Conscription and Australian Military Capability

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Debate about conscription in Australia is usually concerned with morality and equity and has become inseparable from the issue of the Vietnam war. Though the questions of morality and equity deserve attention, they have tended to overshadow important military considerations. This paper focuses on a post-Vietnam situation and, in that context, is concerned with the cost and effectiveness of conscription as a factor in Australian military capability. It examines the supply of manpower to the services generally, and particularly the supply of volunteers.

Though of particular concern to economists, since it deals with the application of economic analysis to a controversial political issue, this paper will interest all concerned with conscription and Australian defence policy.
Conscription and Australian Military Capability

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CONSCRIPTION AND AUSTRALIAN MILITARY CAPABILITY

The debate about conscription, or 'national service' is normally conducted largely from the point of view of the issues of morality and equity that are involved, and is customarily connected with the controversy about the Vietnam war. Morality and equity deserve the attention they have been given, but they have tended to overshadow important military considerations. This paper focuses on a post-Vietnam situation, and in that context is concerned with the cost and effectiveness of conscription as a generator of Australian military capability. This involves an examination of the supply of manpower to the services generally, and particularly the supply of volunteers.

DEMOGRAPHIC BACKGROUND

Fig. 1 shows a forecast by the Department of Demography of the Australian National University of the 17-25-year-old Australian male population. Some 95 per cent of the other rank (non-officer) recruits to the army are in this 17-25-year-old group. A similar predominance exists in Britain, the United States, and Canada, and the figure for the

1 The present Australian national service program was enacted in late 1964, and provides for compulsory service for a two-year period, either in Australia or overseas. Young men aged twenty are selected on the basis of a ballot of birthday dates, currently to a total of 8,000 per year. They all serve in the army.

2 That is, when the bulk of the American (and Australian) ground combat forces have been withdrawn.
other Australian services is not very different from that of the army. This cohort within the population behaves quite differently from the Australian population as a whole. In 1979, for example, the 17-25-year-old male population will be less than in 1974. One explanation

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Fig. 1 Australian 17-25-year-old projected male population and work force

*Source: Department of Demography, Australian National University (January 1969).

Assumptions:

- Migration: constant at 0.8 per cent per annum
- Fertility: falling to G.R.R. of 1.2 in 1969 and increasing to 1.3 in 1973

†(1) minus (3)
‡Forecast numbers of tertiary students for 1967, 1971, and 1975 were obtained from the 1964 Report of the Committee on the Future of Tertiary Education in Australia. The proportion of boys was assumed constant at 0.7 and interpolation used for intervening years. Secondary school figures used were forecast male final year student populations plus 50 per cent of penultimate year male population. Beyond 1974 the percentage of the 17-25-year-old population engaged in full-time education was assumed to stabilise at 25 per cent. This is a very conservative forecast.
for this is that the people who will attain the relevant age for military recruiting at that time are the children of depression babies, and there was a slump in the birth rate during the depression which will have an echo every generation. However, the really crucial population cohort is not the 17-25-year-old male *population* but the 17-25-year-old male *work force*. In this respect educational trends have great significance. An important, perhaps fundamental, aspect of the current social revolution is the popularity and availability of education beyond the elementary level. Fig. 1 displays a very approximate forecast of the number of 17-25-year-old males engaged in full-time education and as a residual the 17-25-year-old male work force. Therefore it is probably conservative to have estimated merely a lack of growth in the 17-25-year-old work force, instead of a decline, although a decline could well occur.\(^3\)

A complementary factor of considerable importance in this context is that the work force of 17-25-year-olds is becoming more highly educated. Surprisingly little information is available about the level of education attained by school leavers. Moreover, any nationwide analysis is bedevilled by differences between systems in the various states and by the fact that most states have had rather drastic system changes in recent years. So attention has been concentrated on Victoria because it is a populous state which has not had major system changes in recent years.

Fig. 2 shows the percentage of boys who left school in Victoria before Fifth Form, which is the second last year of secondary education, and forecasts changes in that percentage for some years ahead. Whereas in 1962 an estimated 67 per cent of boys left school before Fifth Form, by 1967 the figure had fallen to 42 per cent and forecasts indicate a levelling off at about 30 per cent. As noted above, about 95 per cent of army recruits are aged between 17 and 25. In fact, of all the other rank army recruits between August 1966 and June 1968, over 36 per cent were only 17 and over 83 per cent were 21 years old or less. Thus most recruits have left school only a few years prior to enlistment. The great bulk of those joining in 1968 will have left school since 1964. If we take 1966 school leavers as representative of those who left between 1964 and 1968, we would expect that in Victoria 46 per cent would have left before Fifth Form. However, of those recruits enlisted voluntarily into the army between May 1968 and April 1969 in Victoria in the other rank categories, over 82 per cent had left school before

\(^3\) The forecast actually shows a growth rate of about 1.5 per cent per annum for the next eight years and then a decline.
Fifth Form. Thus the army seems to be recruiting very predominantly from the not-so-well-educated group in the population, and that group is decreasing not only relatively but absolutely. Moreover, as pay rates in the services are aligned with unskilled or semi-skilled civilian pay, we must expect such concentration to persist in the absence of unemployment. These figures do not augur well for future recruiting and even they do not tell the whole story. Recruiting campaigns attract applicants who are filtered by tests including aptitude tests before admission as recruits. No figures are available, but it is almost certain that the average education and intelligence of applicants are less than those of recruits—hence the need for filtering. So the army, in enforcing minimum aptitude selection criteria, needs more applicants than its recruiting target and the lower the average aptitude of applicants the greater is the surplus that is required of applicants over recruits. As economic considerations become less important in determining educational pro-

*Figures were obtained of actual and forecast student populations (male) by grade from Department of Education and Science. The number who left school before Fifth Form in a particular year was calculated as the sum of the differences of the population that year of each grade up to and including Fourth Form and the population next year of grade one higher, up to and including Fifth Form. The total number of school leavers was similarly estimated with the entire final form class presumed to leave.
gress, the average intelligence or diligence of those leaving school below a certain level, say Fifth Form, could be expected to decrease. Therefore to recruit any given number of men the army will need to attract, in the future, a larger number of applicants. Unless the image of the army for those with more than minimal education changes, this increasing number of applicants must be attracted from a declining number of not-so-well-educated young men. The total other rank enlistments in the army over the past eight years expressed as a percentage of the 17-25-year-old male population has fluctuated between 0·27 per cent and 0·38 per cent. The median level has been about 0·33 per cent of the total population group.

TABLE 1  Army Other Rank Strength Forecasts

<table>
<thead>
<tr>
<th>Year</th>
<th>Assumption 1</th>
<th>Assumption 2</th>
<th>Assumption 3</th>
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<td>19,300</td>
<td>18,550</td>
<td>15,900</td>
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Table 1 shows the forecasts of volunteer other rank army strength under a range of assumptions of the success of recruiting and of the wastage rate. Assumption 1 is 12 per cent per annum wastage (which is about the current level) and an enlistment rate of 0·33 per cent for 1969/70 declining to 0·25 per cent after 1971. This is quite an optimistic assumption because recruiting is here based on the entire 17-25-year-old male population, not the work force, whose education distribution is changing to the army's disadvantage. In addition it is reasonable to expect an increase in the wastage rate since recent years have seen high enlistments for three-year terms which will soon be
terminating. Experience shows that those who initially enlist for a three-year term have a lower re-engagement rate than longer-term recruits.

Assumption 2 involves 14 per cent wastage, with enlistment rates as in Assumption 1. Assumption 3 is 12 per cent wastage and enlistment rates of 0.33 per cent for 1969/70, 0.30 per cent for 1970/71, 0.25 per cent for 1971/72, 0.22 per cent for 1972/73, 0.20 per cent thereafter. Assumption 4 is 14 per cent wastage and enlistment rates as in Assumption 3. Fig. 3 depicts the most and least optimistic of the four forecasts and it can be seen that even on the basis of the most favourable assumptions the volunteer other ranks strength does not increase. The greatest weakness of this analysis is that it is entirely related to the supply of young men. No forecast has been made of the demand for skill and education by civilian industry. Nevertheless, in the absence of such information and given the pessimistic supply-based forecasts, there is ample justification to predict that, without a marked change in the relative attractiveness of service careers, volunteer other rank strength of the army is unlikely to increase significantly in the next decade or so.

THE ROLE OF CONSCRIPTS

At first glance, the foregoing appears to provide a clear indication of the need for conscripts. Yet conscription can only be at best a partial solution to a lack of other rank volunteers. How useful conscripts are
depends upon the strategic and political setting. Australian troops have
been engaged in Vietnam for four years without the government finding
it necessary or desirable to declare war or to declare a state of defence
emergency. In the conflict in Vietnam, there is a political and perhaps
a technical restriction on the ratio of conscripts to volunteers who can
be deployed in the field. The current policy seems to be that no more
than half of the force committed to Vietnam will be made up of con­
scripts. The strength of the force that can be deployed and maintained
is adopted in this paper as a measure of army capability. In situations
short of declared war or declared state of national emergency, it is
apparent that one must look at the size of the volunteer group to see
what increment of conscripts can be placed on top of it. In such a
situation, regular or volunteer soldiers cannot reasonably be expected
to spend an indefinite period in the field. The current policy is that
they should serve not more than one year in three. This one year in three
policy after a unit has been ‘worked up’ means that the volunteer
soldier can be away from home for about half the time, so in a prolonged
commitment a more burdensome policy could hardly be imposed with­
out adversely affecting morale and re-engagement rates. Hence the
number of volunteers which can be deployed at one time is about a
third of the total number of deployable volunteers and only an equal
number of conscripts can be used as well. Thus the size of the volunteer
component of the army is still a crucial determinant of its capability.
In circumstances different from those now prevailing, a larger pro­
portion of conscripts may be able to be deployed so, to a large extent,
an assessment of the usefulness of conscription depends upon one’s
strategic assessment. Nevertheless, volunteers must always be the hard
core of the army; the other two services are manned entirely by volun­
teers.

THE SUPPLY FUNCTION OF VOLUNTEER ENLISTMENTS

Because the conscript contribution to army capability is limited by the
size of the volunteer component, it is necessary to examine the cost and
effectiveness of such policy measures as are available to increase the
volunteer strength. In fact the policy options are quite limited. They are
to improve the services’ ‘industrial’ relations, to intensify and improve
the quality of the recruiting effort, and to improve pay and conditions
of service in the armed forces. The author is not competent to comment
on either industrial relations or recruiting campaigns. Moreover, a very
broad definition of service pay is adopted to include all personnel
expenditure per man. Thus changes in conditions of service will be covered in so far as they affect personnel cost. Qualitative changes in conditions of service life which have no budgetary effect are ignored. The notion of a supply function of military recruits and the associated concept of supply elasticity is not easily accepted by many non-economists, particularly those in uniform, apparently because a function relating enlistment to military pay seems to place insufficient emphasis on non-monetary considerations. In an attempt to convert the non-believers a simple derivation of such a function is presented in some detail.

Let $W_c$ represent the present value of an expected flow of civilian earnings. Then

$$W_c = \sum_{j=1}^{n} \frac{W_{cj}}{(1+i)^j}$$

where $W_{cj}$ is expected civilian earnings in year $j$, $i$ is a discount rate, $n$ is the number of years in which income is expected to be earned.

Let $W_m$ represent the present value of an expected flow of earnings to an individual who enlists in the armed services. Then

$$W_m = \sum_{j=1}^{m} \frac{W_{mj}}{(1+i)^j} + \sum_{j=m+1}^{n} \frac{W_{mej}}{(1+i)^j}$$

where $m$ is the number of years of anticipated military service, $W_{mj}$ is anticipated income in the $j$th year of military service, and $W_{mej}$ is expected earnings in the $(j-m)$th year in civilian employment after completing military service.

An individual deciding whether to enlist or not will take account, among other factors, of the comparison between the values of $W_c$ and $W_m$ (expected civilian earnings and military earnings) which apply to him. It may well be that, in practice, the comparison can be simplified a good deal without much loss of accuracy. Fisher\(^4\) points to evidence that in the United States the income of veterans (ex-servicemen) in civilian employment is not significantly different from the income of civilians who have not served in the forces. That being the case years $m+1$ to $n$ may be ignored in the comparison and attention concentrated on

$$W'_c = \sum_{j=1}^{m} \frac{W_{cj}}{(1+i)^j} \quad \text{and} \quad W'_m = \sum_{j=1}^{m} \frac{W_{mj}}{(1+i)^j}$$

In addition it is true that in the United States the great bulk of volunteers intend, at the time of enlistment, to serve only one term of

three years. For that period the pattern of change of earnings is similar in both spheres of employment (monotonically increasing). Therefore Fisher feels justified in ignoring the discounting and using only the sum of the earnings in military and civilian employment which can be anticipated by the potential recruit. That is, the comparison is only between

\[ W''_c = \sum_{j=1}^{3} W_{cj} \text{ and } W''_m = \sum_{j=1}^{3} W_{mj} \]

Of course many factors other than income must be compared. The term \( d \) is introduced as an expression of an individual's preference for military or civilian employment and allows the axiom to be adopted that an individual will seek to enlist if and only if \( W_m \) is greater than \( W_c(1+d) \). A few examples are probably worth while. Individual A prefers military service to the extent that he is willing to sacrifice a 10 per cent income margin, i.e. he would enlist if \( W_m > 0.9W_c \); so for him \( d = -0.1 \). Individual B dislikes military service so much that he needs to receive double his civilian earnings to enlist, i.e. he enlists only if \( W_m > 2W_c \); so for him \( d = 1.0 \). Presumably a conscientious objector has \( d \) equal to plus infinity. Thus the axiom covers

Fig. 4 Illustration of Supply Curve of Volunteers
all situations by simply compacting all non-monetary considerations into the factor $d$.

Just as there is a cumulative distribution of incomes (log-normal), so there is a cumulative distribution of $W_c (1+d)$. If such a function is graphed, as in Fig. 4, the value on the vertical axis is the proportion of people in the relevant population (males of appropriate age, health, aptitude) to whom a value of $W_c (1+d)$ or less applies. Thus if any value of $W_m$ is plotted on the horizontal scale, the proportion of the population which would seek to enlist could be read off the vertical axis. The cumulative distribution of $W_c (1+d)$ is therefore the supply function of voluntary military recruits. Of course it is one thing to establish the existence of a function and another thing altogether to estimate its parameters.

Associated with such a function is the elasticity of supply: the relative increase in the proportion of people seeking to enlist divided by the relative increase in pay necessary to bring about that increase. The elasticity of supply is a very useful measure of the effectiveness, in inducing increased recruitment, of increasing material returns from military service. It is also important in any attempt to estimate what level of military wage would be necessary to induce some flow of recruits. Once the existence of a supply function has been accepted, there can be no doubt that whatever flow of recruits (within very wide limits) is sought can be achieved if the price is right. So the question of feasibility does not arise. The relevant question relates to the cost the community is willing to bear.

The Report of the Gates Commission points out that the budget cost of paying men in military employment is not necessarily the real cost to the nation. That is particularly true in a full employment economy such as Australia’s. The real cost or opportunity cost is the value of the nation’s forgone production, i.e. the reduction in the nation’s output of non-military goods and services, which results from enticing or conscripting people from civilian to military employment. If the conscript receives a wage whose value is less than his alternative civilian wage, which is a measure of the value of his forgone production, his loss of wages can be viewed as a special tax levied on him or as a subsidy paid by him for the benefit of taxpayers at large. The Gates Commission points to an even larger tax in kind (i.e. ‘way of life’) on conscripts—the increase over the man’s civilian wage which would induce him to

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enlist. That margin, in a free labour market, measures the disutility of military service to an individual and is related to the notion of a civilian wage adjusted by the preference coefficient, which we used to derive the recruiting supply function. The Commission viewed such taxes as sufficiently inequitable and sufficiently at variance with the values on which they like to consider the American way of life to be based, to justify completely putting an end to conscription in America. In this paper the import of such value judgments is ignored. But the adoption of such a view by an eminent group appointed by the President of the United States and including former defence secretary Thomas Gates and Generals Gruenther and Norstad gives the view greater respectability and increases the pressure on the United States President to end conscription.

Hereafter, then, cost comparisons will be made primarily from the point of view of the opportunity cost, that is, the cost of forgone production, and no account will be taken of the uncompensated disutility of conscripts. On the other hand the budget cost is the measure which must gain public acceptability and hence the budget cost of a force of any size or complexity largely determines the likelihood of such a force being maintained (budget cost, of course, being a sum of the personnel expenditures actually outlaid). The Gates Commission devoted much of its report to estimation of the budget cost of all-volunteer forces of various sizes. In this respect, the Gates Commission Report is of value to Australia for two reasons: first, from its attempts to estimate the elasticity of supply of recruits in the U.S. we may gain some insight into the likely magnitude of the elasticity here; secondly, the Commission’s Report can be viewed as a piece of intelligence about the United States and particularly about their likely force levels without conscription, the risk of targeted force levels not being achieved, and the United States government’s flexibility in altering force levels.

The real (as distinct from money) cost of an all-volunteer force of any given capability is less than that of a fully or partly conscripted force of the same capability simply because the more rapid personnel turnover necessitated by a partly conscripted force involves a larger number of men in training, both as trainees and instructors, than is the case for a force manned completely by volunteers who tend to serve for much longer periods. Hence the conscripted force involves the withdrawal of a larger number of men from the work force and therefore a larger opportunity cost. Second, the conscripts are a random sample of the relevant age group and therefore include people with valuable civilian skills who would not normally enlist, and thus the average cost
of their forgone production per man is higher than would be the case for an all-volunteer force. Third, if the personnel expenditure per man in a partly conscripted army is less than the real cost of labour, the selection of forces by military managers will involve capital-labour trade-offs at a false price ratio, and this will cause under-utilisation of capital and over-utilisation of labour in the services. The fact that conscripted military forces appear to be cheaper than they really are may induce a government to devote a higher share of G.N.P. to defence than it would if its decisions were based on accurate costs and might even increase the probability of committing rather than just maintaining such forces. The third point, about capital-labour trade-offs, can be developed to show that the efficient allocation of defence resources can only be achieved with knowledge of the supply elasticity of recruiting, or if manpower targets are conservatively established.

THE SUPPLY FUNCTION AND MANAGEMENT EFFICIENCY

As mentioned earlier, even in a partly conscripted armed force, the capability or deployed strength which can be maintained depends upon the size of the volunteer component. Again, capability so defined varies directly with the level of military wage, since higher wages induce an increased flow of recruits, lower wastage rates and therefore a higher volunteer strength.

No generality is lost and some simplicity is gained in assuming for the sake of illustration an all-volunteer force. Assume that such a force has a current strength of 20,000 men with a manpower wastage rate of 15 per cent and that personnel cost is $A6,000 per man per annum. Let us consider the choice between two defence systems of equal effectiveness, the first of which involves relatively small capital expenditure and requires substantial strength increase, while the second involves heavier capital outlay, but no increase in strength. Presented in Tables 2 and 3 for each system is the flow of increases to the defence vote over an assumed system life of ten years, which results from the decisions to buy that system when the increased strength can be achieved at current rates of personnel expenditure per man. Using a discount rate of 10 per cent per annum, the present value of each flow of increases in expenditure, that is, the cost of each acquisition decision, is such that the labour intensive system should be purchased. If, however, current pay and conditions of service are sufficient to induce only 3,100 recruits per year, which is sufficient to replace wastage and provide an annual strength increase of only 100 instead of the 400
needed, the comparison is quite different. In this case to achieve the targeted strength for System A in the time planned, the recruitment rate needs to be increased by 10 per cent. If the elasticity of supply of recruits is 1, and so the 10 per cent increase in recruiting can be achieved by a 10 per cent increase in personnel expenditure per man, then the cost per man would increase to $A6,600 per annum. Moreover, the extra $A600 per annum accrues not just to new recruits but to the whole force. Since the pay rise would not be necessary if System B were chosen, the additional increase in personnel expenditure for the force is attributable entirely to a decision to acquire System A. Under these circumstances the flow of increases to the defence vote, resulting from a decision to acquire System A, is set out below. The cost of a decision to acquire System A can be seen to be more than double that which would be estimated on the assumption that current personnel expenditure per man was adequate to induce the required strength increase.

Obviously the choice is very different in the two situations. If the optimistic assumption of adequate recruiting is made without justification and System A is acquired, either manpower costs are increased beyond expectation or, as is more likely, the service will simply make do with inadequate manpower and operate the new system and perhaps others

<table>
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<tr>
<th>TABLE 2 Case 1 Cost of System A</th>
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<tr>
<td>Necessary strength increase</td>
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Present value cost of A = $A52.7m

System B

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Decision: Buy System A
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<td>1000</td>
<td>1000</td>
<td>1000</td>
<td>1000</td>
<td>1000</td>
<td>1000</td>
</tr>
<tr>
<td>Extra cost for existing strength</td>
<td>12</td>
<td>12</td>
<td>12</td>
<td>12</td>
<td>12</td>
<td>12</td>
<td>12</td>
<td>12</td>
<td>12</td>
<td>12</td>
</tr>
<tr>
<td>Raw total</td>
<td>20</td>
<td>10</td>
<td>14.6</td>
<td>17.3</td>
<td>18.6</td>
<td>18.6</td>
<td>18.6</td>
<td>18.6</td>
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<tr>
<td>Discounted at 10%</td>
<td>20</td>
<td>9</td>
<td>11.8</td>
<td>12.6</td>
<td>12.1</td>
<td>10.9</td>
<td>9.8</td>
<td>8.8</td>
<td>7.9</td>
<td>7.1</td>
</tr>
</tbody>
</table>

Present value $110.0

Decision: Buy System B

as well at less than the anticipated level of effectiveness. It is difficult to see how the cost effectiveness approach to defence decision making can be employed without some knowledge of the parameters of the military recruitment supply function and the associated elasticity of supply.

SPECULATION ON THE AUSTRALIAN SUPPLY FUNCTION

Reports from the dozens of individual research projects undertaken by the staff of the President's Commission on an All-Volunteer Armed Force are not yet available. Nevertheless, American economic journals contain a number of studies of the supply function of military volunteers, some of which were written by members of the Commission's research staff.  

In these the basic technique was to calculate a linear regression relating the proportion seeking to enlist to the ratio of military to civilian pay. Account was also taken of other factors such as the level of unemployment, the proportion of Negroes in a population, and the draft accession rate. However, pay received most attention, probably because it is the only policy variable amongst them.  

A supply equation developed in a paper by Altman and Fechter on  

---

6 Stuart H. Altman and Walter Oi became Directors of Research on the Commission's staff while Alan E. Fechter was entrusted with the research project on army enlistments.

the basis of cross-section data and with a coefficient of determination 
$= 0.86$ has the form
\[
\ln \frac{E}{P} = a + b \ln Y + c \ln u + d \ln N
\]
where $E/P$ is the enlistment rate, $Y$ is the ratio of military to average 
civilian earnings, $u$ the unemployment rate, $N$ the percentage of non- 
white males, and $\ln$ is the natural logarithm.

Other things being equal, the fact that Australia has a lower enlist­
ment rate than the U.S. in spite of a higher ratio of military to civilian 
pay implies that the coefficient $b$ is lower in Australia than in the U.S. 
But given the form of the above equation, $b$ is the estimate of elasticity.$^8$

Fisher has made some mathematical inference about the nature of 
the supply function and established that beyond some point short of the 
mean civilian income, supply elasticity decreases as military pay 
increases.$^9$ Moreover, he believes the U.S. to be in the region of declin­
ing elasticity.$^{10}$ His supply model and that used by Oi$^{11}$ are structured 
to provide an elasticity which varies inversely with the ratio of military 
to civilian pay. Once again, the fact that this ratio is higher in Aus­
tralia than the U.S. supports the proposition that the pay elasticity of 
volunteer recruiting is lower in Australia than in the United States. 
On the other hand, the Appendix points to the possibility that the shape 
of the civilian income distribution in this country may be such that over 
a range of the military to civil pay ratio, somewhat higher than that 
which now prevails, there could be an increase in elasticity. On balance, 
though, what research has been done (albeit foreign research) gives 
little reason to hope that our elasticity of supply is high.

Qualitative observation is also consistent with the suspicion that the 
effectiveness of raising military pay as an inducement to increased 
recruiting is not as high as it would be in the United States. Australia 
had not attempted before the 1960s to maintain a substantial standing 
army in peace time. In all declared wars in which Australia has been 
involved material inducement has not been an important factor in

\[ \frac{d \frac{E}{P}}{d Y} \cdot \frac{Y}{\frac{E}{P}} = \text{elasticity.} \]


$^9$ Ibid., p. 246.

determining the rate of enlistments. On the other hand, military service has never competed effectively with civil careers. The Australian myth is one of undisciplined individualism, to be temporarily put aside only when its existence is thought to be threatened.

These are hardly the premises which can provide a rigorous basis for any conclusion, but it seems reasonable enough to surmise that it is unlikely that manipulating pay rates would be as effective in Australia as in the U.S. Such effectiveness as would be achieved is measured in terms of the proportion of the relevant population which enlists. The considerations above (p. 2) indicate no growth in that relevant population. (The Gates Commission report points to another factor which would be negative on the Australian recruiting scene—the strength of Australia’s apprenticeship system. However, the services run their own successful apprenticeship programs so it is not clear that apprenticeship deserves the attention accorded by the Commission.)

While the very notion of the supply curve of recruits implies that almost any sized army could be recruited, a substantial increase in the volunteer strength would probably be quite expensive, and to raise and maintain a standing army of current strength entirely by voluntary enlistment would almost certainly involve an increase in the budget cost of the army which would be politically infeasible. It is well worth noting that the mooted abolition of conscription in the U.S. is to be accompanied by a shrinking of the force level to pre-Vietnam levels, i.e. from a high of 3.3 million men to approximately 2.5 million—a reduction of over 30 per cent—and that is in the context of a favourable demographic trend. In all countries which have abolished conscription since World War II, the abolition has been accomplished by a reduction in force level. To debate the need for conscription in isolation from strategic considerations of force level requirements is naive.

THE AUSTRALIAN-AMERICAN ALLIANCE IN THE EVENT OF ALL-VOLUNTEER U.S. FORCES

Australia has an interest in the level of probability that targeted American force levels will be achieved, and in the flexibility of the U.S. government to increase its force levels. On the basis of its studies, which rely heavily on statistical regression analysis, the Gates Commission has estimated the budget cost of maintaining various U.S. force levels by voluntary enlistment and suggests that the cost increases are acceptable. However, in going from a very generalised and theoretical notion of a supply function as derived above from first principles to such specific
models as are used for forecasting, a number of crucial assumptions have to be made. From the rationale provided by Fisher\textsuperscript{12} for forecasting on the basis of such regression equations it can be deduced that at least three risky assumptions have been made: first, that the distribution of preferences between military and civilian employment is independent of civilian income; second, that it does not vary over time; and third, that the civilian income distribution does not vary over time.

These are quite tenuous assumptions on which to base a long-term forecast about the likely response of the public to recruiting efforts based on increasing wage rates. So, no matter how accurately the regressions have been estimated, there is reason to doubt that the Commission’s estimate of the cost of maintaining volunteer forces today will hold good in a few years’ time, even after the normal allowance for inflation. For example, success in what the Americans have called the war on poverty would reduce the variance of the civilian income distribution and therefore reduce the elasticity of supply of volunteer military labour as shown in the Appendix. In addition to this concern about the nature of the extrapolation which must be undertaken, some aspects of those statistical investigations so far available do not inspire confidence. The actual study reports of the Commission may show a firmer basis, but those analyses so far published are based on very few observations. For the most part, estimates of the elasticity of supply have been based on cross-section analyses of only nine regions of the U.S. For estimates based on equation (1) of the Appendix, a coefficient of determination of 0.73 is given in the literature\textsuperscript{13}, the coefficient of determination being interpreted as the proportion of variation in the variable on the left hand side of the equation which can be explained in terms of variations in the variables on the right hand side. However, the 0.73 quoted is a sample point estimate of the true coefficient; given this point estimate and a sample size of nine observations, there is one chance in ten that, in fact, the coefficient of determination is as low as 0.42.\textsuperscript{14}

To appreciate the magnitude of the task of abolishing conscription in the U.S. (which is admittedly not wholly comparable with that in Australia) one needs to be aware of the phenomenon of draft-induced enlistment. The following totals, based on interviews with first term

\textsuperscript{12}Fisher, op. cit.
\textsuperscript{13}Altman and Fechter, op. cit.
\textsuperscript{14}The correlation coefficient of 0.85 transforms to a normal variate with point estimate 1.255 and variance of $\frac{1}{2}$. The tenth percentile point of that normal distribution corresponds to a correlation coefficient of 0.65.
TABLE 4 Distribution of answers by volunteers to the question: 'Would you have entered the service if there had been no draft?'

A—Enlisted personnel on first tour of active duty

<table>
<thead>
<tr>
<th></th>
<th>Yes Definitely</th>
<th>Yes Probably</th>
<th>No Probably</th>
<th>No Definitely</th>
<th>No Idea</th>
<th>Draft Motivated†</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total of all services</td>
<td>30·0%</td>
<td>27·6%</td>
<td>20·1%</td>
<td>15·2%</td>
<td>7·0%</td>
<td>38·0%</td>
</tr>
<tr>
<td>Army only</td>
<td>27·1%</td>
<td>25·6%</td>
<td>20·7%</td>
<td>19·4%</td>
<td>7·2%</td>
<td>43·2%</td>
</tr>
<tr>
<td>Education</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>less than high school graduation</td>
<td>42·9%</td>
<td>28·8%</td>
<td>11·7%</td>
<td>9·7%</td>
<td>6·9%</td>
<td>23·0%</td>
</tr>
<tr>
<td>high school graduate</td>
<td>27·2%</td>
<td>28·2%</td>
<td>22·4%</td>
<td>14·9%</td>
<td>7·3%</td>
<td>40·2%</td>
</tr>
<tr>
<td>at least some college</td>
<td>16·3%</td>
<td>23·1%</td>
<td>28·3%</td>
<td>26·0%</td>
<td>6·3%</td>
<td>58·0%</td>
</tr>
</tbody>
</table>

B—Officers on first tour of active duty

<table>
<thead>
<tr>
<th></th>
<th>Yes Definitely</th>
<th>Yes Probably</th>
<th>No Probably</th>
<th>No Definitely</th>
<th>No Idea</th>
<th>Draft Motivated†</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total of all services</td>
<td>36·0%</td>
<td>20·0%</td>
<td>24·1%</td>
<td>15·3%</td>
<td>4·6%</td>
<td>41·3%</td>
</tr>
<tr>
<td>Army only</td>
<td>30·6%</td>
<td>18·6%</td>
<td>27·4%</td>
<td>19·0%</td>
<td>4·4%</td>
<td>48·4%</td>
</tr>
</tbody>
</table>

* Altman and Fechter, op. cit., p. 23.
† Respondents answering 'No probably' and 'No definitely' as a percentage of the total excluding those who answered 'No idea'.

Military personnel, show the very high incidence of draft-induced enlistment in the U.S. among both enlisted men and officers:

In the statistical analyses referred to, enlistment data has been adjusted to take account of this factor. However, there must be some question as to the accuracy of estimates of its incidence based on interviews with serving personnel. The flexibility of American force levels will depend to a considerable extent on the supply of reserve manpower. According to a 1969 U.S. Defense Department survey of reserve personnel, only 27 per cent of enlisted men in the reserves drill voluntarily. While the Gates Commission recognises the importance of the reserves, its report admits that 'Analysis of the reserve problem, however, suffers seriously from a lack of data. Even though special care was taken to provide against errors of estimations, the assessments of what is required to maintain an all volunteer reserve force are much more tenuous than those for the active duty force' (p. 97). The comments of this section are not intended as criticisms of the quality of that research which is so far available for our scrutiny. The researchers have done quite as well as could be expected given the data available to them; but, unless the Gates Commission has been able to use much better data than that which has until recently been available, one must concede a considerable
risk that over future years the U.S. may have trouble meeting recruiting targets at forecast levels of personnel expenditure. Moreover, there is even greater cause to fear that U.S. reserves, after conscription, will not be adequate. Even if the Commission’s estimates prove to be accurate, the flexibility of the American President as Commander-in-Chief to increase force levels is surely impeded. To achieve any marked increase in strength by voluntary means he would need to budget not only for a larger number of men on the payroll but for a higher pay rate as well, and the rate of increase of the required pay rate can be expected to increase with the force level. The Gates Commission has recommended a stand-by conscription power, but it is an act of much greater moment for a President to introduce conscription anew than merely to increase the intake rate of an existing conscription scheme. What is more, the Commission recommended that the stand-by draft system should be invoked only by resolution of Congress at the request of the President, rather than by the President independently. The obvious conclusion, then, so far as the Australian-American alliance is concerned, is that President Nixon’s moves towards the abolition of conscription, made possible by the Guam (or Nixon) doctrine (which indicates that the Americans are not going to become involved again in Asia with ground forces except in the event of a Chinese attack across its borders), will tend to reinforce that doctrine. The abolition of conscription in America, if put into effect, will limit the capacity for such involvement. Whether this is seen to make the U.S. alliance any more or less valuable depends, of course, on one’s assessment of the effectiveness and desirability of U.S. ground forces in Asia.

FORCE STRUCTURE CONSIDERATIONS

Australia maintains armed forces for possible deployment in the following regions: (a) the South-east mainland of Asia (b) the Malaysia-Singapore region (c) Papua-New Guinea and (d) Australia itself. Of course there is not a separate set of forces maintained for each possibility, but one force structure chosen with a view to flexibility. Nor is it possible to maintain forces in being which are capable now of coping with any foreseeable situation in which they may become involved. Given economic and other constraints, our forces may be considered adequate if they are capable of sufficient expansion to meet a foreseen threat within the intelligence lead time for such a threat to materialise. For example, if it is considered that if country X decided to invade Arnhem Land it would need ten years to acquire a capability to do so,
then our present force structure should be capable of adequate expansion in the next ten years to deter or defeat such an invasion. In general, the longer the intelligence lead time of a threat or set of threats, the more emphasis should be placed on those forces which have a long build-up lead time (such as ships) and/or a long life (ships, roads, airfields).

SOUTH-EAST MAINLAND ASIA (EXCLUDING MALAYSIA-SINGAPORE)

The foregoing has shown that we cannot be certain of U.S. ground force involvement, after Vietnam, on the mainland of Asia. It is therefore unthinkable that Australia would commit its ground force units to combat there. There may be some training commitment, but it can be reasonably presumed that the region will have no relevance to the question of whether conscription should be continued in Australia.

MALAYSIA AND SINGAPORE

Australia has committed a small force, including an army component, to the defence of the area. That force is probably of itself too small to have much effect in a conflict but it could be reinforced from Australia. However, we have seen that, with the present level of conscription, we cannot expect to increase our ground force capability in situations short of 'defence emergency' beyond that now deployed in Vietnam, i.e. three battalions plus supporting arms. The Vietnam commitment is assumed to be as much as the volunteer component of the army can man on a one year in three basis and, under the policy of not more than 50 per cent conscripts in the force, the volunteer strength determines the limit to capability. Demographic, educational, and industrial trends are not seen to favour a much larger volunteer strength. In his statement to the House of Representatives on 10 March 1970, the Minister for Defence stated: 'The very nature of war has changed. We now have to contend with a variety of politico-military situations. These include subversion, confrontation, guerilla wars, “revolutionary warfare” and other limited conventional operations short of a “declared” war'.

That being the case, it seems Australia’s maximum ground force contribution to Malaysia-Singapore could be about the size of its Vietnam task-force. The question is whether such a contribution is worth its cost to Australia. Since the situations foreseen by the Minister require heavy numerical superiority on the defensive side, such a small Australian commitment could hardly be decisive. More than that, a ground
force contribution from Australia at the expense of alternative contributions with less manpower content may not strengthen the alliance force. A contribution of conventional infantry by this country to a combined force with an Asian ally is analogous to subsidising the export of goods with a high labour content to Asia. It would be a labour intensive contribution from a labour-poor, capital-rich, technology-rich Australia to a labour-rich, capital- and technology-poor ally. Only the most elementary understanding of the benefits of international trade is needed to appreciate that a contribution consisting mainly of capital and technology by this country would allow Malaysia and Singapore to devote their resources, otherwise so engaged, to the maintenance of infantry and that such a Malaysian and Singaporean infantry force would be stronger than the infantry force which Australia could provide as an equal cost alternative. To ignore the comparative advantages of the allies weakens the capability of the alliance.

This is not to say that there is no value in our present army contingent in the region. However, it is dangerous to see the contingent as having a significant military capability in its own right or as an outpost capable of massive reinforcement from Australia. The one role it can usefully serve is that which the American garrison serves in West Berlin—a tripwire, a flesh and blood guarantee that an attack on the region will involve Australian troops and therefore commit the Australian government to the hostilities. As such it can, and probably does, encourage a sense of security. With the commitment thus guaranteed, it is in the interests of Malaysia and Singapore that the forces provided by Australia make the maximum contribution to the combined capability. Such will be the case if, apart from the tripwire forces, we provide R.A.A.F., naval, and highly specialised army contributions, and not a few thousand more riflemen.

An example of the type of capital intensive army contribution which might be undertaken is given in a paper, ‘The Strike Teams: Tactical Performance and Strategic Potential’, by F. J. West. Strike teams are units, already in use in Vietnam, which are characterised by smallness in size, concealment in movement, surprise in attack, and suddenness in withdrawal. The strike teams in Vietnam include the Australian S.A.S. (Special Air Service). The teams themselves are very small groups (about five men) but West sees them as part of a system involving larger infantry units and heavy investment in helicopters, ground attack

15 The RAND Corporation, Santa Monica, California, reference number P-3987, January 1969.
16 Ibid., p. 3.
aircraft, and artillery. The proposal apparently is that the teams move through the enemy's 'safe' area engaging in harassment to affect his morale and increase the cost of administration, training, and movement. They also reconnoitre, and may be deployed as screens around cities and important installations.

In either case, if they find large enemy units they call into action other components of the system such as very mobile airborne battalions, artillery, and air strikes.

An army force of this type in Malaysia-Singapore need not be large to be quite valuable. Two very mobile battalions, with artillery and air support and S.A.S. units, may well be able to be provided, after Vietnam, without reliance on conscripts. It is the type of ground force the local people could not so easily provide for themselves. Moreover, publicity about its foreseen role and the very nature of its training and equipment may reduce the likelihood of such a force being involved in communal strife.

The Australian Mainland

As the Prime Minister said before the last Federal elections in 1969, there is no apparent threat of invasion of Australia in the next decade or so. So far as continental defence is concerned, Australia's force structure should be such as to provide not so much a present capability as a potential capability. Armies are not created overnight and a sufficient army must be maintained to provide a career for those professionals who will continually reshape the army organisation to keep it up to date and who will acquire and pass on military technology and skills. Thus even for continental defence the maintenance of the army is necessary. The question is at what strength.

A conscript trained in 1971 will not be a valuable defence asset in the event of an invasion in, say, 1985. However, the resources expended in his training, equipment, and maintenance could have been invested in defence assets with a much longer term pay-off such as dockyards, ships, aircraft, airfields, and apparently non-military items such as roads and education. So far as continental defence is concerned, conscription is consumption rather than investment and, at a time of such low threat, consumption rather than investment is waste.

Papua-New Guinea

It would appear that any external attack on Papua-New Guinea, whether it be the old fashioned direct assault or the newer 'confrontation', would most likely come through Indonesia. Yet the current govern-
ment of Indonesia shows no inclination to threaten these Australian territories. Presumably the fact that a shift in the balance of power in Indonesia is a prerequisite to attack on New Guinea means that there would be some warning of impending troubles.

What is needed to guard against such a possible threat is not so much men in uniform today as the capability to build up armed strength within the warning time of the need for that strength. Nevertheless, the demands on Australian military manpower are potentially greater in its dependent territories than anywhere else. It is conceivable, also, that internal security problems could demand a greater military effort than at present. What strength the Australian army needs now depends on the warning time our intelligence resources can confidently provide and on the relationship between speed of build up and the initial size of the army.

Unfortunately, whatever knowledge of these two factors exists is likely to remain the preserve of military officers and civil servants in the Defence group of departments. It may be that the defence of Papua-New Guinea requires an army strength greater than that which could be maintained by purely voluntary means from traditional sources of supply. Since the other areas considered above do not justify more than a small army, any continuation of conscription after Vietnam would seem to indicate either a concern for defence of our territories or a surrender to emotional pressure groups.

If the government does decide that a larger army than would be provided by voluntary enlistment under current conditions is necessary, the question remains of how the extra strength should be acquired. We have seen that in terms of real or opportunity cost, conscription is the most expensive way of manning an army. Yet the fact that the inequity of the implicit taxing system of conscription allows a large strength to be maintained at a small budget cost is perhaps its political strength. The majority of taxpayers who are willing to be subsidised by conscripts may be unwilling to bear the burden of the greatly increased taxation which would result from the abolition of conscription and the improvement of conditions of service to the extent necessary to increase voluntary enlistment sufficiently to maintain required strength. However, there is possibly another way to maintain capability without conscription at no greater budget cost and an even lower real cost than an expanded volunteer component of the regular army.

It was noted earlier that the real cost of an army capability is the
loss of civil production which results from withdrawing men from the
civilian work force. One of the major reasons for the uncertain prospects
of voluntary enlistment is a shrinkage of the young work force as young
men in increasing numbers continue their education for longer periods.

A soldier who is at the same time a student has a zero real cost.
Students have one vacation of almost three months and two shorter
vacations during which many of them seek employment to assist with
their maintenance while studying. Finding vacation employment is often
quite difficult and, for many, life while studying is frugal. An enlistment
scheme whereby a young man enlists in November, trains for three
months, then studies the course of his choice with a living allowance
from the army and a training obligation during all vacations may prove
attractive to many. A recruit would enlist for the duration of his course
with the proviso that, at any time, the government may judge that the
defence situation has deteriorated and demand that he serve some
period (say two years) of full-time service. The student soldier could
be guaranteed that if such a period of full-time service was imposed
on him, he could complete his study at the army's expense with recog­
nition that at least an additional year would probably be necessary to
compensate for dislocation.

Such servicemen would represent capability in much the same way as
conscripts do. However, since they are not in the work force they do
not cause a reduction in civil output. They would not always be on duty
and so the response time to an emergency would probably be slower
than for conscripts. However, in a low threat situation where sufficient
warning time of an emergency can be anticipated, that should not matter
too much. The student soldiers could be spending about four months
in full-time training per year, and would be at a reasonable state of
readiness, particularly those who had been in the scheme for three
years and would thus have completed approximately twelve months' 
full-time service. In some other senses the student-soldiers would be a
superior standby force. At any time that conscripts are committed to
combat, many of them will have only a brief remaining service obliga­
tion and will require early replacement which must involve inefficiency.
The student volunteers would have a fixed term obligation from the
time of mobilisation.

It seems reasonable to assume that the motivation of students who
volunteer would be superior to that of conscripts. There could be no
doubt that the social cost of protest and disorder would be reduced.
During the periods of study rather than military service, the students
may be paid a living allowance which would be less than the service
wage and so the budget cost would be reduced. The scheme could cover many levels of education—University, College of Advanced Education, and Technical College. It might also be attractive to people who are beyond normal secondary school age, but wish to complete their secondary education. In the latter case a mature age secondary school might be established for the purpose.

Much more consideration of this proposal is necessary before it could seriously be presented as a policy recommendation. However, it just could turn out to be that elusive novelty—an Australian solution to an Australian problem.

CONCLUSION

It can be established that in terms of real or opportunity cost, conscription is the most expensive system of military manpower procurement. Under conscription, military managers allocate resources in response to a false price ratio of capital to labour and are therefore very likely to misallocate resources.

In situations short of a defence emergency the volunteer component determines the limit to army capability as defined (i.e. the strength which can be maintained in combat). Demographic and educational trends encourage pessimism about the prospects for expanding the volunteer component under current relativity of service to civilian pay and conditions.

Insufficient data (particularly relating to civilian incomes of relevant age groups) exists for estimation of the Australian supply curve of volunteer recruits. Such speculation as is possible about Australia on the basis of U.S. research suggests inelasticity of labour supply, i.e. a low effectiveness of improved pay and conditions in increasing the flow of volunteer enlistments.

Fulfilment of President Nixon's promise to move towards an all-volunteer army will reduce the U.S. freedom of action in Asia and reinforce the impact of the Guam Doctrine. We must assume that the U.S. will not become involved in new situations on the ground in Asia in the foreseeable future. Therefore, after Vietnam, it appears highly unlikely that Australian ground forces will be involved on the Asian mainland, except possibly in Malaysia.

Australia's current ground force commitment to Malaysia-Singapore

\[17\] That is, except in the unlikely circumstances where the whole country is in danger and there are not enough volunteers to secure it against attack and take-over.
is within the limits of its capability without conscription. Additional ground forces (even as reinforcements) are an inefficient contribution to the capability of the alliance. Australia's alliance contribution should have a major content of capital and technology rather than manpower. A role, in keeping with that principle, is suggested for a modest army force.

The defence of the Australian mainland is a long-term business and demands long-term investments. Conscription is seen to serve no useful purpose in that context.

The defence of Papua-New Guinea could conceivably involve larger manpower demands. Furthermore, such restrictions as the 50 per cent limit on the ratio of conscripts to volunteers and the one year's service in three policy for volunteers may not apply in New Guinea. Nevertheless the threat in Papua-New Guinea appears low, and sufficient warning should be available to allow some alternative to conscription. How large a force must be maintained for the defence of Papua and New Guinea depends on factors not known to the public.

If a larger force than can be maintained by voluntary enlistment at politically acceptable levels of reward is insisted upon by the government, a scheme for inducing students to serve would be cheaper and more efficient than conscription while apparently providing an adequate capability. The feasibility and cost effectiveness of such a scheme must, however, be examined from other viewpoints than those used in this paper.
APPENDIX

The Supply of Volunteer Military Personnel:
A Hypothesis

1. American estimates of the cost of abolishing conscription are based on a model relating supply of labour to a sector of the economy to the price of labour offered by that sector. In a two-sector economy, Friedman relates the supply of labour to a sector to the ratio of wage rates of the two sectors.\(^\text{18}\) The studies undertaken by Altman and Fechter\(^\text{19}\) and by Oi\(^\text{20}\) on data provided by the U.S. Department of Defense use a relationship between service pay and average civilian income of 17-20-year-old males in full-time employment. To be precise their model is

\[
1 - \frac{E}{P} = a(\frac{W_m}{W_c})^{-b}
\]

(1)

where \(E\) = number of enlistments, \(P\) = number of persons eligible to enlist and of relevant age, \(W_m\) = average first term service pay, \(W_c\) = average civilian income for 17-20-year-old males in full-time employment, \(a, b\), are constants.

2. The civil sector of the economy has, of course, a whole spectrum of wage rates and so the average civilian income has been used as the denominator of the ratio \(\frac{W_m}{W_c}\). For any particular wage \(W_i\) in the civil sector there is an appropriate ratio \(\frac{W_m}{W_i}\). To calculate the average ratio the appropriate formula is \(\sum W_m W_i f(W_i)\) where \(f(W_i)\) is the proportion of the relevant population receiving wage \(W_i\). An alternative equivalent expression is \(W_m \sum (\frac{1}{W_i}) f(W_i)\) which is \(W_m \epsilon (\frac{1}{W_i})\). (\(\epsilon\) represents


\(^{19}\) Altman and Fechter, op. cit.

\(^{20}\) Oi, op. cit.
'expected value of'). However, the average of the reciprocals does not equal the reciprocal of the average.

\[ \epsilon \left( \frac{1}{W_i} \right) \neq \frac{1}{W_e} \]

Hence \( \frac{W_m}{W_e} \) is not the appropriate factor to use as an exogenous variable in equation (1).

3. Moreover, it can be shown that \( \epsilon \left( \frac{1}{W_i} \right) \geq \frac{1}{W_e} \)
so that \( \frac{W_m}{W_e} \leq W_m \epsilon \left( \frac{1}{W_i} \right) \) so that there is a positive bias in the estimate of parameter \( b \). The very low unemployment and effective minimum wage legislation in Australia reduces the spread of wages below \( W_e \) and so this bias is more significant in the U.S. than Australia.

\[ \text{i.e.} \quad W_m \epsilon \left( \frac{1}{W_i} \right) - \frac{W_m}{W_e} \]

would be less in Australia than in the U.S. so to expect the same relationship between recruiting and \( \frac{W_m}{W_e} \) in the U.S. and Australia is unjustified. Since the elasticity of supply implicit in equation (1) is \( b \left( \frac{P}{E} - 1 \right) \), the aggregation error causes a positive bias in estimation of the elasticity.

4. Moreover, any function which seeks to describe the effect of the whole distribution of civilian wages in terms of a single parameter, the average, is suspect. A simple example will illustrate the importance of variance or spread of wage rates. Consider two populations each with two male members eligible to enlist and each with an average annual income of $A1,000. Let the actual incomes of the people be as set out in Table 5. The table assumes \( W_m = $A1,000 \). \( W_i \) is the civil income of members \( i \) of population

<table>
<thead>
<tr>
<th>Table 5 Two populations with male members eligible to enlist</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
</tr>
<tr>
<td>----------------</td>
</tr>
<tr>
<td>Wage</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>Member 1</td>
</tr>
<tr>
<td>950</td>
</tr>
<tr>
<td>Member 2</td>
</tr>
<tr>
<td>1050</td>
</tr>
<tr>
<td>Average</td>
</tr>
<tr>
<td>1000</td>
</tr>
</tbody>
</table>
It is obvious from the table that member 1 of population 2 is much more likely to enlist than member 1 of population 1 if he is guided by economic considerations. While it is true that member 2 of population 1 has a stronger economic incentive to join than member 2 of population 2 the incentive is negative in each case and presumably not as significant in terms of resultant enlistments as the positive incentive offered to member 1 of each population. Table 5 also serves the purpose of illustrating the aggregation error of the model described by equation (1).

For the second population \( \frac{W_m}{W_e} = 1.00 \) would be used in equation (1) whereas the true average of the ratios \( \frac{W_m}{W_i} = 1.34 \). It can be shown that, in general, the bias increases with the variance. Professor Oi kindly provided the following confirmation of my suspicion of such a relationship: let \( \bar{C} = \) arithmetic mean, \( \mu = \) the geometric mean and \( \sigma^2 \) the variance of the logarithmic transformations of \( C \) to the base \( e \). Then Kenny and Keeping show in *The Mathematics of Statistics*, Vol. II, pp. 122–3, that for a log-normal distribution

\[
\log \bar{C} = \mu + \frac{\sigma^2}{2}
\]

Finally, in the limit as sample sizes approach infinity, the geometric and harmonic means converge.

5. The model specified by equation (1) implies a supply elasticity which declines as \( \frac{E}{P} \) increases. The rationale offered is that as the proportion of people in the service increases the remainder of the labour market will contain an increasing proportion of people with a strong disinclination for military service. Moreover, equation (1) implies that the elasticity declines monotonically as \( \frac{E}{P} \) increases. The latter implication is strongly criticised by Canby of the RAND Corporation.\(^21\)

6. Canby's argument is that the rationale mentioned above in para. 5 takes no account of the shape of the distribution of civilian incomes. Typically the graph of such an income distribution would look like Fig. 5.

Such a cumulative frequency curve is consistent with the tendency of income distributions towards log-normality. So long as \( W_m > W_A \) any increase in \( W_m \) will cause only a small increase in the percentage of people who stand to gain financially by enlisting, i.e. a small increase in \( N_w \). If one ignores, for the moment, the prospect of people joining the armed services at a financial loss, because of their attraction to service life, all recruits would come from those people who stand to gain financially by enlisting.

7. Between \( W_A \) and \( W_B \) the curve rises more rapidly and a small increase in income causes a large increase in \( N_w \). However, \( N_w \) increases very slowly with increasing income above \( W_B \). If the proportion of people who stand to gain financially by enlisting is an important determinant of \( \frac{E}{P} \) it is likely that the elasticity of supply of recruits would be low so long as military pay is less than \( W_A \), high between \( W_A \) and \( W_B \) and low when military pay exceeds \( W_B \).

8. Consideration of enlistment at a financial loss to the recruit does not invalidate Canby's conclusion about the three regions of elasticity so long as it is assumed that people will make only small financial sacrifices in order to satisfy their attraction to service life. It is apparent from Fig. 5 that up to an income a little below \( W_A \) and beyond an income a little below \( W_B \) the number of people earning slightly more than a given income is small. On the basis of this assumption one is justified in attributing changes in the elasticity of supply to the characteristics of that portion of the population earning an income which is not greater than the military pay offered. It appears that a new approach is needed
—a hypothesis involving a measurable expression of the incentive to enlist posed by \( W_m \) and the distribution of smaller civilian incomes.

9. In paragraph 2 above, the expression \( W_m \epsilon \left( \frac{1}{W_i} \right) \) where \( W_i \) is a member of the set of all civilian wages \( \{W_i\} \), was suggested as an alternative to the \( \frac{W_m}{W_c} \) of equation (1). Let \( W_j \) be any member of this set \( \{W_j\} \) of civilian wages not greater than \( W_m \). If only this set of wages is considered relevant, an appropriate measure of the attraction of military wage \( W_m \) would be

\[
W_m \Sigma_j \frac{1}{W_j} f(W_j)
\]

Note that \( \Sigma_j f(W_j) < \Sigma_i f(W_i) = 1 \)

Let \( \Sigma_j f(W_j) = P_m \), the proportion of the qualified civilian wage earning population (of relevant age, health, etc.) who do not earn more than \( W_m \). Then the expression can be rewritten as

\[
W_m \Sigma_j \frac{1}{W_j} f(W_j) = W_m P_m \epsilon \left( \frac{1}{W_j} \right) = A_m
\]

Use of the measure requires that we know the proportion of the relevant population earning not more than \( W_m \) and the average of the reciprocals of wages earned by that proportion of the population. Since any change in \( W_m \) implies change to both \( P_m \) and \( \epsilon \left( \frac{1}{W_j} \right) \), the use of the expression as determinant of \( \frac{E}{P} \) should satisfy Canby’s objection to the model specified by equation (1). That is to say that a change in \( A_m \) reflects the shape of the distribution of civilian incomes as well as the change to \( W_m \).

10. If the form of equation (1) is retained, the proposed model is

\[
1 - \frac{E}{P} = a A_m^{-b}
\]

(2)

This model implies the elasticity of supply with respect to \( A_m \) which the model of equation (1) implied with respect to \( W_m \) i.e. \( b \left( \frac{P}{E} \right) - 1 \).

Thus it preserves the attractive feature of ultimately decreasing elasticity as \( E \) approaches \( P \). The composition of \( A_m \) and the effect of the shape of the civilian income distribution on \( \frac{d(A_m)}{dW} \), on the other hand, means that the decrease is not necessarily monotonic with increasing \( W_m \).
11. It is possible that an empirical test of this hypothesis might produce results inconsistent with the observation in the section of the paper under the heading 'Speculation on the Australian Supply Function'. Unemployment in this country is almost always very low and we have effective minimum wage legislation and awards for skill, set in the main by national arbitration commissions. The 'seller's' labour market results in wage payments above the awards which are legal minima. Military wages are based on civilian awards, but exceed them by very little. The result is that although the ratio \( \frac{W_m}{W_e} \) is quite high (though less than unity), \( P_m \) is very low and so therefore is \( A_m \). On the other hand, the compact distribution of incomes (at the low end) may well mean that increases in \( W_m \) would cause considerable increase in \( A_m \) in Australia.

12. Unfortunately income data with which to test the hypothesis are not available.
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