

AD-A123 657

THE MILITARY'S MONOPSONY POWER(U) CENTER FOR NAVAL
ANALYSES ALEXANDRIA VA NAVAL STUDIES GROUP
A QUESTER ET AL. OCT 82 CNA-PP-364 N00014-76-C-0001

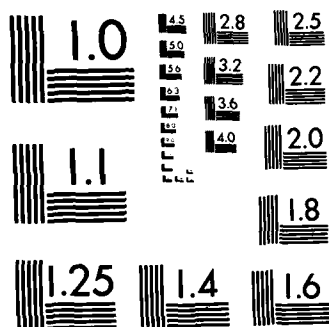
1/1

UNCLASSIFIED

F/G 5/1

NL

													END FILMED DTIC



MICROCOPY RESOLUTION TEST CHART
NATIONAL BUREAU OF STANDARDS-1963-A

2

PROFESSIONAL PAPER 364 / October 1982

AD A 123657

THE MILITARY'S MONOPSONY POWER

Aline Quester
Michael Nakada

Contract # N00014-76-C-0001

DTIC
ELECTE
JAN 21 1983
H

DTIC FILE COPY



CENTER FOR NAVAL ANALYSES

DISTRIBUTION STATEMENT A

Approved for public release;
Distribution Unlimited

PROFESSIONAL PAPER 364 / October 1982

2

THE MILITARY'S MONOPSONY POWER

Aline Quester
Michael Nakada

DTIC
JAN 21 1983
H



Naval Studies Group

CENTER FOR NAVAL ANALYSES

2000 North Beauregard Street, Alexandria, Virginia 22311

DISTRIBUTION STATEMENT A

Approved for public release;
Distribution Unlimited

An so, having made my plea, let me salute the profession with what might well have been the title of this paper, with what is certainly the key that points to the solution of most problems in applied welfare economics, with what surely should be the motto of any society that we applied welfare economists might form, and what probably, if only we could learn to pronounce it, should be our password:

$$-\int_{z=0}^{z^*} \sum_i D_i(z) \frac{\partial X_i}{\partial z} dz."$$

Harberger, 1971



Accession For	
NTIS GRA&I	☒
DTIC TAB	☐
Unannounced	☐
Justification	
By _____	
Distribution/	
Availability Codes	
Dist	Avail and/or Special
A	

TABLE OF CONTENTS

	<u>Page</u>
INTRODUCTION.....	1
Monopsony.....	3
The Dominant Firm Monopsony.....	5
The Monopsonist Military: Equity and Efficiency.....	9
Homogeneous Military Productivity and Heterogeneous Civilian Productivity.....	12
Identical Evaluations of Productivity by the Civilian and Military Sectors.....	13
Calculating the Welfare Loss.....	15
Concluding Comments.....	19
Appendix A: the Dominant Firm Monopsony.....	21
Appendix B.....	26
Bibliography.....	28

Introduction

Since the inception of the AVF the issue of military compensation, its current remuneration and the size of future increases, comes up for annual Congressional debate. The competing civilian sector forces military pay toward parity lest shortfalls and attrition take their toll. Central to the issue of remuneration and a proposed increase is its effect on accessions and retention. The effectiveness of military pay has brought back the debate between the All Volunteer Force (AVF) and the draft. Surely, given a fixed military budget, there are competing demands on these resources, i.e., hardware procurement and soldiers to man them.

It is the purpose of this paper, then, to examine the labor market behavior of the military services combined. To date, the military attracts an average of a quarter of a million 17-21 year-old non-prior service high school graduate males annually. The total size of our armed forces numbers two million. Exclusive of military retirement payments, the size of the military's wage bill in FY 81 is nearly 34 billion dollars. This sum is 20 percent of DoD's total FY 81 budget of 171.2 billion dollars.

Suppose we focus on the issue of military pay and accessions. The debate between the AVF and the draft is only credible here. Were the military were a perfect competitor for labor, any failure on the part of

the military to pay the competitive wage would doom the AVF. Indeed, the military would face a completely elastic supply curve at the going wage. An examination of empirical estimates, however, reveals elasticities of supply estimates for this age group considerably less than infinity. Most estimates, in fact, are about one (See Goldberg, 1981).

The only conclusion, then, is the military does face an upward sloping labor supply curve and, to the extent that increasing military pay increases enlistments, the military does wield some power in the labor market. This power has been analyzed within the framework of a monopsony model by Thomas Borcharding (1971) and Richard Cooper (1975). Thomas Borcharding "calculated" the deadweight burden associated with the monopsonistic purchase of volunteers and "compared" the magnitude of this loss to the loss associated with the over-employment of labor under conscription. The "calculations" and "comparisons" in the Borcharding paper are pictorial and not numerical. Richard Cooper provided a more detailed and numerical comparison of these two losses.

While we are satisfied with Cooper's analysis of the social cost of the draft, we believe his analysis of an All Volunteer Force devoted insufficient attention to the linkages between military and civilian wages. In this paper we develop those linkages, exploring the extent of the military's monopsony power in an economy-wide framework.

Monopsony

The monopsonist firm faces an upward sloping supply of labor curve. If it wants more labor, it must pay more. In contrast, the competitive firm faces a perfectly elastic supply of labor. That is, at the equilibrium (market) wage, the firm can obtain all the labor it wants. The presumption is that a change in the firm's demand will not influence the wage because the individual firm buys a small fraction of the available labor. The U.S. military currently employs approximately 6 percent of non-prior service male youths 17-21 years old. However, when focusing only on those in this age group who work full-time, the military's employment rises from 6 percent to about 20 percent. Thus the military is a substantial employer of youth labor. In what sense, then, can we apply the monopsony model to the military? Consider first the textbook monopsony model.

Such pure monopsony models suggest that there is a single employer of labor; company towns in the coal mining areas of the country have often been utilized as examples. Figure 1 illustrates this pure case. The monopsonist faces an upward sloping supply of labor curve as higher wages induce workers to substitute work for "leisure." A profit maximizer, the firm equates the marginal return from labor (the marginal

revenue product curve) to the marginal cost of labor.* (The supply curve is the average cost of labor curve; when average costs are rising, marginal costs are above average costs. In the linear case, marginal costs are increasing at double the rate of average costs.)

This first order condition determines the level of employment. Since the employer will pay no more for the labor than he has to, he will pay his workers W_m . When compared to the monopsonist, a competitive solution would involve both increased employment (E_c) and a higher wage (W_c). The monopsonist will exist as long as workers lack alternative employment opportunities.

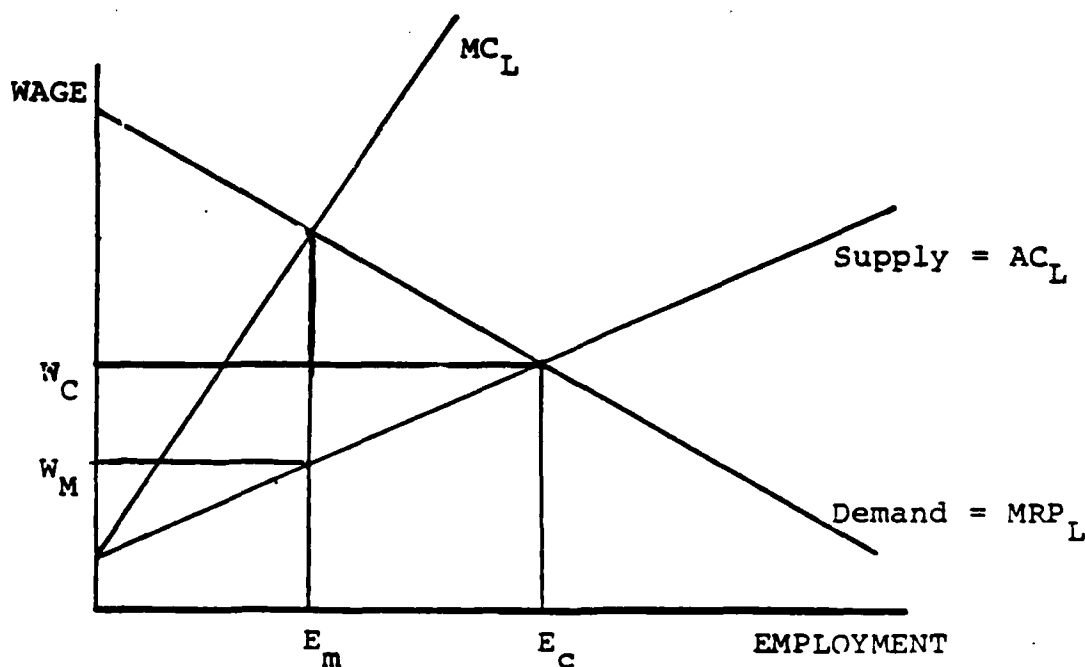


Figure 1

*Note that, in the monopsony case, the monopsonist has no demand curve for labor. That is, there is no longer a unique relationship between the quantity of labor demanded and its price. This is analogous to the absence of a supply curve for a monopolist in the product market.

This pure monopsonist model seems inappropriate for the problem at hand. Since there are alternative employers (and thus alternative wages) for youth, the military could not pay less than other employers and hope to obtain enlistees.* In short, a voluntary military cannot monopsonize the youth labor market, setting its compensation in a vacuum from other firms. For the existence of a stable solution, wages for equally productive workers must be equal across employers, but the pure monopsony model assumes away these other employers. Consider, then, a dominant firm monopsony model based on dominant product pricing models.

The Dominant Firm Monopsony

The model begins with three relationships: (1) a U.S. supply of labor curve for homogeneous labor (mental group, HSG, etc.),** (2) a demand for labor by the military, and (3) a demand for labor by the other small firms. These demand curves are the marginal revenue product curves for homogeneous labor. Next we derive a labor supply curve for the military by subtracting the demand for labor by the small firms from the total supply of labor. (In the diagram on the following page, the supply of labor to the military, S_{DoD} , is the horizontal difference between $S_{u.s.}$ and D_{sm} .) Since the average cost of labor is rising, the

*Of course, under conscription, the military can utilize any compensation scheme.

**We assume here that an individual's marginal product is invariant to the sector in which he works. That is, the military and civilian sectors have similar valuations of individual productivity.

military, as the dominant employer, is in a position to exert some power (see figure 2).*

The military equates the marginal cost of labor to the marginal revenue product of labor to determine employment, Q_{DoD} . To obtain this amount of labor, the military pays the wage associated with Q_{DoD} on its supply curve, W_{mono}^{dom} . The wage is then transmitted as the price for this homogeneous labor to the small firms who obtain all the workers they want at this price. (Note that the equilibrium solution is guaranteed because the military supply curve was constructed to be the difference between the total supply curve and the small firms' demand curve.)**

The wage and employment are both somewhat lower than they would be in the competitive case. The competitive wage is determined by the intersection of the military's supply and demand for labor. Alternatively, it can be derived by adding the military's demand to the small firm's demand and looking at the intersection of the demand and supply curves. An increase in the military's demand for labor simply

*Our formulation abstracts from non-pecuniary aspects of employment. In particular, wages need not equalize across civilian and military markets if there is sufficient homogeneity in the tastes or distastes for military versus civilian life.

**Following the dominant firm model, we have formulated the military's supply curve as an excess supply curve. This formulation suggests that, among equally productive workers, those with the highest reservation wages are found in the military sector. Lottery assignment to the civilian and military sectors would result in a lower DOD wage.

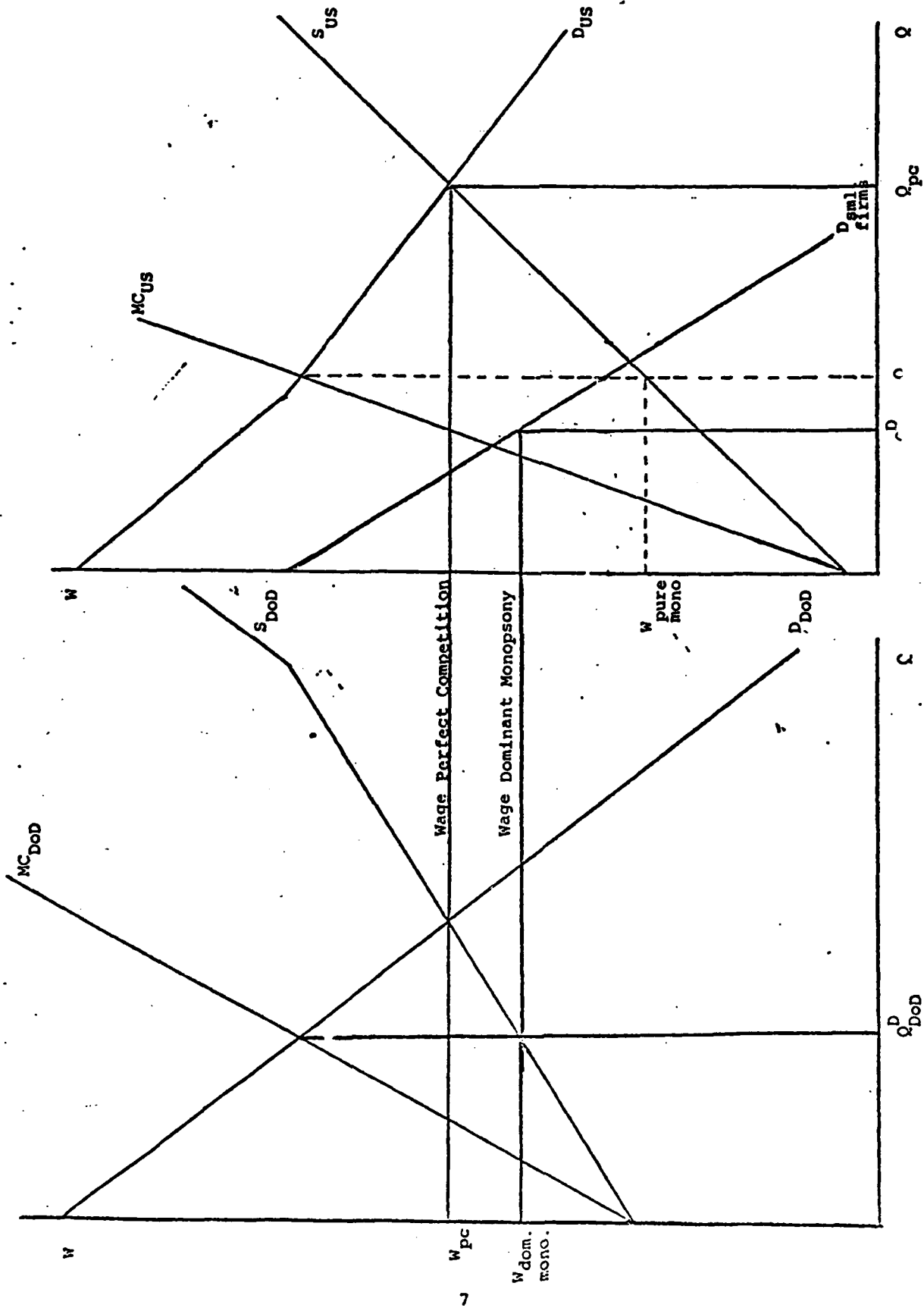


Figure 2

Solutions for the military as a pure monopsonist, dominant firm monopsonist, and perfect competitor.

involves a new calculation (determine employment by the intersection of MC_{DoD} and MRP_{DoD} and determine the wage by the supply of labor to the military).

How much monopsony power does the military have? By monopsony power we mean the ability to deviate from a competitive equilibrium, to move toward a pure monopsony equilibrium. The military's monopsony power depends upon the size of its demand relative to the total demand for this type of labor, on the supply elasticity, and on the elasticities of demand (the military's and the small firms'). Even with linear curves, however, price and employment deviations are complex functions of these variables, and we've no easily interpretable results (see appendix A for the linear and general solutions).

One general complaint about this genre of models has been the lack of an explanation of how the situation arose. This problem seems less severe here as there is no confusion about how the military became the dominant firm. As a substantial employer of youth labor, the military saw that it could reduce its costs by pursuing a monopsonist strategy. The solution is stable and profit- or value-maximizing. Thus, we would argue that the military behaves as a dominant firm monopsonist. Whether or not it is appropriate that the military behave as a monopsonist is the next issue. Consider first the question of equity.

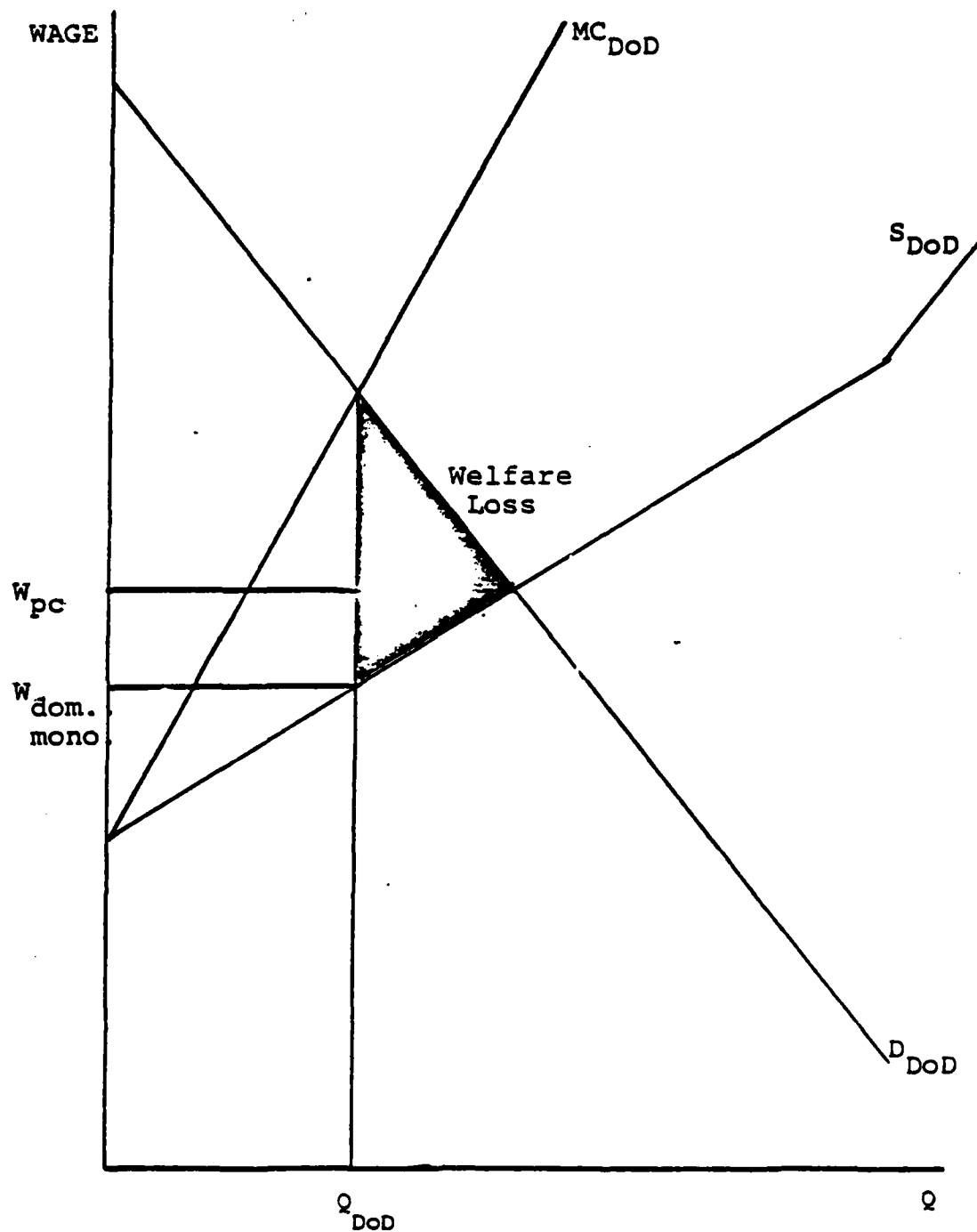
The Monopsonist Military: Equity and Efficiency

When the military behaves as a dominant firm monopsonist rather than as a competitive employer, the wages of youth are lowered (see figure 2). Youth employment is also lower, but this is a voluntary response to a reduced wage. One can think of this lower wage as being a uniform tax on youth, a tax which helps pay for defense. While not only the young benefit from defense, in a life cycle framework, the "tax" is fair. That is, during our youth, we all "paid" the "tax." Moreover, youth wages would be considerably lower if the military stopped demanding youth labor. In short, it seems difficult to argue against the monopsony model on equity grounds.

Since monopsonist solutions move us away from competitive Pareto optimums, there are still the questions of efficiency. Figure 3 illustrates the welfare or dead weight loss involved in the military moving from a competitive to a dominant firm monopsony.* Before investigating the size of this welfare loss, however, let us consider the military's possibilities for price discrimination.

If the military could act as a perfect price discriminator, the supply curve would become the marginal cost curve. There would be no welfare loss, and the solution would differ from the competitive only in

*Note that if the military's demand for labor is fixed (completely inelastic), there is no welfare loss.



The Welfare Loss Under the Dominant Firm Monopsony Model

Figure 3

the distribution of the surplus (all labor surplus is extracted by the military). The extent to which the military practices price discrimination, then, determines the extent to which the marginal cost and average costs of labor differ. Cooper argues that the military does price discriminate:

Enlistment bonuses for the combat arms occupational specialties are limited to individuals who are high school graduates and who score average or above average on the mental aptitude examinations, those individuals one would expect to have higher reservation wages. Similarly, those with higher mental aptitude scores and educational achievement generally receive the better jobs. Finally, recruiters are usually authorized only a limited number of slots for the shorter enlistment tours, with the result that these shorter enlistments are given only to those individuals who appear otherwise reluctant to join — hence, those with higher reservation wages. These are but a few of the many ways the military has of discriminating according to supply price. (Richard Cooper, The Social Cost of Maintaining a Military Labor Force, Rand R-1758-ARPA, August, 1975.)

While Cooper's examples suggest that the military is able to vary compensation (to provide a more attractive package to recruits with higher reservation wages), we are not convinced that this is price discrimination. Price discrimination involves compensating equally productive individuals differently; it does not mean compensating differentially productive employees differently. These two phenomena must be distinguished in order to evaluate possibilities for reduction in the size of the welfare loss.

We will consider two cases. The first assumes the military regards the productivity of all first term enlistees as identical while the civilian sector recognizes heterogeneity in the labor productivity of this age group. The second case assumes identical evaluations of productivity by the civilian and military sectors. That is, both sectors evaluate productivity of this age group to be heterogeneous, or both sectors evaluate productivity to be homogeneous. The important point is that both sectors have the same point of view.

Homogeneous Military Productivity and Heterogeneous Civilian Productivity

This assumption, although rarely explicated, appears fairly common in the literature.* Cooper, for example, implicitly suggests that an individual's position on the military's supply of labor curve is determined by his civilian productivity (plus a taste factor).** If it

*Hansen and Weisbrod (1967) are an exception. In discussing the distributive and allocative effects of the draft, they explicitly draw a "supply curve" of labor in which an individual's position on the curve is determined by his civilian productivity. They then show that the actual civilian output foregone under a lottery draft is considerably greater than would be necessary. The efficient solution is to select the lowest civilian productivity individuals into the military, given a base level of competence defined by mental group or education.

Hansen and Weisbrod's argument is correct only under the assumption that military productivity is constant across individuals, e.g., that it is invariant to civilian productivity. That is, they can draw one supply curve for military labor only if all individuals on that supply are homogeneous in the production of military output.

**The fact that Cooper places these individuals on the same supply curve (for which the military has just one demand curve) means that the military regards these individuals as homogeneous in production.

is true that the military's demand for enlistees is invariant to the enlistee's characteristics, then Cooper is correct that the military can substantially reduce the size of the welfare loss by price discriminating with the mechanisms he mentions.* Here, one notes that the military fills its ranks from the bottom up, taking those who are least productive in the civilian world.

Currently the military is not accessing only the least productive, and Congressional directives aside, examination of the military's personnel needs indicate that today's military cannot be fully staffed by such individuals. While some military jobs can be filled by less able individuals, the military seems to require an overall ability mix similar to the civilian world. This suggests that the homogeneous military productivity assumption could be rejected.

Identical Evaluations of Productivity by the Civilian and Military Sectors

In this case, the military and the civilian sectors find individuals of given demographic characteristics equally productive. Consider eight labor categories, each defined by high school graduation (or not) and by mental groups (I-IV). Assume, next, that for each of

*Under these productivity assumptions, the military's labor supply curve is derived by the horizontal addition of the differences between overall supply and the other firms' demand for each type of labor: the degree of non-homogeneity in civilian productivities determines the number of terms in the summation.

these eight labor markets, the military makes its hiring and wage decisions based upon the dominant firm monopsony model illustrated in figure 2.

This process generates eight equilibrium wages: military and civilian wages equalize for comparable employees. While military base pay is the same for enlistees in any of the eight productivity groups, total compensation is not. The mechanisms that Cooper refers to as price discrimination tools are instead the mechanisms by which the military adjusts pay to bring its compensation structure into line with the private sector's. Individuals whose private sector alternative wage is below base pay are assigned jobs with negative non-pecuniary aspects; individuals whose private sector alternatives are greater than base pay are assigned to ratings with large training components, given their location preferences, etc. Bonuses or shorter enlistments are not evidence of price discrimination. Instead, these mechanisms are the tools which the military uses to maintain pay comparability, to keep itself competitive with the private sector.

What scope is left, then, for price discrimination? Could the military price discriminate on any of these supply curves, supply curves which are drawn for individuals with the same alternative civilian wage offers? We would suggest that the answer is no. In order to do so, the military would need some mechanism which revealed how these individuals valued their time, how their reservation wages, given civilian wage

offers, differed. Since no such mechanisms occur to us, we conclude that a monopsonistic military has few possibilities for price discrimination.*

Calculating the Welfare Loss

We have argued that the military behaves as a dominant firm monopsonist in the market for 17-21 year old labor. This suggested a dead weight loss unless the military could price discriminate, a possibility we, in general, reject. It seems now appropriate to calculate the value of the loss.

To do this we have combined past empirical work with theoretical formulations and some "good" guesses. We utilized Larry Goldberg's estimated relationship between accessions of 17-21 year-old non-prior service high school graduate males and wages in order to locate the supply of labor to the military. From this supply curve we constructed the implied marginal cost curve (figure 4). The intersection of the

*We do not explicitly discuss the career force. We do feel, however, that the military has the scope here for price discrimination. Career compensation is varied by rating: inducements are provided for ratings which are hard to fill (very unpleasant or excellent civilian wage offers). Only if one can envisage a supply curve of careerists which contained all careerists (implying the military sees hospital corpsmen and boiler technicians as perfect substitutes) is it price discrimination to pay different wages to different ratings.

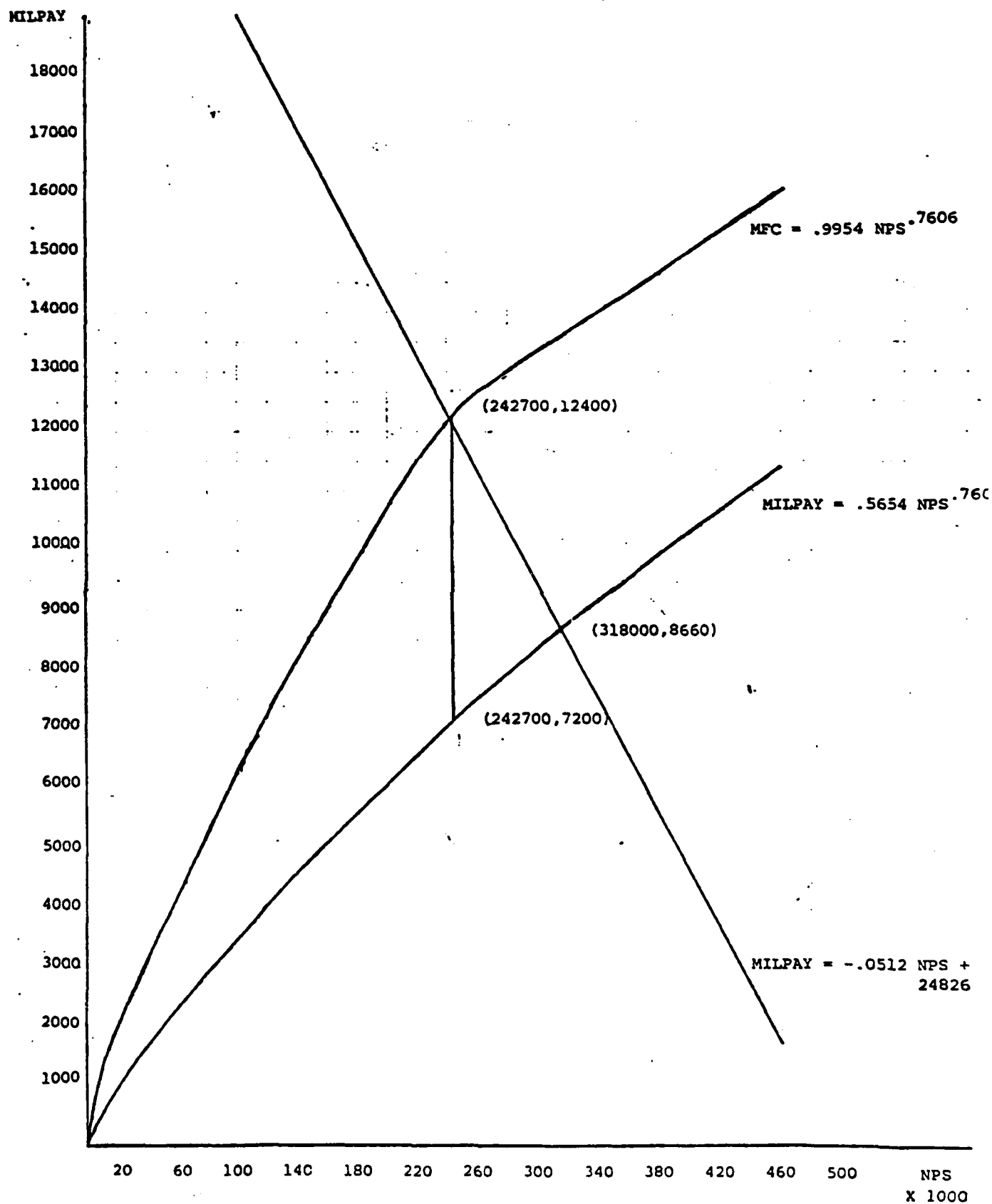


Figure 4

military's marginal cost of labor curve and the military's (Marginal Revenue Product) MRP ("demand") curve has coordinates (242700,12400). We identify the military's MRP curve by this point and by its elasticity.* To calculate the elasticity, we use a formula for derived demand that was first suggested by Hicks.

The elasticity of military's derived demand for labor (λ) is a function of the elasticity of demand for the final output (η), the elasticity of the supply of capital (ϵ), labor's share in total costs (s), and the elasticity of substitution between capital and labor (σ). The Hicks' formula appears below. A discussion of the values we assumed for the four variables follows.

$$\lambda = \frac{-\sigma\eta + \epsilon(s\eta - (1-s)\sigma)}{(-s\sigma + (1-s)\eta) + \epsilon}$$

We will evaluate the welfare loss at a long run equilibrium position. In the long run we expect the elasticity of the supply of capital (ϵ) to be infinite. While the military buys rather specialized capital, the military's position as a buyer of capital is not one of a dominant firm in the economy. The assumption that the supply of capital is infinitely elastic simplifies the formula for λ as follows:

$$\lambda = s\eta - (1-s)\sigma$$

*By taking a linear approximation to the demand curve at this point, the curve is identified by a point and it's elasticity.

There are no empirical estimates for σ , the military's elasticity of substitution between capital and labor. Estimates of σ for other sectors of the economy have yielded a fairly wide range of estimates, .14 to 13.7 for the elasticity of substitution between blue collar workers and capital. The range of these estimates is somewhat misleading, however, as the majority of studies have estimated σ between .5 and 3.* Believing that the military probably has less substitution possibilities than other firms, we will take σ equal to one.**

The remaining parameter is η , the price elasticity of demand for defense. In the long run, we have kept our total real expenditures for defense constant. This implies an elasticity of one. These parameter values suggest that the elasticity of the derived demand for labor by the military is one. With a linear approximation of the demand curve, as is sketched in figure 4, we now possess the necessary information to determine the size of the welfare loss.

The calculations of the welfare loss are found in appendix B. Estimates range between 200 and 250 million dollars. Relative to the size of the military's wage bill for new recruits, this welfare loss is

*Daniel S. Hamermesh and James Grant, "Econometric Studies of Labor-Labor Substitution and their Implications for Policy," The Journal of Human Resources, Summer, 1979:519-542.

**We choose to be conservative, because we want a lower bound estimate of the size of the welfare loss: A larger value for sigma produces a more elastic demand curve and thus a larger dead weight loss.

12 to 15 percent. These welfare losses appear fairly large, certainly much larger than the losses estimated for product market monopoly.*

Of course, if we compared the 250 million dollars to the total cost of defense, the losses would appear considerably less important. Such a comparison, however, would require calculating an additional dead weight loss since all evidence indicates that the military also faces an upward sloping supply curve for careerists. The size of this total loss relative to the total FY 81 DoD budget will be smaller than our 12 to 15 percent. However, we speculate that that percent will not be as insignificant as Harberger's.

Concluding Comments

On efficiency grounds should the military, as a provider of a public good, ignore its potential monopsony power because of resulting inefficiencies? More basically, does the military currently "profit maximize" and exploit its monopsony power? In product markets one compares price and marginal cost. Here one should compare the

*Harberger (1954) estimated the welfare losses from product market monopoly at .1 percent of GNP. Since then differing methodologies and assumptions have produced estimates similar to Harberger's (Schwartzman, 1960; Scherer, 1970; and Worcester, 1973) as well as estimates in the 6-7 percent range (Stigler, 1956; Kamerschen, 1966; and Cowling and Mueller, 1978).

enlistee's marginal revenue product with his wage. Unfortunately, data deficiencies preclude such comparisons. Thus, although we cannot prove that the military does exploit what power it has, we will assume, as most researchers appear to, that it does.

Clearly, the military, and society in general, can be made better off by moving to the competitive equilibrium, the Pareto optimal solution. However, even if the competitive solution is not politically possible, the present monopsony solution for the AVF is preferred to a draft. Cooper's 1975 analysis has shown that the draft is not the better alternative to the AVF. He demonstrates that the welfare loss associated with a draft will exceed the welfare loss associated with the All Volunteer Force.

APPENDIX A
THE DOMINANT FIRM MONOPSONY

General

Linear

Let Q = quantity; W = wage

I. U.S. supply of labor

$$Q_{US}^S = f_1(W); W_{US}^S = g_1(Q)$$

$$Q_{US}^S = a + bW; W_{US}^S = \frac{1}{b} Q - \frac{a}{b}$$

$a < 0, b > 0$

II. Total firm demand for labor

$$Q_F^D = f_2(W); W_F^D = g_2(Q)$$

$$Q_F^D = c + dW; W_F^D = \frac{1}{d} Q - \frac{c}{d}$$

$c > 0, d < 0$

III. Military's demand for labor

$$Q_{DoD}^D = f_3(W); W_{DoD}^D = g_3(Q)$$

$$Q_{DoD}^D = e + fW; W_{DoD}^D = \frac{1}{f} Q - \frac{e}{f}$$

$e > 0, f < 0$

IV. Determine supply of labor to the military

$$Q_{DoD}^S = f_4(W) = Q_{US}^S - Q_F^D$$

$$Q_{DoD}^S = (a+bW) - (c+dW)$$

$$= (a-c) + (b-d)W$$

$$\text{Let } h = b-d > 0$$

$$k = a-c < 0$$

General

$$w_{DoD}^S = g_4(Q)$$

Linear

$$w_{DoD}^S = \frac{1}{h} Q - \frac{k}{h}$$

V. Solve for quantity of labor employed by the military. First order condition: military's demand for labor equals military's marginal cost of labor.

A. Military's Cost of labor, C_{DoD}

$$C_{DoD} = Q \cdot w_{DoD}^S = Q \cdot g_4(Q)$$

$$C_{DoD} = Q \left(\frac{1}{h} Q - \frac{k}{h} \right)$$

B. Military's marginal cost of labor = $\frac{dC_{DoD}}{dQ}$

$$\frac{dC_{DoD}}{dQ} = w_{DoD}^S + Q \cdot g_4'(Q)$$

$$\begin{aligned} \frac{dC_{DoD}}{dQ} &= \frac{1}{h} Q - \frac{k}{h} + Q \frac{1}{h} \\ &= \frac{2}{h} Q - \frac{k}{h} \end{aligned}$$

C. First order condition: solve for Q^*

$$\begin{aligned} g_3(Q^*) &= w_{DoD}^S + Q \cdot g_4'(Q) \\ &= g_4(Q^*) + Q^* \cdot g_4'(Q^*) \end{aligned}$$

$$\begin{aligned} \frac{1}{f} Q - \frac{e}{f} &= \frac{2Q}{h} - \frac{k}{h} \\ Q^* &= \frac{he - fk}{h - 2f} \end{aligned}$$

VI. Solve for wage military pays: substitute Q from step C into military's supply of labor.

General

$$w_{DoD}^{S*} = g_4(Q^*)$$

Linear

$$\begin{aligned} w_{DoD}^{S*} &= \frac{1}{h} \left(\frac{he-fk}{h-2f} \right) - \frac{k}{h} \\ &= \frac{(he-fk) - k(h-2f)}{h(h-2f)} \\ &= \frac{he+fk-kh}{h(h-2f)} \end{aligned}$$

VII. Quantity demanded by firms

$$Q_f^{D*} = f_2(w_{DoD}^{S*})$$

$$Q_F^{D*} = c + d \left[\frac{he+fk-kh}{h(h-2f)} \right]$$

VIII. For the linear case only, show $Q_{US}^S = Q_{DoD}^S + Q_F^D$ (Step IV).

$$\begin{aligned} a+b \left[\frac{he+fk-kh}{h(h-2f)} \right] &\stackrel{?}{=} k+h \left[\frac{he+fk-kh}{h(h-2f)} \right] + c+d \left[\frac{he+fk-kh}{h(h-2f)} \right] \\ \frac{ah(h-2f)+b(he+fk-kh)}{h(h-2f)} &\stackrel{?}{=} \frac{h(k+c)(h-2f)+(h+d)(he+fk-kh)}{h(h-2f)} \end{aligned}$$

Show: $ah(h-2f)+b(he+fk-kh) \stackrel{?}{=} h(k+c)(h-2f)+(h+d)(he+fk-kh)$

Show: $ah \stackrel{?}{=} h(k+c)$ and $b \stackrel{?}{=} (h+d)$

But $k = a-c$ and $h = b-d$ from IV.

IX. Let Q_{COMP}^* = equilibrium quantity employed under pure competition

Q_{MONO}^* = equilibrium quantity employed under dominant firm
monopsony

w_{COMP}^* = equilibrium wage under pure competition

W_{MONO}^* = equilibrium wage under dominant firm monopsony

Find $\frac{Q_{MONO}^*}{Q_{COMP}^*}$ and $\frac{W_{MONO}^*}{W_{COMP}^*}$ for linear case only.

A. Find Q_{COMP}^* and W_{COMP}^* by equating demand and supply of labor by the military.

$$W_{DoD}^D = W_{DoD}^S$$

$$\frac{1}{f}Q - \frac{e}{f} = \frac{1}{h}Q - \frac{k}{h}$$

$$Q_{COMP}^* = \frac{he-fk}{h-f}$$

$$W_{Comp}^* = \frac{1}{h} \left(\frac{he-fk}{h-f} \right) - \frac{k}{h}$$

$$\begin{aligned} W_{COMP}^* &= \frac{he-fk-k(h-f)}{h(h-f)} \\ &= \frac{e-k}{h-f} \end{aligned}$$

$$B. \quad \frac{Q_{MONO}^*}{Q_{COMP}^*} = \frac{\frac{he-fk}{h-2f}}{\frac{he-fk}{h-f}}$$

$$= \frac{h-f}{h-2f} < 1; \quad \frac{h-f}{h-2f} > 0$$

$$\begin{aligned}
 \text{C. } \frac{W_{\text{MONO}}^*}{W_{\text{COMP}}^*} &= \frac{\frac{he+fk-kh}{h(h-2f)}}{\frac{e-k}{h-f}} \\
 &= \frac{(he+fk-kh)(h-f)}{h(e-k)(h-2f)} \\
 &= \frac{h^2e-h^2k+2fhk-f(fk-he)}{h^2e-h^2k+2fhk-2efh}
 \end{aligned}$$

$$\frac{W_{\text{MONO}}^*}{W_{\text{COMP}}^*} \text{ depends on } \text{sgn}(fk-he)$$

But from V.C $he-fk > 0$ for a stable solution.

Hence, $(fk-he) < 0$.

$$\therefore 0 < \frac{W_{\text{MONO}}^*}{W_{\text{COMP}}^*} < 1$$

APPENDIX B

I. Welfare Loss, WL, by area of triangle:

$$\begin{aligned} WL &= 1/2bh \\ &= 1/2 (5200)(75300) \\ &= \$195,780,000 \end{aligned}$$

II. Welfare Loss, WL, by formulation ala D. Clay-Mendez:

$$WL = \frac{1}{2} \left[\frac{Rt\epsilon_D}{1 + \frac{\epsilon_D}{\epsilon_S}} \right] \text{ where } R = \text{amount of "tax"}$$

t = "tax" rate

ϵ_D = elasticity of demand for labor

ϵ_S = elasticity of supply for labor

$$\begin{aligned} &\frac{1}{2} \left[\frac{(242,700)(5200)(1) \left(\frac{5200}{7200} \right)}{1 + \frac{1}{1.31467}} \right] \\ &= \$258,845,080 \end{aligned}$$

III. Welfare Loss, WL, by Musgrave's formula:

$$WL = \frac{1}{2} \frac{\epsilon_D \epsilon_S}{\epsilon_D + \epsilon_S} \frac{R^2}{N} \text{ where } R = \text{amount of "tax"}$$

N = total amount paid including "tax"

ϵ_D = elasticity of demand for labor

ϵ_S = elasticity of supply for labor.

$$= \frac{1}{2} \frac{(1)(1.31467)}{1 + 1.31467} \frac{(5200 \times 242700)^2}{(12400 \times 242700)}$$

$$= \$197,640,460$$

BIBLIOGRAPHY

- Bergson, A. (1973), "On Monopoly Welfare Losses," American Economic Review, vol. 63 (December), pp. 853-70
- Borcherding, Thomas E., (1971), "A Neglected Social Cost of a Volunteer Force," American Economic Review, 61 (March), pp. 195-196
- Center for Naval Analyses, Memorandum (CNA)81-0145.10, "Navy Enlisted Supply Study," by Lawrence Goldberg, Unclassified, 10 Feb 1981
- Cooper, Richard (1975), "The Social Cost of Maintaining a Military Force," Rand, R-1758-1-ARPA
- Cowling, Keith and Dennis Mueller (1978), "The Social Costs of Monopoly Power," The Economic Journal, 88 (December), pp. 727-747
- Fisher, Anthony W. (1969), "The Cost of the Draft and the Cost of Ending the Draft," American Economic Review, 59 (June), pp. 239-254
- Goldberg, Lawrence, "Summary of Navy Enlisted Supply Study," Center for Naval Analyses, Memorandum 81-1158, 22 July 1981.
- Hansen, W. Lee, and Burton A. Weisbrod (1967), "Economics of the Military Draft," Quarterly Journal of Economics, 81 (August), pp. 395-421
- Harberger, A.C. (1954), "Monopoly and Resource Allocation," American Economic Review, vol. 45 (May), pp. 77-87
- _____ (1971), "Three Basic Postulates for Applied Welfare Economics: An Interpretative Essay," Journal of Economic Literature, XI, No. 3 (September), 785-797
- Hicks, Sir John, The Theory of Wages
- Kamerschen, D.R. (1969), "An Estimation of the Welfare Losses from Monopoly in the American Economy," Western Economic Journal, vol. 4 (Summer), pp. 221-36
- Oi, Walter Y. (1967), "The Economic Cost of the Draft," American Economic Review Proceedings, 57 (May), pp. 39-62
- Sherer, F.M. (1970), Industrial Market Structure and Market Performance, Chicago: Rand McNally
- Schwartzman, D. (1960), "The Burden of Monopoly," Journal of Political Economy, vol. 68 (December), pp. 627-30

Stigler, G.J. (1956), "The Statistics of Monopoly and Merger," Journal of Political Economy, vol. 64 (February), pp. 33-40

Worcester, D.A., Jr. (1973), "New Estimates of the Welfare Loss to Monopoly: U.S. 1956-69," Southern Economic Journal, vol. 40 (October), pp. 234-46

CNA PROFESSIONAL PAPERS - 1978 TO PRESENT*

- PP 211
Mizrahi, Maurice M., "On Approximating the Circular Coverage Function," 14 pp., Feb 1978, AD A054 429
- PP 212
Mangel, Marc, "On Singular Characteristic Initial Value Problems with Unique Solution," 20 pp., Jun 1978, AD A058 535
- PP 213
Mangel, Marc, "Fluctuations in Systems with Multiple Steady States. Application to Lanchester Equations," 12 pp., Feb 78 (Presented at the First Annual Workshop on the Information Linkage Between Applied Mathematics and Industry, Naval PG School, Feb 23-25, 1978), AD A071 472
- PP 214
Weinland, Robert G., "A Somewhat Different View of The Optimal Naval Posture," 37 pp., Jun 1978 (Presented at the 1976 Convention of the American Political Science Association (APSA/IUS Panel on "Changing Strategic Requirements and Military Posture"), Chicago, Ill., September 2, 1976), AD A056 228
- PP 215
Colle, Russell C., "Comments on: Principles of Information Retrieval by Manfred Kochen," 10 pp., Mar 78 (Published as a Letter to the Editor, Journal of Documentation, Vol. 31, No. 4, pages 298-301), December 1975), AD A054 426
- PP 216
Colle, Russell C., "Lotka's Frequency Distribution of Scientific Productivity," 18 pp., Feb 1978 (Published in the Journal of the American Society for Information Science, Vol. 28, No. 6, pp. 366-370, November 1977), AD A054 425
- PP 217
Colle, Russell C., "Bibliometric Studies of Scientific Productivity," 17 pp., Mar 78 (Presented at the Annual meeting of the American Society for Information Science held in San Francisco, California, October 1976), AD A054 442
- PP 218 - Classified
- PP 219
Huntzinger, R. LaVar, "Market Analysis with Rational Expectations: Theory and Estimation," 60 pp., Apr 78, AD A054 422
- PP 220
Maurer, Donald E., "Diagonalization by Group Matrices," 26 pp., Apr 78, AD A054 443
- PP 221
Weinland, Robert G., "Superpower Naval Diplomacy in the October 1973 Arab-Israeli War," 76 pp., Jun 1978 (Published in Seapower in the Mediterranean: Political Utility and Military Constraints, The Washington Papers No. 61, Beverly Hills and London: Sage Publications, 1979) AD A055 564
- PP 222
Mizrahi, Maurice M., "Correspondence Rules and Path Integrals," 30 pp., Jun 1978 (Invited paper presented at the CNRS meeting on "Mathematical Problems in Feynman's Path Integrals," Marseille, France, May 22-26, 1978) (Published in Springer Verlag Lecture Notes in Physics, 106, (1979), 234-253) AD A055 536
- PP 223
Mangel, Marc, "Stochastic Mechanics of Molecule Molecule Reactions," 21 pp., Jun 1978, AD A056 227
- PP 224
Manger, Marc, "Aggregation, Bifurcation, and Extinction in Exploited Animal Populations," 48 pp., Mar 1978, AD A058 536
"Portions of this work were started at the Institute of Applied Mathematics and Statistics, University of British Columbia, Vancouver, B.C., Canada
- PP 225
Mangel, Marc, "Oscillations, Fluctuations, and the Hopf Bifurcation," 43 pp., Jun 1978, AD A058 537
"Portions of this work were completed at the Institute of Applied Mathematics and Statistics, University of British Columbia, Vancouver, Canada.
- PP 226
Raiston, J. M. and J. W. Mann,* "Temperature and Current Dependence of Degradation in Red-Emitting GaP LEDs," 34 pp., Jun 1978 (Published in Journal of Applied Physics, 50, 3630, May 1979) AD A058 538
*Bell Telephone Laboratories, Inc.
- PP 227
Mangel, Marc, "Uniform Treatment of Fluctuations at Critical Points," 50 pp., May 1978, AD A058 539
- PP 228
Mangel, Marc, "Relaxation at Critical Points: Deterministic and Stochastic Theory," 54 pp., Jun 1978, AD A058 540
- PP 229
Mangel, Marc, "Diffusion Theory of Reaction Rates, I: Formulation and Einstein-Smoluchowski Approximation," 50 pp., Jan 1978, AD A058 541
- PP 230
Mangel, Marc, "Diffusion Theory of Reaction Rates, II Ornstein-Uhlenbeck Approximation," 34 pp., Feb 1978, AD A058 542
- PP 231
Wilson, Desmond P., Jr., "Naval Projection Forces: The Case for a Responsive MAF," Aug 1978, AD A054 543
- PP 232
Jacobson, Louis, "Can Policy Changes Be Made Acceptable to Labor?" Aug 1978 (Submitted for publication in Industrial and Labor Relations Review), AD A061 528

*CNA Professional Papers with an AD number may be obtained from the National Technical Information Service, U.S. Department of Commerce, Springfield, Virginia 22151. Other papers are available from the Management Information Office, Center for Naval Analyses, 2000 North Beauregard Street, Alexandria, Virginia 22311. An index of Selected Publications is also available on request. The index includes a Listing of Professional Papers; with abstracts; issued from 1969 to June 1981.

- PP 233
Jacobson, Louis, "An Alternative Explanation of the Cyclical Pattern of Quits," 23 pp., Sep 1978
- PP 234 - Revised
Jondrow, James and Levy, Robert A., "Does Federal Expenditure Displace State and Local Expenditure: The Case of Construction Grants," 25 pp., Oct 1979, AD A061 529
- PP 235
Mizrahi, Maurice M., "The Semiclassical Expansion of the Anharmonic-Oscillator Propagator," 41 pp., Oct 1978 (Published in Journal of Mathematical Physics 20 (1979) pp. 844-855), AD A061 538
- PP 237
Maurer, Donald, "A Matrix Criterion for Normal Integral Bases," 10 pp., Jan 1979 (Published in the Illinois Journal of Mathematics, Vol. 22 (1978), pp. 672-681)
- PP 238
Utgoff, Kathleen Classen, "Unemployment Insurance and The Employment Rate," 20 pp., Oct 1978 (Presented at the Conference on Economic Indicators and Performance: The Current Dilemma Facing Government and Business Leaders, presented by Indiana University Graduate School of Business), AD A061 527
- PP 239
Trost, R. P. and Werner, J. T., "The Effects of Military Occupational Training on Civilian Earnings: An Income Selectivity Approach," 38 pp., Nov 1979k, AD A077 831
- PP 240
Powers, Bruce, "Goals of the Center for Naval Analyses," 13 pp., Dec 1978, AD A063 759
- PP 241
Mangel, Marc, "Fluctuations at Chemical Instabilities," 24 pp., Dec 1978 (Published in Journal of Chemical Physics, Vol. 69, No. 8, Oct 15, 1978), AD A063 787
- PP 242
Simpson, William R., "The Analysis of Dynamically Interactive Systems (Air Combat by the Numbers)," 160 pp., Dec 1978, AD A063 760
- PP 243
Simpson, William R., "A Probabilistic Formulation of Murphy Dynamics as Applied to the Analysis of Operational Research Problems," 18 pp., Dec 1978, AD A063 761
- PP 244
Sherman, Allen and Horowitz, Stanley A., "Maintenance Costs of Complex Equipment," 20 pp., Dec 1978 (Published By The American Society of Naval Engineers, Naval Engineers Journal, Vol. 91, No. 6, Dec 1979) AD A071 473
- PP 245
Simpson, William R., "The Accelerometer Methods of Obtaining Aircraft Performance from Flight Test Data (Dynamic Performance Testing)," 403 pp., Jun 1979, AD A075 226
- PP 246
Brechling, Frank, "Layoffs and Unemployment Insurance," 35 pp., Feb 1979 (Presented at the Nber Conference on "Low Income Labor Markets," Chicago, Jun 1978), AD A096 629
- PP 248
Thomas, James A., Jr., "The Transport Properties of Dilute Gases in Applied Fields," 183 pp., Mar 1979, AD A096 464
- PP 249
Glasser, Kenneth S., "A Secretary Problem with a Random Number of Choices," 23 pp., Mar 1979
- PP 250
Mangel, Marc, "Modeling Fluctuations in Macroscopic Systems," 26 pp., Jun 1979
- PP 251
Trost, Robert P., "The Estimation and Interpretation of Several Selectivity Models," 37 pp., Jun 1979, AD A075 941
- PP 252
Nunn, Walter R., "Position Finding with Prior Knowledge of Covariance Parameters," 5 pp., Jun 1979 (Published in IEEE Transactions on Aerospace & Electronic Systems, Vol. AES-15, No. 3, Mar 1979)
- PP 253
Glasser, Kenneth S., "The d-Choice Secretary Problem," 32 pp., Jun 1979, AD A075 225
- PP 254
Mangel, Marc and Quanbeck, David B., "Integration of a Bivariate Normal Over an Offset Circle," 14 pp., Jun 1979, AD A096 471
- PP 255 - Classified, AD B051 441L
- PP 256
Maurer, Donald E., "Using Personnel Distribution Models," 27 pp., Feb 1980, AD A082 218
- PP 257
Thaler, R., "Discounting and Fiscal Constraints: Why Discounting Is Always Right," 10 pp., Aug 1979, AD A075 224
- PP 258
Mangel, Marc S. and Thomas, James A., Jr., "Analytical Methods in Search Theory," 86 pp., Nov 1979, AD A077 832
- PP 259
Glass, David V.; Hsu, Ih-Ching; Nunn, Walter R., and Perlin, David A., "A Class of Commutative Markov Matrices," 17 pp., Nov 1979, AD A077 833
- PP 260
Mangel, Marc S. and Cope, Davis K., "Detection Rate and Sweep Width in Visual Search," 14 pp., Nov 1979, AD A077 834
- PP 261
Vila, Carlos L.; Zvijac, David J. and Ross, John, "Frank-Condon Theory of Chemical Dynamics. VI. Angular Distributions of Reaction Products," 14 pp., Nov 1979 (Reprinted from Journal Chemical Phys. 70(12), 15 Jun 1979), AD A076 287
- PP 262
Peterson, Charles C., "Third World Military Elites in Soviet Perspective," 50 pp., Nov 1979, AD A077 835
- PP 263
Robinson, Kathy I., "Using Commercial Tankers and Container-ships for Navy Underway Replenishment," 25 pp., Nov 1979, AD A077 836

- PP 264
Weinland, Robert G., "The U.S. Navy in the Pacific: Past, Present, and Glimpses of the Future," 31 pp., Nov 1979 (Delivered at the International Symposium on the Sea, sponsored by the International Institute for Strategic Studies, The Brookings Institution and the Yomiuri Shimbun, Tokyo, 16-20 Oct 1978) AD A066 837
- PP 265
Weinland, Robert G., "War and Peace in the North: Some Political Implications of the Changing Military Situation in Northern Europe," 18 pp., Nov 1979 (Prepared for presentation to the Conference of the Nordic Balance in Perspective: The Changing Military and Political Situation," Center for Strategic and International Studies, Georgetown University, Jun 15-16, 1978) AD A077 838
- PP 266
Utgoff, Kathy Classen, and Brechling, Frank, "Taxes and Inflation," 25 pp., Nov 1979, AD A081 194
- PP 267
Trost, Robert P., and Vogel, Robert C., "The Response of State Government Receipts to Economic Fluctuations and the Allocation of Counter-Cyclical Revenue Sharing Grants," 12 pp., Dec 1979 (Reprinted from the Review of Economics and Statistics, Vol. LXI, No. 3, August 1979)
- PP 268
Thomason, James S., "Seaport Dependence and Inter-State Cooperation: The Case of Sub-Saharan Africa," 141 pp., Jan 1980, AD A081 193
- PP 269
Weiss, Kenneth G., "The Soviet Involvement in the Ogaden War," 42 pp., Jan 1980 (Presented at the Southern Conference on Slavic Studies in October, 1979), AD A082 219
- PP 270
Remnek, Richard, "Soviet Policy in the Horn of Africa: The Decision to Intervene," 52 pp., Jan 1980 (To be published in "The Soviet Union in the Third World: Success or Failure," ed. by Robert H. Donaldson, Westview Press, Boulder, Co., Summer 1980), AD A081 195
- PP 271
McConnell, James, "Soviet and American Strategic Doctrines: One More Time," 43 pp., Jan 1980, AD A081 192
- PP 272
Weiss, Kenneth G., "The Azores in Diplomacy and Strategy, 1940-1945," 46 pp., Mar 1980, AD A085 094
- PP 273
Nakade, Michael K., "Labor Supply of Wives with Husbands Employed Either Full Time or Part Time," 39 pp., Mar 1980, AD A082 220
- PP 274
Nunn, Walter R., "A Result in the Theory of Spiral Search," 9 pp., Mar 1980
- PP 275
Goldberg, Lawrence, "Recruiters Advertising and Navy Enlistments," 34 pp., Mar 1980, AD A082 221
- PP 276
Goldberg, Lawrence, "Delaying an Overhaul and Ship's Equipment," 40 pp., May 1980, AD A085 095
- PP 277
Mangel, Marc, "Small Fluctuations in Systems with Multiple Limit Cycles," 19 pp., Mar 1980 (Published in SIAM J. Appl. Math., Vol. 38, No. 1, Feb 1980) AD A086 229
- PP 278
Mizrahi, Maurice, "A Targeting Problem: Exact vs. Expected-Value Approaches," 23 pp., Apr 1980, AD A085 096
- PP 279
Walt, Stephen M., "Causal Inferences and the Use of Force: A Critique of Force Without War," 50 pp., May 1980, AD A085 097
- PP 280
Goldberg, Lawrence, "Estimation of the Effects of A Ship's Steaming on the Failure Rate of Its Equipment: An Application of Econometric Analysis," 25 pp., Apr 1980, AD A085 098
- PP 281
Mizrahi, Maurice M., "Comment on 'Discretization Problems of Functional Integrals in Phase Space'," 2 pp., May 1980, published in "Physical Review D", Vol. 22 (1980), AD A094 994
- PP 283
Dismukes, Bradford, "Expected Demand for the U.S. Navy to Serve as An Instrument of U.S. Foreign Policy: Thinking About Political and Military Environmental Factors," 30 pp., Apr 1980, AD A085 099
- PP 284
J. Kellison,* W. Nunn, and U. Sumita,** "The Laguerre Transform," 119 pp., May 1980, AD A085 100
*The Graduate School of Management, University of Rochester and the Center for Naval Analyses
**The Graduate School of Management, University of Rochester
- PP 285
Remnek, Richard B., "Superpower Security Interests in the Indian Ocean Area," 26 pp., Jun 1980, AD A087 113
- PP 286
Mizrahi, Maurice M., "On the WKB Approximation to the Propagator for Arbitrary Hamiltonians," 25 pp., Aug 1980 (Published in Journal of Math. Phys., 22(1) Jan 1981), AD A091 307
- PP 287
Cope, Davis, "Limit Cycle Solutions of Reaction-Diffusion Equations," 35 pp., Jun 1980, AD A087 114
- PP 288
Golman, Walter, "Don't Let Your Slides Flip You: A Painless Guide to Visuals That Really Aid," 28 pp., (revised Aug 1982), AD A092 732
- PP 289
Robinson, Jack, "Adequate Classification Guidance - A Solution and a Problem," 7 pp., Aug 1980, AD A091 212
- PP 290
Watson, Gregory H., "Evaluation of Computer Software in an Operational Environment," 17 pp., Aug 1980, AD A091 213
- PP 291
Maddala, G. S.* and Trost, R. P., "Some Extensions of the Nerlove Press Model," 17 pp., Oct 1980, AD A091 946
*University of Florida

- PP 292
Thomas, James A., Jr., "The Transport Properties of Binary Gas Mixtures in Applied Magnetic Fields," 10 pp., Sept 1980 (Published in Journal of Chemical Physics 72(10), 15 May 1980)
- PP 293
Thomas, James A., Jr., "Evaluation of Kinetic Theory Collision Integrals Using the Generalized Phase Shift Approach," 12 pp., Sept 1980 (Printed in Journal of Chemical Physics 72(10), 15 May 1980)
- PP 294
Roberts, Stephen S., "French Naval Policy Outside of Europe," 30 pp., Sept 1980 (Presented at the Conference of the Section on Military Studies, International Studies Association Kiawah Island, S.C.), AD A091 306
- PP 295
Roberts, Stephen S., "An Indicator of Informal Empire: Patterns of U.S. Navy Cruising on Overseas Stations, 1869-1897," 40 pp., Sept 1980 (Presented at Fourth Naval History Symposium, US Naval Academy, 26 October 1979, AD A091 316)
- PP 296
Dismukes, Bradford and Petersen, Charles C., "Maritime Factors Affecting Iberian Security," (Factores Maritimos Que Afectan La Seguridad Ibeica) 14 pp., Oct 1980, AD A092 733
- PP 297 - Classified
- PP 298
Mizrahi, Maurice M., "A Markov Approach to Large Missile Attacks," 31 pp., Jan 1981, AD A096 159
- PP 299
Jondrow, James M. and Levy, Robert A., "Wage Leadership in Construction, 19 pp., Jan 1981, AD A094 797
- PP 300
Jondrow, James and Schmidt, Peter, "On the Estimation of Technical Inefficiency in the Stochastic Frontier Production Function Model," 11 pp., Jan 1981, AD A096 160
*Michigan State University
- PP 301
Jondrow, James M., Levy, Robert A. and Hughes, Claire, "Technical Change and Employment in Steel, Autos, Aluminum, and Iron Ore, 17 pp., Mar 1981, AD A099 394
- PP 302
Jondrow, James M. and Levy, Robert A., "The Effect of Imports on Employment Under Rational Expectations," 19 pp., Apr 1981, AD A099 392
- PP 303
Thomson, James, "The Rarest Commodity in the Coming Resource Wars," 3 pp., Aug 1981 (Published in the Washington Star, April 13, 1981)
- PP 304
Duffy, Michael K.; Greenwood, Michael J. and McDowell, John M., "A Cross-Sectional Model of Annual Interregional Migration and Employment Growth: Intertemporal Evidence of Structural Change, 1958-1975," 31 pp., Apr 1981, AD A099 393
*University of Colorado
**Arizona State University
- PP 305
Nunn, Laura H., "An Introduction to the Literature of Search Theory," 32 pp., Jun 1981
- PP 306
Anger, Thomas E., "What Good Are Warfare Models?" 7 pp., May 1981
- PP 307
Thomson, James, "Dependence, Risk, and Vulnerability," 43 pp., Jun 1981
- PP 308
Mizrahi, M.M., "Correspondence Rules and Path Integrals," Jul 1981. Published in "Nuovo Cimento B", Vol. 61 (1981)
- PP 309
Weinland, Robert G., "An (The?) Explanation of the Soviet Invasion of Afghanistan," 44 pp., May 1981
- PP 310
Stanford, Janette " and Tai Te Wu, "A Predictive Method for Determining Possible Three-dimensional Foldings of Immunoglobulin Backbones Around Antibody Combining Sites," 19 pp., Jun 1981 (Published in J. theor. Biol. (1981) 88, 421-439
*Northwestern University, Evanston, IL
- PP 311
Bowes, Marianne, Brechling, Frank P. R., and Utgoff, Kathleen P. Classen, "An Evaluation of UI Funds," 13 pp., May 1981 (Published in National Commission on Unemployment Compensation's Unemployment Compensation: Studies and Research, Volume 2, July 1980)
- PP 312
Jondrow, James; Bowes, Marianne and Levy, Robert, "The Optimum Speed Limit," 23 pp., May 1981
- PP 313
Roberts, Stephen S., "The U.S. Navy in the 1980s," 36 pp., Jul 1981
- PP 314
Jehn, Christopher; Horowitz, Stanley A. and Lockman, Robert F., "Examining the Draft Debate," 20 pp., Jul 1981
- PP 315
Buck, Ralph V., Capt., "Le Catastrophe by any other name...", 4 pp., Jul 1981
- PP 316
Roberts, Stephen S., "Western European and NATO Navies, 1980," 20 pp., Aug 1981
- PP 317
Roberts, Stephen S., "Superpower Naval Crisis Management in the Mediterranean," 35 pp., Aug 1981
- PP 318
Vega, Milan N., "Yugoslavia and the Soviet Policy of Force in the Mediterranean Since 1961," 187 pp., Aug 1981
- PP 319
Smith, Michael W., "Anti-air Warfare Defense of Ships at Sea," 46 pp., Sep 1981 (This talk was delivered at the Naval Warfare System and Technology Conference of the American Institute of Aeronautics and Astronautics in Washington on December 12, 1980; in Boston on January 20, 1981; and in Los Angeles on June 12, 1981.)

- PP 320
Trost, R. P.; Lurie, Philip and Berger, Edward, "A Note on Estimating Continuous Time Decision Models," 15 pp., Sep 1981
- PP 321
Duffy, Michael K. and Ladman, Jerry R.,* "The Simultaneous Determination of Income and Employment in United States--Mexico Border Region Economies," 34 pp., Sep 1981
*Associate Professor of Economics, Arizona State University, Tempe, AZ.
- PP 322
Warner, John T., "Issues in Navy Manpower Research and Policy: An Economist's Perspective," 66 pp., Dec 1981
- PP 323
Bomse, Frederick M., "Generation of Correlated Log-Normal Sequences for the Simulation of Clutter Echoes," 33 pp., Dec 1981
- PP 324
Horowitz, Stanley A., "Quantifying Seapower Readiness," 6 pp., Dec 1981 (Published in Defense Management Journal, Vol. 18, No. 2)
- PP 326
Roberts, Stephen S., "Western European and NATO Navies, 1981," 27 pp., Jul 1982
- PP 327
Hammon, Colin, Capt., USN and Graham, David R., Dr., "Estimation and Analysis of Navy Shipbuilding Program Disruption Costs," 12 pp., Mar 1980
- PP 328
Weinland, Robert G., "Northern Waters: Their Strategic Significance," 27 pp., Dec 1980
- PP 329
Mangel, Marc, "Applied Mathematicians And Naval Operators," 40 pp., Mar 1982 (Revised)
- PP 330
Lockman, Robert F., "Alternative Approaches to Attrition Management," 30 pp., Jan 1982
- PP 331
Roberts, Stephen S., "The Turkish Straits and the Soviet Navy in the Mediterranean," 15 pp., Mar 1982 (Published in Navy International)
- PP 332
Jehn, Christopher, "The RDF and Amphibious Warfare," 36 pp., Mar 1982
- PP 333
Lee, Lung-Fel and Trost, Robert P., "Estimation of Some Limited Dependent Variable Models with Application to Housing Demand," 26 pp., Jan 1982 (Published in Journal of Econometrics 8 (1978) 357-382)
- PP 334
Kenny, Lawrence W., Lee, Lung-Fel, Maddala, G. S., and Trost R. P., "Returns to College Education: An Investigation of Self-Selection Bias Based on the Project Talent Data," 15 pp., Jan 1982. (Published in International Economic Review, Vol. 20, No. 3, October 1979)
- PP 335
Lee, Lung-Fel, G.S. Maddala, and R. P. Trost, "Asymptotic Covariance Matrices of Two-Stage Probit and Two-Stage Tobit Methods for Simultaneous Equations Models with Selectivity," 13 pp., Jan 1982. (Published in Econometrica, Vol. 48, No. 2 (March, 1980))
- PP 336
O'Neill, Thomas, "Mobility Fuels for the Navy," 13 pp., Jan 1982. (Accepted for publication in Naval Institute Proceedings)
- PP 337
Warner, John T. and Goldberg, Matthew S., "The Influence of Non-Pecuniary Factors on Labor Supply," 23 pp., Dec 1981
- PP 339
Wilson, Desmond P., "The Persian Gulf and the National Interest," 11 pp., Feb 1982
- PP 340
Lurie, Philip, Trost, R. P., and Berger, Edward, "A Method for Analyzing Multiple Spell Duration Data," 34 pp., Feb 1982
- PP 341
Trost, Robert P. and Vogel, Robert C., "Prediction with Pooled Cross-Section and Time-Series Data: Two Case Studies," 6 pp., Feb 1982
- PP 342
Lee, Lung-Fel, Maddala, G. S., and Trost, R. P., "Testing for Structural Change by D-Methods in Switching Simultaneous Equations Models," 5 pp., Feb 1982
- PP 343
Goldberg, Matthew S., "Projecting the Navy Enlisted Force Level," 9 pp., Feb 1982
- PP 344
Fletcher, Jean, W., "Navy Quality of Life and Reenlistment," 13 pp., Nov 1981
- PP 345
Utgoff, Kathy and Thaler, Dick, "The Economics of Multi Year Contracting," 47 pp., Mar 1982. (Presented at the 1982 Annual Meeting of the Public Choice Society, San Antonio, Texas, March 5-7, 1982)
- PP 346
Rostker, Bernard, "Selective Service and the All-Volunteer Force," 23 pp., Mar 1982
- PP 347
McConnell, James, M., "A Possible Counterforce Role for the Typhoon," 24 pp., Mar 1982
- PP 348
Jondrow, James, Trost, Robert, "An Empirical Study of Production Inefficiency in the Presence of Errors-in-The-Variables," 14 pp., Feb 1982
- PP 349
W. H. Breckenridge, O. Kim Malmin, "Collisional Intramultiplet Relaxation of Cd(5s5p³P_{0,1,2}) by Alkane Hydrocarbons," 7 pp., Jul 1981. (Published in Journal of Chemical Physics, 76(4), 15 Feb 1982)

PP 350

Levin, Marc, "A Method for Increasing the Firepower of Virginia Class Cruisers," 10 pp., Apr 1982. (To be published in U.S. Naval Institute Proceedings)

PP 351

Coutre, S. E.; Stanford, J. M.; Hovis, J. G.; Stevens, P. W.; Wu, T. T., "Possible Three-Dimensional Backbone Folding Around Antibody Combining Site of Immunoglobulin MOPC 167," 18 pp., Apr 1982. (Published in Journal of Theoretical Biology)

PP 352

Barfoot, C. Bernard, "Aggregation of Conditional Absorbing Markov Chains," 7 pp., June 1982 (Presented to the Sixth European Meeting on Cybernetics and Systems Research, held at the University of Vienna, Apr 1982.)

PP 353

Barfoot, C. Bernard, "Some Mathematical Methods for Modeling the Performance of a Distributed Data Base System," 18 pp., June 1982. (Presented to the International Working Conference on Model Realism, held at Bad Honnek, West Germany, Apr 1982.)

PP 354

Hall, John V., "Why the Short-War Scenario is Wrong for Naval Planning," 6 pp., Jun 1982.

PP 356

Cylike, Steven; Goldberg, Matthew S.; Hogan, Paul; Melrs, Lee; "Estimation of the Personal Discount Rate: Evidence from Military Reenlistment Decisions," 19 pp., Apr 1982.

PP 357

Goldberg, Matthew S., "Discrimination, Nepotism, and Long-Run Wage Differentials," 13 pp., Sep 1982. (Published in Quarterly Journal of Economics, May 1982.)

PP 358

Akst, George, "Evaluating Tactical Command And Control Systems--A Three-Tiered Approach," 12 pp., Sep 1982.

PP 359

Quester, Aline; Fletcher, Jean; Marcus, Alan; "Veteran Status As A Screening Device: Comment," 26 pp., Aug 1982.

PP 361

Quanbeck, David B., "Methods for Generating Aircraft Trajectories," 51 pp., Sep 1982.

PP 362

Horowitz, Stanley A., "Is the Military Budget Out of Balance?," 10 pp., Sep 1982.

PP 363

Marcus, A. J., "Personnel Substitution and Navy Aviation Readiness," 35 pp., Oct 1982.

PP 364

Quester, Aline; Nakada, Michael; "The Military's Monopsony Power," 29 pp., Oct 1982.

PP 366

Sprulli, Nancy L.; Gastwirth, Joseph L., "On the Estimation of the Correlation Coefficient From Grouped Data," 9 pp., Oct 1982. (Published in the Journal of the American Statistical Association, Sep 1982, Vol. 77, No. 379, Theory and Methods Section.)

PP 370

Rostker, Bernard D., "Human Resource Models: An Overview," 17 pp., Nov 1982.

END

FILMED

2-83

DTIC