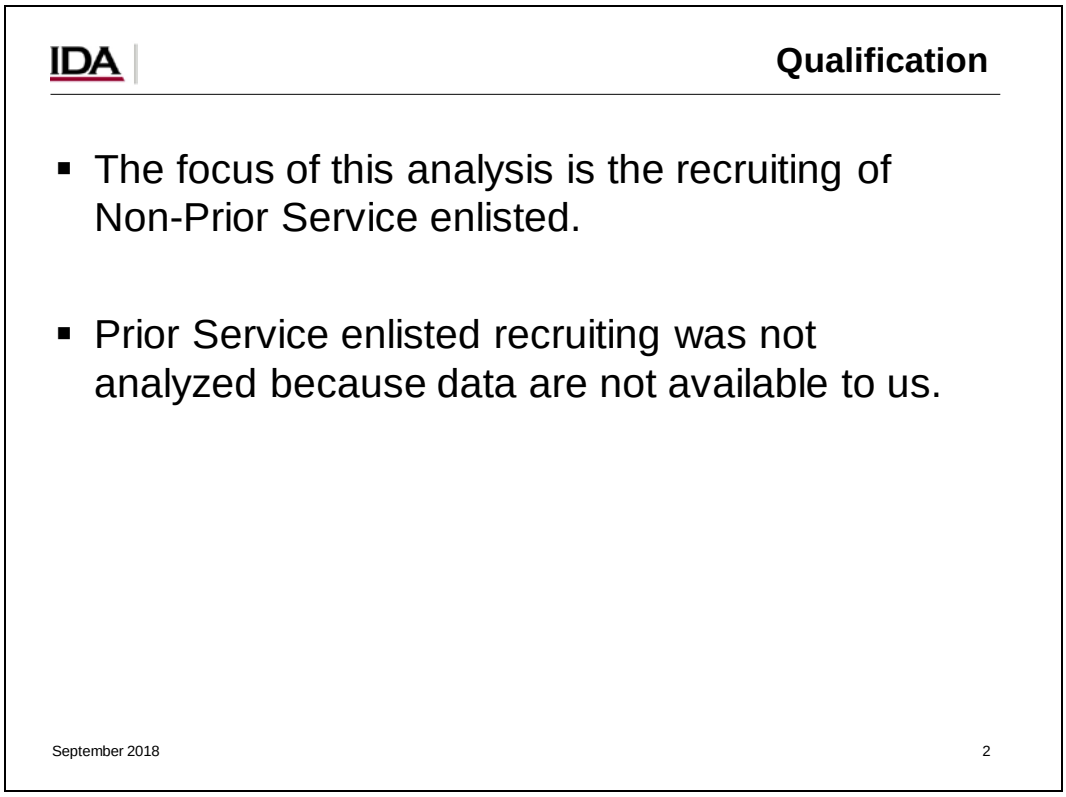
Institute for Defense Analyses
Cost Analysis and Research Division

The study team includes Susan L. Rose (Project Leader), Lawrence Goldberg (enlistment supply expert), Dennis Kimko (econometrician), Maggie Li (data processing), and Liam O'Farrell (data processing). All made important contributions.

B. Briefing Outline

The briefing is organized as follows: (1) Trends in Recruiting; (2) Problem and Objectives; (3) Enlistment Supply Theory; (4) Statistical Model; (5) Data; (6) Findings; and (7) Conclusions.

C. Trends in Recruiting



The focus of this analysis is the recruiting of Non-prior Service (NPS) enlisted. Prior Service (PS) enlisted recruiting was not analyzed because data were not available to us. In addition, we did not consider the impact of achieving end strength, or of high retention, on recruiting. Let's review trends in NPS enlisted recruiting.

IDA National Accession Goals Infrequently Achieved

	Army National Guard (ARNG) Non-Prior Service (NPS)*^			
FY	Accessions	Enlisted Missions	Percent Achieved	Shortfall
2003	29,881	33,041	90%	yes
2004	27,359	38,065	72%	yes
2005	27,647	43,425	64%	yes
2006	42,443	39,945	106%	no
2007	41,987	48,274	87%	yes
2008	45,044	44,031	102%	no
2009	39,985	50,610	79%	yes
2010	41,891	45,989	91%	yes
2011	36,204	39,564	92%	yes
2012	37,371	36,507	102%	no
2013	39,007	43,615	89%	yes
2014	38,215	40,688	94%	yes
2015	34,525	38,428	90%	yes
2016	28,964	40,787	71%	yes

* Includes the 50 states, DC, GU, PR, and VI

^ NPS enlistment records for FY 2003–2016

Large Total Shortfall

Total Mission Achieved

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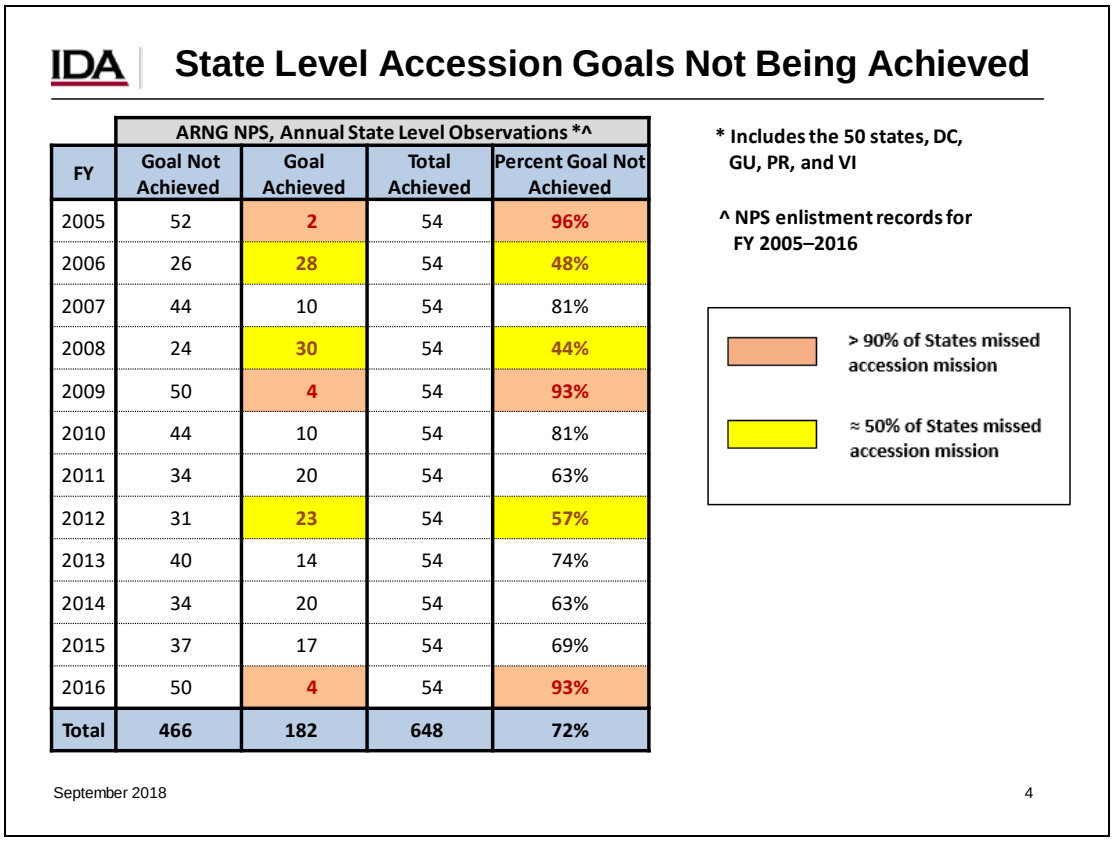
This table provides trends in accessions versus mission in FYs 2003–2016 for the total United States. Accessions fluctuated over the period: low in 2003–2005; high in 2006–2010; moderate in 2011–2015; and low again in 2016. There were shortfalls in 11 of the 14 years. The goal was achieved only in 2006, 2008, and 2012. Shortfalls were especially large in 2004, 2005, and 2016 because production was low and goals were high.



IDA State Level Accession Goals Not Being Achieved

	ARNG NPS, Annual State Level Observations *^			
FY	Goal Not Achieved	Goal Achieved	Total Achieved	Percent Goal Not Achieved
2005	52	2	54	96%
2006	26	28	54	48%
2007	44	10	54	81%
2008	24	30	54	44%
2009	50	4	54	93%
2010	44	10	54	81%
2011	34	20	54	63%
2012	31	23	54	57%
2013	40	14	54	74%
2014	34	20	54	63%
2015	37	17	54	69%
2016	50	4	54	93%
Total	**466**	**182**	**648**	**72%**

* Includes the 50 states, DC, GU, PR, and VI

^ NPS enlistment records for FY 2005–2016

> 90% of States missed accession mission

≈ 50% of States missed accession mission

The Guard also has had chronic recruiting shortfalls at the state level. In FYs 2005–2016, the goal was not achieved 72 percent of the time. In the worst recruiting years nationally (2005 and 2016) 96 and 93 percent of states/territories had shortfalls. Even in the years when the Guard made its overall goal (2006, 2008, and 2012), about half of the states missed theirs. In the other years, 75 percent of the states had shortfalls.

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Average Annual NPS Missions and Accessions (FYs 2005–2016)

States	Mission	Accessions	Shortfall	Shortfall %
MN	1,196	1,431	-236	-19.73%
IN	1,558	1,642	-84	-5.39%
WI	923	958	-35	-3.79%
GA	1,218	1,257	-39	-3.20%
IA	820	843	-23	-2.80%
OH	1,356	1,382	-26	-1.92%
IL	1,314	1,315	-1	-0.08%
MO	1,079	1,058	21	1.95%
NJ	748	733	16	2.14%
NV	364	352	11	3.02%
SC	1,069	1,030	39	3.65%
AR	974	937	37	3.80%
MS	1,073	1,022	51	4.75%
MI	1,043	993	51	4.89%
KY	883	839	44	4.98%
SD	275	260	15	5.45%
ID	313	294	19	6.07%
MA	726	681	46	6.34%
NC	1,191	1,105	86	7.22%
PA	1,892	1,752	140	7.40%
MT	332	306	26	7.83%
CT	400	367	33	8.25%
WV	458	416	42	9.17%
UT	552	499	53	9.60%
NE	379	342	37	9.76%

States	Mission	Accessions	Shortfall	Shortfall %
OK	904	800	104	11.50%
DE	156	138	18	11.54%
NH	219	193	26	11.87%
LA	1,151	1,009	142	12.34%
TN	1,272	1,093	179	14.07%
ME	247	210	37	14.98%
AL	1,415	1,182	233	16.47%
VT	260	217	44	16.92%
NY	1,411	1,167	244	17.29%
RI	226	183	43	19.03%
FL	1,199	969	231	19.27%
VA	1,072	836	236	22.01%
NM	351	273	78	22.22%
ND	345	267	78	22.61%
KS	573	443	130	22.69%
TX	2,381	1,817	564	23.69%
WY	184	140	44	23.91%
AZ	712	530	181	25.42%
OR	808	595	213	26.36%
HI	307	226	81	26.38%
CA	2,196	1,542	654	29.78%
CO	441	308	133	30.16%
AK	220	148	73	33.18%
MD	620	393	227	36.61%
WA	813	472	341	41.94%
DC	153	76	77	50.33%

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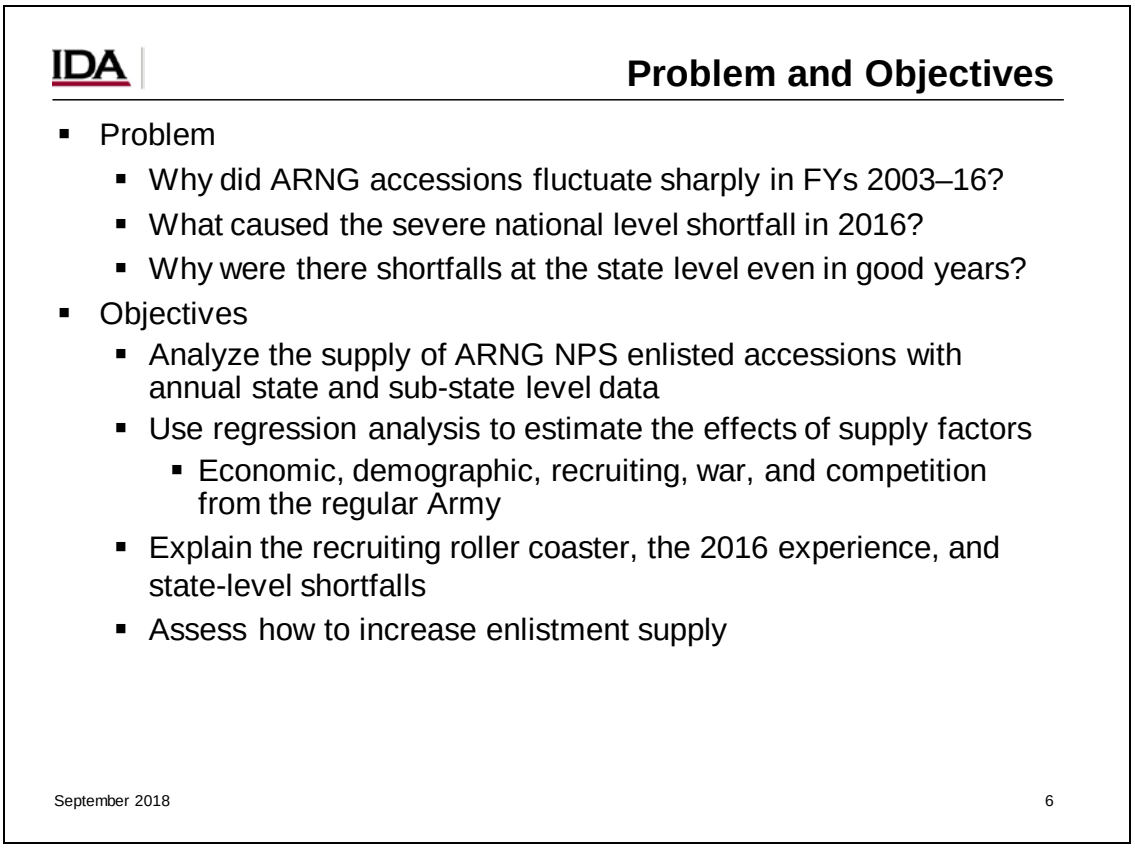
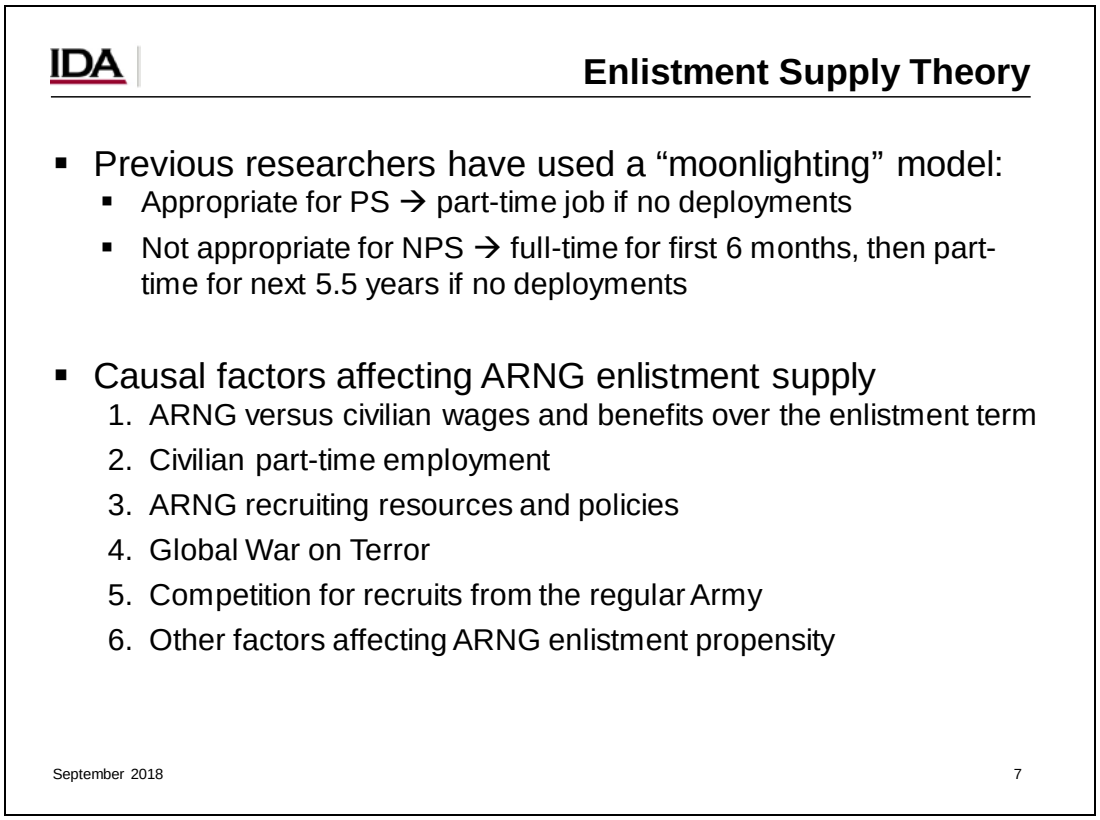
Seven states achieved their recruiting mission in FYs 2005–2016: MN, IN, GA, WI, OH, IA, and IL. The top performer was MN, which "overproduced" 236 accessions (nearly 20 percent) per year. DC was the worst performer by percentage, missing the goal by over 50 percent. The worst performer in absolute terms was CA, which had an average shortfall of 654 per year.

D. Problems and Objections



ARNG NPS enlisted accessions fluctuated sharply in FYs 2003–2016. What caused the fluctuations? What caused the severe shortfall in FY 2016? Why do so many states have shortfalls—even in good years? The ARNG has a recruiting problem nationally and at the state level. How can it be fixed? The objectives of the study are to (1) analyze the supply of ARNG NPS enlisted accessions; (2) estimate the effects of supply factors; (3) explain the recruiting roller coaster, the large shortfall in 2016, and state-level shortfalls; and (4) assess how to increase enlistment supply.

E. Enlistment Supply Theory



Previous researchers have used the "moonlighting" theory to analyze enlistment supply to the Reserves. This theory treats enlistment in the Reserves as a part-time second job. It is appropriate for PS enlistees, since they work part-time during their entire term of service (assuming no deployments). However, it is not an accurate description of military service for NPS enlistees, since they are full-time initially and then moonlighters (again assuming no deployments). We draw on moonlighting theory to identify causal factors affecting ARNG enlistment supply. These include (1) ARNG vs. civilian wages and benefits over the enlistment term, (2) civilian part-time employment, (3) ARNG recruiting resources and policies, (4) the Global War on Terror, (5) competition for recruits from the regular Army, and (6) other factors that affect ARNG enlistment propensity.

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Wide Scope of the Study

- Economic (expected effect in parentheses)
  - Part-time employment (+)
  - Relative military pay (+)
  - Youth unemployment (+)
- Recruiting Resources, Policies, and Training Centers*
  - ARNG recruiters and stations (+)
  - ARNG training centers (+)
  - Education benefits (+)
  - Enlistment bonuses (+)
  - Guard Recruiting Assistance Program (+)
- Propensity Demographics (%)
  - Asian, Black, Hispanic, and Native Americans (?)
  - College enrollees and graduates (?)
  - Rural (+)
  - TRICARE dependents of military retirees (+)
  - Veterans (+)
- War variables: deployments (-) and fatalities (-)
- Competition from the regular Army and USAR
  - Recruiters (-) and stations (-)

* Data not available for advertising, waivers, and standards

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We considered many enlistment supply factors suggested by theory and used regression analysis to estimate their effects. We include the expected effect on recruiting in parentheses. A plus (minus) sign indicates that increasing the factor (e.g., increasing the number of recruiters) increases (decreases) the number of accessions, while a question mark indicates the expected effect is unclear.

Some factors were dropped because they had no effect. Advertising, waivers, and standards were not analyzed because data were unavailable. We first discuss the regression analysis methodology and then present the results.

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Enlistment Supply Measurement: Motivation For A Switching Model

- Recruiting goal not achieved → observe enlistment supply
  - Recruiters make a maximum effort
  - Observations are "supply-limited"
- Recruiting goal achieved → do not observe enlistment supply
  - Recruiters "slow down"
  - Observe less supply & less than full effect of supply factors
  - Observations are "goal-limited"
- At the state level, goals were achieved 28% of the time in FY 2005–2016
- Goal-limited observations would yield lower, biased estimates of enlistment supply and effects of variables.

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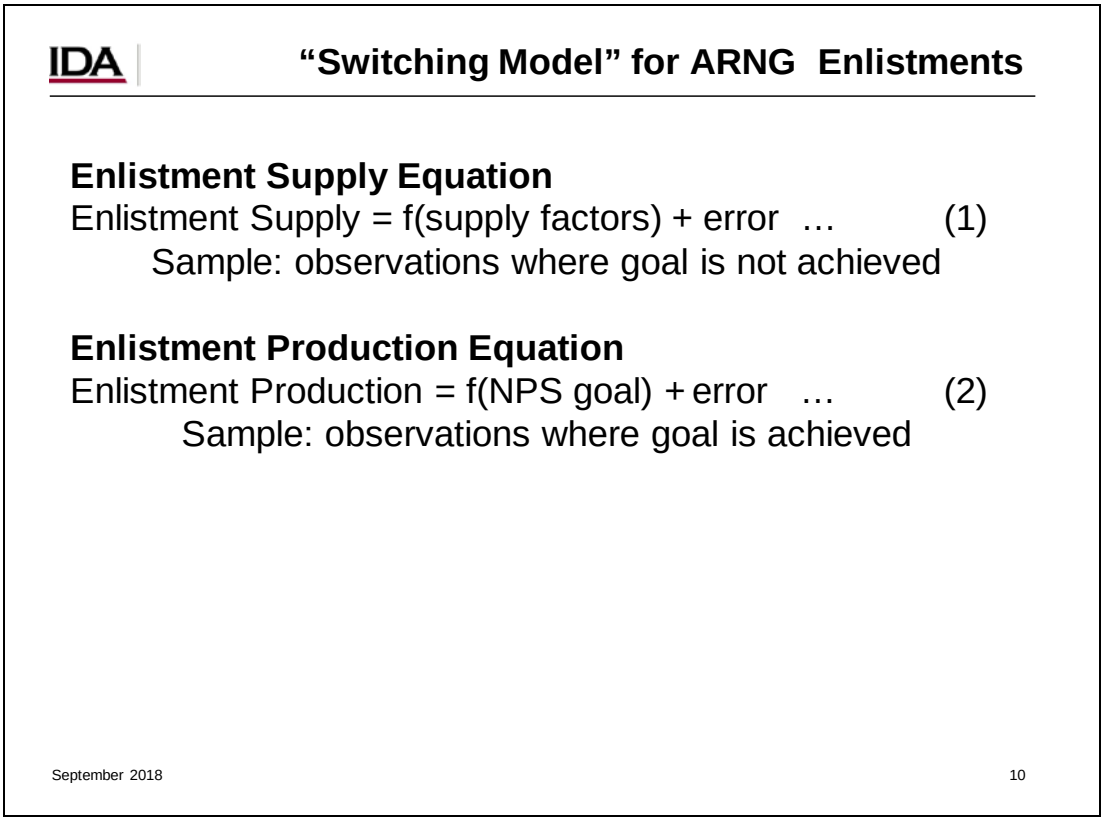
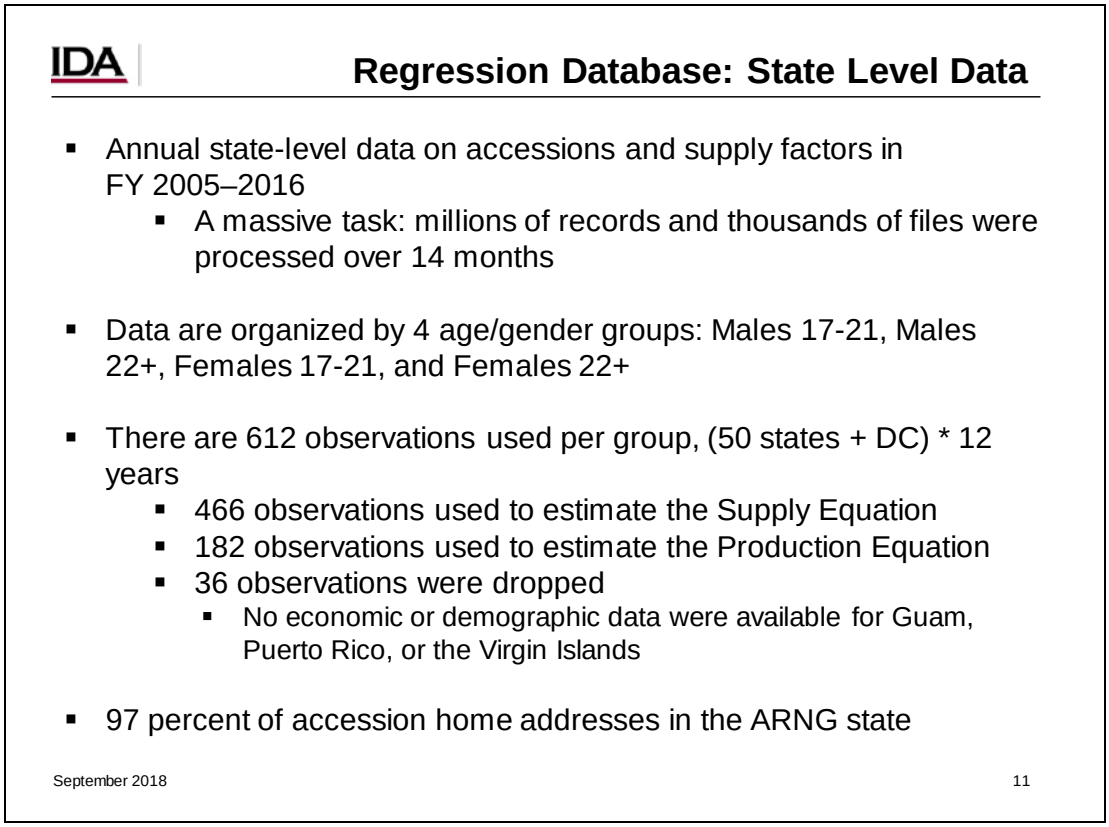
Enlistment supply is the maximum number of accessions that can be recruited, given pay, benefits, and other supply factors. We *observe* enlistment supply when the recruiting goal is not achieved; these observations are "supply limited." When goal is achieved, recruiters naturally "slow down" and we observe less than supply; observations are "goal-limited." At the state level, ARNG NPS enlistment goals were achieved 28 percent of the time in FYs 2005–2016. Using goal-limited observations would yield biased low estimates of both enlistment supply and the effects of variables.

F. Statistical Model



To deal with this issue, we use a "switching model" to analyze ARNG enlisted accessions. Equation 1 (enlistment supply) is a function of supply factors. It is estimated with observations where goal was not achieved. Equation 2 (enlistment production) is a function of the NPS enlisted recruiting goal; it is estimated with observations where goal was achieved.

G. Data



We constructed an annual state-level database for FYs 2005–2016 by age group (17–21, 22+) and gender. This was a massive task: millions of records and thousands of files were processed over 14 months. There are 648 observations in total: 466 where goal was not achieved to estimate the Supply Equation, and 182 where goal was achieved to estimate the Production Equation. Because no economic or demographic data were available for Guam, Puerto Rico, or the US Virgin Islands, those 36 observations were dropped and 612 observations were used.

Approximately 97 percent of home address zip codes at accession are in the ARNG state at accession. Therefore, it is reasonable to assume state-level supply factors affect state-level accessions. Next we discuss some key variables.

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Relative Military Pay

$$\text{Relative Military Pay} = \frac{\text{PV(Military Cash Pay)}}{\text{PV(Civilian Cash Pay)}}$$

$$= \frac{\text{f(Military Full Time, Military Part Time)}}{\text{f(Civilian Full Time, Civilian Part Time)}}$$

- Full Time = first 6 months
- Part Time = after first 6 months
- In FY16, relative military pay = 1.04
  year 1 military pay ~ $7,700; year 2 drill pay ~ $3,800
- Military Pay: DoD Pay Tables
- Civilian Pay: Civilian Population Surveys
- Assumes 14.9% discount factor (average interest rate of credit card debt)

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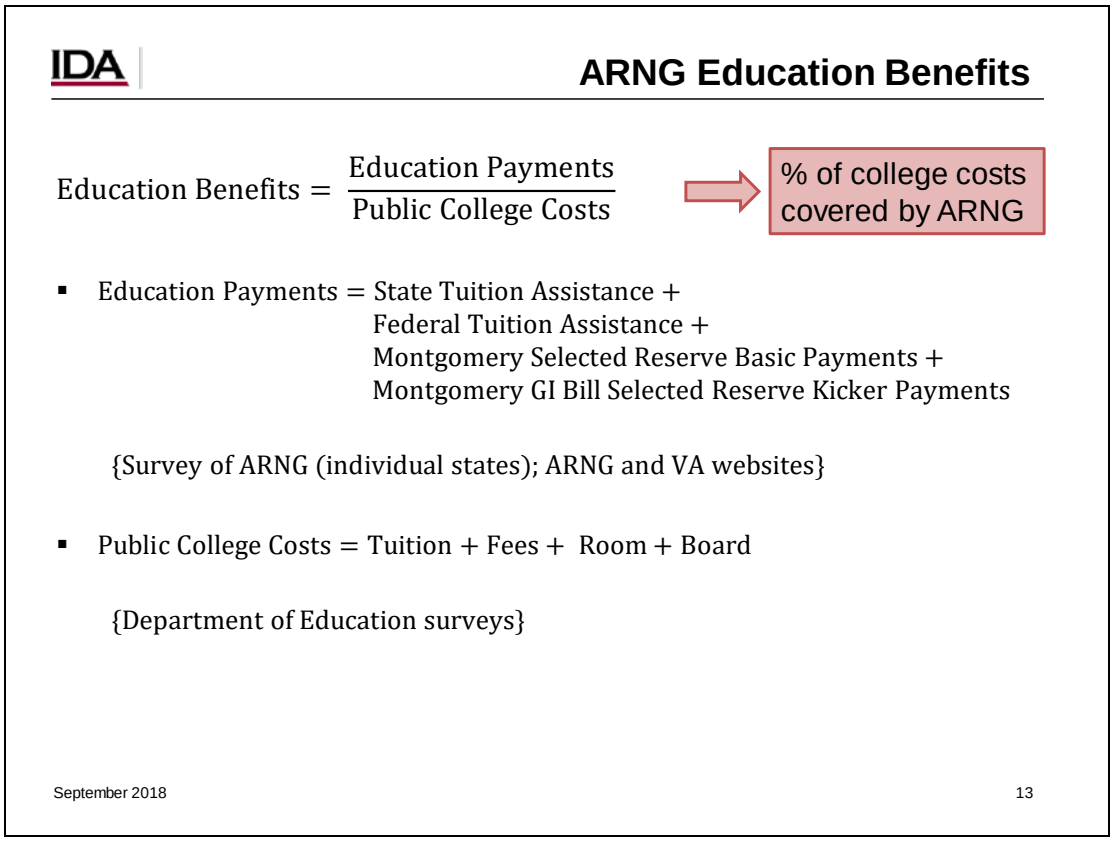
The typical ARNG NPS enlistment term is 6 years. We define relative military pay as the ratio of the present values of military and civilian cash earnings. The present values are functions of full-time wages during the initial training period (6 months), and part-time wages when the Reservist is drilling. They measure the stream of full- and part-time earnings over the entire enlistment period. In FY 2016, relative military pay was 1.04 (average among states); ARNG cash pay for a typical NPS enlistee in year 1 was $7,700; drill pay for a typical year 2 enlistee was $3,800. Military earnings are from Department of Defense (paygrade and time in grade tables). Data on civilian earnings are averages computed by IDA from monthly Current Population Surveys.



Our measure of education benefits is annual ARNG education payments divided by annual public college costs, i.e., percent of a college year's expenses covered by the program. ARNG education payments include State Tuition Assistance (STA), Federal Tuition Assistance (FTA), and Montgomery GI Bill Selected Reserve basic payments. In addition there are Montgomery GI Bill extra payments (kickers) provided if the Reservist chooses a hard-to-fill job. Public college costs include tuition, fees, room, and board. Montgomery GI Bill payments can be used for all college costs; STA and FTA may only be used for tuition and fees. Data on state tuition assistance are from the individual state ARNGs. Data on the federal benefits are from ARNG and Department of Veterans Affairs (VA) websites. Data on college costs are from a Department of Education website.

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Declining ARNG Education Benefits

FY	College Costs (Public)	ARNG Payments	Percent of Costs Covered
2005	$ 11,146	$ 8,590	77%
2006	$ 11,808	$ 9,143	77%
2007	$ 12,512	$ 9,637	77%
2008	$ 13,224	$ 9,990	76%
2009	$ 14,088	$ 9,938	71%
2010	$ 14,819	$ 9,855	67%
2011	$ 15,686	$ 10,158	65%
2012	$ 16,483	$ 10,708	65%
2013	$ 17,207	$ 11,095	64%
2014	$ 17,814	$ 11,211	63%
2015	$ 18,329	$ 11,528	63%
2016	$ 18,344	$ 11,538*	63%

* In 2016, education payments = 3 times drill pay

Public College Costs

$\$18,344 - \$11,146 = \$7,198$ Incr.

$\left|\frac{18,344 - 11,146}{11,146}\right| = 65\%$ Change

ARNG Payments

$\$11,538 - \$8,590 = \$2,948$ Incr.

$\left|\frac{11,538 - 8,590}{8,590}\right| = 34\%$ Change

Costs Covered

$63\% - 77\% = 14$ Decrease

$\left|\frac{63 - 77}{77}\right| = 18\%$ Decrease

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ARNG education payments are a great benefit. In FY 2016, the population weighted average was $11,538, i.e., 3 times the year-2 drill pay! However, this benefit is eroding. In FY 2005, ARNG payments ($8,590) covered 77 percent of college expenses ($11,146). From FY 2005 to FY 2016, college costs increased by 65 percent, but ARNG payments increased by only 34 percent. So by FY 2016, ARNG benefits covered only 63 percent of college costs (18 percent decline). Why did the benefit erode?

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Declining Coverage of College Room and Board Expenses

FY	College Costs	ARNG Payments	Costs Not Covered	Average State University Tuition	Average of FTA+STA	Tuition Not Covered	Average of Room and Board	Average of MGIB-SR+ Kicker	Room/Board Not Covered
2005	$11,146	$8,590	-$2,556	$4,964	$4,913	-$51	$6,182	$3,677	-$2,505
2006	$11,808	$9,143	-$2,664	$5,293	$5,195	-$98	$6,515	$3,949	-$2,566
2007	$12,512	$9,637	-$2,875	$5,657	$5,509	-$148	$6,855	$4,128	-$2,728
2008	$13,224	$9,990	-$3,234	$5,971	$5,786	-$185	$7,253	$4,203	-$3,049
2009	$14,088	$9,938	-$4,149	$6,350	$6,107	-$243	$7,738	$3,831	-$3,907
2010	$14,819	$9,855	-$4,964	$6,782	$6,389	-$393	$8,037	$3,466	-$4,571
2011	$15,686	$10,158	-$5,529	$7,204	$6,666	-$538	$8,483	$3,492	-$4,991
2012	$16,483	$10,708	-$5,775	$7,712	$7,049	-$663	$8,771	$3,659	-$5,112
2013	$17,207	$11,095	-$6,112	$8,114	$7,356	-$758	$9,093	$3,739	-$5,354
2014	$17,814	$11,211	-$6,604	$8,374	$7,435	-$939	$9,441	$3,776	-$5,665
2015	$18,329	$11,528	-$6,801	$8,610	$7,660	-$950	$9,719	$3,868	-$5,851
2016	$18,344	$11,538	-$6,807	$8,610	$7,761	-$848	$9,734	$3,776	-$5,958

Indicates Large Deficit

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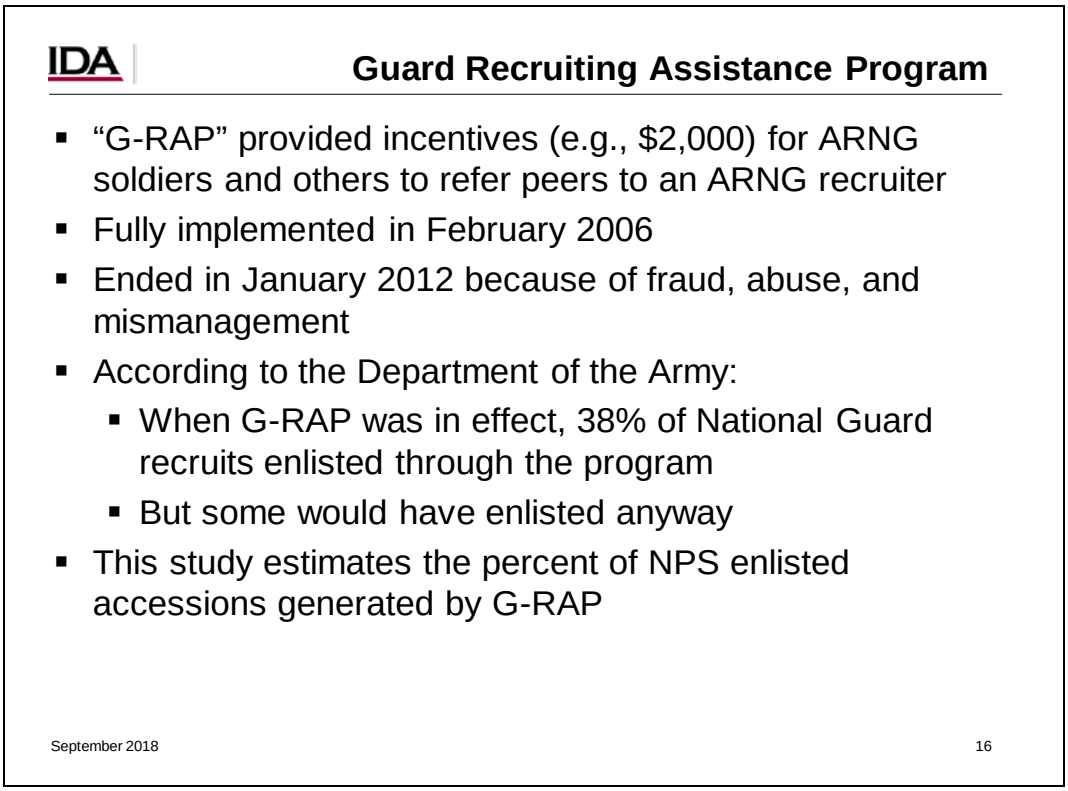
STA and FTA are keeping up more or less with college tuition. However, Montgomery Selected Reserve payments and kickers, available to cover college room and board, fell far behind the growth in these expenses.



G-RAP provided incentives (e.g., $2,000) for National Guard soldiers and others to refer peers to an ARNG recruiter. Fully implemented in February 2006, it ended in January 2012 because of fraud, abuse, and mismanagement. According to the Department of the Army, when G-RAP was in effect, 38 percent of National Guard recruits during FYs 2005–2012 enlisted through the program.[1] But some would have enlisted anyway. This study estimates the percent of NPS enlisted accessions generated by G-RAP. Data on G-RAP are from the ARNG.

[1] Subcommittee on Financial and Contracting Oversight Majority Staff, "Hearing: Fraud and Abuse in Army Recruiting Contracts," Memorandum to Members of the Subcommittee on Financial and Contracting Oversight, February 3, 2014, note 5.

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Other Supply Factors and Data Sources

- ARNG FTE recruiters and stations (ARNG)
- Bonuses = MOS weighted avg. bonuses taken (ARNG)
- Deployment rate of ARNG personnel (ARNG)
- Training Centers = # training center zip codes (ARNG)
- Youth Unemployment (BLS)
- Part-time job holders for states (CPS)
- Employment in the Leisure & Hospitality industry (CEW)
- RA and USAR FTE recruiters and stations (USAREC)
- Population by age, gender, and ethnicity (Woods & Poole)
- TRICARE dependents = 18-24 year old TRICARE dependents of military retirees (TRICARE)
- Rural population (2010 Census)
- Veteran population (ACS)

Other supply factors are listed on the slide. Data sources are given in parentheses. See Abbreviations slide at the end of the presentation. For more information on how the variables are constructed, see the slide labeled Variable Definitions (slide 58).

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Estimation

1. Two-stage least squares Heckit method (2SLS Heckit)

2. Full information maximum likelihood method (FIML)

- Estimates of both the Supply and Production equations
- Focus is on the Supply equation
- Both methods yield similar coefficient estimates, but 2SLS Heckit method has smaller standard errors

We estimated the supply and production equations using both the full information and two-stage least squares Heckit techniques, i.e., "FIML" and "2SLS (Heckit)." The supply equation is the relationship of primary interest, so we will focus on it. 2SLS (Heckit) and FIML yield similar coefficient estimates; however, 2SLS (Heckit) standard errors are much smaller, so we report those estimates. The 2SLS (Heckit) and FIML models are discussed in the backup slides (slides 35 through 57).

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Reporting and Using the Results

- We report the estimated supply factor "elasticities"

$$\frac{\%\ \text{change accessions}}{\%\ \text{change supply factor}} = \text{estimated elasticity}$$

  - Coefficient of "log " variable
  - Coefficient of "level variable" times its mean
    - For example, demographic population coefficient times mean percent

- Percentage change in accessions of 10% change in recruiters

$$\frac{\%\ \text{change accessions}}{\%\ \text{change recruiters}} = \text{estimated elasticity recruiters} = 0.5$$

$$\%\ \text{change accessions} = 0.5 * 10\ \%\ \text{change recruiters} = 5\%$$

- Change in accessions of 10% change in recruiters

= recruiter elasticity * 10% change recruiters * mean accessions
= 0.5 * 10% * mean accessions

We report estimates of supply factor "elasticities." Elasticity is a convenient measure of the impact of a variable on accessions: it is the percentage change in accessions associated with a percentage change in a supply factor. For example, if the recruiter elasticity is 0.5, a 1 percent increase in recruiters is associated with a 0.5 percent increase in accessions. Elasticities can be used to easily estimate actual and percentage changes in accessions associated with a change in a supply factor. The slide illustrates how to do this for a 10 percent change in recruiters. To facilitate a comparison of the effects of variables, 2SLS (Heckit) estimates of supply factor elasticities for all groups are presented in the next slide.

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Supply Factor Elasticities by Age Group and Gender: 2SLS (Heckit) Estimates Obtained with State-Level Data

Category	Supply Factors	Males 17-21	Males 22+	Females 17-21	Females 22+	Weighted Average
Economic	**Relative Military Pay**	2.043	1.062	2.532	1.647	**1.910**
	Youth Unemployment	0.110	0.361	0.000	0.203	0.146
	Leisure & Hospitality	0.520	0.000	0.782	0.457	**0.457**
Recruiter Resources & Training Centers	**ARNG Recruiters**	0.471	0.606	0.515	0.458	**0.504**
	Education Benefits	0.673	0.193	0.801	0.000	**0.567**
	Bonuses	0.000	0.203	0.000	0.182	0.049
	G-RAP	0.109	0.280	0.000	0.326	0.135
	Training Center Locations	0.282	0.067	0.173	0.208	0.218
Demographics	Asian Population	0.000	0.024	0.000	0.030	0.006
	Black Population	0.000	0.000	0.106	0.172	0.026
	Hispanic Population	-0.085	0.000	-0.079	0.000	-0.063
	Native American Population	0.000	0.000	0.035	0.043	0.008
	TRICARE Dependents	-0.086	-0.075	-0.184	-0.137	-0.102
War	Deployments	-0.086	-0.051	-0.099	-0.076	-0.081
Competition	Regular Army Recruiters	0.000	-0.364	0.000	-0.161	-0.079
Accession Shares	FY 2005-2016	0.588	0.197	0.166	0.048	

Indicates Important Factor

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Elasticities for each group are reported in columns 3–6; the last column is the weighted average (weights are accession shares). Factors not statistically significant with an elasticity close to zero have a "0" entry to avoid over-interpretation of negligible effects. Relative military pay, education benefits, ARNG recruiters, and part-time employment have large positive effects. Training Centers are also positively associated with an increase in enlistments but the effect is smaller. G-RAP increased accessions by 13.5 percent, i.e., elasticity of 0.135 times a 100 percent increase in the program. Recruiting is negatively affected by deployments (war) and competition from regular Army recruiters. The moonlighting theory predicts that service in the ARNG will be more attractive when civilian employment opportunities are mostly part-time. We use an industry employment proxy for high part-time employment. The Leisure & Hospitality industry has a high proportion of part-time positions and we find percentage of state employment in the industry has a large positive effect on recruiting. In previous studies, TRICARE dependents of mostly active force retirees increase active force enlistments (elasticity about 0.15). Here the effect is negative (-0.13). One theory is that dependents of active force military retirees have a preference for Active Duty and this reduces the ARNG enlistment rate. We included rural population as a variable. By itself it has positive effect; however, when relative military pay is entered in the model, the effect of rural population is statistically

insignificant and close to zero, suggesting that “rural” is a proxy for pay. We also included the veteran population percentage (ages 17–34 and 35–54) as variables. They had no effect.

IDA

Impact of Selected Factors

- Impact of 10% increase in recruiters (334)

= recruiter elasticity*10%*mean NPS Accessions

  - Impact = 0.50*0.10*36,095 = 1,804
  - Increasing recruiters by 10% (334) results in 1,804 more NPS enlisted accessions

- Impact of 10% increase in ARNG education payments ($1,057)

= ARNG Ed. Benefit elasticity*10%*mean NPS Accessions

  - Impact = 0.57*0.10*36,095 = 2,057
  - Increasing ARNG education payments by 10% ($1,057) results in 2,057 more NPS enlisted accessions

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We calculated the change in accessions associated with a 10 percent increase in recruiters and ARNG payments. Impacts are estimated at the means in FYs 2005–2016: recruiters 3,340; ARNG education payments $1,057; and NPS enlisted accessions 36,095. The impact of a 10 percent increase in recruiters (334) is calculated: recruiter elasticity (0.5)*10% increase*mean of NPS accessions (36,095). As shown above, this results in an increase of 1,804 recruits. The impact of ARNG education payments equals the elasticity the education benefits (0.57)*10% increase in education payments ($1,057)*mean of NPS recruits (36,095). As shown above, this results in an increase of 2,057 recruits.

IDA

Annual Impact of 10 Percent Increases in Pay and Youth Unemployment

- Impact of 10% increase in relative military pay

= pay elasticity*10%*mean NPS Accessions

  - Impact = 0.81*0.10*36,095 = 2,924
  - Increasing pay by 10% results in 2,924 more NPS enlisted accessions

- Impact of 10% increase in youth unemployment

= Unemployment elasticity*10%*mean NPS Accessions

  - Impact = 0.15*0.10*36,095 = 541
  - An increase in youth unemployment of 10% results in 541 more NPS enlisted accessions

We calculated the change in accessions associated with 10 percent increases in relative military pay and youth unemployment. The impact of a 10 percent increase in pay is 2,924 recruits. The impact of a 10 percent increase in youth unemployment is 541 recruits.

IDA

Regression Database: AREA-Level Data

- Annual AREA-level data on accessions and supply factors in FY 2005–2016
  - AREA stands for enlistment recruiting area, and it is defined by ARNG-assigned ZIP codes (FAZR)
  - Another massive task: millions of records and thousands of files processed over 18 months
- Data were organized by 4 age/gender groups: Males 17–21, Males 22+, Females 17–21, and Females 22+
  - Includes only AREAs in operation for the entire fiscal year
  - Each AREA has on average 9.5 counties and 9.5 FTE recruiters
  - Available for some AREAs in FY 2005–2006, and for all in FY 2007–2016
- Assumed AREA goal = State goal * AREA's share of recruiters
  - 2,500 observations used to estimate the Supply equation
  - 1,300 observations used to estimate the Production equation
- Only 79 percent of accession home addresses in ARNG AREAs

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We also constructed an annual AREA-level database for FYs 2005–2016 by age group and gender. There are about 3,800 observations per group: about 2,500 where goal was not achieved to estimate the Supply equation, and about 1,300 where goal was achieved to estimate the Production equation. AREAs have an average of 9.5 counties and 9.5 FTE recruiters.

There are two issues likely to adversely affect estimates obtained with AREA data. First, only 79 percent of home address ZIP codes at accession are in the ARNG AREA at accession. Thus, individuals in an ARNG AREA may be affected by supply factors in another AREA other than the one that was credited with the accession. Second, data are unavailable on AREA goals, a critical variable. We made a reasonable assumption: AREA goal is proportional to the AREA's share of recruiters in the state. Because of a looser connection between home address ZIP codes and AREAs and the need to impute goal data, we expect weaker relationships between AREA accessions and AREA supply factors than those obtained with state-level data.

H. Findings

IDA

Supply Factor Elasticities by Age Group and Gender: 2SLS (Heckit) Estimates Obtained with AREA-Level Data

Category	Supply Factor	Males 17-21	Males 22+	Females 17-21	Females 22+	Weighted Average
Economic	**Relative Military Pay**	1.045	0.000	1.068	0.432	**0.812**
	Youth Unemployment	0.000	0.187	0.000	0.183	0.046
	Percent Part-Time	0.510	0.247	0.403	0.000	**0.416**
	Leisure & Hospitality	0.538	0.292	0.478	0.255	**0.465**
Recruiter Resources & Training Centers	**ARNG Recruiters**	0.565	0.548	0.630	0.696	**0.578**
	ARNG Stations	0.314	0.137	0.276	0.054	**0.260**
	Education Benefits	1.069	0.537	0.933	0.278	**0.903**
	Bonuses	0.000	0.098	0.000	0.000	0.019
	G-RAP	0.000	0.189	0.000	0.193	0.046
	Training Center Locations	0.000	0.000	0.000	0.000	0.000
Demographics	Asian Population	-0.028	0.000	-0.028	0.000	-0.021
	Black Population	0.000	0.000	0.091	0.061	0.018
	Hispanic Population	-0.054	0.000	0.000	0.000	-0.032
	Native American Population	0.000	-0.012	0.000	0.000	-0.002
	TRICARE Dependents	-0.079	-0.072	-0.086	-0.005	-0.075
War	**Deployments**	-0.144	-0.076	-0.188	-0.097	**-0.136**
Competition	Regular Army Recruiters	0.000	0.000	0.000	0.000	0.000
Accession Shares	FYs 2005-16	0.588	0.197	0.166	0.048	

Indicates Important Factor

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Estimates of elasticities for all groups obtained with AREA data are given in the table. The last column is a weighted average (weights are accession shares). Factors not statistically significant with an elasticity close to zero have a "0" entry. Relative military pay, recruiters, stations, and education benefits have large positive associations with recruiting success. Compared to the state models, effects are much smaller for G-RAP (4.6 percent); zero for Training Centers and regular Army (RA) recruiters. ARNG recruiting is negatively affected by deployments (war). As predicted by moonlighting theory, the proxies for high part-time employment (Leisure & Hospitality and Percent Part-Time) have large positive effects. In previous studies, TRICARE dependents increase active force enlistments (elasticity about 0.15). Here the effect is negative (-0.075). It appears that dependents of Active Duty military retirees have a preference for Active Duty enlistment and this depresses the ARNG enlistment rate.

IDA

Trends in Accessions and Supply Factors for 17–21 Year Old NPS Males

Variables	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Accessions 17-21 Males	16643	24445	23955	25156	21747	23735	19194	21223	21779	21551	19375	16092
Relative Military Pay Males	1.02	1.02	1.02	1.02	1.03	1.06	1.07	1.09	1.1	1.09	1.07	1.04
Youth Unemployment Males (%)	16.61	15.54	15.68	18.28	24.09	26.54	25.61	24.68	23.71	20.67	17.65	15.95
Leisure & Hosp. Emp. (%)	9.65	9.66	9.78	9.89	10.05	10.14	10.24	10.38	10.54	10.67	10.76	10.91
ARNG Recruiters	3088	3880	4041	4192	3955	3543	3226	3006	2857	2836	2714	2691
Education Benefits	0.75	0.75	0.75	0.73	0.68	0.64	0.63	0.64	0.63	0.62	0.63	0.62
G-RAP (%)	0	70	100	100	100	100	100	33	0	0	0	0
NPS Bonus Males	9444	15751	19675	19817	16417	7663	3636	5397	9239	10367	11381	10738
Training Centers	2182	2104	2066	1994	1970	2023	1961	1930	1931	1930	1925	1739
Asian pop. (%)	5.45	5.45	5.46	5.49	5.54	5.58	5.63	5.69	5.75	5.82	5.9	5.97
Black Pop. (%)	13.52	13.68	13.86	14.03	14.18	14.32	14.44	14.52	14.58	14.61	14.64	14.65
Hispanic Pop. (%)	13.14	13.2	13.29	13.41	13.56	13.74	13.95	14.2	14.49	14.81	15.14	15.47
Native Amer. Pop. (%)	0.68	0.68	0.68	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.69	0.68
TRICARE Dependents (%)	5163	5277	5320	5357	5312	5300	5380	5460	5496	5591	5576	5475
Deployment Rate (%)	23.24	18.29	12.28	12.76	16.96	16.43	12.74	11.45	8.09	4.42	0.7	2.2
Regular Army Recruiters	5200	5687	5692	6269	6860	6182	6248	5755	5714	6519	6647	6896

* In 2016: Expected bonus = 2.8 times drill pay

Important observation for explaining enlistment fluctuations and the poor FY 2016 experience

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The table provides trends in male accessions and explanatory variables in FYs 2005–2016 obtained using the state data. The enlistment "roller coaster" tracks with fluctuations in supply factors of ARNG recruiters, relative pay, youth unemployment, NPS bonuses, and G-RAP. Low accessions in FY 2016 are due to a perfect storm: low relative pay, youth unemployment, low numbers of ARNG recruiters, declining education benefits, G-RAP suspended, and high numbers of RA recruiters. Over the entire period, accessions were hurt by declines in education benefits and helped by declines in deployments. NPS bonuses are increased when accessions are low and reduced when they are high. For example, bonuses were cut sharply in FY 2010, a good year. The budgeting behavior makes it difficult to measure the effects of bonuses on enlistment supply.

IDA | **ARNG NPS 17-21 Male Accession Rates and Supply Factors Ranked from High (Green) to Low (Red): Averages for States in FYs 2005-16**

State	Accession Rate	Relative Military Pay	Rec per Pop.	ARNG ED Benefit	Hispanic Pop. (%)
ND	11.34	1.08	1.75	0.86	1.33
SD	9.23	1.10	1.43	0.88	1.56
MS	8.77	1.14	1.12	0.79	1.51
AR	8.63	1.12	1.04	0.84	3.63
VT	8.15	1.02	1.77	0.60	1.26
IA	7.27	1.07	0.80	0.77	3.37
MT	7.07	1.11	1.18	0.78	2.64
WY	6.45	1.04	1.42	0.70	7.27
MN	6.21	0.96	0.64	0.82	3.34
OK	5.95	1.11	0.79	0.80	5.98
WV	5.75	1.12	0.87	0.73	0.87
SC	5.74	1.10	0.81	0.77	2.97
LA	5.68	1.10	0.89	0.81	2.88
IN	5.56	1.05	0.67	0.73	4.34
AL	5.50	1.10	0.90	0.76	2.18
KY	5.08	1.09	0.59	0.81	1.89
NE	5.02	1.08	0.76	0.77	6.36
AK	5.02	0.89	1.03	0.70	5.75
HI	4.98	1.00	0.91	0.69	9.38
ID	4.30	1.07	0.84	0.78	7.55
WI	4.18	1.03	0.52	0.85	3.89
TN	4.06	1.10	0.70	0.69	2.99
RI	3.96	0.99	0.91	0.69	12.46
MO	3.91	1.06	0.48	0.78	2.79
UT	3.88	1.01	0.74	0.80	10.75

State	Accession Rate	Relative Military Pay	Rec per Pop.	ARNG ED Benefit	Hispanic Pop. (%)
ME	3.77	1.05	0.70	0.67	1.03
DE	3.53	0.99	0.76	0.72	5.53
OR	3.53	1.00	0.65	0.58	9.10
KS	3.37	1.08	0.70	0.81	7.66
PA	3.30	1.04	0.47	0.75	4.10
NH	3.15	0.98	0.48	0.76	2.40
NC	3.13	1.07	0.40	0.73	4.53
NM	2.95	1.09	0.64	0.76	49.28
GA	2.87	1.06	0.41	0.70	4.69
NV	2.79	0.98	0.43	0.59	20.43
OH	2.73	1.06	0.36	0.72	2.54
VA	2.53	1.01	0.38	0.75	5.70
IL	2.48	1.02	0.29	0.75	11.33
CT	2.37	0.93	0.37	0.69	13.26
MA	2.16	0.94	0.36	0.73	8.74
MI	2.00	1.04	0.29	0.62	4.01
DC	1.79	0.93	0.88	0.50	7.63
WA	1.70	0.94	0.34	0.59	7.89
TX	1.69	1.07	0.26	0.75	31.57
AZ	1.67	1.00	0.32	0.61	26.77
NJ	1.61	0.96	0.31	0.69	16.88
FL	1.37	1.05	0.20	0.64	22.34
MD	1.30	0.97	0.33	0.69	5.09
CO	1.20	0.97	0.26	0.68	18.74
NY	1.11	1.01	0.22	0.62	17.56
CA	0.80	0.95	0.15	0.58	32.79
AVERAGE	**4.17**	**1.03**	**0.68**	**0.72**	**8.83**

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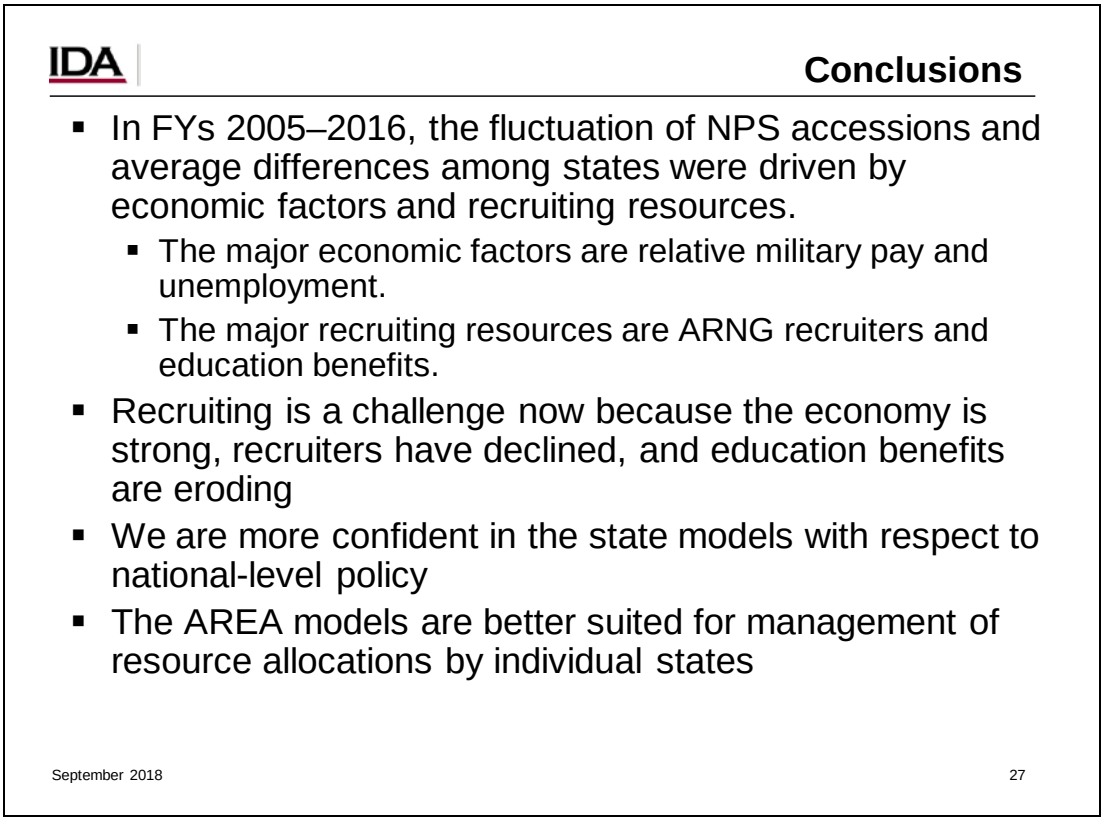
Differences in supply factors also explain differences in enlistment rates among the states and DC. For 17–21 year old males, we ranked the states by their average accession rates from high to low: the top 25 cells were shaded green; the bottom 26, red. Three of the most important supply factors are relative military pay, recruiters per capita, and ARNG education benefits. These have a positive effect on supply. We also ranked these in descending order and shaded them similarly. The Hispanic population has a negative effect, so we ranked this from low to high; lowest 25, shaded green; highest 26, shaded red. States with the highest accession rates, i.e., ND, SD, MS, and AR, have high values for relative military pay, recruiters per capita, and ARNG education benefits, and a low value for Hispanic population. It is the reverse for the states with the lowest accession rates, i.e., CA, NY, CO, and MD: low values of relative military pay, recruiters per capita, and ARNG education benefits, and a large Hispanic population (except for MD). MA has a relatively low accession rate despite the fact that the education benefit is above average and the Hispanic population is relatively low. The reason is that MA has very low recruiters per capita and very low relative military pay.

I. Conclusions



In FYs 2005–2016, the fluctuation of NPS accessions and average differences among states were largely driven by economic factors and recruiting resources. Relative military pay and unemployment are the major economic factors. ARNG recruiters and education benefits are the major recruiting resources. Recruiting is a challenge now because the economy is strong, recruiters have declined, and education benefits are eroding. We are more confident in the state models with respect to national-level policy. The AREA models are better suited for management of resource allocations by individual states.

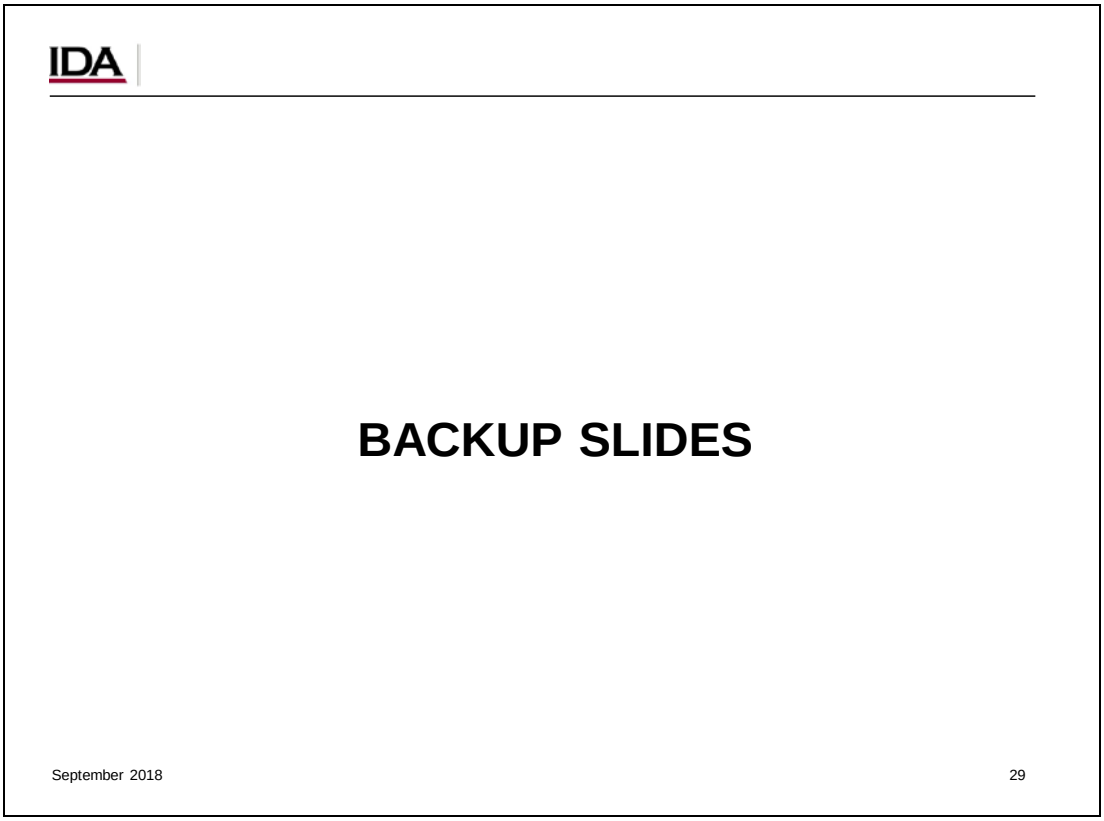
IDA

Next Steps

- What can you do now?
  - Increase recruiters
  - Increase education benefits
- How can we help you?
  - Briefings?
    - Within ARNG?
    - Outside ARNG?
  - Data?
    - State level? AREA level?
    - Enhance data retention systems
  - Strategic planning
    - Management support
    - Optimization of resource allocation, missions, etc.

How may we help you?

J. Backup Slides



The backup slides provide data and technical information on the analysis of ARNG enlistment supply.

IDA

Enlistment Supply to the Reserves: More Detail on Previous Studies

- Theory
  - Researchers typically use a "moonlighting" (second job) model
    - Key variables are full- and part-time wages; hours worked if full-time
    - Implies supply to the Reserves is a positive function of civilian part-time employment
  - Moonlighting theory OK for PS enlistments; it is a part-time job
  - Not OK for NPS; full-time for the first 6 months then part-time for 5.5 years
  - Need a "hybrid model" reflecting the full-time/part-time service of NPS Reservists
- Empirical studies (mostly RAND)
  - Not many and small samples; none using post-9/11 data
  - Researchers include economic and demographic factors; recruiters; and competition from Active and Reserves
  - Only one for the Army National Guard (Hong Tan,1991)
    - Just 130 annual observations, FYs 1985-86
    - Dependent variable enlistments; should be *enlistment rate*
    - Does not account for demand limitations
    - Statistically significant elasticities: recruiters 0.77; unemployment 0.23; relative hourly wage rates 0.52; *population -0.81*
- Need for current more refined estimates
  - With a large sample of post-9/11 data;
  - Analyze enlistment rates
  - Measure relative pay over the entire enlistment term
  - Consider more factors, e.g., war and policies

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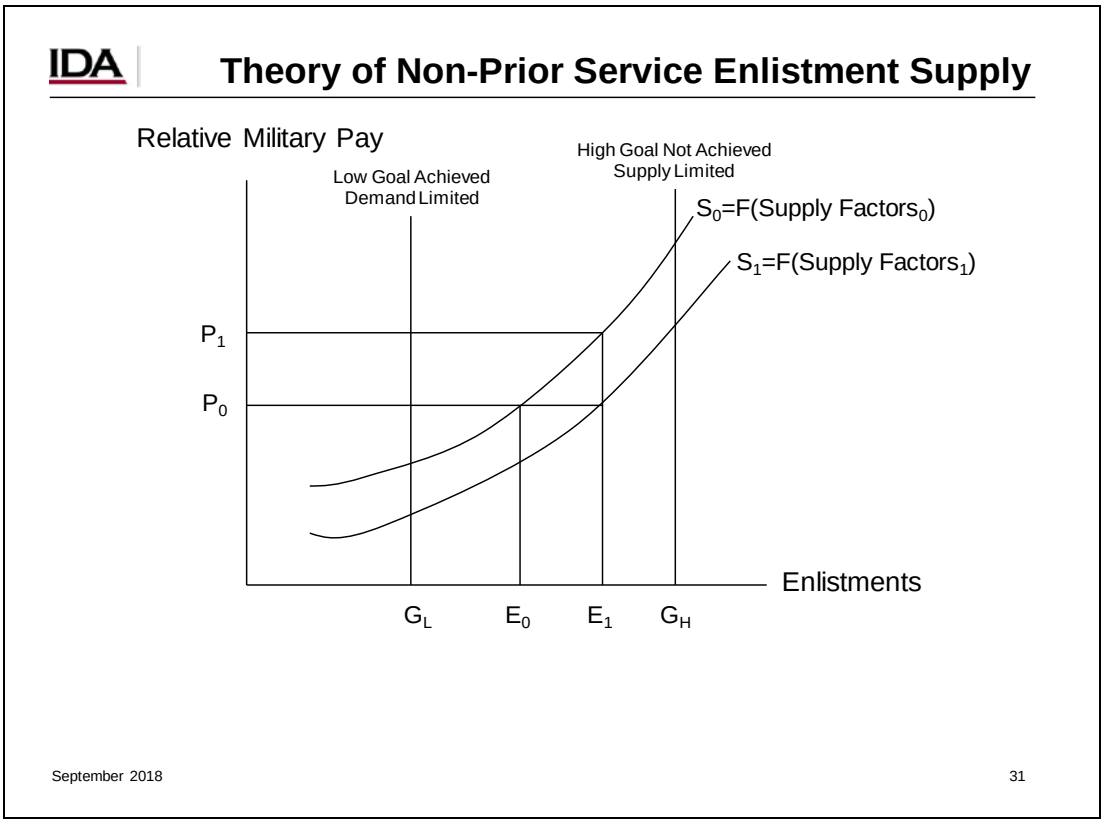
Researchers typically use a "moonlighting" model. Key variables are full- and part-time wages; and hours worked if full-time. Theory implies supply is a positive function of civilian part-time employment. Moonlighting theory is okay for PS enlistments; it is a part-time job. It is not okay for NPS, who are full-time for the first 6 months then part-time for typically 5.5 years. Need a model that reflects the full-time/part-time service of ARNG Reservists. There have been few empirical studies (mostly RAND): small samples; and none with post-9/11 data. The only ARNG study was by Hong Tan of RAND. He analyzed enlistments rather than enlistment rates. While estimates of effects are reasonable for many factors, the effect of population is implausible (-0.81 elasticity). There is a need for more refined estimates measured with a large sample of post-9/11 data.



We assume enlistment supply (S_0) is a positive function of relative benefits and recruiting resources: at pay P_0 enlistments are $E_{0;}$ at pay P_1 enlistments are E_1. An increase in a positive factor, such as recruiting resources, shifts the curve to the right to S_1; given pay P_0 enlistments are higher, E_1. To observe S_0 the goal must be greater than supply, if the goal is relatively high, e.g., at G_H, recruiters would make a maximum effort and we would observe E_0. If pay were to increase to P_1 we would observe more enlistments E_1 and we could measure the effect of the pay change. However, if pay were P_0 and the goal was low, e.g., at G_L, we would observe less than supply E_0. Recruiters would naturally "slow down," having achieved their mission. Instead of supply, we would observe enlistments somewhat above the low goal; we could not measure the effects of changes in pay or other supply factors. At the state level, ARNG enlistment goals were achieved 28 percent of the time in FYs 2005–16, so using all of the observations would yield biased low estimates of effects.

Our solution is to estimate separate models: (1) an enlistment supply equation (a function of supply factors) estimated with observations when goal is not achieved; and (2) a "production equation" estimated with observations when goal is achieved. This is called a "switching model."

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NPS Goal Not Achieved 67% of the Time in FY 2003–2016

	NPS Only, Annual State Level Observations			
FY	Supply Limited	Demand Limited	Total	Percent Supply Limited
2003	395	253	648	61%
2004	542	106	648	84%
2005	576	72	648	89%
2006	331	317	648	51%
2007	429	219	648	66%
2008	302	346	648	47%
2009	446	202	648	69%
2010	467	181	648	72%
2011	399	249	648	62%
2012	336	312	648	52%
2013	440	208	648	68%
2014	405	243	648	63%
2015	434	214	648	67%
2016	535	113	648	83%
Total	**6,037**	**3,035**	**9,072**	**67%**

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We also calculated the percent of goal achieved monthly for states. In FYs 2003–2016, goal was not achieved 67 percent of the time versus 72 percent with annual data. Qualitatively the results are similar. However, states with an annual shortfall sometimes made the mission during the year. States that made the mission sometimes had shortfalls during the year.

IDA

Percent Part-Time Employees
Youth Population (age 16–29), FY 2005–2016

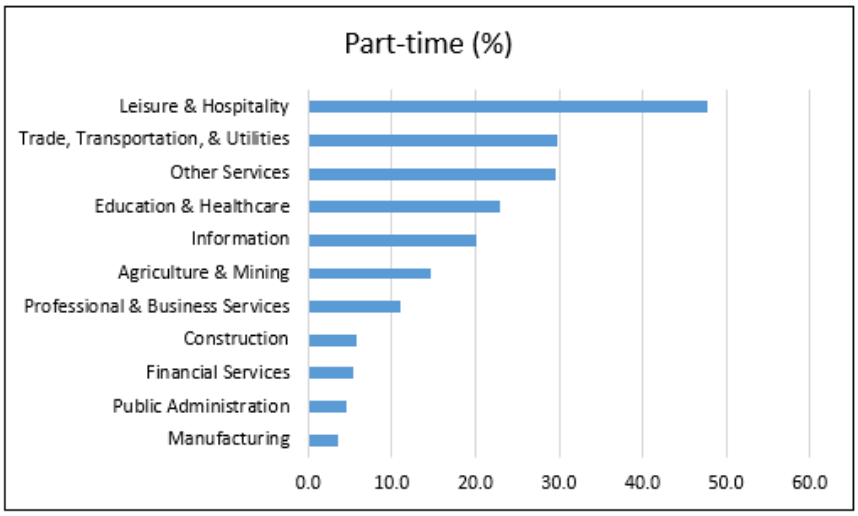
State	Part-Time (%)
AK	21.7
AL	22.2
AR	19.7
AZ	22.0
CA	25.8
CO	22.8
CT	31.1
DC	11.3
DE	21.9
FL	22.0
GA	20.0
HI	27.9
IA	30.3
ID	29.1
IL	27.1
IN	26.4
KS	26.9
KY	25.2
LA	19.7
MA	29.1
MD	22.4
ME	30.8
MI	33.4
MN	30.8
MO	24.1

State	Part-Time (%)
MS	22.0
MT	26.3
NC	21.7
ND	25.0
NE	27.3
NH	28.9
NJ	25.4
NM	27.5
NV	20.1
NY	23.6
OH	29.8
OK	19.6
OR	28.1
PA	26.8
RI	32.0
SC	23.2
SD	24.9
TN	24.9
TX	19.9
UT	28.3
VA	22.9
VT	28.5
WA	25.6
WI	31.5
WV	22.8
WY	25.2

This slide provides data on the average percent of civilian employees who work part-time.

IDA

Part-Time Employment by Industry for the Youth Population (16–29), CPS June 2016 Graph



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This chart is a bar graph of part-time employment by industry. Because Leisure & Hospitality has the highest percent of part-time employment, we used Leisure & Hospitality employment as an explanatory variable in the Supply equation.

IDA

Regression Results State Data

Two-Stage Least Squares Heckit Estimates Obtained With State-Level Data

The next four slides report the 2SLS (Heckit) estimates by group obtained with state-level data.

IDA

ARNG Enlistment Supply Model for 17-21 Year Old NPS Males: 2SLS (Heckit) Estimates Obtained with State-Level Data

Supply Equation	Coefficient	Std. Err.	z	P>z
Relative Military Pay	2.043	0.254	8.05	0
Youth Unemployment	0.006	0.004	1.58	0.115
Leisure & Hospitality Employment	0.520	0.093	5.61	0
ARNG Recruiters	0.471	0.056	8.35	0
Education Benefits	0.673	0.118	5.69	0
G-RAP	0.001	0.000	2.70	0.007
Training Center Locations	0.282	0.048	5.86	0
Hispanic Population	-0.009	0.002	-4.95	0
TRICARE Dependents	-0.138	0.029	-4.71	0
Deployments	-0.007	0.001	-5.13	0
Constant	1.929	0.258	7.48	0
Inverse Mills Ratio m_{11}	-0.336	0.057	-5.94	0
Production Equation	**Coefficient**	**Std. Err.**	**z**	**P>z**
Missions	1.097	0.029	37.50	0
Constant	-0.429	0.058	-7.39	0
Conditional Hazard Rate m_{00}	-0.192	0.031	-6.31	0

We find large statistically significant effects for relative military pay, education benefits, ARNG recruiters, and part-time employment. All variables are statistically significant except unemployment.

IDA

ARNG Enlistment Supply Model for 22+ Year Old NPS Males: 2SLS (Heckit) Estimates With State-Level Data

Supply Equation	Coefficient	Std. Err.	z	P>z
Relative Military Pay	1.062	0.265	4.01	0
Youth Unemployment	0.039	0.008	5.13	0
ARNG Recruiters	0.606	0.060	10.05	0
Education Benefits	0.193	0.120	1.60	0.109
Bonuses	0.203	0.043	4.70	0
G-RAP	0.003	0.000	6.07	0
Training Center Locations	0.067	0.052	1.28	0.200
Asian Population	0.005	0.002	2.97	0.003
TRICARE Dependents	-0.075	0.032	-2.32	0.020
Deployments	-0.004	0.001	-3.01	0.003
RA Recruiters	-0.343	0.088	-3.91	0.000
Constant	0.965	0.281	3.44	0.001
Inverse Mills Ratio m_{11}	-0.340	0.060	-5.71	0
Production Equation	**Coefficient**	**Std. Err.**	**z**	**P>z**
Missions	0.874	0.053	16.54	0
Constant	-1.342	0.085	-15.77	0
Conditional Hazard Rate m_{00}	-0.113	0.060	-1.90	0.058

We find large statistically significant effects for relative military pay, unemployment, and ARNG recruiters.

IDA

ARNG Enlistment Supply Model for 17-21 Year Old NPS Females: 2SLS (Heckit) Estimates Obtained With State-Level Data

Supply Equation	Coefficient	Std. Err.	z	P>z
Relative Military Pay	2.532	0.286	8.84	0
Leisure & Hospitality Employment	0.782	0.103	7.58	0
ARNG Recruiters	0.515	0.058	8.91	0
Education Benefits	0.801	0.120	6.67	0
Training Center Locations	0.173	0.056	3.06	0.002
Black Population	0.008	0.001	5.70	0
Hispanic Population	-0.009	0.002	-3.84	0
Native American Population	0.023	0.007	3.25	0.001
TRICARE Dependents	-0.184	0.035	-5.25	0
Deployments	-0.008	0.001	-5.71	0
Constant	-0.006	0.282	-0.02	0.984
Inverse Mills Ratio m_{11}	-0.364	0.062	-5.89	0
Production Equation	**Coefficient**	**Std. Err.**	**z**	**P>z**
Missions	1.015	0.043	23.74	0
Constant	-1.651	0.083	-19.87	0
Conditional Hazard Rate m_{00}	-0.142	0.047	-3.00	0.003

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We find large statistically significant effects for relative military pay, education benefits, ARNG recruiters, and part-time employment. All variables are statistically significant.

IDA

ARNG Enlistment Supply for 22+ Year Old NPS Females: 2SLS (Heckit) Estimates Obtained With State-Level Data

Supply Equation	Coefficient	Std. Err.	z	P>z
Relative Military Pay	1.647	0.364	4.53	0
Youth Unemployment	0.026	0.014	1.91	0.056
Leisure & Hospitality Employment	0.457	0.124	3.69	0
ARNG Recruiters	0.458	0.081	5.67	0
Bonuses	0.182	0.054	3.37	0.001
G-RAP	0.003	0.001	5.79	0
Training Center Locations	0.208	0.072	2.91	0.004
Asian Population	0.006	0.002	2.80	0.005
Black Population	0.014	0.002	7.52	0
Native American Population	0.028	0.008	3.56	0
TRICARE Dependents	-0.137	0.045	-3.01	0.003
Deployments	-0.006	0.002	-3.62	0
RA Recruiters	-0.161	0.113	-1.42	0.155
Constant	-1.275	0.428	-2.98	0.003
Inverse Mills Ratio m_{11}	-0.380	0.075	-5.10	0
Production Equation	**Coefficient**	**Std. Err.**	**z**	**P>z**
Missions	0.835	0.055	15.21	0
Constant	-2.735	0.087	-31.46	0
Conditional Hazard Rate m_{00}	-0.118	0.062	-1.91	0.056

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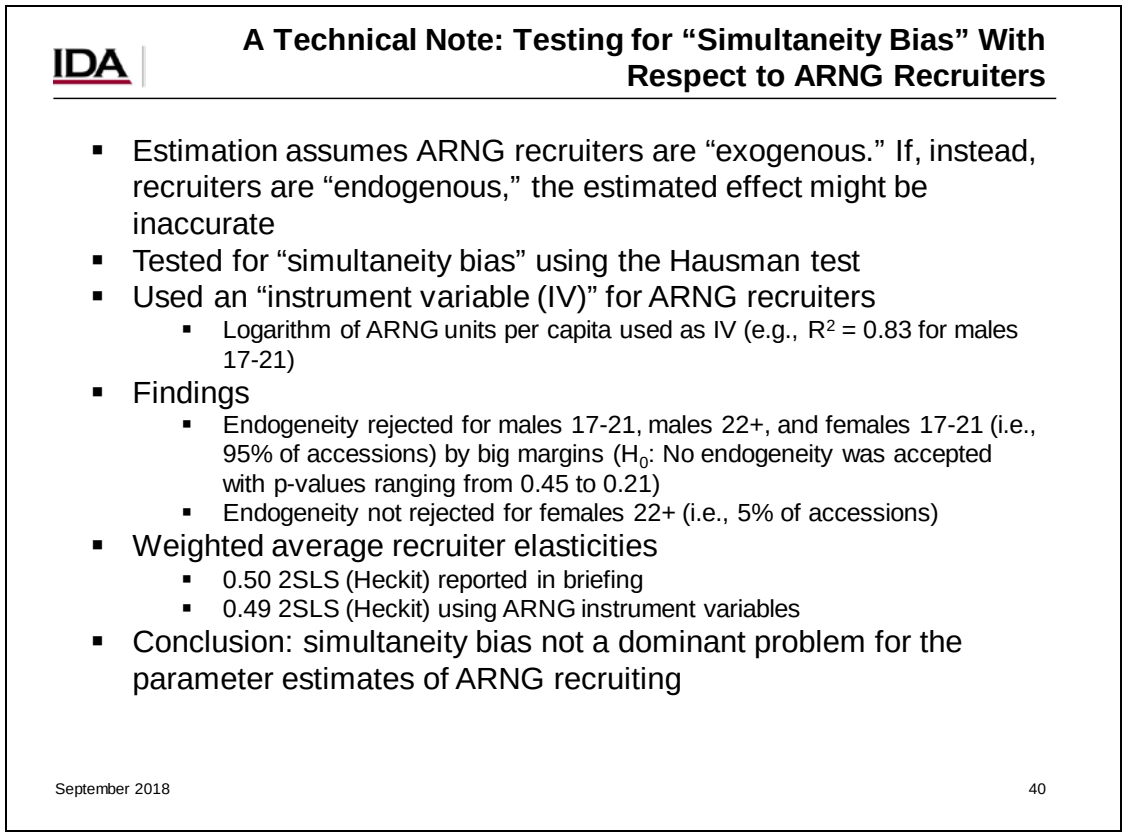
We find large statistically significant effects for relative military pay, education benefits, ARNG recruiters, and part-time employment. All variables are statistically significant except regular Army recruiters (youth unemployment is significant at the 10 percent level).



Estimation assumes ARNG recruiters are "exogenous." If, instead, recruiters are "endogenous," the estimated effect might be inaccurate because of "simultaneity bias." What might cause endogeneity? Recruiters may be allocated to states that have had greater enlistment success in the past. This would bias the recruiter effect upwards. Conversely, during years when accessions are plentiful, recruiting budgets may be cut. This would bias the recruiter effect downwards. We tested for "simultaneity bias" with state-level data using the Hausman test. We used an "instrument variable (IV)" for ARNG recruiters: logarithm of ARNG units per capita. Simultaneity bias (endogeneity) is rejected for males 17–21, males 22+, and females 17–21 (i.e., 95 percent of accessions) by a large margin. However, endogeneity is not rejected for females 22+ (i.e., 5 percent of accessions). The weighted average recruiter elasticity reported in the briefing obtained with state-level data is 0.50. The estimate obtained using ARNG instrument variables is 0.49, i.e., virtually the same. We conclude that simultaneity bias is not a dominant or significant problem that could invalidate the parameter estimates of ARNG recruiting models presented in the briefing.

IDA

Regression Results AREA Data

Two-Stage Least Squares Heckit Estimates Obtained With AREA-Level Data

The next four slides report the 2SLS (Heckit) estimates by group obtained with AREA-level data.

IDA

ARNG Enlistment Supply Model for 17-21 Year Old NPS Males: 2SLS (Heckit) Model Estimated with AREA-Level Data

Supply Equation	Coefficient	Std. Err.	z	P>z
Relative Military Pay	1.045	0.271	3.86	0
ARNG Recruiters	0.565	0.055	10.27	0
ARNG Stations	0.314	0.049	6.41	0
Education Benefits	1.069	0.127	8.39	0
Part-Time Employment (State)	0.510	0.099	5.15	0
Leisure & Hospitality Employment	0.538	0.101	5.33	0
Asian Population	-0.008	0.003	-2.72	0.006
Hispanic Population	-0.004	0.001	-3.20	0.001
TRICARE Dependents	-0.079	0.022	-3.59	0
Deployments	-0.012	0.002	-7.65	0
Constant	-0.243	0.371	-0.65	0.513
Inverse Mills Ratio m_{11}	-0.777	0.091	-8.52	0
Production Equation	**Coefficient**	**Std. Err.**	**z**	**P>z**
Missions	1.057	0.013	84.05	0
Constant	-0.113	0.033	-3.41	0.001
Conditional Hazard Rate m_{00}	-0.273	0.024	-11.19	0

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As with the state data, we find large statistically significant effects for relative military pay, education benefits, ARNG recruiters, and part-time employment. Unlike the state models, with AREA data, ARNG stations are highly significant and have a large effect.

IDA

ARNG Enlistment Supply for 22+ Year Old NPS Males: 2SLS (Heckit) Model Estimated With AREA-Level Data

Supply Equation	Coefficient	Std. Err.	z	P>z
Youth Unemployment	0.019	0.007	2.85	0.004
Part-Time Employment (State)	0.247	0.091	2.71	0.007
Leisure & Hospitality Employment	0.292	0.090	3.25	0.001
ARNG Recruiters	0.548	0.048	11.32	0
ARNG Stations	0.137	0.044	3.14	0.002
Education Benefits	0.537	0.119	4.50	0
Bonuses	0.098	0.035	2.77	0.006
G-RAP	0.002	0.000	4.52	0
Native American Population	-0.008	0.004	-2.08	0.038
TRICARE Dependents	-0.072	0.020	-3.63	0
Deployments	-0.006	0.002	-4.26	0
Constant	-0.695	0.342	-2.03	0.042
Inverse Mills Ratio m_{11}	-0.570	0.086	-6.66	0
Production Equation	**Coefficient**	**Std. Err.**	**z**	**P>z**
Missions	0.806	0.022	36.78	0
Constant	-0.900	0.052	-17.42	0
Conditional Hazard Rate m_{00}	-0.302	0.042	-7.12	0

IDA

ARNG Enlistment Supply for 17-21 Year Old NPS Females: 2SLS (Heckit) Model Estimated With AREA-Level Data

Supply Equation	Coefficient	Std. Err.	z	P>z
Relative Military Pay	1.068	0.286	3.73	0
Part-Time Employment (State)	0.403	0.109	3.70	0
Leisure & Hospitality Employment	0.478	0.106	4.50	0
ARNG Recruiters	0.630	0.055	11.38	0
ARNG Stations	0.276	0.051	5.42	0
Education Benefits	0.933	0.132	7.09	0
Asian Population	-0.008	0.003	-2.55	0.011
Black Population	0.007	0.001	4.93	0
TRICARE Dependents	-0.086	0.024	-3.59	0
Deployments	-0.016	0.002	-9.69	0
Constant	-1.246	0.416	-2.99	0.003
Inverse Mills Ratio m_{11}	-0.820	0.091	-9.05	0
Production Equation	**Coefficient**	**Std. Err.**	**z**	**P>z**
Missions	0.948	0.020	47.79	0
Constant	-1.471	0.052	-28.50	0
Conditional Hazard Rate m_{00}	-0.061	0.040	-1.54	0.123

IDA

ARNG Enlistment Supply for 22+ Year Old NPS Females: 2SLS (Heckit) Model Estimated With AREA-Level Data

Supply Equation	Coefficient	Std. Err.	z	P>z
Relative Military Pay	0.432	0.247	1.75	0.080
Youth Unemployment	0.022	0.009	2.55	0.011
Leisure & Hospitality Employment	0.255	0.096	2.67	0.008
ARNG Recruiters	0.696	0.050	13.83	0
ARNG Stations	0.054	0.046	1.17	0.241
Education Benefits	0.278	0.120	2.32	0.020
G-RAP	0.002	0.000	4.53	0
Black Population	0.004	0.001	3.83	0
TRICARE Dependents	-0.005	0.022	-0.25	0.804
Deployments	-0.008	0.002	-5.10	0
Constant	-1.498	0.210	-7.14	0
Inverse Mills Ratio m_{11}	-0.608	0.084	-7.22	0
Production Equation	**Coefficient**	**Std. Err.**	**z**	**P>z**
Missions	0.768	0.028	27.35	0
Constant	-2.685	0.068	-39.42	0
Conditional Hazard Rate m_{00}	0.025	0.057	0.44	0.663

Full Information Maximum Likelihood Estimates Obtained With State-Level Data

IDA

ARNG Enlistment Supply Model for 17-21 Year Old NPS Males: FIML Estimates Obtained with State-Level Data

Supply Equation	Coefficient	Std. Err.	z
Relative Military Pay	1.907	0.256	7.45
Youth Unemployment	0.005	0.002	2.16
Leisure & Hospitality Employment	0.463	0.120	3.86
ARNG Recruiters	0.470	0.107	4.38
Education Benefits	0.624	0.171	3.65
G-RAP	0.001	0.000	1.94
Training Center Locations	0.280	0.069	4.03
Hispanic Population	-0.009	0.004	-2.50
TRICARE Dependents	-0.139	0.088	-1.59
Deployments	-0.006	0.001	-5.74
Constant	2.018	0.725	2.78
Production Equation	**Coefficient**	**Std. Err.**	**z**
Missions	1.096	0.099	11.10
Constant	-0.435	0.120	-3.63

We find large statistically significant effects for relative military pay, ARNG recruiters, and education benefits. All variables are statistically significant except TRICARE dependents.

IDA

ARNG Enlistment Supply for 22+ Year Old NPS Males: FIML Estimates Obtained With State-Level Data

Supply Equation	Coefficient	Std. Err.	z
Relative Military Pay	0.726	0.306	2.37
Youth Unemployment	0.041	0.005	7.54
ARNG Recruiters	0.612	0.102	6.00
Education Benefits	0.113	0.155	0.73
Bonuses	0.211	0.046	4.62
G-RAP	0.003	0.001	4.76
Training Center Locations	0.062	0.086	0.73
Asian Population	0.005	0.001	3.81
TRICARE Dependents	-0.042	0.046	-0.91
Deployments	-0.004	0.002	-2.16
RA Recruiters	-0.364	0.132	-2.76
Constant	0.613	0.381	1.61
Production Equation	**Coefficient**	**Std. Err.**	**z**
Missions	0.905	0.122	7.44
Constant	-1.241	0.205	-6.05

IDA

ARNG Enlistment Supply for 17-21 Year Old NPS Females: FIML Estimates Obtained With State-Level Data

Supply Equation	Coefficient	Std. Err.	z
Relative Military Pay	2.497	0.428	5.83
Leisure & Hospitality Employment	0.890	0.372	2.39
ARNG Recruiters	0.486	0.134	3.62
Education Benefits	0.858	0.328	2.61
Training Center Locations	0.184	0.090	2.04
Black Population	0.009	0.003	3.12
Hispanic Population	-0.010	0.006	-1.75
Native American Population	0.026	0.011	2.43
TRICARE Dependents	-0.199	0.107	-1.85
Deployments	-0.009	0.003	-3.04
Constant	-0.126	0.611	-0.21
Production Equation	**Coefficient**	**Std. Err.**	**z**
Missions	1.070	0.242	4.42
Constant	-1.652	0.148	-11.19

IDA

ARNG Enlistment Supply for 22+ Year Old NPS Females: FIML Estimates Obtained With State-Level Data

Supply Equation	Coefficient	Std. Err.	z
Relative Military Pay	1.507	0.422	3.57
Youth Unemployment	0.029	0.012	2.53
Leisure & Hospitality Employment	0.463	0.112	4.12
ARNG Recruiters	0.440	0.123	3.57
Bonuses	0.196	0.062	3.16
G-RAP	0.003	0.001	4.53
Training Center Locations	0.234	0.128	1.83
Asian Population	0.007	0.002	3.81
Black Population	0.014	0.004	3.94
Native American Population	0.028	0.011	2.69
TRICARE Dependents	-0.141	0.096	-1.46
Deployments	-0.007	0.002	-3.13
RA Recruiters	-0.185	0.165	-1.12
Constant	-1.254	0.877	-1.43
Production Equation	**Coefficient**	**Std. Err.**	**z**
Missions	0.861	0.094	9.12
Constant	-2.662	0.171	-15.60

IDA

Supply Factor Elasticities by Age Group and Gender: FIML Estimates with State-Level Data

Category	Supply Factor	Males 17-21	Males 22+	Females 17-21	Females 22+	Weighted Average
Economic	**Relative Military Pay**	1.907	0.726	2.497	1.507	**1.751**
	Youth Unemployment	0.097	0.376	0.000	0.227	0.142
	Leisure & Hospitality	0.463	0.000	0.890	0.463	**0.442**
Recruiter Resources & Training Centers	**ARNG Recruiters**	0.470	0.612	0.486	0.440	**0.499**
	Education Benefits	0.624	0.113	0.858	0.000	**0.531**
	Bonuses	0.000	0.211	0.000	0.196	0.051
	G-RAP	0.080	0.272	0.000	0.327	0.116
	Training Center Locations	0.280	0.062	0.184	0.234	0.219
Demographics	Asian Population	0.000	0.023	0.000	0.034	0.006
	Black Population	0.000	0.000	0.115	0.183	0.028
	Hispanic Population	-0.083	0.000	-0.087	0.000	-0.063
	Native American Population	0.000	0.000	0.039	0.042	0.009
	TRICARE Dependents	-0.139	-0.042	-0.199	-0.141	-0.130
War	Deployments	-0.072	-0.042	-0.106	-0.079	-0.072
Competition	Regular Army Recruiters	0.000	-0.364	0.000	-0.185	-0.081
Accession Shares	FYs 2005-2016	0.588	0.197	0.166	0.048	

Indicates Important Factor

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Estimates of elasticities for all groups are given in the table. The last column is a weighted average (weights are accession shares). Factors not statistically significant with an elasticity close to zero have a "0" entry to avoid over-interpretation of negligible effects. The economy, recruiters, and education benefits have large positive effects associated with recruiting success. Accessions are also increased by G-RAP (11.6 percent) and Training Centers (21.9 percent). ARNG recruiting is negatively affected by deployments (war) and competition from regular Army recruiters. As predicted by moonlighting theory, the industry employment proxy for high part-time employment (Leisure & Hospitality) has a large positive effect. In previous studies, TRICARE dependents increase active force enlistments (elasticity about 0.15). Here the effect is negative (-0.13). It appears that dependents of military retirees have a preference for Active Duty enlistment and this reduces the ARNG enlistment rate.

Full Information Maximum Likelihood Estimates Obtained With AREA-Level Data

IDA

ARNG Enlistment Supply Model for 17-21 Year Old NPS Males: FIML Model Estimated with AREA-Level Data

Supply Equation	Coefficient	Std. Err.	z
Relative Military Pay	1.102	1.005	1.10
ARNG Recruiters	0.511	0.435	1.17
ARNG Stations	0.364	0.473	0.77
Education Benefits	1.161	0.963	1.21
Part-Time Employment (State)	0.584	0.228	2.56
Leisure & Hospitality Employment	0.509	0.403	1.26
Asian Population	-0.008	0.003	-2.84
Hispanic Population	-0.005	0.005	-1.00
TRICARE Dependents	-0.080	0.061	-1.30
Deployments	-0.010	0.004	-2.68
Constant	-0.343	2.249	-0.15
Production Equation	**Coefficient**	**Std. Err.**	**z**
Missions	1.041	0.044	23.86
Constant	-0.158	0.151	-1.05

We find large statistically significant effects for relative pay, ARNG recruiters and education benefits. Only Part-Time employment, Asian population, and Deployments are statistically significant.

IDA

ARNG Enlistment Supply for 22+ Year Old NPS Males: FIML Model Estimated With AREA-Level Data

Supply Equation	Coefficient	Std. Err.	z
Youth Unemployment	0.022	0.013	1.71
Part-Time Employment (State)	0.298	0.259	1.15
Leisure & Hospitality Employment	0.275	0.191	1.44
ARNG Recruiters	0.566	0.128	4.44
ARNG Stations	0.134	0.079	1.70
Education Benefits	0.519	0.390	1.33
Bonuses	0.129	0.048	2.68
G-RAP	0.003	0.002	1.93
Native American Population	-0.013	0.017	-0.75
TRICARE Dependents	-0.064	0.051	-1.26
Deployments	-0.005	0.003	-1.67
Constant	-0.745	0.767	-0.97
Production Equation	**Coefficient**	**Std. Err.**	**z**
Missions	0.816	0.062	13.17
Constant	-0.687	0.410	-1.68

IDA

ARNG Enlistment Supply for 17-21 Year Old NPS Females: FIML Model Estimated With AREA-Level Data

Supply Equation	Coefficient	Std. Err.	z
Relative Military Pay	1.184	0.768	1.54
Part-Time Employment (State)	0.453	0.278	1.63
Leisure & Hospitality Employment	0.596	0.310	1.92
ARNG Recruiters	0.614	0.105	5.85
ARNG Stations	0.281	0.100	2.82
Education Benefits	1.092	0.453	2.41
Asian Population	-0.006	0.004	-1.66
Black Population	0.011	0.005	2.45
TRICARE Dependents	-0.089	0.071	-1.26
Deployments	-0.015	0.003	-5.58
Constant	-1.620	0.959	-1.69
Production Equation	**Coefficient**	**Std. Err.**	**z**
Missions	0.967	0.042	22.99
Constant	-1.107	0.415	-2.67

IDA

ARNG Enlistment Supply for 22+ Year Old NPS Females: FIML Model Estimated With AREA-Level Data

Supply Equation	Coefficient	Std. Err.	z
Relative Military Pay	0.502	0.494	1.02
Youth Unemployment	0.023	0.011	2.12
Leisure & Hospitality Employment	0.302	0.180	1.68
ARNG Recruiters	0.671	0.096	6.96
ARNG Stations	0.089	0.103	0.86
Education Benefits	0.369	0.310	1.19
G-RAP	0.002	0.001	2.40
Black Population	0.004	0.003	1.58
TRICARE Dependents	-0.024	0.059	-0.41
Deployments	-0.009	0.003	-3.16
Constant	-1.425	0.390	-3.65
Production Equation	**Coefficient**	**Std. Err.**	**z**
Missions	0.769	0.051	15.09
Constant	-2.724	0.168	-16.18

IDA

Supply Factor Elasticities by Age Group and Gender: FIML Estimates with AREA-Level Data

Category	Supply Factor	Males 17-21	Males 22+	Females 17-21	Females 22+	Weighted Average
Economic	**Relative Military Pay**	1.102	0.000	1.184	0.502	**0.869**
	Youth Unemployment	0.000	0.212	0.000	0.223	0.052
	Percent Part-Time	0.584	0.298	0.453	0.000	**0.477**
	Leisure & Hospitality	0.509	0.275	0.596	0.302	**0.467**
Recruiter Resources and Training Centers	**ARNG Recruiters**	0.511	0.566	0.614	0.671	**0.546**
	ARNG Stations	0.364	0.134	0.281	0.089	**0.291**
	Education Benefits	1.161	0.519	1.092	0.369	**0.984**
	Bonuses	0.000	0.129	0.000	0.000	0.025
	G-RAP	0.000	0.342	0.000	0.220	0.078
	Training Center Locations	0.000	0.000	0.000	0.000	0.000
Demographics	Asian Population	-0.028	0.000	-0.023	0.000	-0.020
	Black population	0.000	0.000	0.151	0.055	0.028
	Hispanic Population	-0.062	0.000	0.000	0.000	-0.037
	Native American population	0.000	-0.019	0.000	0.000	-0.004
	TRICARE Dependents	-0.080	-0.064	-0.089	-0.024	-0.075
War	Deployments	-0.120	-0.060	-0.182	-0.102	-0.117
Competition	Regular Army Recruiters	0.000	0.000	0.000	0.000	0.000
Accession Shares	FYs 2005-16	0.588	0.197	0.166	0.048	

Indicates Important Factor

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Estimates of elasticities for all groups are given in the table. The last column is a weighted average (weights are accession shares). Factors not statistically significant with an elasticity close to zero were dropped ("0"). Relative military pay, recruiters, stations, and education benefits have large positive effects associated with recruiting success. G-RAP increases older accessions. ARNG recruiting is negatively affected by deployments (war) and TRICARE dependents. As predicted by moonlighting theory, part-time employment increases ARNG enlistments. Unlike with state data, with AREA-level data we find no effect of Training Centers or competition from the regular Army.

IDA

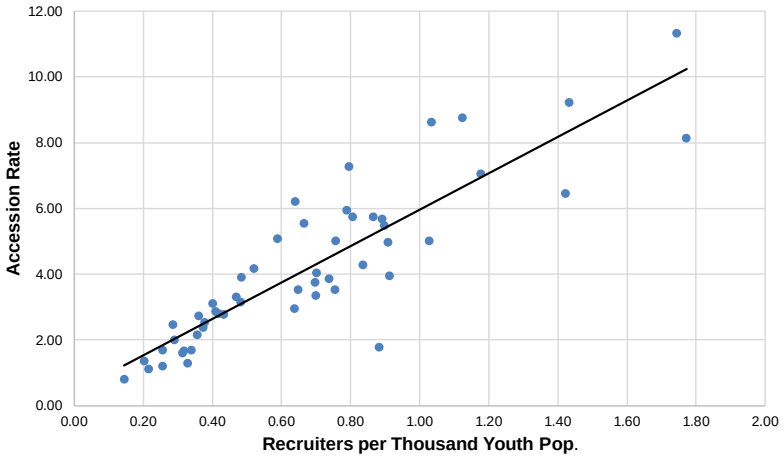
Variable Definitions

- Supply Equation: Logarithm NPS enlisted accessions/youth population
- Explanatory Factors
  - Logarithm relative military pay
    - PV military pay/PV civilian pay over a 6-year enlistment
  - Industry employment (%) proxies for part-time job holders
    - High percent part-time in Current Populations Surveys: Leisure & Hospitality
    - Low percent part-time in Current Populations Surveys: Government; Professional & Business Services
  - Youth unemployment
    - Current unemployment minus state's long term average
  - Logarithm ARNG FTE recruiters/youth population
  - ARNG education benefits/cost of public college
  - Logarithm NPS enlistment bonuses/PV civilian pay over a 6-year enlistment
  - Guard Recruiting Assistance Program dummy variable
  - Logarithm Training Center Locations/youth population
  - Demographics: %Asian, %Black, %Hispanic, %Native American
  - Deployment probability of ARNG personnel
  - Logarithm Regular Army FTE recruiters/youth population
  - Inverse mills ratio
- Production Equation: Logarithm NPS enlisted accessions/youth population
- Explanatory Factors
  - Logarithm NPS enlisted missions/youth population
  - Conditional hazard rate

The slide lists variables in the switching models. We seek to explain enlistments per capita, so enlistments and many explanatory variables are divided by youth population. Monetary variables are divided by an appropriate deflator to obtain the "real value." For example, the present value of military pay is divided by the present value of civilian pay; education benefits, by the cost of college. In general, variables are entered as logarithms if the data have a large range; if not, the variables are in levels, e.g., demographic percentages. Sensitivity analyses were undertaken to confirm which specification best fits the data.

IDA

Scatterplot of Accession Rates vs. ARNG Recruiters per Youth Population Averages for States in FYs 2005-2016



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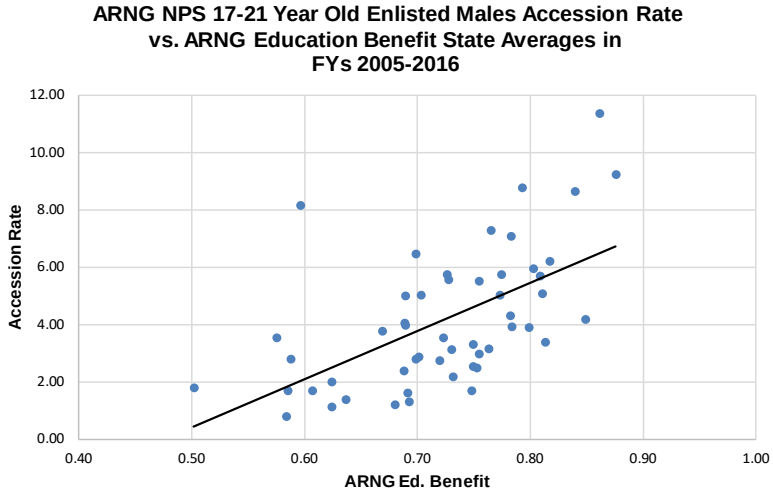
Accession Rates Vs. ARNG Education Benefits Averages for States in FYs 2005-2016



K. References

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L. Abbreviations

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Abbreviations

- 2SLS (Heckit) – Two Stage Least Squares Heckit
- ACS – American Community Survey
- ARNG – Army National Guard
- BLS – Bureau of Labor Statistics
- CEW – Census of Employment and Wages
- CPS – Current Population Survey
- FIML – Full Information Maximum Likelihood
- FTA – Federal Tuition Assistance
- FTE – Full-Time Employee
- FY – Fiscal Year
- G-RAP – Guard Recruiting Assistance Program
- IV – Instrument Variable
- MGIB-SR – Montgomery GI Bill and Selected Reserve
- MOS – Military Occupational Specialty
- NPS – Non-prior Service
- PS – Prior Service
- RA – Regular Army
- STA – State Tuition Assistance
- USAR – US Army Reserve
- USAREC – US Army Recruiting Command
- VA – Department of Veterans Affairs

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14. ABSTRACT

The Army National Guard must achieve its accession goals on a state-by-state basis, creating recruiting challenges not faced by the regular Army. This project assesses the recruiting implications of national trends in demographics, geographic location, and labor markets. We find that relative military pay, recruiters, and education benefits are important factors in Army National Guard recruiting.

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