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INDIVIDUAL PREFERENCES AND THE DEMAND FOR MILITARY EXPENDITURE*

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Whose preferences determine the tradeoff between security and civilian output in deciding upon budget allocations to defence? This paper considers the role that consumer preferences might play in influencing military spending. We propose normative criteria to judge the economic or political efficiency of defence provision at a given time, and test them using Australian survey-based micro-data. Our results suggest that the political system has not delivered a simple social-choice translation of individual preferences into collective outcomes, nor has it delivered results consistent with simple majority-voting median preferences.

KEY WORDS: Military spending; Demand for defence; Social choice; Contingent valuation

JEL CLASSIFICATION: H56

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"[A student] at the medieval University of Paris, ... after listening to his professors dispute how many teeth were in a horse's mouth (not a multiple of three for fear of offending the Trinity, not a multiple of seven because God had rested on the seventh day, and so on) shocked them by opening the horse's mouth and counting the teeth." (Roger Sherman, 1977, p. 1046.)

INTRODUCTION

Recent surveys by Smith (1989) and Seigle (1992) have drawn attention to the wide variety of models that have been put forward over the years to explain the determination of military expenditures. Amongst these, economists and econometricians have shown greatest interest in standard neoclassical-type models portraying defence within a market economy with public goods (Dudley and Montmarquette, 1981; Sandler and Hartley, 1995, ch. 3; Smith, 1980, 1995). In such models the arguments of the social welfare function are assumed to be civilian output and security, the latter being some function of military expenditure and other strategic variables. The demand function for military expenditure implied by the model shows outlays as a function of aggregate output and political and strategic variables which affect the perceived threat level. The optimality conditions for the model suggest that at the margin additional welfare obtained from military expenditure (i.e. from added security) will be equal to the opportunity cost of the additional defence spending to the civilian economy.

But one of the problems with this model is the question of how this trade-off between civilian output and security is to be determined – i.e. whose preferences are taken into account in evaluating alternative outcomes? Several possibilities could be identified, including the following:

- (a) *Benevolent dictator*: governments use their superior knowledge of national security matters to make decisions which they believe to be in the best interests of the community;
- (b) *Self-interested oligarchy*: politicians are captured by or form coalitions with other interested parties including bureaucrats, service chiefs and the defence industry, such that the preferences of one or more of these groups prevail;
- (c) *Social choice*: governments act on their interpretation of the aggregated preferences of individuals in the community.

Amongst these, the last-mentioned is of particular interest because it has been the least studied empirically, due primarily to lack of data. In

the present paper, the availability of a unique data set on community preferences for public outlays allows us to take some steps towards remedying this deficiency.

The paper aims to suggest a means of determining a benchmark by which optimality in military expenditures can be gauged with reference to the demands of consumers. This question is of importance with respect to allocative efficiency in the economy, given the presumed government role in correcting for market failure in the presence of public goods. It is also important from a political perspective in terms of judging the effectiveness of political mechanisms in translating voter preferences into government decisions. Our approach involves recognising that if individual preferences can be empirically observed, they can be used as a basis for determining optimality conditions in a public-goods economy. An individual demand model is put forward in the paper and contingent valuation methodology is proposed as a means of determining willingness to pay under conditions controlling for strategic and other biases. We estimate the model using the dataset mentioned above, which derives from a survey of consumer demand for public expenditure in Australia.

Australia provides a particularly interesting prospect for applying the model, for the following reasons. Australian defence spending comprises 7 per cent of Federal government outlays, or about 2 per cent of GDP. Spending is determined as part of the budget process, guided by the government's defence policy. Over the last decade there have been two White Papers on defence (Department of Defence, 1987, 1994). Both have identified the first priority as the defence of Australian territory from short-warning conflicts. These White Papers are essentially based on policies and prescriptions developed during the Cold War era, and rely on a pessimistic assessment of regional security. The emphasis is on uncertainties within the region, with little faith in phenomena such as the increasing economic interdependence and co-operation within the Asian region, the growth in multilateral institutions, the strengthening of bilateral relationships, and other developments which could be taken to indicate a continued decline in the threat level over time. In other words, the White Papers reflect a conservative philosophy which "sees war between states as inevitable and the preparation for war as the only means of achieving true security" (Cheeseman, 1995, p. 38). Although there has been a change of Federal government since these White Papers were produced, Australian defence policy in the current period has continued along much the same lines as before. In the new government's first budget after taking office in 1996, public expenditure was significantly cut across the board

in line with its deficit reduction strategy; the only area fully quarantined from these expenditure reductions was defence.

In this context it is of interest to find out whether the Australian community shares its successive governments' views about the need to maintain relatively high levels of defence expenditure. Of course, our test is limited to a single year, albeit one (1992) occurring in a period of economic and political stability in Australia in which defence issues were neither more nor less prominent than usual in the public arena. Our results suggest that Australian defence spending at that time did indeed diverge significantly from measured consumer preferences.

THE DEMAND FOR MILITARY EXPENDITURE

Consider an economy of m individuals $i = 1 \dots m$ containing two goods, a private good (x) and defence (z). Assume defence is a pure public good and that there are no spill-ins from other economies. Consumers demand varying quantities of the private good, x_i , at a uniform price p_x . However, they consume a uniform quantity of defence, z , and express their individual demand by means of their individual willingness to pay for that quantity of defence, p_z^i . Suppose that a given level of defence provision z gives rise to a perception of security (s) in the population that varies across individuals, i.e.

$$s^i = s^i(z) \quad (1)$$

Then, given (1) the individual's utility maximisation problem can be represented as:

$$\max u^i = u^i(x^i, s^i) \quad (2)$$

subject to:

$$p_x x^i + p_z^i = y^i \quad (3)$$

where y^i = individual income.

From the first-order conditions, we can derive the individual's demand function for defence¹ as:

¹ In this paper we use the expressions "demand for defence" and "willingness to pay for defence" interchangeably.

$$p_i^l = p_i^l(y^i, s^i | z, p_x) \quad (4)$$

The perception of security s may have several dimensions. Consumers might have concern for their own individual safety, and/or they may perceive the level of security enjoyed by others in the community. Their demand for the security-providing characteristics of defence expenditure might be influenced differently by these different perceptions. For example, someone may care little for their own protection, but be aware of the needs and desires for security felt by others in the community. To account for the possibility that people might perceive different benefits from defence expenditure on their own and on others' behalf, we can specify:

$$s^i = s^i(s_i^l, s_j^l), j \neq i \quad (5)$$

where s_i^l is the level of security perceived by the i -th individual on his or her own behalf, and s_j^l is the level of security he or she perceives on behalf of some other representative individual j . These perceptions could be termed respectively the "self-regarding" and "other-regarding" evaluations of the benefits of defence expenditure, as perceived by individual i . Substituting (5) into (4) enables individual willingness to pay (WTP) for the current level of defence expenditure (which procures a level of defence output z) to be expressed as a function of individual income and the levels of self-regarding and other-regarding security benefits flowing from defence output z , given the price of the private good x . For estimation purposes observations on WTP, income and levels of benefit perceived would be required across individuals $i = 1 \dots m$.

In addition, the estimating equation would need to be augmented by whatever socio-demographic variables might also be considered important in influencing WTP, such as gender, age, educational level, etc. Let such variables be represented by a vector W^i for individual i . Then the full demand equation to be estimated can be written:

$$p_i^l = p_i^l(y^i, s_i^l, s_j^l, W^i | z, p_x) \quad (6)$$

The model thus processes information concerning threats to national security through the preference patterns of individuals and translates them into demand for government defence expenditure, where demand is expressed in terms of willingness to pay.

Equation (6) assumes preferences are identical across individuals, with variations in people's WTP for the given current level of defence

output explained by their threat perception, their incomes and their socio-demographic characteristics. The functional form of equation (6) might be regarded as a matter to be determined empirically. However, it can be observed that the likelihood of heteroskedasticity problems arising from cross-section data where income is an explanatory variable, together with a plausible assumption as to constant income elasticity, would suggest that a double-log specification on WTP and income might be *a priori* preferred.

Suppose now that the public good is currently supplied and is financed out of direct taxation. If current output is called one unit (i.e. $z = 1$), the cost to the individual can be called the tax price. If total current government expenditure on defence C_z comprises a proportion γ of aggregate tax receipts in the economy, then we can assume that the individual's tax price for defence c_z^i can be approximated by γT^i where T^i is the total tax payments by individual i . We note that $C_z \equiv \sum_i c_z^i$.

From the equilibrium conditions for a public-good economy, we know that in the present case the current level of provision of defence will be optimal if:

$$\sum_i p_z^i = C_z \quad (7)$$

Dividing (7) by the population m provides a benchmark indicating *economic inefficiency* if:

$$p_z^* \neq c_z^* \quad (8)$$

where $*$ denotes the mean over the population. A corresponding "*political inefficiency*" benchmark indicating failure to reflect the preferences of the median voter can be written as:

$$p_z^{**} \neq c_z^{**} \quad (9)$$

where $**$ denotes medians. Of course, the median-voter theorem requires strict assumptions such as single-peaked preferences, undimensional choice, and simple majority voting. Divergence from the benchmark proposed in (9) may therefore arise for a range of reasons, and application of the test should proceed with caution unless it can be clearly established that these underlying assumptions are valid in particular cases.

Let the optimal level of z defined against one or other benchmark be z' . It can be hypothesised that, with respect to the "economic" benchmark,

$p_z^* > c_z^*$ indicates $z' > 1$ and vice versa, and that, with respect to the "political" benchmark, $p_z^{**} > c_z^{**}$ indicates $z' > 1$ and vice versa. In other words, a mean WTP for defence across the population that is greater than (less than) the current mean tax price for defence can be taken to indicate an aggregate community preference for more (less) expenditure on defence compared to the current level.² A corresponding conclusion can be drawn with regard to the preferences of the median voter.

In quantifying the above demand function and in testing the efficiency criteria, an appropriate means for measuring WTP is required. Such a means is provided by contingent valuation methodology, whereby individuals in an experimental or survey context are asked about their willingness to pay for various levels of provision of public goods, or their willingness to accept compensation for their loss.³ An illustration of such a study is reported in the next section.

CONTINGENT VALUATION SURVEY

In 1992 a direct interview survey was conducted of a random sample of the Australian population ($n = 600$), seeking to determine community demand for government expenditures. Full details of the survey including coverage, sampling methods, etc. are given in Throsby and Withers (1994) and Withers, Throsby and Johnston (1994).

The survey asked respondents their perception of benefits for each of 16 different avenues of public outlay, covering the entire spectrum of government expenditure. The areas of government expenditure covered were:

public transport	education
police, law and order	housing assistance
roads	unemployment benefits
national defence	retraining assistance
arts and public broadcasting	age pensions
sport and recreation	family assistance
environment	industry assistance
medical and hospital services	general government administration

² This proposition assumes that the community perceives defence spending to be technically efficient in producing the current level of output z – i.e. that $p_z^i > c_z^i$ does not indicate a belief that the current output could be supplied at lower cost.

³ For further discussion of contingent valuation methods, see, for example, Mitchell and Carson (1989), Hausman (1993), Portney (1994).

The major relevant groups of questions related to:

- *Qualitative assessment of benefits from public outlays:* This group of questions covered each area of expenditure, sought a qualitative judgement as to scale of benefit (none, a little, a reasonable amount, a lot) and asked respondents to distinguish between benefit to themselves and to the community at large.
- *Quantitative assessment of willingness to pay:* Respondents were asked to adjust the total and the composition of outlays in the light of the benefits that they had indicated accruing to themselves or to others. General directions of change were first sought (decrease a lot, decrease a little, same, increase a little, increase a lot). Then, current individualised tax prices for each outlay and in total, calculated from a tax incidence model, were provided to each respondent, and they were asked to indicate preferred outlays in dollar amounts on each area and in total.

In addition, information was sought on major socio-demographic characteristics of respondents. Particular features of the survey methodology included:

- controlling for free-rider behaviour using the method of Bohm (1979), by segmenting the sample into non-labile/liable groups; these were differentiated by separate preambles to the quantitative response questions which implied zero personal liability to pay and full liability to pay, respectively;
- providing full individualised tax price information in a manner that also controlled for fiscal illusion effects by including indirect as well as direct tax costs;
- conditioning answers by a preamble making clear that the phrase "current level" referred to the amount and types of public activity being supported by public expenditure, so that answers would refer to a specific amount and type of the public good as evaluated by the respondents, and not to some alternative hypothetical level or characteristics;
- eliminating "embedding problems" that result from consideration of projects in isolation, by requiring full aggregation by the respondent across public outlays to an agreed total personal tax willingness-to-pay (using iteration, as necessary);
- inclusion of subjective individual and broader community evaluation of benefits in order to distinguish "self-regarding" from "other-regarding" motivations.

Other problems common to contingent valuation studies such as the ordering of questions, the relationship between WTP and willingness to accept compensation, and the form in which alternatives are presented, were also dealt with; full details are provided in Throsby and Withers (1994).

EMPIRICAL RESULTS

The results from the survey outlined above can be used to evaluate the hypotheses concerning defence expenditure put forward in the demand model, through analysis of the determinants of WTP (i.e. estimation of equation (6)), and testing of the economic and political efficiency benchmarks (equations (8) and (9)) for the Australian case. We report first the broad indications concerning the perceived benefits of defence spending and the preferred directions of adjustment of spending, as derived from the survey results. Table 1 shows the proportions of respondents perceiving various levels of individual and community benefit from defence spending, and Table 2 shows the proportions indicating a preference for change in spending levels. By inference from the survey sample to the whole population, we can conclude that a majority of the Australian community at the time of the survey did not believe that the then current levels of defence expenditure brought significant benefit either to themselves as individuals or to the community at large. Around half the population felt that defence spending should be reduced, and only 16.5 per cent favoured an increase, with about one-third of respondents supporting the status quo.

Turning to the determinants of WTP, we found as expected that a logarithmic functional form for equation (6) provided the most satisfactory estimates. Table 3 shows an OLS estimate of equation (6). The variables used in the equation and their metrics, as well as the appropriate diagnostics, are listed under the Table. It is apparent that individual income is the principal determinant of WTP, with every additional 1 per cent in annual income yielding an approximately equivalent percentage increase in WTP, other things being equal. The perceptions of individual and/or community benefit⁴ are also significantly related to WTP. Predicted values calculated from the fitted demand function

⁴ Note that the aggregation of the benefit dummies for use in the regression equations converts an ordinal preference ranking across heterogeneous categories (a little, a reasonable amount, a lot) into a yes/no dummy of the conventional sort.

Table 1 Perception of Benefit from Defence Outlays (per cent of respondents)

Perception of benefit	Individual benefit	Community benefit
None	39.6	10.4
A little	31.4	43.7
A reasonable amount	20.1	32.8
A lot	8.9	13.2
Total	100.0	100.0

Table 2 Preferred Adjustment to Outlays (per cent of respondents)

Preference	Proportion of respondents
Decrease	49.7
Remain the same	33.8
Increase	16.5
Total	100.0

indicate that a respondent at the sample mean income and who is average in all other respects will contribute only \$221 to national defence if he or she perceives neither individual nor community benefit from defence spending; \$370 if only individual benefit and no community benefit is perceived; \$419 if only community benefit and no individual benefit is perceived; and \$703 if both individual and community benefits are perceived.

Next, we consider how the levels of defence expenditure in the survey year measured up against the tests for economic and political efficiency specified above. Table 4 compares mean and median WTP for defence with mean and median tax prices. It is apparent that the levels of military expenditure were excessive on both counts, and that reductions in spending of the order of about 20 per cent would be required to meet an economic efficiency benchmark, and a downward shift of the median of about 30 per cent would be needed to meet a political criterion of consistency with median-voter preferences.⁵

⁵ The magnitude of this latter deviation from the benchmark is probably sufficient in this case to accept the hypothesis of "political inefficiency", notwithstanding the cautions in applying the test which were noted under equation (9) above.

Table 3 OLS estimate of demand function for defence spending

Explanatory variable	Coefficient	Standard error	t-value
Log income	1.0225	0.0593	17.25
Individual benefit	0.5174	0.0953	5.43
Community benefit	0.6423	0.1517	4.23
Gender	0.0779	0.0945	0.82
Age	0.0020	0.0028	0.73
Education 2	-0.0432	0.1193	-0.36
Education 3	-0.0639	0.1507	-0.42
Occupation	-0.0933	0.1146	-0.81
Liability	-0.0291	0.0870	-0.33
Constant	1.8076	0.2561	7.06

Notes: $n = 562$; $R^2 = 0.4992$; Adjusted $R^2 = 0.4910$; S.E. of regression = 1.0232; RSS = 577.92; $F(9,552) = 61.1380$ (0.000); Ramsey's RESET test for functional form: $F(1,551) = 6.9074$ (0.009); Heteroskedasticity test (regression of squared residuals on squared fitted values): $F(1,560) = 3.3700$ (0.067).

Dependent variable:

Log Willingness to pay for national defence (\$ per year).

Explanatory variables:

Log income: Natural log of individual income (\$'000 per year).

Individual benefit: Dummy variable where some perception of individual benefit (a little, a reasonable amount, a lot) = 1, zero otherwise.

Community benefit: Dummy variable where some perception of community benefit (a little, a reasonable amount, a lot) = 1, zero otherwise.

Gender: Dummy variables where male = 1, female = 0.

Age: Respondent's age in years.

Education 1: Dummy variable where highest level of completed education is primary = 1, zero otherwise (suppressed).

Education 2: Dummy variable where highest level of completed education is secondary = 1, zero otherwise.

Education 3: Dummy variable where highest level of completed education is post-secondary = 1, zero otherwise.

Occupation: Dummy variable where professional or white collar = 1, zero otherwise

Liability: Dummy variable = 1 where respondent told he/she will be liable for payment of the nominated WTP, zero where not liable.

Finally, replacing WTP on the LHS of equation (6) with the percentage change in defence outlays preferred enables us to determine which characteristics of individuals, if any, are associated with a preference for reduced defence spending. The results for a straightforward linear specification are reported in Table 5. They indicate that reductions in defence outlays are favoured by professional and whitecollar groups, those on higher incomes and those who are better educated. On the other hand, males and older citizens, and those receiving benefits flowing from defence spending, tend to favour increases.

Table 4 Tests of economic and political inefficiency benchmarks for WTP for national defence

	Mean	Median
Willingness to pay for national defence (\$)	504	300
Individual tax price for national defence (\$)	637	420
Deviation WTP/tax price (%)	-21	-29

Table 5 Determinants of preferences for change in expenditure on national defence

Explanatory variable	Coefficient	Standard error	t-value
Income	-0.1817	0.1036	-1.75
Individual benefit	19.7691	3.2416	6.10
Community benefit	7.5686	5.1492	1.47
Gender	4.5279	3.2039	1.41
Age	0.2580	0.0958	2.89
Education 2	-5.1866	4.0714	-1.28
Education 3	-9.7165	5.1655	-1.88
Occupation	-1.6324	3.8952	-0.42
Liability	0.2539	2.9711	0.09
Constant	-40.2893	7.7352	-5.21

Notes: $n = 562$; $R^2 = 0.1326$; Adjusted $R^2 = 0.1184$; S.E. of regression = 34.8365; RSS = 669897.2; $F(9,552) = 9.3737(0.000)$; Ramsay's RESET test for functional form: $F(1,551) = 5.8693(0.016)$; Heteroskedasticity test (regression of squared residuals on squared fitted values): $F(1,560) = 1.3635(0.243)$.

Dependent variable:

Deviation of WTP for defence from individual's tax price (expressed as a percentage of individual tax price).

Explanatory variables:

See Table 3.

IMPLICATIONS

There have been previous studies of the determinants of defence expenditure for Australia, including those of Murdoch and Sandler (1985) and Madden *et al.* (1995). These have been aggregative studies explaining movements in the level of defence outlays over time. They suggest that macroeconomic considerations and spillins from Australia's closest allies are particularly important.

The present study is different. It develops normative criteria to judge the economic or political efficiency of defence provision at a given time,

and uses survey-based micro-data on individual preferences as a basis for evaluation. Our results are clear-cut: individual citizens' preferences do not determine the level of defence expenditure in Australia. In other words, a "social choice" interpretation does not seem plausible as a basis for assessing the trade-off between civilian output and security in the determination of Australian military outlays.

Nevertheless, it is possible that the Australian government could be *trying* to judge mean or median voter preferences and simply getting them wrong. However, there is supplementary evidence from the survey that discounts this as a complete or sufficient explanation: the absolute and proportionate excess of actual outlays over community-preferred levels is considerably greater for national defence than for any other public expenditure, including other pure public goods such as police, law and order (Withers, Throsby and Johnston, 1994).

Consideration of the attitudes expressed by respondents in this study as reported in Tables 1 and 2 raises the question as to how much individuals can be expected to know about the organisation, operation and costing of complex military matters. Could such lack of knowledge, if it were present, upset our conclusion? It is difficult to judge the extent to which ignorance might affect the expression of preferences for different levels of defence spending. However, if WTP or other variables are indeed so affected, it is by no means clear that any bias thus introduced would lie systematically in one direction or the other. Thus we are still left with the observed divergences between actual and benchmark results, and hence with our conclusion that a social-choice rule for decision-making does not appear to have been used by the government in this case.

Alternatively, then, it is possible that a strict "benevolent dictator" hypothesis could apply, whereby politicians, government officials and service chiefs assume superior knowledge of national security needs. Of course, whether it is "benevolence" or "self-interest" that motivates this oligarchy is a matter that cannot be resolved on the evidence available here. What can be said, however, is that, whilst an autocratic role for government officials and service personnel may have been justified in the past, especially in times of war, the flow of information to an increasingly well-educated public is now so comprehensive, diverse and readily available that consumers have adequate opportunity to reach informed judgements on matters such as the political and economic stability of countries in their region, and the broad likelihood of threats to national security. Thus the grounds for rationalising "dictatorial"

decisions in this area might appear nowadays to be weaker than they may have been in the past.

We therefore conclude for the Australian case that, on the evidence of this study, consumer preferences should be taken somewhat more seriously in regard to defence expenditure decisions than appears to have been the case in recent times. An update of the survey would indicate if this has changed. Its replication for other countries would indicate whether the strength of such influence differs in other jurisdictions.

One final implication of these results has to do with the possibility of a "peace dividend" resulting from a reduction in military spending. In the NATO countries the end of the Cold War and the collapse of the Soviet Union have been seen as triggers for a potentially substantial redeployment of resources from military to civilian uses. In Australia, however, such triggers would be felt only indirectly if at all, and have never been thought likely to exert significant downward pressure on military spending. Yet our results suggest that bringing defence expenditures more into line with consumer preferences could clearly yield an outcome similar to a peace-dividend effect. Even a reduction in military spending of only around say 10 per cent would yield an annual volume of resources equivalent in proportional terms to the classic peace dividends projected for other countries, providing an opportunity for significant resource reallocation within the Australian economy. A release of resources of such a magnitude would be far greater than the likely effects flowing from many other avenues of possible structural change in the Australian economy at the present time, such as waterfront reform (Filmer and Dao, 1994), and would be expected to yield benefits both through increased civilian consumption and through reallocation to other forms of social expenditure. Further, given the relatively high import content of Australian defence spending, there may be benefits to the external account as well.

CONCLUSION

This paper has sought to provide a model of individual demand for defence expenditure and to demonstrate how this may be measured by direct analysis of individual willingness-to-pay for such services. The empirical analysis for the particular case of Australia found clear evidence that the level of military spending by the Australian government has exceeded the level regarded by the civilian community as desirable or necessary to protect national security, perhaps by the order of 20

per cent. This result is *prima facie* evidence that the political system has not delivered a simple social choice translation of individual preferences into collective outcomes. Nor has it delivered results consistent with simple majority voting median preferences.

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