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Measuring the Costs and Benefits of Army Service

SAG Corporation

for

Contracting Officer's Representative
Laurel W. Oliver

Organizational and Personnel Resources Research Unit
Paul A. Gade, Chief

Manpower and Personnel Research Division
Zita M. Simutis, Director

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EDGAR M. JOHNSON
Director

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Technical review by

James M. Foland
Peter Greenston
Hyder A. Lakhani

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This research puts the costs and benefits of Army service into a social accounting framework. The traditional budget cost and defense readiness perspective is expanded to account for joint product effects of Army service. The analysis concentrates on Army personnel and training programs, noting that the value of military experience and training in the civilian sector is a major area in which the social value of Army service is likely to exceed the private value. The social value of certain forms of unit training and exercises is scrutinized to detect potential structural changes that yield additional social benefits.

The analytical framework developed helps the Army to better understand the true social costs and benefits of its personnel and training programs; to choose ways of achieving a given level of military readiness that produces the greatest net social value; to articulate to Congress the social value, in addition to the military readiness value, of some of its programs, thus producing more informed decisions concerning defense and non-defense uses of taxpayer resources; and to explain to potential recruits and to the taxpayer the value of some Army programs to other sectors of the economy.

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FOREWORD

The Manpower and Personnel Policy Research Division of the U.S. Army Research Institute for the Behavioral and Social Sciences (ARI) performs research on the economics of manpower and personnel issues of particular significance to the U.S. Army. This project developed a framework to measure the costs and benefits associated with Army service. It developed a social accounting framework and methodology to analyze those aspects of Army behavior that provide "joint benefits" to the civilian sector and the direct benefit of military readiness. The results of the research suggest empirical applications of the framework.

ARI's participation in this effort is part of an ongoing program of research designed to improve the Army's ability to effectively manage the force. This analysis of social costs and benefits arising from Army activities assists the Army in its mission by promoting awareness of the economic impacts of Army actions on both the civilian and military sectors.

MEASURING THE COSTS AND BENEFITS OF ARMY SERVICE

EXECUTIVE SUMMARY

Requirement:

Debate on the size and role of U.S. military forces has shifted dramatically with the demise of the Warsaw Pact. Downsizing and cries for a "peace dividend" are reallocating resources to social goals. However, in addition to national defense, the Army and service therein provide substantial contributions to social goals. This research examines the true social cost of resources allocated to the defense sector with an eye toward better understanding the cost and benefits of service in the Army and the value and costs of activities undertaken while in the Army. Failure to include non-defense benefits of Army activities results in underinvestment and a smaller than optimally sized Army.

Procedure:

The research puts the costs and benefits of Army service into a social accounting framework by broadening the definitions of costs and benefits to include those accruing to society as a whole. The traditional budget cost and defense readiness perspective is thus expanded to properly account for "joint product" effects of Army service. The analysis concentrates on Army personnel and training programs, noting that the value of military experience and training in the civilian sector is a major area in which the social value of Army service is likely to exceed the private value. The social value of certain forms of unit training and exercises is scrutinized to detect potential structural changes that yield additional social benefits.

Findings:

The analytical framework developed helps the Army to better understand the true social costs and benefits of its personnel and training programs; to choose ways of achieving a given level of military readiness that produces the greatest net social value; to articulate to Congress the social value, in addition to the military readiness value, of some of its programs, thus producing more informed decisions between defense and non-defense uses of taxpayer resources; and to explain to potential recruits and to the taxpayer the value of some Army programs to other sectors of the economy. An example of the cost-benefit

methodology is applied to estimate the external (societal) benefits of the Army's high school student testing program.

Utilization of Findings:

This research provides a social accounting framework to measure the impact on society of Army service. These results show the usefulness of such a framework and demonstrate the need to quantify these social costs and benefits of military service through further work. This framework can be readily applied to estimate the impacts on society arising from other Services.

MEASURING THE COSTS AND BENEFITS OF ARMY SERVICE

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MEASURING THE COSTS AND BENEFITS OF ARMY SERVICE

Introduction

Background

With the demise of the Soviet Union, public debate on the size and role of U.S. military forces has shifted dramatically in the United States. With the possible exception of a brief period in the early 1970s, there was a general consensus that the threat posed by the military forces of the Soviet Union and the Warsaw Pact jeopardized world peace, the existence of an independent Western Europe, and even national survival. The goal of remaining ahead of a single, powerful, potential adversary, apparently intent on accelerating the growth of its military capability, dominated the justification for the level of the nation's resources devoted to national defense.[1]

While defense budget debates and issues in the post-World War II era have focused largely on how much to add, the major debate in the 1990s has been how much to cut. The quest for a substantial "peace dividend" associated with the apparent end of the Cold War, and the reallocation of this dividend to social goals,[2] provides motivation for these reductions.

Commentators generally agree that (1) resources devoted to defense should largely be determined by the magnitude and nature of the threat the nation faces to its security; and (2) that threat is substantially lower now than at any time in the preceding three decades. Hence, reductions in the resources devoted to national security are clearly warranted. However, it is our premise that as resources are withdrawn from the defense sector, we should at the same time reexamine the true social costs and benefits of resources allocated to the defense sector. In particular, we should attempt to understand better the costs and benefits of service in the Army and the value and costs of activities undertaken while in the Army.

We propose adopting a social accounting framework for examining the costs and benefits of Army service. This framework broadens the definitions of costs and benefits from a purely budget cost and defense readiness perspective to include a social

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[1]Indeed, Harold Brown, serving as Secretary of Defense in the Carter Administration, remarked that "When we build (our military forces), they (the Soviet Union) build. When we stop building, they build."

[2]The social goals take two forms: deficit reduction—essentially, releasing the claim to resources back to the taxpayer; and the expansion of government domestic programs.

accounting of costs and benefits to society as a whole.[3] That is, the perspective is expanded to include not solely the budget costs to the Army and the taxpayer of Army service and the very important and substantial benefit of producing a ready, fighting force to support our nation's security interests. It will also include the value of defense activities and resources to non-defense sectors of the economy, both public and private, and the value of military service to the individual.

Our primary focus in applying this framework is Army personnel and training programs. There are two reasons for this. First, the value of military experience and training in the civilian sector is a major area where the social value of Army service is likely to exceed the private value. The decline in the number of active duty personnel and the number of new job opportunities, as measured by accessions, will have a visible impact on the youth labor market. Current and future cohorts of youth, particularly those high school graduates who score below average on the Armed Services Vocational Aptitude Battery (ASVAB), will find it more difficult to secure an entry-level Army position that offers training and experience that may be valuable in civilian life. Our social accounting framework may help to understand better the implications of this loss. Moreover, our framework suggests that personnel and individual skill training of personnel should be reduced to a lesser degree when one considers the full social costs and benefits. Second, resources for unit training and exercises—the type of training that arguably provides the greatest payoff in readiness—will become increasingly scarce. Yet, some of this training can potentially be structured to increase or maintain military readiness but also offer additional, social benefits. Hence, when the social benefits are considered, more unit training and maintenance of higher levels of readiness may be optimal.

Purpose

As the drawdown continues, difficult choices must be made, first, regarding the overall reduction in resources devoted to the defense sector and, second, between the force structure and the type of weapon systems that make up that structure, and the readiness and sustainability of those forces. The primary criterion for these tough choices should always be, in our view, the nature of the threat and reducing the risk posed by that threat to acceptable levels at the lowest possible cost to the economy. That is, the primary criterion for allocating resources to the defense sector, and across force structure,

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[3]The social accounting framework, however, is structured and disciplined. It is based on modern welfare economics as outlined in, for example, Richard E. Just, Darrel L. Hueth, and Andrew Schmitz, *Applied Welfare Economics and Public Policy*, Prentice Hall, 1982.

readiness activities, modernization, and so forth, should remain the effect on military capability.[4] However, when choosing among alternative ways to obtain a given level of overall military capability or effectiveness, or alternative methods of achieving a readiness goal, the method that yields the greatest net social value—benefits less costs—is the rational choice. Moreover, it is the choice that is more likely to maintain support of the Army's mission outside of the defense community.

The purpose of this paper is to develop a framework for analyzing the full social costs and benefits of defense resources and activities. This framework will help the Army:

1. better understand the true social costs and benefits of its programs;

2. choose ways of achieving a given level of military readiness that produces the greatest net social value (benefits less costs);

3. articulate to Congress the social value, in addition to the purely military value, of some of its programs, producing more informed decisions regarding the tradeoffs between defense and non-defense uses of taxpayer's resources;

4. explain to potential recruits and to the taxpayer the value of some Army programs to other sectors of the economy.

We focus on Army military personnel and training resources and activities under the theme of the costs and benefits of Army service. Service in the Army is valuable in its own right. Individuals are trained in military skills and become contributors to the Army's readiness and overall warfighting capability. In the process, however, other products may be produced that have social value outside of the primary military context for which they are undertaken. In this paper, we provide a framework for exploring these social costs and values.

The major sections include:

1. Framework for Estimating Social Costs and Benefits of Army Service: the elements of the social accounting framework, discussion of social costs of Army personnel programs, and identification of social benefits arising from Army service

[4]We emphasize this point in order that our social accounting framework, presented below, be not misinterpreted as suggesting that resources should be allocated to the defense sector for reasons other than national defense.

2. Potential Application of the Social Accounting Framework: A methodology to estimate true social costs and benefits of Army service

3. Appendices: a taxonomy of Army service costs and benefits, the external benefits of student testing, and the results of the literature search

Framework for Estimating Social Costs and Benefits of Army Service

Estimating Personnel and Other Resource Costs

Social Opportunity Cost and Rent

The cost of allocating resources to the defense sector or to the Army is the "opportunity cost" of the resources in the non-defense sector. The "opportunity cost" is simply the value of the resources in their best non-defense alternative. If the resources have no value other than their use in the defense sector, then from a social accounting view, the social cost of allocating those resources to the defense sector is zero.

The budget cost of those resources is (in this social accounting framework) rent--a social surplus paid over and above the amount necessary to attract the resources into this activity.[5] In that sense, it is a "transfer payment" from the economy in general to particular recipients. It does not affect the allocation of resources because the resource would have been absorbed by the defense sector anyway, regardless of the transfer payment. Its net social cost is zero, because the value of the purchasing power—the claim over other goods and services—given up by those in the economy who provide the payment is just equal to the value of the payment received by the resource or its owners. Of course, few (if any) resources allocated to the defense sector have absolutely no alternative use; thus, the social cost of using them for defense is positive.

Conceptually, we measure the opportunity cost of the resource in the defense sector and the Army as the area under its "supply curve" to the Army. The supply curve indicates the price at which an additional unit of the resource is willingly supplied to the Army. Correspondingly, it represents the value of the resource—what is given up—in the non-defense sector. In the diagrams below, we illustrate two extreme cases.

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[5]Strictly speaking, there may be distortions introduced by the tax system and other real collection costs introduced in obtaining the necessary revenues. We ignore these costs in this discussion. They are likely to be small relative to the revenue collected.

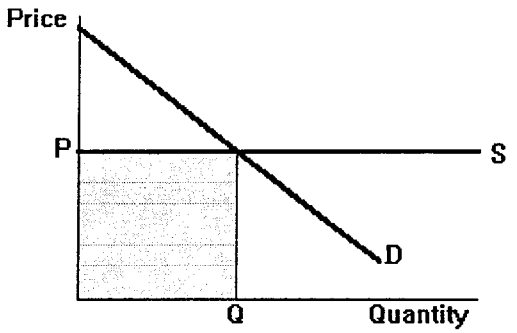

Figure 1: Case of Perfectly Elastic Supply

Figure 1 illustrates the case in which the Army can purchase its desired amount of a resource at a constant price per unit, P. The supply curve for this resource, labeled "S," is perfectly elastic. The Army's demand curve, labeled "D," indicates that, given the supply price, quantity Q is purchased. The total cost to the Army is PQ. The social cost of the resource to the Army—the area under the supply curve—is also PQ, the hatched area. The opportunity cost of the resource—the value in its next best non-defense alternative—is simply P. Hence, in this case, the budget cost to the Army of the resource is equal to its social cost. There is no "rent" generated.

In Figure 2, the supply curve is vertical, or perfectly inelastic. The quantity, Q, of the resource will be supplied to the Army regardless of the price Army pays. Given Army's actual demand, the price is again P, and the total budget cost is PQ. However, in this case, the entire budget cost is "rent" to the

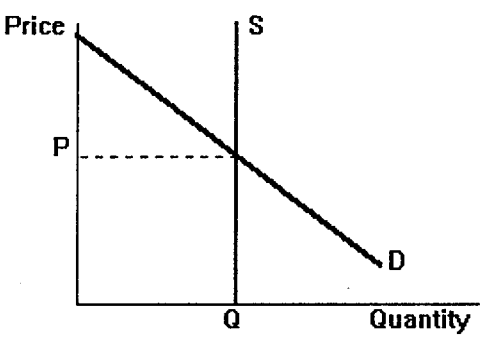

Figure 2: Case of Perfectly Inelastic Supply

resource, and the net social cost of Army's use of the resource is zero.[6]

The cases represent two extremes. The more general case (shown in Figure 3) occurs when the supply of the resource is upward sloping but not perfectly inelastic. Moreover, this is a particularly interesting and important case for the Army, because the supply of qualified personnel for active duty Army service is generally considered to be upward sloping.[7]

In Figure 3, the budget cost is the rectangle PEQ0. However, the social opportunity cost of using an amount, Q, of this resource in the Army is the area under the supply curve P_oEQ0. This area reflects the "opportunity cost" of this resource—the value it would have in its next best non-Army use. The area PEP_o is equal to the "rent" paid to the resource, or its owners. It is the amount paid that is over and above the amount necessary to

[6]This extreme case is somewhat unrealistic, in that if only the Army has a demand for the resource, the price Army would actually have to pay is arbitrarily low. However, if we consider the case of the allocation of resources to DoD as a whole, with the four Services implicitly competing for the resource that is supplied inelastically to DoD, the outcome becomes somewhat more plausible.

[7]Both the supply of new entrants—enlisted recruits—and the supply of experienced career personnel tends to be upward sloping. When increasing the demand for recruits from, say 80,000 to 110,000, Army would fully expect to offer higher average enlistment bonuses and educational incentives, and perhaps request a higher pay raise for first termers. Moreover, if first term reenlistment goals were to rise from, say 40% to 60%, Army would undoubtedly request additional Selective Reenlistment Bonuses to induce the additional enlistments. As long as the Army cannot perfectly discriminate, portions of the payment will be "rents" to recruits or soldiers who would have enlisted or reenlisted without the additional inducements. The reader is referred to the articles on retention and on enlistment supply in Army Manpower Economics, Curt Gilroy, ed., 1986; the articles on retention in the Army in Army Reenlistment and Compensation Models, Curt Gilroy et al, ed., 1991, and more recently for Army enlistment supply, to Larry Goldberg, Paul F. Hogan, and D. Alton Smith, "A Cost-Effectiveness Analysis of the Army College Fund," SRA, 1991, for econometric evidence that the supply of enlistments and reenlistments to the Army is upward sloping.

purchase that quantity for Army use.

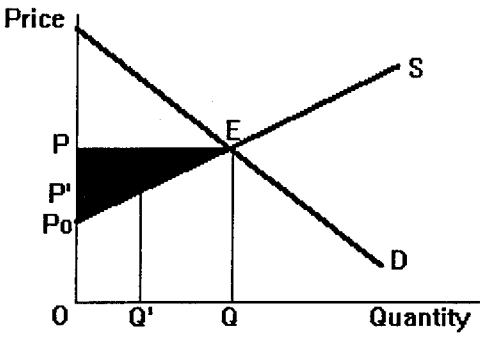

Figure 3: Case of Upward Sloping Supply

The supply of qualified recruits, or the supply of reenlistments of qualified soldiers, is upward sloping in its relevant range as shown in Figure 3. In order to increase the supply of recruits from, say Q´ to Q, the wage rate must be raised from P´ to P.[8] However, Q´ recruits would have enlisted anyway. Hence, the difference, P-P´, is "rent" to them—payment in excess of what is required to attract them into that activity.[9] This "rent", from a social cost accounting framework, is not a real economic cost of the resource. It does not, to a first approximation, represent the value of real resources or the services of those resources that are expended or used up. Instead, it is an implicit transfer payment from some in the economy to others.[10] As long as those receiving the transfer payment value the claim to resources about as much as those providing the payment, there is no net gain or loss to the economy as a whole.[11] The real cost, or opportunity cost, of the resource to the economy is the area under the supply curve.

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[8]The wage rate is not simply pay and allowances, but all the incentives offered to attract recruits into the Army, including enlistment bonuses and the Army College Fund.

[9]Note the ability to "target" incentives to that portion of the market that would not enlist without them through the selective allocation of enlistment bonuses or education benefits. If one can perfectly "discriminate"—pay each enlistment only the minimum amount required to volunteer—the get cost would correspond to the social cost, the area under the supply curve, and there would be no "rent."

[10]See, for example, E.J. Mishan, Cost-Benefit Analysis, Praeger, 1971, pp. 69-79.

[11]If the process of extracting the transfer payments distorts incentives for working, saving, or purchasing particular goods or services—the effects of some taxes are an example—there is a social cost to the economy that is indirectly due to the transfer payment.

Hence, we conclude from this analysis that the budget cost of the Army military personnel account exceeds the social cost of the services of personnel represented by that budget due to the rent implicit in compensation. In fact, if the Army takes into account the "rent" it must pay to soldiers who would have enlisted or reenlisted anyway when deciding its recruiting and strength goals, it is likely that too few recruits or reenlistments will be programmed. That is, if the Army takes into account its *monopsony power* in the recruiting or reenlistment market—the fact that additional recruits or reenlistments, beyond some point, can be obtained only by increasing incentives, some of which goes to recruits or soldiers who would have enlisted or reenlisted anyway—an Army that has too few personnel from a social accounting perspective will result.

To see this, consider Figure 4. Originally, the Army chooses that level of strength where its demand (the marginal value it places on the services of an additional soldier) just equals the supply price (the opportunity cost of the soldier to the economy). This is the socially optimal level of strength. Now assume that the Army considers, among other things, the rent it must implicitly pay to soldiers who would enter or remain in the Army anyway when it chooses its level of strength. This is represented by the curve labeled "MFC." This curve is the increase in total budget cost when the Army raises the wage to attract one additional soldier. That is, it is the marginal cost to the Army of the additional soldiers and includes the "rent"

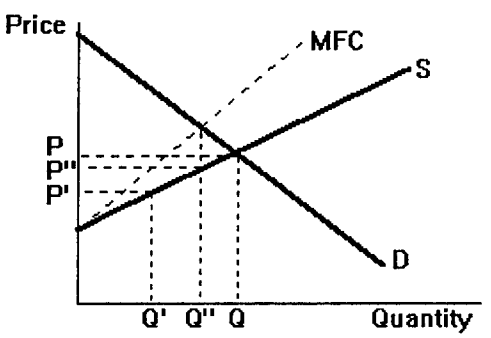

Figure 4: Case of Upward Sloping Supply with MFC

implicitly paid to the soldiers who would serve without the higher wage.

If the Army acts as a monopsonist, it will employ too few soldiers when the supply curve is upward sloping. By taking into account the cost of the "rent" paid to soldiers who would have enlisted or reenlisted in the Army without an increase in wages, it will choose to employ quantity Q", rather than Q, soldiers. The socially optimum quantity would be at the point where the

marginal social cost is equal to the marginal value, or Q in the diagram, and the wage would be P. Instead, by including the cost of the additional rents that must be paid, the Army would choose to employ quantity Q" and pay a wage (P") that is less than P.

To the extent that the Army can target incentives to those soldiers or recruits who would not have reenlisted or enlisted without additional incentives, the amount of rent is reduced and budget costs reflect, approximately, social opportunity costs. In general, however, budget costs will overstate the social costs of personnel, and Army strength level may be "too low" as a result. Appendix A lists the elements of compensation used to attract, retain, and motivate soldiers.

Cash vs. In-Kind Incentives

In the previous discussion, incentives were in the form of cash wages or bonuses—generally purchasing power. When incentives are supplied "in-kind," the rent generated from the incentive may be less than the budget cost of that incentive. The logic of this proposition is that cash wages provide general purchasing power while the "in-kind" benefit provides a particular good or service. In general, as long as the individual can purchase the in-kind benefit at the same cost that it is provided to him or her, the value placed on the in-kind benefit should be no greater than its cash equivalent in cost. Moreover, because the in-kind incentive cannot readily be transformed to general purchasing power without a loss in value, it will generally be valued less than its cost. Hence, if incentives are provided in the form of in-kind benefits, any "rents" may be valued less than the general purchasing power given up by the taxpayers who provide the resources. Because the value of the in-kind benefits may be less than the cost, the social opportunity cost of the apparent rents will be proportional to the value placed on the benefits relative to their cost. In other words, if individuals receiving the in-kind benefits value those benefits less than those who ultimately pay—the taxpayers—there will be a social cost to the apparent rents.

Taxes in the Social Cost Framework

In principle, the social cost of all resources used by the Army should be calculated net of taxes.[12] This means, in principle, that a budget dollar's worth of tax-free benefits, such as a housing allowance, is actually more costly than a budget dollar's worth of cash wages, which is taxable to the recipient. The rationale for estimating the opportunity cost net of taxes is that taxes represent value, similar to "rent," that is in excess of the real opportunity cost of the resource. Since the services

[12]When comparing in-house versus contract costs, one should, of course, compare them on the same, net of taxes, basis. This is the "net social cost" basis for both.

associated with the resource are willingly supplied by the owner at the net of tax price or wage, the tax itself represents a claim to general purchasing power that is above the opportunity cost of the resource. Hence, it is a "social surplus" and should be netted out in the computation of social cost.

It is important to recognize, however, that when comparing the cost of Army activities conducted "in-house" to the costs of, for example, contracting out for the activity, both alternatives should be compared on a net of tax basis. The portion of prices or wages represented by taxes in the private sector are also a social surplus.[13]

Joint Products and External Benefits of Army Service

As noted in the introduction, the rationale for maintaining the size and composition of the nation's Armed Forces at a certain level has changed dramatically in recent years. The Cold War has ended, the Soviet Union and its satellites have dissolved as political entities, and with these events the main military threat to U.S. interests—at least insofar as force planning was concerned—has also diminished to a point of relative insignificance.

As a result, it has become clear that a revised national military strategy must be developed to replace the previous one, which was "threat-based" (i.e., designed to respond to the military challenges posed by the need to contain the Soviet Union and its Warsaw Pact allies). While the details of a new strategy have not been completely developed, there seems to be widespread agreement that it should be "capabilities-based" (i.e., in the absence of a dominant threat), the U.S. should preserve the capacity and flexibility necessary to respond globally to multiple contingencies, and the U.S. should retain the ability to reconstitute a larger force to counter a major threat should it emerge.

However, the absence of a single, dominant threat has increased the public interest in using the capabilities of the Armed Forces in efforts not traditionally defense-related. In this view, the peace dividend comes not so much from the financial savings obtained by reducing the defense budget, but by

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[13]In comparing in-house and private sector costs for the same activity, it is reasonable that one adopt the convention that both be compared gross of taxes or both be compared net of taxes. The most egregious error would be to compute one set of costs gross of taxes and the other net. However, because some military benefits, such as the housing allowance, are tax-free to the individual, while such benefits are generally not tax-free in the civilian sector, it would be necessary to compute an implicit tax on the tax-free military benefits when comparisons are made gross of taxes. In our view, it is simply cleaner to make all such comparisons net of tax.

employing the unique capabilities of the Armed Forces to solve pressing and complex domestic problems. The recent examples of using the Armed Forces in Kurdish relief and in maintaining order in Somalia—prototypical examples of the new strategy—tend to reinforce the perception that the public interest would be better served by doing the same things at home—devoting available defense resources to seemingly more important requirements such as disaster relief, infrastructure repair, health and education services in rural areas and inner cities. This view gains additional credence when the military is perceived as outperforming existing agencies, as was the case during the relief efforts for Hurricane Andrew, when the military was seen as being much more effective than FEMA.

In the FY93 National Defense Authorization Act, Congress included a number of initiatives that begin or expand the use of defense resources, especially manpower, in civil cooperation or other non-traditional ways. Briefly, these initiatives are:

- Civil-Military Cooperative Action Program (Section 1081)
- National Guard Civilian Youth Opportunities Pilot Program (Section 1091)
- Civilian Community Corps Demonstration Program (Sections 1092 & 1094)
- Junior Reserve Training Corps (Section 533)
- Pilot Program to use National Guard Personnel in Medically Underserved Communities (Section 376)
- Teacher and Teachers Aide Placement Program for Separated Members of the Armed Forces, et. al. (Sections 4441-4444)
- Service Members Occupational Conversion and Training (Section 4481)

The greatest risk associated with focusing military resources and activities on domestic concerns is that, over time, these alternative concerns may begin to come at the expense of the primary mission—maintaining readiness and warfighting capability. While many may contend that DoD and the Army should embrace the opportunity to use its human capital resources for the benefit of society as a whole—the freedom even to consider the possibility is one of the benefits of having won the Cold War—beyond this noble impulse there is a certain programmatic fuzziness and a potential danger. While the provisions of the FY93 authorization act imply that there is a synergism involving the military and civilian sectors when applied to social problems, neither the

details of organization nor the costs of these cooperative efforts are spelled out.

What is needed in this regard is a comprehensive conceptual framework that provides a rationale for use of defense resources to achieve domestic goals while at the same time ensuring that warfighting readiness and capability are not only preserved, but perhaps enhanced. In this way DoD can satisfy both itself and Congress that defense resources are being utilized well and guide the development of policy for the future.

In fact, many of the activities the Army now engages in provide benefits not only to military preparedness, but to other, non-military related activities. The following framework presents the notion of "joint product" for Army activities.

A Simple Framework for Analyzing Non-Defense Applications of Defense Resources and Assessing External Benefits of Army Service

The primary purpose of resources allocated to the Department of the Army is to ensure the security of the United States and its allies against external threats of force. It does this by maintaining sufficient warfighting capability to deter aggression, and to defeat its adversaries in combat should deterrence fail. Given the magnitude of the resources devoted to achieving this vital mission, however, the question arises of whether the Department can allocate some of its resources to improve welfare in the non-defense area without adversely affecting its primary mission. Here we provide a simple framework for considering the efficacy of "non-defense" defense expenditures and their benefits to the country.

Joint Products: Defense and General Welfare

A general case in which the Army may have a comparative advantage in providing certain non-defense needs is when the act of providing the non-defense good or service also contributes directly to the defense mission. Exemplary of this are training activities which, as a by-product or joint product, can produce goods or services which increase welfare in the civilian sector at the same time that it provides relevant military training that would be required in any case. Delivery of emergency relief goods or search-and-rescue missions to the civilian sector by helicopters that must fly training missions to remain proficient are examples of such cases. We can distinguish three possibilities:

- First, the civilian good or service is supplied as a by-product of a defense-related activity that would have occurred, in one form or another, in any case. No significant additional cost is incurred in providing the civilian good or service over what would otherwise be incurred in the defense activity. Nevertheless, the

civilian sector benefits from this defense activity by more than the purely defense-related value of the activity.

- Second, the additional cost of providing the non-defense good or service may be much less, though not negligible, when done in conjunction with a defense activity. That is, producing the defense output reduces the cost of producing the civilian output. The total cost of jointly producing the defense activity and the civilian activity is less than the total of producing the defense and civilian output separately, though it is more costly than producing the defense output alone.

- Third, provision of the non-defense good or service by the defense establishment may simply be less costly than provision by non-defense sources because of the specialized resources in defense. That is, provision of the non-defense good by defense may not provide any defense-related benefits, as in the joint products case; but defense may simply have a cost advantage, because of its specialized resources and training, in providing that particular non-defense good or service at the margin.

These cases are illustrated in the diagrams below. In the first diagram, Figure 5, a non-defense good or service is provided jointly with a defense good or service, such as military training. The marginal value or demand curve for military training in this activity is given by the curve labeled MV Training. The marginal cost curve of providing this training is constant, as shown in the diagram. In the absence of any non-defense value of the training activity, the optimal amount of training to provide is Q1, the point at which the marginal value of training is just equal to the marginal cost. In addition, a non-defense good or service can be provided jointly with the training. Its marginal value or demand is given by the curve labeled MV Non-Defense. Marginal cost of providing this non-defense good or service is again the constant marginal cost curve shown in the diagram. In the absence of the defense activity, the implication of this diagram is that this non-defense good or service would not be provided, because there is no point at which its marginal value exceeds its marginal cost of provision.

However, given that the military training is provided, the non-defense good or service can also be provided, in this illustration, at no additional marginal cost. An example may be the transportation of medical supplies to an area where a natural disaster has occurred. The sorties flown to transport the

supplies would have been flown in any case as part of normal continuation training for airlift air crews. Transportation of supplies, in this example, jointly supplies military training and humanitarian relief.[14] Notice in this example that, because of the value of military training activities in the non-defense area, the optimal amount of military training increases from Q1 to Q2. At Q2, the sum of the marginal value of military training and the marginal value of the non-defense benefits provided by that training are equal to the marginal cost of providing that training. Hence, in this stylized instance, recognizing and exploiting the non-defense value of the military training activity results in more total training and, presumably, greater military readiness.

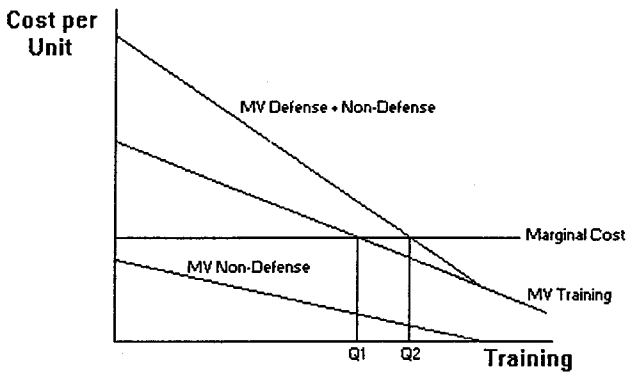

Figure 5: Analysis of Joint Benefits

The second diagram, Figure 6, illustrates the case where there are economies of joint provision of defense and defense goods or services, but that the marginal cost of joint provision is somewhat greater than the marginal cost of providing only the defense or only the non-defense good or service. MC1 is the marginal cost curve of providing either separately. Given the marginal valuation curves for the defense and non-defense good or service, Q1 of the non-defense and Q2 of the defense activity will be provided. The total cost of providing both, but separately, is given by MC1*(Q1+Q2). If they are jointly supplied, the marginal cost rises to MC2. However, optimal output is at the point where the sum of the marginal values is equal to MC2. Hence, the quantity of both the defense and the non-defense good or service rises to Q3. In this example, net benefits or welfare, as measured by the area under the sum of the marginal value curves but above MC2, necessarily rises. However,

[14]While there exists a training benefit and a benefit to society, there may also exist a high readiness cost.

total costs, now calculated as MC2*Q3, may be higher or lower

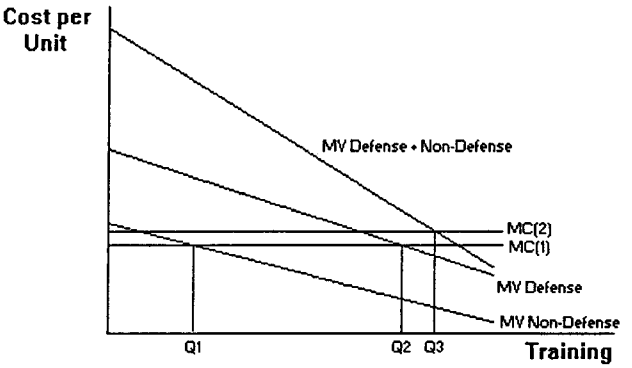

Figure 6: Analysis of Joint Benefits with Differing Marginal Costs

than when the goods or services are provided separately.[15]

Finally, we consider a third case in which the goods and services are not provided jointly but, for whatever reasons, the Army has a cost advantage in supplying the non-defense good or service, relative to other sources of supply. This cost advantage may be derived from (1) specialized equipment employed by the Army for military use, or (2) specialized training of Army personnel. The distinction between this case and the previous two is that provision of the non-defense good or service does not, at the same time, provide any direct military benefit. However, because of the specialized resources that are justified on the basis of national security, Army has a cost advantage in providing the non-defense good or service. The purchase of these specialized resources, however, could not be justified based on the non-defense benefits alone. Moreover, implicit is the notion that the opportunity cost to the defense sector of selectively using these resources is small.

The diagram below illustrates the case that for a non-defense good or service, with demand curve MV, the marginal cost curve for non-defense sector provision of the good or service is above

[15]Note that if DoD is constrained to producing the activity only when there are also non-defense goods jointly produced, the output of the DoD activity may decline.

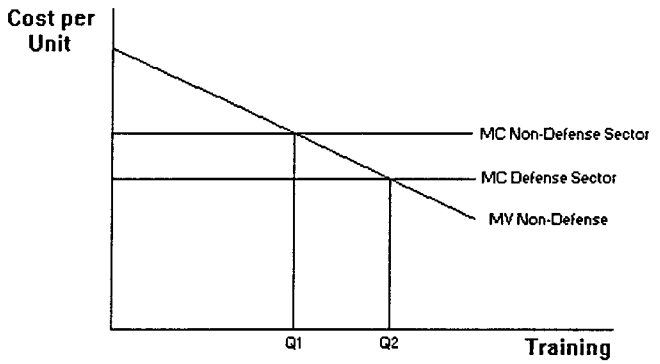

Figure 7: Analysis of Cost of Civilian Sector Benefits

that of the defense sector. Optimal output, if defense provides the good or service, is Q2 rather than Q1.

In all the cases illustrated, the output of the activity for defense purposes was large relative to that output for non-defense purposes. When this is not the case, the analysis based on net welfare maximizing output would suggest that, while some defense provision of the non-defense output is optimal, additional output should be provided by the non-defense sector. In this analysis the reaped economies are driven by the notion that a significant portion of the cost of investment is justified for national security reasons alone. Because of this, the marginal cost of providing certain non-defense goods and services within that envelope will be small. In particular in the last case, the "specialized resources" that presumably give DoD a cost advantage over some range of output would, at other ranges, no longer be necessary for defense purposes. Hence, DoD's cost advantage would disappear, and the marginal cost curve would jump up to the non-defense cost curve (or perhaps higher).

There are several important additional considerations regarding Army activities that may provide civilian sector benefits. First, some of the "economies" achieved by the Army in the provision of the civilian sector output may be because Army resources are not as fully employed or utilized during peacetime as they would be in times of war. If this were the case, the implications for the civilian sector upon withdrawal of the resources and curtailment of the benefit-generating activities, because of deployment for war or to meet a defense contingency, should be considered. If such withdrawal were to pose a high

cost on the civilian sector, the reliance on Army resources should be reconsidered.[16]

Second, in a similar vein, if the Army demand for the activity declines because, for example, of a further reduction in the national security threat, the amount of this activity that is jointly provided to the non-defense sector should also decline if the criterion is net welfare maximization. The economics of the political sector admonishes us, however, that there will be special interests and political constituencies that will have built up around this activity that may make such contraction difficult in practice. Experience with base closures adds empirical support to this admonition. However, not withstanding the longer run public choice considerations, our simple framework helps to describe cases where jointly supplying an output that contributes to national security and to non-defense-related welfare may be optimal and may, in fact, result in a higher level of readiness than would be the case without considering the non-defense benefits.

External Benefits of Army Training and Its Net Social Cost

Perhaps the single most important area where the benefits of military service extend beyond national security is the area of formal skill training. A large number of skills in which the Army provides formal training are valued in the civilian sector. These include electronics, computer science and data processing, mechanical repair and engineering skills, pilot training, medical training, and organizational, management and leadership skills.

In a sense, one may consider the provision of some types of Army training as a "joint product." The training makes the Army member more productive and more valuable to the Army. This alone justifies the expense incurred by the Army. But, in addition, the training and experience in applying that training while in the Army potentially has value in the civilian sector should the member leave the Army. It increases the "human capital" or potential productivity of the soldier in areas that are valued by the civilian sector. Hence, when Army training is provided, the "joint product" is the value of the increase in military

[16]For example, Army vehicles and personnel could, perhaps, substitute for civilian rescue and firefighting capability during normal peacetime periods. However, withdrawal of those resources would impose large costs on the civilian sector, even during wartime. Hence, it would be shortsighted to attempt to reap the apparent economies of such a substitution.

productivity and the increase in future civilian productivity provided by the training.[17]

While there have been some estimates of the effect of military training and experience on civilian earnings, there has been no attempt, to our knowledge, to estimate the net social benefits (or costs) of Army training.[18] Heuristically, the net social benefit of Army training can be written as:

> Net Social Benefit = value to the Army + min{value of increased civilian productivity, civilian training cost to produce that increase} - cost of training[19]

More formally, assume that an individual enters the Army at period 0, is trained in Army skill j at training cost C_j, provides increased value to the Army of ΔM_{jt} in Army skill j in period t. At period T, the member leaves the Army, entering the civilian sector. The individual has differential civilian productivity ΔW_{jt} in period t in the civilian sector—that is, the difference between the individual's productivity with the Army training and experience and the productivity the individual would have had in the civilian sector in period t if he or she had remained in the civilian sector, but had not obtained any civilian training. Finally, C^*_T is the cost of civilian training at period T that would produce the same change in the value of civilian productivity that results from the Army training. The individual is assumed to retire from the civilian labor market at period T*. Then, the net social value of military training is given by:

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[17]The value of the training to society is the minimum of the value of the increase in productivity and the cost of generating that increase some other way. For example, civilian training could also generate a similar increase in productivity. The value of the military training, then, is the minimum of the cost of civilian training and the value of the increase in productivity.

[18]See, for example, Matthew Goldberg and John T. Warner, "Earnings of Military Veterans," CRC-472. Alexandria, Va.: *Center for Naval Analyses;* or Jon R. Crane and David Wise, "Military Service and Civilian Earnings of Youth," in D.A. Wise, ed., Public Sector Payrolls. Chicago: University of Chicago Press (NBER), 1978.

[19]Here, cost of training is composed of the pecuniary and non-pecuniary training costs to the individual and to society.

$$\textit{Net Social Benefit} = \sum_{t=0}^{T}\left[-C_j + \frac{\Delta M_{jt}}{(1+r)^t}\right] + \min\left[\sum_{t=T}^{T^*}\frac{\Delta W_{jt}}{(1+r)^t}\,,\ \frac{C^*_{jT}}{(1+r)^T}\right].$$

Assume that the Army invests in training up to the point at which the cost of training an additional soldier in the skill is just equal in value to the Army of the additional training,

$$C_j = \sum_{t=0}^{T}\frac{\Delta M_{jt}}{(1+r)^t}$$

In general, this will lead to an underinvestment in training from society's perspective, because it does not take into account the eventual value of the training in the civilian sector. That is, the net social benefit of the training, at the margin, exceeds the cost of the training, by the amount:

$$\min\left[\sum_{t=T}^{T^*}\frac{\Delta W_{jt}}{(1+r)^t}\,,\ \frac{C^{*jT}}{(1+r)^T}\right].$$

Note that, if potential recruits recognize the future value of Army training in their post-Army civilian career, it may be reflected in their voluntary supply price. That is, they may be willing to serve for a wage less than they otherwise might, because they consider the benefits of the training as part of their compensation. Flight training, for example, may be particularly of value in a post-Army career. Hence, individuals who otherwise would not have been willing to enter the Army at the pay rates offered are willing to do so because of the opportunity for flight training. If so, the Army may "internalize" or take into account the post-Service value of the training they provide, through lower compensation costs, and offer more training than they otherwise would. If compensation costs fall by the full post-Service value of the training in the civilian sector, the Army may provide the (socially) optimum amount of training.

Army Service as a Measure of Quality and Certification

An important, but particularly difficult, external benefit of Army service is the information provided by veteran status, years of experience, and rank. This information is valuable to future employers and to society as a whole in that it conveys information regarding the character and ability of the veteran. In contrast to the increase in "human capital" that results from Army training and experience, the screening/certification aspect

of Army simply allows civilian employers and others in society to recognize the productive capacity inherent in the individual.

Value of Entry Screening

Those who enter military service must meet certain entry standards or screening criteria. These include a level of mental aptitude, physical well-being, educational attainment, and moral fitness. DoD and the Services incur significant costs in determining the mental aptitude and medical qualifications of applicants for military service. Three types of benefits are generated from these tests. First, and most obviously, it provides the information the Army requires to determine if the applicant is a good candidate for service. This is the reason DoD and the Army invest in these screening activities. Second, applicants, or others who choose to take one or more of the screening tests,[20] disclose information regarding their physical health and mental aptitudes regardless of whether they enter military service.[21] Finally, for those who enter military service, the screening process through which they have successfully passed provides information to future employers regarding their mental, moral and physical fitness for a position of some trust. Because the screening criteria remain relatively constant from year to year, the information contained in having served in the volunteer force is valuable to future employers and others who may evaluate the individual.[22]

Value of Service Completion and a "Good Paper" Discharge

An individual who enters military service has passed a rigorous set of screens and is implicitly certified as having met certain minimum standards. Similarly, an individual who successfully completes his or her term of service and leaves with an honorable discharge has, perhaps, passed an even more stringent screen.

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[20]The Military Enlistment Processing Centers administer the Armed Services Vocational Aptitude Battery to students in high schools, if the high school authorities sanction its administration, without requiring that the students apply for military service. The Services do obtain valuable publicity, and recruiters obtain leads. However, students who have no intention of volunteering for military service gain potentially valuable information regarding their areas of relatively high and low aptitude.

[21]See Appendix B for a discussion of the external benefits of aptitude testing through the student testing program.

[22]Entry standards do change over time. However, some minimum entry standards are fixed in law, and others, while they may change depending on supply and demand conditions, do not fluctuate widely over time, at least since 1981. See Office of the Secretary of Defense, The President's Military Manpower Task Force, 1983 for a discussion of the role of entry standards. Also, see David Armor and Charles R. Roll, Jr., "Military Manpower Quality: Past, Present, and Future," Part I of Modeling Cost and Performance for Military Enlistment, Bert Green and Anne Mavor, eds. National Research Council of the National Academy of Sciences, 1994.

Because most potential employers and others know the rigors of military service and the qualities necessary to complete a term of service, the fact that an individual has been successful in that organization conveys a significant amount of information. Hence, a recent veteran with evidence of honorable completion of service possesses a valuable credential that indicates potentially high levels of productivity to prospective employers, while service completion under less than honorable conditions, or attrition from service, provides some evidence of potentially low productivity to potential employers.

Hence, the Army provides useful information to the civilian labor market in its decisions to retain productive soldiers (those who complete training and the initial term of service) and to discharge unproductive soldiers (those who fail to complete training or who fail to become productive after completion of training). Without this information, additional resources would be required to generate equivalent amounts of information regarding the potential productivity of individuals, and/or additional costs would be incurred due to the poor job matches that would occur without that information.

Promotion and Rank

Finally, the rank that a soldier has obtained by the end of his or her period of services potentially provides further information regarding the potential productivity of the individual. Potential civilian employers will find rank at discharge to be potentially useful information if standards for promotion have remained relatively constant over time. Though promotion rates will vary—by military occupational specialty and, over time, by policy and budget constraints—promotion points, as a function of years of service, have been relatively constant over the period of the all-volunteer force. A soldier who leaves at a rank of PFC after four years of service did not do well, while a soldier who left with a rank of SSG probably did very well.

The information content of rank for those who remain in service until retirement eligibility—20 years of service—is potentially more valuable simply because there is likely to be wider variation in rank that is due to differences in ability and motivation rather than to extraneous factors. Hence, the soldier who retires at a rank of SSG with 20 years of service is, other things being equal, likely to be of lesser ability in a number of important dimensions than a soldier who retires at a rank of 1SG, after 20 years of service.

Summary

In this chapter, we have attempted to provide a framework for the estimation of the costs and benefits of Army service. The emphasis has been on personnel-related costs and benefits and

those areas where there are costs and benefits that are "external" to the Army. Our analytical social accounting framework allows us to consider the cost and the benefits of military service in a new way. In particular, it provides new insights in the treatment of the following:

Costs

Social vs. Budget Cost. The budget cost of Army manpower will overstate the social or opportunity cost of that manpower, in many instances, because of the large component of inframarginal "rent" in military pay.

Taxes. The appropriate way to consider taxes and tax-exempt allowances and benefits within the framework occurs in estimating the real cost of Army personnel and comparing those costs to the costs of civilian counterparts.

Cash vs. In-Kind benefits. Recognizes the potential inefficiency associated with the provision of some in-kind benefits.

Benefits

Joint Products and Non-Military Value of Military Activities. The framework explicitly recognizes that some Army activities can potentially produce two or more products simultaneously—the military specific product for which the activity was intended and possible benefits to the non-military sector as a result of generating the primary product. The analysis framework discussed provides some guidelines regarding the types of "joint product" activities that might be productively undertaken and guidelines in general for considering the application of Army resources for civilian use. In some instances, the recognition that joint products are produced suggests that more of the activity be undertaken when the full social benefits are recognized, resulting in greater Army readiness as a result.

Value of Army Formal Training. Army training has value to soldiers and to the civilian sector when the soldier pursues a civilian career after service. The training and direct experience in the Army may raise the soldier's potential contribution in some civilian occupations. Under some conditions, this value may not be "internalized" in Army decisions concerning formal training, resulting in less training than may otherwise occur.

Value of Screening and Certification. Initial screening for entrance into the Army, successful completion of a tour of military service, and the rank attained while in the service provide information regarding the quality and potential productivity of Army veterans that is valued in the civilian

sector. Hence, the direct benefits to the Army of these screening and certification activities probably understate the social benefits.

A Potential Application of the Framework

In this section, we outline our proposal to measure specific costs and benefits of Army service using the social accounting framework. The section outlines how we would proceed in estimating costs and benefits associated with Army service. Some of the questions that can be addressed with our framework include:

Manpower Cost: What is the true social cost of Army manpower?

Joint Products: What Army activities (training exercises, other activities) have jointly generated defense and non-defense sector benefits (joint products) over the last five years? What dollar value can be placed on these non-defense benefits? Has their provision adversely affected the military value of the activity? What activities represent opportunities that jointly provide military and non-military benefits, without adversely affecting the military mission in the future?

Army Formal Training: What is the value of Army training and experience in the civilian sector? What is the value of Army screening and certification in the civilian sector? Can these benefits be quantified and can the value of training and experience be distinguished from the value of screening and certification?

Army Manpower Cost

Empirical analysis in this area entails a systematic analysis of Army personnel by relevant categories (e.g., officer/enlisted; MOS/branch; first term/career), by measures of supply and demand in each category, and by the compensation and other incentives provided to attract, retain and motivate individuals. The supply and demand information would be summarized in terms of elasticities of supply (a measure of the responsiveness of retention or accessions to changes in compensation). These measures would not be calculated directly for this analysis; rather, they would be taken from the extensive literature of applied econometric studies on supply models.

Given total compensation in each category, numbers of personnel in that category, and an estimate of the supply elasticity, an estimate of the proportion of total compensation that is "rent" can be made. For each personnel category, then, we could estimate total and per soldier budget cost and net social cost, appropriately accounting for "rent" and taxes. The

estimates would proceed as follows. Consider the following linear supply curve:

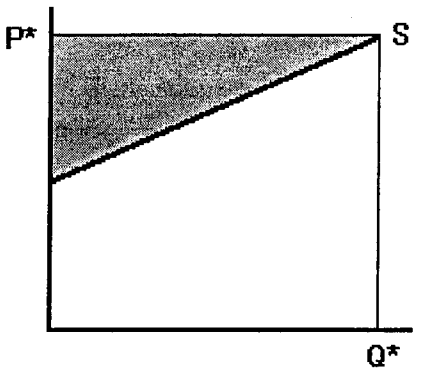

Figure 8: An Estimate of Rent in Compensation Costs

Assume that we know Q*—the number of personnel in a given category—and the average compensation cost, P*. Also, assume that we know the elasticity of supply, ε, at Q*P*. If we also assume that the supply curve is approximately linear, an estimate of the "rent" is given by:

$$P^*Q^* - \int_0^{Q^*} \left[P^* - \frac{P^*}{\epsilon} + \left(\frac{P^*Q}{Q^*\epsilon} \right) \right] dQ$$

$$= \frac{1/2P^*Q^*}{\epsilon}$$

$$= P^*Q^* - P^*Q^* + \frac{P^*Q^*}{\epsilon} - \frac{1/2P^*Q^*}{\epsilon}$$

The following table illustrates one approach to data collection and output.

Enlisted/ Officer	MOS/ Branch	Years of Service	Person-nel(Q*)	Per Capita Compen-sation Cost	Elasti-city	Rent Cost	Net Social Cost
Enlisted	MOS 11B	O-4	yyy	$zzz	1.1[23]		

Joint Products

For this empirical application, we propose to:

- Review and catalog the Army's major activities over the past five years that have potentially provided benefits to the civilian sector.
- Estimate a dollar value of the civilian-sector benefits provided as part of the Army activities and the additional cost incurred by providing these benefits beyond "in any case" situations.
- Summarize these activities in the form of case studies.
- Develop general guidelines for Army participation in activities that provide "joint products"—benefits to the civilian sector in addition to the direct military-related benefits of the activities. Activities could be categorized into
  - those that provide no joint products;
  - those that provide civilian benefits, but at no additional cost to the Army;
  - those that provide civilian benefits, but at some additional cost to the Army.

Implications for pursuing specific activities, given the guidelines, would be developed. Both budget and readiness implications would be included.

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[23]Smith, D. Alton, Sylwester, Stephen D., & Villa, Christine M. (1991). Army reenlistment models. In Curtis Gilroy, David K. Horne, & D. Alton Smith (Eds.), Military compensation and personnel retention: Models and evidence. Alexandria, VA: U.S. Army Research Institute, 43-179.

Value of Army Training, Experience and Certification

In order to estimate the effect of Army service on post-service earnings, we would attempt to distinguish the human capital effects of training and experience on post-service earnings from screening effects. We would attempt to sort out the effects of (a) the innate ability of the soldier; (b) the screening and certification of the ability revealed by the Army's personnel system; (c) the effects of training; and (d) experience.

In the analysis, care must be taken to:

- Account for factors, other than direct military experience, that distinguish veterans from non-veterans in the civilian labor market and potentially affect earnings. This includes, especially, the screening-related differences between veterans and non-veterans.

- Account for unobserved factors related to post-service earnings potential that result in some soldiers choosing relatively short military careers and others choosing to stay for two or more terms of service.

In Mackin, Hogan, and Mairs (1993),[24] civilian earnings data from the 1979 Current Population Survey (CPS) were used to estimate the potential earnings of Army officers. The CPS data consists of the earnings of civilians, some of whom were veterans, and their characteristics—education, imputed experience, and demographic. This data could be used to determine whether, holding all else constant, there is a "veteran's premium" in civilian earnings. Potential civilian earnings of military officers are estimated from the model under the assumption that the expected earnings of veterans and non-veteran civilians in the civilian sector differ only as a function of differences in the characteristics that are measured in the model, including veteran status. Further, we could assume that Army training is being used in civilian occupations for which there are closely related Army occupations, and that it is not in unrelated occupations. By allowing the veteran's variable to interact with occupational variables, we can estimate the effect of the sum of Army training and screening on civilian earnings, by occupation.

There are at least two related shortcomings associated with using civilian data, such as the CPS, to infer the potential earnings of Army personnel and the effect of Army training. First, military members may differ systematically from their

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[24]Mackin, Patrick C., Hogan, Paul F., and Mairs, Lee S. "A Multiperiod Model of U.S. Army Officer Retention Decisions: Final Report," ARI Technical Report 293 (1993).

civilian counterparts in unmeasured ways that are systematically related to potential earnings. They chose to enter the Army when civilians chose to pursue alternative careers. The Army, in turn, accepted them only after they had passed screens related to physical, moral, and mental fitness for service. For these reasons, it is most likely not possible to separate human capital (productivity-enhancing) aspects of Army service from screening. The second shortcoming is that there is no basis for estimating the effect of military experience on civilian earnings.[25]

In principle, it would be useful to estimate civilian earnings equations using data consisting of the actual earnings of civilians who are veterans of the Army officer force and to allow separate effects on earnings from military and civilian experience in these models. Earnings equations, by occupation, would be of the form:

$$\ln C_t = \alpha + \beta_1 MilExp + \beta_2 (MilExp)^2 + \beta_3 CivExp + \beta_4 (CivExp)^2 + \ldots +$$

where C_t is an observation on the civilian earnings of a former military officer at time t. However, earnings data is not systematically collected for military veterans. The only existing data set with veterans earnings from which to estimate such a model is the Defense Manpower Data Center's Post-Service Earnings History File (PSEHF). The earnings data was obtained from the Internal Revenue Service (IRS) and the Social Security Administration (SSA), and is grouped by them to preserve confidentiality. It consists of observations on the earnings of veterans who *separated* from military service over the period 1972 through 1980. Veterans from the four services who separated over the period were placed into cells defined by Service, year of service, education, rank, year of separation and military occupation. No cell contains more than 25 members. Cell averages of other potentially relevant characteristics, such as number of dependents, are appended. The IRS attached the W-2 earnings of each member in the cell for 1979 through 1983, while SSA did the same for social security earnings for 1972 through 1980. Both sets of earnings are potentially truncated. For SSA, the truncation is at the social security ceilings, while for IRS the truncation is at an annual earnings level of $150,000.

Hogan and Goon (1990) used the PSEHF to estimate civilian earnings equations for Air Force officers.[26] These were used in

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[25]Civilian data sources do not distinguish between military and civilian years of experience.

[26]Paul F. Hogan and Majorie Goon, "An Econometric Model of Air Force Officer Retention: Reestimation of the DOPMS Model," SRA Corporation, 1990.

an ACOL model of officer retention, using an algorithm in which civilians earnings opportunities were a function of the mix of civilian and military experience. The same model was also estimated using earnings equations from the Current Population Survey.

The major advantage of estimating civilian earnings using the PSEHF is that expected civilians earnings estimates could become a function of the mix of military and civilian experience. The effect of a year of military experience, compared to a year of civilian experience, on civilian earnings is a crucial empirical issue.

The specification using the PSEHF could, perhaps, be combined with data from the Current Population Survey in an attempt to separately identify veteran screening effects and a human capital effect of military service. Clearly, however, such a model would be severely pushing the limits of a database that is (a) less than ideal, due to its grouped nature;[27] (b) somewhat old; and (c) has been the subject of several independent estimates of post-service earnings to date.

An alternative would be to develop a new post-service earnings data base from which to estimate the effects of Army training, experience, and screening on earnings. The ultimate source of the data would, again, be IRS and/or Social Security files. However, we would attempt to ask for the data in such a way that individual observations could be obtained. Developing such a data base has the following advantages:

- All, or almost all, relevant variables could be included in the data base, including test scores, training courses taken, and other factors. (Given our knowledge of its potential use in both this project, and more generally as a source of estimates of the civilian opportunity cost of military service for the estimations of retention equations, additional variables regarding bonus policies, cohort survival rates, promotion opportunities and so forth are in effect.)

- The earnings data would be updated through at least 1993.

- We would attempt to generate the request in such a way that the equivalent of individual observations could be preserved for analysis purposes. (Sampling by a precise set of descriptive values, such that there are multiple observations in each set, is one possibility.)

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[27]Grouped estimates will be less precise. Moreover, it is more difficult to test for sample selection bias with the grouped data.

From this new data set, we would estimate regression equations that would identify effects of Army training and experience on post-service earnings, and, by pooling with other data, such as Current Population Survey data or data from the National Longitudinal Survey (NLS), we would identify initial screening effects.

Hence, the two alternatives for pursuing estimates of the effect of Army training and experience on post-service earnings are:

- Analyses using existing data sets, in particular, the PSEHF.
- Development and analyses of a new post-service earnings file.

Summary and Agenda for Future Research

In this paper we have provided a framework for assessing the social costs and benefits of Army service. We have emphasized that the social costs and benefits of service extend beyond narrowly defined budget and resource costs and direct benefits of military readiness to include the net costs and benefits of Army service to society as a whole. The application of our social accounting framework to manpower and personnel costs suggests that the budget costs of Army personnel exceed social costs.

We developed a decision framework to evaluate alternative uses of Army resources which may benefit the civilian sector in ways other than national security. Finally, we considered the benefits of Army service in a broader context to include the value of Army training, experience, and certification to the civilian economy as a whole.

The Army could greatly benefit from further work in this area. Several direct applications of our framework should be considered:

- estimation of the net social cost of Army personnel;
- evaluation of recent Army activities which provide joint benefits to the civilan sector; and development of rational criteria for deciding when the Army should engage in activities that generate such joint benefits;
- estimation of the value of military training, experience, and certification, possibly including development of a new veteran's earnings database in the process.

APPENDIX A: BENEFITS ATTRIBUTABLE TO ARMY SERVICE

This appendix enumerates a taxonomy of benefits of Army service. All figures are taken from the 1993 Uniformed Services Almanac and are accurate as of January 1, 1993.

Benefits

Easily Quantified Pecuniary Benefits

Pays & Allowances

- Basic Pay
  - The salary portion of a soldier's pay. It varies by pay grade and length of time in the military.
  - An E-6 with 12 years of service receives $1,706.10 per month before taxes.
- Basic Allowance for Quarters (BAQ)
  - Non-taxable. Varies by whether the member has dependents or lives in government provided housing as well as by pay grade.
  - An E-6 with a dependent of any kind would receive $452.40 regardless of where he or she lives. An E-6 without dependents would receive $9.90 if living in government quarters or $308.80 if living in private quarters.
- Basic Allowance for Subsistence (BAS)
  - Enlisted compensation that varies by rank. Received when on leave or authorized to eat outside of the cafeteria or when a cafeteria is not available.
  - E-6 who lives in private quarters would receive approximately $225.00 a month.
  - Officers receive a flat amount monthly.
    - $139.39.
- Tax advantage
  - Tax-free status of BAQ and BAS.
    - Value increases if member has other outside income from moon-lighting or spouse working.
    - For an E-6 with 12 years of service the tax advantage is approximately $826.50 a year.

- Uniform Allowance
  - Cash allowances for uniforms. Varies by gender and type of allowance. For assignments where extra clothing is required, the member would receive a special clothing allowance.
    - An enlisted male receives $898.90 upon entry into the Army and $190.80 annually.
- Variable Housing Allowance
  - Differential for higher than normal housing cost areas.
  - Varies by pay grade, dependent status and area of the country.
    - An E-6 with dependents living in Aberdeen, MD, would receive an allowance of $1,555.44 per year.
- Special Pays
  - Imminent danger
    - Payable to members assigned to or associated with a unit subject to hostile fire or imminent danger.
    - $150.00 per month.
  - Diving Pay
    - Payable to members assigned diving duty. Varies by skill level of the diver.
    - Officers receive not more than $200.00 per month.
    - Enlisted members receive not more than $300.00 per month.
  - Hazardous Duty Pay
    - Given to members who perform various kinds of hazardous duty. Examples include parachute jumpers, toxic fuel handlers and demolition experts.
    - Members can receive at most two types of incentive pay provided they are assigned to units whose mission requires the performance of both types of hazardous duty.
    - Each pay is $110.00 per month with the exception of parachute jumping at high altitudes with a low altitude opening which is $165.00 per month.
  - Aviation Career Incentive Pay (ACIP)

- Paid to aviators who meet certain performance standards. Varies by years of aviation service as an officer.
- An officer with between six and eighteen years of service who has met the performance standards would receive an additional $7,200.00 per year.

- Continuation pay for scientific & engineering officers
  - Paid to officers who have been certified as having the technical qualifications to work at engineering or scientific duty.
  - An officer who is entitled to receive this pay may receive up to $3,000.00 multiplied by the number of years obligated service. The number of years must be at least one year but not more than four years.

- Foreign Language Proficiency Pay
  - Cash incentive for service members to become proficient or increase their proficiency in foreign languages.
  - $100.00 per month.

- Civilian Clothing Allowance
  - Paid to officers assigned duty where civilian clothing is required all or most of the time.

- Medical Officer Pays
  - Paid to Medical Officers who meet certain criteria. Varies by specialty, years of creditable service, pay grade and obligation.
  - A board certified Neurologist with nine years of creditable service who agrees to stay on active duty for three years could receive an additional $43,000.00 per year.

- Dental Officer Pay
  - Paid to Dental Officers who meet certain criteria. Varies by years of creditable service, certification and obligation.
  - A board certified dentist with nine years of creditable service could receive an additional $12,000.00 per year.

- Nurse Corps Accession Bonuses
  - Paid to nurses upon joining for an obligation of four years. Also paid to Nurse Anesthetists for an obligation of at least one year.

- Upon joining for four years, a nurse may receive up to $5,000.00. A Nurse Anesthetist may receive up to $6,000.00.

- Special Duty Assignment
  - Paid to enlisted members who are required to perform extremely demanding duties or duties of an unusual degree of responsibility. Paid only to certain specialties and varies by job. A member authorized this pay may receive between $55.00 and $275.00 per month.
- Certain places – Paid to members who are on duty at specified locations outside of the United States. Varies by pay grade.
  - An E-6 assigned to one of these locations would receive an additional $240.00 per month.

- Overseas housing & station allowance
  - Difference between basic allowance for quarters and the housing cost in that area. Varies by country and pay grade.

Travel & Transportation Allowances

- In-kind and cash allowances reimbursing travel resulting from orders

  - Varies by type of travel, pay grade and dependent status.

  - An E-6 who has a spouse and two children and is changing duty locations receives $.20 per mile, approximately $150.00 a day in expense money and reimbursement for temporary lodging, not to exceed $110 per day. Also entitled to packing, crating, draying, shipping, storage and unpacking of up to 11,000 pounds of household goods.

Vacation Benefits

- 30 days annual paid leave

Retirement Benefits

- Monthly income

  - to those members reaching retirement eligibility.
    - Varies based on the year service began, the number of years served and basic pay received prior to retirement

- Normally, 20 years minimum service for retirement eligibility. Some downsizing incentives reduced this to 15 years.
- An E-8 who entered the Army in 1968 and retired with 25 years of service would receive $1,755.38 a month.

- Military services

Educational Benefits

- Formal skill training
  - Primarily military courses that cover a variety of military specific skills as well as leadership and management skills. Occasionally includes civilian courses.
  - For military specific skill training, benefits vary. For more general training, courses are analogous to those taught in civilian workplaces.
- On-the-Job Training
  - Depending on the job, benefits vary. For a highly-skilled job, the value of this training can be quite high.
- Post-graduate Education
  - Masters and Ph.D. curricula required by the service
- Tuition Reimbursement
- GI Bill
  - Provides tuition assistance in return for a three year obligation. Voluntary program.
    - Provides $400.00 per month for 36 months for a total of $14,400.00. The service member has $100.00 deducted from his or her paycheck for the first 12 months of service.

Miscellaneous Cash Benefits

- Enlistment Bonus
  - Bonus to induce individuals to enlist. Varies by obligation and skill.
  - Amount varies up to $12,000.00.

- Selective Reenlistment Bonus
  - Given to service members in critical skills upon their reenlistment or extension for at least three years. Varies by pay grade, skill and obligation.
  - Varies up to $45,000.00.
- Family Separation Allowance
  - Paid to service members whose duty requires separation from their families.
  - An E-6 stationed in Alaska may receive $308.80 per month.
- Separation, Readjustment & Disability Severance Pay
  - Provided to officers who are involuntarily separated from the military.
  - Benefits include a cash payment, extended health benefits, government housing for up to 180 days at a reduced price, movement and storage of household goods and use of post facilities for two years after separation.
- Survivor Benefit
  - Voluntary program in which a military retiree may elect to receive a reduced amount of retired pay in order to provide an annuity to the eligible survivor.
  - A member who retires with a base amount of $1,200.00 would pay $78.00 a month to provide his beneficiary with an annuity of $420.00 per month.
- Unemployment Compensation
  - Provides a weekly income for a limited period of time for service members who have separated under honorable conditions. Varies by pay grade, special pays and state law.
  - A member applying for unemployment compensation in Virginia could receive between $65.00 and $208.00 per week for between 12 and 26 weeks.

Quantifiable Non-Pecuniary Benefits

Life Insurance

- Servicemembers' Group Life Insurance
  - All service members have the opportunity to purchase up to $200,000 worth of life insurance at consistent rates. Depending on the age of the service member, this may or may not result in a cost savings.
    - For example, service member selecting the maximum coverage of $200,000 would pay $16.00 per month. A person under thirty would only pay $12.00 per month through Principal Mutual Group Life. However, cost is $36.00 per month at age forty.

Miscellaneous Benefits

- Childcare
  - Provides childcare to service members' children. Cost varies by location, family income, and pay grade.
  - Prices are significantly lower than private day-care facilities.
- Service Member Discounts
- Various businesses offer discounts to holders of military ID cards.
  - Delta Airlines offers up to 60% fare reductions
- Space Available Travel
  - Service members and their dependents are eligible for travel on DoD owned or controlled aircraft on a space available basis. Availability varies greatly.
- Veterans Benefits
  - Home Loans
    - Government guaranteed loans for the purchase of a home or the repairs or construction of a home.
  - Counseling Services

- Alcohol & Drug Dependence Services

- Readjustment Counseling
  - Provides outreach, counseling and referral services to veterans who have served in various conflict areas and who have encountered trouble readjusting.

- Outpatient Medical Treatment
  - Provides outpatient medical services to certain veterans. Varies by disability, income and veteran status.

- Outpatient Dental Treatment
  - Required dental treatment to certain eligible veterans. Varies by disability and veteran status.

- Medical care for dependents & survivors of certain veterans
  - Assistance in paying for medical services and supplies obtained from civilian sources by eligible dependents and survivors of certain veterans.

- Burial Expense
  - Provides allowance to assist with cost of burial. Varies by cause of death.
    * For a non-service related death, allowance is $300.00 plus $150.00 plot allowance. For a service related death, allowance is $1,500.00.
  - Burial in national cemeteries for service members who die on active duty or those veterans discharged under honorable circumstances. Also their spouses and minor dependent children are eligible. Can also receive a burial flag and a headstone or grave marker.

- Hiring Preference
  - Preference to veterans in hiring for civil service jobs. Varies by disability and pay grade.

- Employment and Training Programs
  - Counseling, testing, skill training and placement in private and public sector jobs.

- Disability Benefits
  - Monthly payment by the Veterans Administration to a veteran for a service

connected disability. Varies by severity of disability. Non-taxable.
    * A veteran with a 40% disability would receive an additional $352.00 per month.
- Dependents Educational Assistance
    * Cash allowance for post-secondary education for spouse and dependents of military members who died while on active duty or who received a permanent and total disability. Must be used within a certain period of time. A child receiving full-time training would receive $404.00 per month.

o VA Rehabilitation Program
    * Vocational rehabilitation program to enable service-disabled veterans to achieve maximum independence in daily living.
- Specially adapted housing for certain disabled veterans – Assistance in obtaining specially adapted housing for veterans with permanent and total service-connected disability.
    * Varies by disability—receive up to $38,000.00.
- Hospitalization – VA hospitalization and nursing home care. Eligibility varies by income, veteran status and disability.
    * Care is provided at varying rates depending on income, insurance and injury.
- Domiciliary care for veterans who have a permanent disability
- Private nursing homes for persons not in need of hospitalization. Varies by income, veteran status and disability.

Health Services

In this section we have computed the premium costs for similar private sector benefits obtained through the Principal Insurance Company. Note that this is only a *maximum* estimate of the value of the military benefit.

- CHAMPUS Insurance
    - If care not available at a military facility, civilian facilities can be authorized. The policy is at no charge to the service member. A similar group health insurance policy with a $200.00 deductible for a person in their thirties through

Principal Mutual would cost $126.62. The individual would pay the $200.00 deductible plus 80% of the remaining charges up to a $750.00 out-of-pocket ceiling per year. He or she may have to pay none, some or all of the premium depending on the employer's policy.

- Inpatient Care
  - Services and supplies normally furnished by the hospital.
    - An active duty service member would forfeit their daily subsistence allowance.
    - A civilian covered under Principal would pay up to $750.00 per year.
- Outpatient Care
  - Outpatient care through both the hospitals and military clinics.
    - The service member would pay no charge for this service.
    - A civilian covered under Principal would pay $10.00 per doctor visit.
- Dependent Care
  - Both inpatient and outpatient care for spouse, children and other approved dependents.
    - For military dependents, no premium is charged, outpatient care is obtained at no charge and inpatient care is provided for $9.30 per day.
    - For a spouse and two children, Principal would charge an additional premium of $476.47. Charges would then be the same as for the individual with a family ceiling of $1,500.00.
- Handicapped dependent care
  - Care for seriously disabled dependents of active duty service members. Cost varies by pay grade.
    - For an E-6 the cost would be $30.00 per month for up to $1,000.00 per month in benefits. Any costs above the $1,000.00 point would be paid for by the member.
    - Under Principal, the standard dependent coverage would be in effect. However, if coverage was extended to the dependent, it would probably warrant a much higher premium because of the disability.

- Drugs
  - Prescriptions written by either military or civilian physicians to be filled at military pharmacies, if available.
    - Prescriptions are filled at no cost to the military member.
    - Under Principal, prescriptions are $5.00 for generic or $5.00 plus 25% of remaining charges for name brands.
- Physical Examinations
  - Including eye examinations, hearing examinations and all other tests and procedures needed for a complete physical examination.
    - Provided at no cost to the service member.
    - Subject to $10.00 fee under principal. Eye examinations are not covered.
- Maternity Care
  - Obstetrical and infant care, routine care, examinations of newborn, and well-baby care.
    - Provided at no cost to the service member except for standard inpatient cost for a hospital stay.
    - Under Principal, provided at $10.00 per doctor visit plus the standard inpatient cost for a hospital stay.
- Dental Care
  - Provided at no cost to the service member.
  - Under Principal, an additional premium of $20.81 per month is charged and services are provided under a variable schedule of fees.
- Ambulance Service
  - Surface or air to transport members to, from or between medical facilities when determined by the medical officer in charge to be medically necessary.
    - Provided at no cost to the service member.
    - Under Principal, covered completely after the $200.00 deductible is met as long as it is under $3,000.00 per year.
- Artificial Limbs & Eyes

- Including initial issue, fitting, repair, replacement and adjustment.
  - Provided at no cost to the service member
  - Under Principal, subject to standard deductibles.

- Durable Equipment

  - Wheelchairs, hospital beds, etc.
    - Provided at no cost to the service member on a loan basis.
    - Under Principal, rental of these items is subject to the standard deductibles.

- Orthopedic Aids

  - Braces, crutches, walking irons, elastic stockings, etc.
    - Provided at no cost to the service member.
    - Under Principal, subject to the standard deductibles.

- Immunizations

  - Provided at no cost to the service member.

  - Under Principal, subject to the $10.00 per doctor visit fee.

Use of Post Facilities

- Commissary

  - Military grocery store. Items can be purchased at reduced prices with no sales tax.

- Post Exchange

  - Military department store. Items can be purchased at reduced prices with no sales tax.

- Theaters

  - On-post movie theaters that show current movies for reduced prices.

- Officer, NCO and Enlisted Club

- Family Center

- Provides family counseling, assistance to families moving into the area and other types of assistance to service members and their dependents.

- Clothing Sales Store
  - Provides uniforms and uniform accessories for military members.
- Recreation Services
  - Golf courses, gymnasiums, tennis courts, bowling alleys, camping gear rental, etc.
- Officer, NCO and Enlisted Open Messes
  - Military cafeterias.
- Laundry & Dry Cleaning Stores
  - Provide laundry and dry cleaning services to military members at reduced prices.
- Consolidated Package Store
  - Military liquor store. Items can be purchased at reduced prices with no sales tax.
- Libraries
  - Provide library services on post to military members and their dependents.
- Chapels & Related Services
  - Provide religious services and counseling to military members and their dependents.
- Transient Quarters
  - Provide temporary housing to military members and their dependents.
- Legal Assistance
  - Provides legal advice and in very limited circumstances legal representation.
- Casualty Assistance
  - Provides assistance when a military member or a dependent dies.

Difficult to Quantify Non-pecuniary Benefits

Patriotism
Pride Building
Sense of Community
Physical & Mental Discipline
Opportunities For Responsibility
Advancement & recognition based more on merit than in civilian occupations
Image

Costs

Pecuniary

Lost Civilian Income

- Possible lower wages in military than in civilian employment. Also, one year of military service seldom translates into one year of civilian job experience.

Frequent Moves

- If young and single, this may be a benefit.

Non-Pecuniary

Restricted Rights of Citizens

- Freedom of speech
- Privacy

Family Separation
Difficulty Changing Jobs
Long hours
Increased Risk

- Death
- Dismemberment

Data Sources

Pecuniary cost and benefit data are easily available.

SAG Corporation compensation files used for estimating econometric retention models range back to FY79.

Non-pecuniary benefits and costs are difficult to estimate at best

DMDC Surveys of Officers, Enlisted Personnel and Their Spouses conducted in 1979, 1985 and 1992.

- Contributions of military service to divorce
- Measures of family separation during previous year
- Perception of health benefits relative to civilian sector
- Hours child care is required

ARI Army Sample Survey of Military Personnel (SSMP)

- Current level of morale
- Responses to "Would you recommend that others pursue an active duty career in the Army?"
- Degree of job satisfaction
- Family adjustment to the demands of being an "Army family"
- Army responsibilities created problems for family
- Job conflict with family obligations

DOD World-Wide Survey of Alcohol and Non-medical Drug Use Among Military Personnel surveys in 1980,1982 and 1988.

- Self-reported use of alcohol
- Hospitalization due to alcohol use (previous 12 months)
- Outpatient treatment due to alcohol use (past 12 months)

Health Interview Survey sponsored by National Institutes of Health

- Self-reported use of alcohol
- Self-reported smoking

Some social benefits may be estimated through extensive analysis

Social benefits from educational programs

Social health improvement benefits

APPENDIX B: EXTERNAL BENEFITS OF STUDENT TESTING

Cost-Benefit Methodology

Suppose a recruit selection program designed to reduce Army's first term attrition losses costs $1 million annually. If the program only reduced first term attrition costs by $750,000 it is likely this effort would fall victim to the budget analyst's axe and be terminated as cost-ineffective. However, if our analysis indicates that the selection program provides $15.00 in testing and counseling benefits to the 200,000 high school students participating in the program, then there is a non-Army social benefit worth approximately $15*200,000 = $3,000,000. Thus, a $1 million taxpayer investment is actually returning more than three times cost. While Army benefits do not exceed Army cost, societal benefits vastly exceed social cost. The program should be continued—perhaps with Health and Human Services, Department of Energy or Department of Labor providing partial funding.

While the foregoing is just a trivial example, the following applies our analytical framework to a real world situation.

Selection Process Costs and Benefits

The ASVAB Career Exploration Program is designed to increase the efficiency with which the military is able to recruit high school-aged youths. The extent to which this is possible depends on two factors:

- the relative efficiency of the ASVAB program as a screening and identification tool, and
- the extent to which youths and their schools are willing to participate.

Our cost-benefit analysis develops an explicit trade-off model for Army decisions that highlights the impact of career counseling efforts on other manpower, personnel and training costs. A formal analysis of the incentive structure facing students and participating institutions (schools, districts and state authorities) will reveal which aspects of the program increase participation and which factors tend to dampen responsiveness. Benefits accruing to participating students will be analyzed and quantified in a human-capital investment modeling framework.

Budget cuts, endstrength constraints and the increasing importance of training magnify the value of tools that allow Army to improve recruit selection. A well-designed cost-benefit analysis can demonstrate the recruiting-, personnel- and training-cost savings realized through improved screening.

Screening vs. Job-Matching

The Costs and Benefits of Recruiting Selectivity

All recruiting expenditures must ultimately be justified by their marginal (additional) contribution to Army's ability to attract and retain qualified personnel. Such additional expenditures are justified if they produce savings that meet or exceed their cost. Two major approaches exist:

- Carefully examine and screen potential employees to guard against hiring and investing in a "poor" choice.
- Hire many more than required and let the work environment cull the "good" and attrite the "poor."

The ASVAB program is able to do this by providing DoD with a screening tool for new hires. These youths also use the ASVAB program as a screening device for their own career exploration and human-capital investment decisions. Thus the tested youth receives an individual benefit, Army receives an information benefit and the DoD pays the cost.

An employment contract or relationship may be viewed as a "marriage" in that it requires the employer to hire and retain the worker and requires the employee to join and remain with the organization. This agreement, on the employer's part, depends on how productive the worker is and how much it costs the organization to retain that worker. Conversely, the employee bases his/her decision on the pecuniary compensation and the non-pecuniary aspects of the job.

A fundamental problem endemic to all hiring decisions, and most notably to hiring new entrants to the work force, revolves around imperfect information on both sides. Neither employer nor employee is absolutely certain about what they are getting. Any hiring process and employment relationship includes elements of screening and job-matching processes. Screening involves gathering and synthesizing information about potential new hires to increase the employer's ability to identify successful candidates. Prospective employees, conversely, also screen jobs by gathering information about the job and the employer and determining how well the jobs match their own abilities and preferences.

In contrast to screening, job matching is a sorting process that occurs after an individual is hired. Workers are sorted into the most productive jobs (those suited most closely to individual talents and preferences). No matter what level of screening is employed, workers are hired with both sides possessing imperfect knowledge about their abilities. Wages increase as individuals reveal their abilities and move to their

most productive employment within the organization (or leave for more productive employment elsewhere). Note that the marriage nature of this process means that either party can terminate the employment. In the military such terminations are, of course, subject to service obligation agreements, although high first-term non-ETS attrition suggests that these obligations are non-binding in practice.

Job matching imposes a cost on both parties in the employment relationship. The employer may invest training and wages in workers who, ultimately, are not very productive. Alternatively, the employee may invest time, effort and education in a job or career which does not exploit his or her talents and resources.

Conversely, testing, examining and screening potential new hires (e.g., recruits) reduces the amount of matching required by increasing the amount of a priori information on both sides of the employment agreement. DoD has traditionally used high-school degree status and AFQT scores as screening instruments for potential recruits. Numerous studies of first-term enlisted personnel have proven these two measures to be fairly reliable indicators of overall suitability. In the case of career counseling, recruiters may be able to identify more exactly those students with an aptitude and preference for military service. The screening may also indicate the most appropriate job for such recruits. At the same time the counseling process may reveal to the students whether a military career is likely to appeal to them.

The proper mix of screening and job matching depends on the costs associated with each. For example, jobs in which the cost of a "failure" is high justify more screening than jobs with lower failure costs. High-cost failures result from expensive training, higher wages during the matching process or safety concerns. The screening processes for military academy selections, pilot programs and medical scholarships are relatively stringent, as are the selection screens for the Navy's enlisted Nuclear Field program.

In general, recent trends in the military workforce mitigate in favor of increased screening. First, downsizing in the active enlisted force and increasing reliance on Reserve forces for certain missions, combined with a closed personnel system, mean that the Services are not able to recruit large pools of first-term personnel who can be matched with appropriate occupations or separated after one term. In other words, the personnel "pyramid" is fatter with a much narrower base, thus increasing the costs of premature attrition and separation.

The smaller force of the 1990s must also be more highly trained and diverse. As discussed above, increases in training costs tend to make screening more attractive relative to

job-matching. Moreover, the wide range of technical skills required for different military jobs means that aggregate screening measures such as high-school degree status and AFQT score will be less effective.

Some efficient combination of screening and sorting exists in the case of military recruits. That mixture may be determined on a cost-benefit basis. At some point, the costs of additional screening measures are not justified by an attendant drop in personnel, recruiting and training costs. The career counseling program may be evaluated in this manner by applying costs and benefits to the behavioral information generated by analysis of the program.

The cost-benefit analysis will be based on an underlying objective function using some sort of figure of merit. For example, the objective may be to minimize the cost to recruit a fixed number of high-quality recruits. Additional investment in the testing program is justified if Army can reduce costs while continuing to attract a sufficient number of qualified recruits. We feel strongly, however, that this narrow definition of the objective function ignores many of the true benefits possible from the testing program. That is, the program is likely to have an impact on first-term attrition and retention. Moreover, it may reduce training costs by allowing Army to better match individuals more closely to occupations for which they are best suited.

Incentive Structure and Benefits Facing Students

Student participation in the testing program is voluntary. Thus, it is important to examine the incentives that are likely to induce them to participate. One expects students to participate if they:

- have a strong *a priori* desire to join the military or
- feel the program produces some long-term benefit in terms of career choices, earnings, etc.

Students incur some costs by participating in the program. At a minimum, the testing and counseling require an investment of time. Also, the students may feel that participating would open them up to a great deal of pressure from recruiters. These costs must be weighed against perceived benefits. For students who come in considering a military career, the program may offer them additional information about that choice. Previous research has confirmed that youths invest rationally in search methods while making career choices. Holzer [1988] showed that search method choices are related to the costs and expected productivities of the methods, as well as to potential wages and wealth. In other words, job seekers make the same sorts of cost-benefit

evaluations of screening versus matching processes based on the expected cost of a "failure" as do employers.

Understanding the value placed on the testing and evaluation process requires an understanding of the value of a military career to potential recruits. Ongoing and previous research have revealed the extent to which a military career can affect later career and earnings options.

Summary

Our multidisciplinary study examines the decision of individuals to enter or remain in the military workforce in a broader context than do traditional retention models. A military career offers more than wage income; the training, discipline and institutional aspects of service have implications for a member's entire working career. This is especially true given the relatively young age at which members can retire, allowing them to undertake a second career in the civilian sector.

APPENDIX C: OUTCOME OF THE LITERATURE SEARCH

Preface

This appendix presents a review of issues and research related to measuring the cost and benefits of a chosen career. Primary emphasis is placed on the nonpecuniary costs and benefits of a military career (particularly, in the Army), although the discussion is not limited to these domains.

The face of the workforce is changing. For example, Ellig (1990) notes some of the following trends in the workforce: an increase in the number of older workers due to aging baby-boomers; a poorly qualified, younger labor pool due to national increases in high school dropout and illiteracy rates; an increasing influx of minority and women workers; a decrease in the overall labor pool; an increase in worker emphasis on nonpecuniary work attributes; and less tolerance of organizational abuse leading to increased litigation and less organizational commitment. Ellig (1990) suggests corporate culture and organizational value systems will be critical in addressing these changing aspects of the workforce.

Clearly, the demographic trends in the workforce pose critical issues for employers and human resource professionals to address. Along with changing attributes of the workforce come different perspectives of organizational life (Fine, Johnson, & Ryan, 1990). For example, Fine et al. demonstrated that organizational "realities" differ depending on one's race, ethnicity, and/or gender. This notion contradicts traditional organizational theory which presumes that workers share common perceptions, values, and attitudes about their organization and work in general (Fine et al., 1990).

The non-demographic trends highlight additional concerns for organizations. Namely, organizations must contend with attracting and retaining qualified and committed employees from a shrinking labor pool. Furthermore, this labor pool will be composed of many individuals lacking basic skills. It thus remains essential for organizations to offer the benefits and conditions of employment that the more "attractive" employees desire. From the cost-controlling perspective adopted by Ellig (1990), organizations are forced to endure rising training costs and must guard against losing their investments (e.g., via turnover, low productivity, etc.). One mechanism useful in reaching this objective is by maximizing the benefits workers seek in the employment contract.

As a major employer and competitor for qualified, employable workers, the Army must also attempt to maximize the benefits of an Army career. To the extent the Army achieves this objective, the chances of attracting and retaining highly committed and productive employees increases (e.g., see Lakhani & Gade, 1992; Mathieu, 1988). In the midst of massive downsizing, structural changes, and

the necessity to maintain a force capable of accomplishing military missions, this objective gains added significance (St. Pierre, 1991). A "leaner" military can ill-afford to endure wastefulness in terms of its workforce.

Organizations seeking to address the benefits they offer must also consider possible costs to joining that organization. From the individual's perspective, the mere notion of career or job choice (e.g., military versus civilian career) implies costs, as well as benefits (Pieters, 1989). An analysis of both costs and benefits typically precedes career decisions. Hence, a full understanding of what a career, military or civilian, can offer prospective employees must begin by investigating both benefits and costs of choosing that particular career.

The trends in the workforce highlighted above open many issues that must be addressed in a cost-benefit analysis of a career. First, such an analysis must consider the different nonpecuniary and nonskill related needs of today's (and tomorrow's) workforce. For example, with women increasingly entering the workforce, family issues that were the sole domain of non-working women now become issues for employers (Lakhani & Gade, 1992; Sullivan, 1992). Second, with projections of fewer qualified workers, organizations must provide training to ensure the productivity of employees. Organizations able to maximize the benefits of training over costs will enjoy a competitive edge (Kirrane, 1986). Finally, a cost-benefit analysis must clearly consider the perspective of all major constituents, namely, employees, employers, and society (Pieters, 1989). Pieters (1989) notes that what is often labeled a cost from the organization's perspective is considered a benefit from another perspective (e.g., society). It should be noted that neither of these perspectives is mutually exclusive; indeed, a great deal of overlap exists. These contextual issues will be revisited in more detail later. First, however, theoretical considerations in investigating career decisions must be addressed.

Career decisions require the individual to make choices between various paths of endeavor. In the investigation of these choice patterns lies information concerning the perceived costs and benefits of a chosen career (Gati, 1990), particularly from the individual's perspective. However, the issue remains of what theoretical approach affords the greatest information gain. Psychology and economics offer complimentary approaches to career decision making; the former approach advocates a person-environment fit orientation (Osipow, 1990), while the latter is based on utility maximization principles (Albanese, 1987).

Psychologists have adopted a point of view emphasizing individual differences (see Osipow, 1990, for detailed overview). Osipow (1990) reviews several theories of career choice including those based on reinforcement/social learning, personality, and developmental perspectives. Common to these approaches is the

investigation of individual characteristics instrumental in influencing career choices. In isolation, these theories fail to capture the full essence of human behavior and the career decision making process (Osipow, 1990).

One strength of the psychological approach to career decision making is that it centers on the perspective of the individual (i.e., the employee). Arguably, this perspective will provide the most information about what ultimately is labeled a benefit versus a cost in a particular career. However, the psychological approach has been criticized for generating unquantifiable and invalid data (van Praag, 1985). Economics provides an alternative approach to investigating career decision making processes.

Economists investigating choice behavior typically apply utility models based on maximization principles (Albanese, 1987). The assumption is that human behavior can be modeled by utilizing mathematical models based on the optimizing of rational human behavior (van Praag, 1985). Recently, however, some researchers have noted the shortcomings of this point of view (e.g., Albanese, 1987; Antonides, 1989; Earl, 1990; and van Praag, 1985). For instance, van Praag suggests that one shortcoming of the traditional economic position involves the failure to fully define "rational" human behavior. Furthermore, he writes:

> *The strongest and most basic assumption in classical economics is of a psychological nature, viz., that individuals behave rationally in a way fit for description by means of a mathematical model. However, most economists have isolated those concepts in their economic aspects, being aware but ignoring that those concepts are part of general human behavior (p. 290).*

Still, researchers and practitioners criticizing the economic viewpoint do not dismiss this perspective as invalid. Instead, researchers note that economists must expand their models to incorporate concepts from other disciplines (Earl, 1990). This is particularly true for psychological variables that provide explanations for behavior which van Praag (1990) regards as central to economic models of decision making. For example, economic optimization models might address the seemingly "irrational" situation in which an engineer forgoes an opportunity for a high paying job for a lesser paying job by explicitly incorporating psychological variables (e.g., need for autonomy). A more complete cost-benefit analysis requires a multidisciplinary theoretical approach.

Given their relatedness, it appears that economics and psychology provide a natural bridge for exploring career decisions. However, Albanese (1987) emphasizes two concerns with this merger. First, a common ground of analysis must be established. Second, an integrative framework must be implemented.

In terms of this first issue, it was noted above that both disciplines seek to understand choice behavior, albeit with different emphasis. Osipow (1990) notes that all psychological theories revolve around a person-environment fit orientation. Psychologists evoke concepts such as traits and attitudes to explain why certain people prefer certain environments or make certain choices.

Likewise, economic models explore the person-environment fit. However, these models assume that all persons behave similarly (i.e., rationally) and attempt to use observed behaviors to recapture the essence of the decision process (Albanese, 1987). Put another way, economic models address concerns with what choices lead to what career decisions, but understanding why these choices were made requires the input of psychology.

Antonides (1989) makes this point in exploring the economic concept of utility and the psychological concept of attitude. By tracing the meaning, development and specification of these concepts, Antonides concludes that "both utility and attitude refer to the want- or need-satisfying properties of objects or issues, both are supposed to represent preferences and to influence behavior (p. 83)." Hence, the common ground between psychology and economic approaches to career decision making revolves around this issue of choice behavior. That is, evidence supports the notion that economics and psychology, in relationship to choice behavior (i.e., preferences), operate at different points along the same continuum (Albanese, 1987).

In terms of an integrative model, neither psychology nor economics occupies a more superior position in investigating career decisions or producing valid, quantifiable data. For example, some researchers identified individual preferences as the key in decision making models (e.g., Albanese, 1987; Gati, 1990). Albanese (1987) reviews how preferences form in an individual's development stages – a psychological perspective. Gati (1990) further notes that utilizing these preferences as inputs to the career decision making process allows individuals to judge congruence and make trade-offs between their desires and what careers offer – an economic perspective. Furthermore, "trade-offs cannot be carried out without translating the preferences in the various aspects to the same scale and quantifying them, the fact that we do make trade-offs implies that we can quantify our preferences (Gati, 1990; p. 509)."

Such integration occurs frequently in investigations of job commitment. For instance, Dornstein and Matalon (1989) combined personal, role-related, structural, work experience, and extra-organizational characteristics (variables) to measure commitment. Similarly, Jans (1989) integrated variables concerning the self, family, and career to predict organizational commitment. And Orthner and Pittman (1986) evaluated organizational support for the

family as a contribution to work commitment. Thus, variables from both psychology and economics have been quantified and applied together in prediction models.

In summary, it appears that the changing nature of the workforce has clear implications for organizations. Organizations will need to evolve their practices to handle the changing perceptions and needs of a changing workforce. One manner to accomplish this objective is through an understanding of the individual career development process, particularly, what individuals view as benefits versus costs of participation in a particular career. Bridging concepts from psychology and economics provides the route to this understanding. Between these two disciplines lies a sound basis for combining concepts into an integrative model of career decision making. What follows is an overview of other relevant factors in an assessment of cost and benefits in this domain.

As mentioned above, one factor to consider in evaluating costs and benefits of a career concerns the issues facing various subpopulations in the workforce. Women, minorities, older workers, etc. bring different needs and expectations to the workplace. Organizations will find it necessary to address some of the following issues in order to attract and retain these workers.

The military remains one of the major employers of African Americans (St. Pierre, 1991). St. Pierre examined the accession and retention rates of blacks in the military. While noting an increase in accession rates of blacks, St. Pierre provided data demonstrating whites continue to occupy the senior ranks in the military. While such a trend can be attributed to various circumstances surrounding blacks, such as lower entry qualifications, subtle racism, disproportioned rates of punishment, and initial assignments in "slow" tracks (see St. Pierre, 1991), this phenomenon could create the perception of the military as less advantageous for African Americans. Conversely, the steady influx of African Americans into the military could signal that blacks view a military career as beneficial. Ultimately, organizations such as the military must evaluate their organizational climates for sensitivity to the issues facing various subpopulations in the workforce (Ellig, 1990).

The increase in women in the workforce adds different concerns for organizations. Poole and Pogrebin (1988) reveal that women (police officers in this study) face various forms of harassment, role stress, and discrimination on the job. Examination of women's reasons for remaining on the job varied with tenure. Interestingly, after three years on the job, women police officers no longer valued the "opportunity for advancement" as a contributor to their retention behavior. However, job challenge/excitement, salary/benefits, and job security remained valued job attributes.

An investigation by Lakhani and Gade (1992) on career development and career decision making provides examples of what are construed as costs or benefits of military careers for another population of concern, married couples. For example, Lakhani and Gade (1992) explored various psychological, sociological, and economic variables as they impact career intentions of married U.S. Army career soldiers. Of the nonpecuniary variables investigated, most related to family issues (i.e., spouse intentions with regard to his or her military career, family size, and family happiness). In fact, spouse intentions proved to be the most important predictor of a soldier's intention to remain in the Army (Lakhani & Gade, 1992). Family size and family happiness also contributed significantly to a soldier's retention intention.

How organizations address issues such as discrimination, sexual harassment, family and child care support, retirement, job challenge, etc. will be considered when an individual evaluates a particular career or job. To the extent that organizations provide venues for handling these concerns, participation in that organization will be deemed beneficial. For example, given the role of the family in retention intentions, the U.S. Army should find it beneficial to provide services which support military families (Lakhani & Gade, 1992). Indeed, the military excels in providing support services to soldiers' family members (e.g., family medical care). Such efforts provide models for determining and meeting the needs of the workforce.

The examples reviewed above fall under the rubric of corporate culture, climate, and/or value systems (Ellig, 1990). Another concern organizations face in providing benefits to employees is the opportunity provided for skill acquisition, training, and career development. Because an employee continues to accrue skills throughout his or her employment contract, such skills accumulation will enhance the employee's ability to provide productive services, while also increasing the employee's "stock" within the organization (Benjamin & Benson, 1986).

Clearly, skill acquisition is a plus for all parties since it increases overall organizational value. Thus, organizations providing training opportunities will also be viewed as advantageous. In a study by Bartling and Eisenman (1992) of youth job perceptions, they found that over 80% of males and females rated learning a valuable skill or trade as *extremely* or *very important* in choosing a job. Again, the military is one organization that provides extensive training in a variety of domains. To the extent that the military training meshes with individual preferences, individuals will view that aspect of a military career as beneficial (Bartling & Eisenman, 1992).

In a study of role conflict and career advancement of African American women, Burlew and Johnson (1992) found evidence for limited political clout and colleague doubt about competence (among

other reasons) as perceived costs of participation in nontraditional professions. In their discussion, Burlew and Johnson suggest the need for "organizations to identify forces that work against the advancement of women...and develop alternative organizational structures that might enhance the opportunities for such women to advance (p. 310)." Following such a prescription ensures that organizations will maximize the benefits it offers to its employees.

In addition to the nonpecuniary and skill/career development issues discussed above, monetary issues will continue to occupy a central role in analyzing the costs and benefits of a chosen career. Greater than 90% of both males and females in the Bartling and Eisenman (1992) study rated "good income" as either *extremely* or *very important* in choosing a job. Related to income is benefits. As Ellig (1990) suggests, this will become increasingly important with such issues as healthcare and retirement occupying center stage. Clearly, it is advantageous for organizations to provide competitive wages and benefits.

In viewing some of the aspects reviewed above, it is important to consider whose perspective is being advocated. As mentioned earlier, the same attribute could be a benefit or a cost depending on the perspective adopted. For example, individuals who receive training in the military will find such training beneficial to the extent that it provides them with career-related skills. However from the military perspective, if that individual leaves the military before the military realizes any return on their training investment, providing training would likely be construed as a cost.

It has been noted that the changing workforce will introduce some new concerns with which organizations will have to contend. Namely, certain nonpecuniary attributes will be sought in employment/career decisions. Furthermore, what attributes appeal to particular people will vary with such factors as race, ethnicity, gender, age, etc. Additionally, career development and pay issues will continue to be instrumental in career choice. Hence, organizations attempting to meet the needs of a changing workforce will need accurate measures of the benefits versus the costs of participation in that organization. Bridging the concepts of psychology and economics provides a foundation for such investigations. These disciplines both share a common ground for analysis, choice behavior, and the capacity for integration in a comprehensive model.

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