AUSTRALIAN ECONOMIC PAPERS

VOL. 24 DECEMBER, 1985 No. 45

ANNUAL SUBSCRIPTION: $18 Published twice a year

REGISTERED IN AUSTRALIA FOR TRANSMISSION BY POST AS A BOOK

THE IMPACT OF DEFENCE SPENDING ON THE AUSTRALIAN ECONOMY

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I. Introduction

Research into defence issues have often been the exclusive domain of political science and history. It is an area that economics has rarely ventured into. However, there are some exceptions. For example, Rothschild (1973) researched into the relationship between military expenditure, exports and growth. Reich (1972) and Smith (1977) analysed the role of defence spending in the maintenance of aggregate demand and the stability of capitalist economies. Leontief, *et al.* (1965) investigated the resource allocation effects of disarmament. Calleo (1981) provided a most insightful analysis into the defence policies of the U.S. and its current economic predicament.

In Australia, where at times defence can be an emotive issue, there has been no serious attempt to analyse the impact of defence spending on the economy. This is despite the fact that defence as a percentage of total government outlays has fluctuated around 9-10 *per cent* for the last five years.[1] Defence spending, if the rhetoric is to be believed, is sacrosanct. However, the realities of politics and the economy have often led politicians (Mr. Reagan and Mr. Fraser being two good examples) to modify if not abandon their apparent sacrosanct views on defence in practice. Like most economists who are painfully aware of the ubiquitous need to balance the many demands on government and available resources, we follow Hitch and McKean (1967) with regard to defence, in adopting the proposition that "There is no budget size or cost that is correct regardless of the pay off, and there is no need that should be met regardless of cost".

In this paper, we are concerned only with cost. We examine cost in a narrow sense: What would be the outcome if resources were to be diverted from other areas of government spending to defence. We are not analysing the standard textbook 'crowding out' effect.[2] In other words, we are interested in two related questions: (i) assuming that the government sector is not to grow any larger, what other areas of government spending would have to contract and by how much to accommodate a planned increase in defence spending and (ii) what would this mean for the Australian economy in general. Insights into these questions are derived from simulating a general equilibrium model of the Australian economy, ORANI. Like Leontief, *et al.* (1965), ORANI concentrates on resource allocation. However, Leontief, *et al.* (1965) is an input-output model with no theories on international trade or the supply side. Furthermore it has no price responses and

The author gratefully acknowledges useful discussions with Brian Parmenter and Alan Powell and helpful comments from an anonymous referee.

[1] Australian Treasury Budget Papers (1978-83)

[2] Those who are interested can consult Barro (1981).

substitution possibilities. In their study, aggregate employment is fixed and only the composition of employment allowed to change. ORANI has none of these limitations.[3]

II. Assumptions Adopted for the Simulations

(i) Our focus is on distribution of government expenditure within a given budget. Thus we hold real consumption, real investment and overall real government expenditure constant. We assume that the available government's fiscal instruments are able to achieve this end. Thus, any endogenous change in the model originates from a change in the *composition* of real government expenditure and not in the change of aggregate real government expenditure.

However, to facilitate the analysis of our projections, we will (as shall be seen later) disaggregate the projections into two basic components. The first component projections represent the impact of defence spending on the economy with other expenditures held constant. They reflect a net increase in real government expenditure and total domestic absorption. The second component projections represent the compensating reduction in another category of government spending required to keep total government expenditure constant.

(ii) A slack labour market is assumed. Real wages are assumed to be fixed for all occupations. Any increase in the demand for labour can be met at constant real wages.

(iii) Capital stocks are fixed for each industry allowing individual rates of return to vary differently across industries. We are assuming that the results of the simulation show the impact on the economy of a change in the composition of real government expenditure after a period which is sufficiently short that we can ignore the changes in the amount of capital stock available for use by each industry. However, this does not rule out investment by each industry. Although aggregate real investment is fixed, the composition of aggregate real investment can vary in response to different rates of return. The period under investigation is too short for the investments in different industries to be realised into operating capital stocks.

(iv) Technology is assumed to be based on that which was available in 1974-75. This assumption is undesirable for obvious reasons, but is adopted solely on data considerations.

(v) Fixed nominal exchange rate.

III. A Ten Per Cent Increase in Defence Spending

Using the ORANI model, we impose a 10 *per cent* increase in defence spending and compare it with an equivalent increase/decrease (in levels) in other categories of

[3] Details of the ORANI model are presented in Dixon, Parmenter, Sutton and Vincent (1982). Briefly, ORANI is a Walrasian type general equilibrium model of 115 commodities and 113 industries based on an input-output data base. The behavioural assumptions of the model are that producers minimize their costs of production (subject to specified production functions) and consumers maximise their utility (subject to the specified aggregate consumption constraint). Substitution possibilities and price responsiveness are highlighted and prices are set to equal costs. Finally, international trade is explicitly modelled. Except for the balance of trade variable which is expressed in absolute change, all other variables are expressed in percentage form.

government spending. We have chosen three categories of government spending that would compete with Defence for public resources. They are Education, Health, and Social Security and Welfare.[4] Together with Defence these have accounted for more than 50 *per cent* of the Australian budget since 1978-79. Furthermore, like Defence they are politically sensitive areas of government involvement, supported by their respective pressure groups. Table I shows their share of the total budget outlays since 1978-79.

TABLE I

Major Components of the Budget: Percentage of Total Outlays

	1978-79	1979-80	1980-81	1981-82	1982-83
Defence	9.0	9.5	9.8	10.0	9.8
Education	8.7	8.2	8.1	8.1	8.1
Health	10.0	10.0	10.1	9.9	9.3
Social Security and Welfare	27.9	27.7	27.3	27.8	28.2

Source: Australian Treasury Budget Papers.

Ideally, the appropriate input-output data used to calculate the share parameters in ORANI should be that of 1982-83. However, the latest version of the data available is that of 1974-75. As we have pointed out earlier in our set of assumptions, because of this data limitation, we have assumed that the 1974-75 technology holds for our analysis. A check of the 1974-75 data shows that the demands by government for Defence, Health Education and Welfare as a group are allocated according to Defence (23.3 *per cent*), Health (23.5 *per cent*), Education (45.8 *per cent*) and Welfare (7.4 *per cent*).

Based on these figures, a 10 *per cent* increase in government spending on Defence would be equivalent in value terms to increases in government spending on either Health (9.9 *per cent*), Education (5.1 *per cent*) or Welfare (31.5 *per cent*). In other words, to hold the level of government spending constant, a 10 *per cent* increase in government spending on Defence would require the government to reduce spending on Health by 9.9 per cent or to reduce spending on Education by 5.1 *per cent* or to reduce spending on Welfare by 31.5 *per cent*. Imposing these shocks on the ORANI model would produce the projections outlined in Table II.

When reading Table II and subsequent tables it is important to remember that the projections presented refer to equivalent real expansion in the four components of government under consideration. Projections where a real increase in defence spending is exactly compensated by a reduction in real spending on either one of the four categories of government spending require the subtraction of projections under the relevant column

[4]Hereafter we shall refer to Social Security and Welfare as just Welfare

TABLE II

The Impact of Exogenous Changes in Government Expenditure (1982-83 Budget Figures) (Percentage Change)

	Defence	Health	Education	Welfare
Balance of Trade ($A Billion)	-0.032	-0.028	-0.012	-0.027
Aggregate Imports (Foreign Exchange)	0.21	0.12	0.07	0.12
Aggregate Exports (Foreign Exchange)	-0.12	-0.18	-0.06	-0.17
Consumer Price Index	0.07	0.12	0.04	0.11
Gross National Product	0.18	0.19	0.22	0.18

from the projections listed under Defence. For example in Table II, if an increase in spending on Defence is to be counteracted by an equivalent decrease in spending on Health, the total impact on gross national product is projected to be -0.01 *per cent* (0.18 0.19).

From the table above, we see that each of the four equal expansions in government expenditure would lead to a projected increase in aggregate imports and a reduction in aggregate exports. Of the four, Defence uses relatively the most imported materials. Its share of imports to total cost of current production is 0.10. Other comparable figures are Health (0.02), Education (0.02) and Welfare (0.03).

By importing more, an industry would put less pressure on domestic prices through its purchases of domestic material inputs. Lower domestic prices would put less pressure on nominal wages as wages are indexed to the consumer price index. Since export industries face given world prices, any increase in domestic costs would affect them adversely. They are not able to pass on any cost increases. Thus, based on the shares of imports to total costs, we would expect the rankings in Table II for aggregate imports to be in the order of Defence, Welfare, Education and Health with the rankings for aggregate exports and the consumer price index the reverse. However, according to Table II, the rankings of the various forms of government expenditure with regard to aggregate exports, aggregate imports and consumer price index do not conform to our prior expectations. The cause for this is the extent to which domestic materials and capital are used for production.

The share of imports in total costs for Defence is 0.10 while that for Education is 0.02. On the other hand, the share of domestic materials and capital in the total costs for Defence is 0.23 while that for Education is only 0.10. Given that we have assumed slack labour markets and foreign material prices are held constant, any cost increases would have to originate from domestic materials and the use of capital. Thus, it is not surprising that an expansion in Education would lead to a lower price increase than an equivalent expansion in Defence. In fact, with its lower reliance on domestic materials and capital compared to the other categories of government spending, the growth in the consumer price index is the lowest for an expansion in government spending on Education. This in turn results in the

expansion of Education being responsible for the lowest decline in exports and the lowest rise in imports.

Both Health and Education have import cost shares with the value of 0.02. With Health having a domestic materials and capital cost share (0.22) double that of Education (0.10), the growth in prices is higher with the expansion of Health than with the expansion of Education. This leads to the increase in government expenditure on Health being responsible for a greater increase in imports and a greater decline in exports relative to an equivalent expansion in Education. The cost shares for Health and Welfare are similar. This explains the similar projections produced by the expansion of Health and Welfare.

With real consumption and real investment being fixed, gross national product depends on real government absorption and the balance of trade. Each of the four components of government expenditure looked at are increased in real terms by equal amounts. Thus variations in gross national product across the four exogenous real government expenditure shocks are explained by variations in the balance of trade. The larger the balance of trade deficit, the smaller the growth in gross national product.

Each of the four exogenous real government expenditure shocks produce a positive effect on gross national product because the rise in the domestic price level due to upward sloping industry supply curves is not sufficient to produce a large enough negative change in the balance of trade to totally counteract the increase in domestic absorption. It appears from Table II that increases in Defence spending accompanied by reductions in spending on Health, Education or Welfare do not affect the overall gross national product by much. The largest loss in gross national product projected is of the order of 0.04 *per cent* (0.22 - 0.18). Although the changes in gross national product is small, its composition would of course change. Some industries and certain types of labour would gain and some would lose. Reallocating demand away from Education towards Defence would, for example, disadvantage industries like newspapers and books that contribute a significant input into Education in favour of industries like ship and boat building, industries that are the major suppliers to Defence.

Although the tracing of industries that gain or lose is of interest, a crucial determinant of the opportunity costs of defence spending is, as we shall see in our later discussion, what we assume about armed services recruitment.

The employment projections are presented in Table III. The growth in employment is the highest for an increase in the Government expenditure on Health, followed closely by Defence, Welfare and lastly Education. An interesting aspect about the employment projections is the growth in the employment of white collar workers. Except for the expenditure on Defence, white collar workers are the workers that benefit most from the growth in the four categories of government spending considered. They comprise more than 50 *per cent* of the workforce employed by the three industries of Health, Education and Welfare. If increases in defence spending are compensated by reductions in government spending on Health, Education and Welfare, the main losers would be white collar workers, with the professional and skilled groups bearing the major burden.

The only occupation that loses from each of the increases in government expenditure is rural workers. As we have pointed out earlier, export industries tend to lose from any expansion in government expenditure. Since rural workers are employed mainly in the

TABLE III

The Impact of Exogenous Changes in Government Expenditure on Employment (Percentage Change)

	Defence	Health	Education	Welfare
Professional white collar	0.09	0.63	1.79	0.60
Skilled white collar	0.09	0.55	0.66	0.66
Semi and unskilled white collar	0.15	0.44	0.14	0.26
Skilled blue collar (metal & electric)	0.12	0.05	0.02	0.08
Skilled blue collar (building)	0.10	0.08	0.06	0.09
Skilled blue collar (other)	0.01	0.21	0.05	0.08
Semi and unskilled blue collar	0.08	0.13	0.09	0.14
Rural workers	-0.08	-0.13	-0.02	-0.06
Armed forces	9.80	0	0	0
Aggregate Employment (persons)	0.25	0.26	0.23	0.24

export orientated agricultural industries, they are adversely affected by any increase in government expenditure.

As expected, among labour, the armed services is the major beneficiary from the growth in defence spending. Their share in the total employment of labour by Defence is 76 *per cent* and they comprise 1.93 *per cent* of the total Australian workforce. The employment of armed services is projected to rise by 9.8 *per cent* with a 10 *per cent* increase in defence spending. The figures of 1.93 and 9.8 *per cent* suggest that the contribution of armed services to the projection of aggregate employment is 0.19 *per cent*. This is a substantial contribution, considering the fact that the aggregate employment projection is 0.25 *per cent*.

With armed services employment dominating the aggregate employment projection, the interesting question is what happens if there is a deliberate policy to update and replace equipment and buildings, rather than increasing defence spending in general? How different would be the trade-offs (projections)? We attempt to provide some insights into these questions with our next set of projections.

To obtain our next set of projections, we simulate the ORANI model assuming that all the increase in defence spending would go towards the purchases of buildings and capital equipment. This is partly in line with the previous government's intention, which is likely to be adopted by the new government, that any increase in real defence spending would in general go into the updating and replacement of equipment and buildings and not towards the expansion of available manpower.

Of the 115 commodities in ORANI, we select nine which we consider to be the commodities that Defence would purchase in its programme of expansion on buildings and equipment. They are motor vehicles and parts, ship and boat building, aircraft building, electronic equipment, electrical machinery, construction equipment, other machinery, building (n.e.c.) and communication. Altogether, based on the ORANI data base, these represent about 60 *per cent* of total material purchases (domestic and imported) by the Defence industry and about 19 *per cent* of Defence outlays.

We subject ORANI to two simulations. The first simulation is conducted under the assumption that the 10 *per cent* increase in defence spending is spent on the purchase of the above nine commodities with the relative domestic (import) share of these purchases unchanged. The second simulation is undertaken with the assumption that all the increases in purchases are purchases from domestic sources.

The projections of the simulations are show in Tables IV and V.

TABLE IV

The Impact of an Increase in the Purchases of Nine Specific Commodities Related to Defence, (a) with the Import Share Unchanged, (b) with a Reduction in the Import Share (Percentage Change)

	(a)	(b)
Balance of Trade ($A Billion)	-0.08	-0.06
Aggregate Imports (Foreign Exchange)	0.56	0.32
Aggregate Exports (Foreign Exchange)	-0.22	-0.28
Consumer Price Index	0.11	0.14
Gross National Product	0.10	0.13
Aggregate Employment (Persons)	0.14	0.19

We can see that if increases in defence spending are restricted to the nine commodities selected, with no increases in armed services employment permitted (Table IV), there is an unequivocal loss both in gross national product and employment where there is a compensating reduction in government spending on Health, Education and (or) Welfare (comparing Table IV with Tables II and III). The gross national product and aggregate employment projections are lower, compared to when defence spending is increased uniformly.

When Defence spending is increased uniformly, part of this increase goes directly into the recruitment of members of the armed services. Since a slack labour market is assumed, an increase in the employment of armed services' personnel is achieved without any increases in the real wage. This increase in armed services employment, therefore, does not lead directly into price increases. On the other hand, with fixed capital stocks, industries will raise their prices when they increase their supplies to cater for the increase in demand for their commodities by Defence. This leads us to the conclusion that equivalent increases

TABLE V

The Impact of Exogenous Increases in the Purchases of Nine Specific Commodities Related to Defence on Employment, (a) with the Import Share Unchanged, (b) with a Reduction in the Import Share (Percentage Change)

	(a)	(b)
Professional white collar	0.07	0.10
Skilled white collar	0.11	0.15
Semi-skilled and unskilled white collar	0.09	0.12
Skilled blue collar (metal and electric)	0.35	0.59
Skilled blue collar (building)	0.33	0.38
Skilled blue collar (other)	-0.03	-0.04
Semi and unskilled blue collar	0.19	0.22
Rural workers	-0.12	-0.27
Aggregate Employment (persons)	0.14	0.19

in Defence spending, if they exclude increases in armed services recruitment, will lead to higher domestic price increases.

A higher rate of domestic price increases will lead to a squeeze on the traded industries by increasing imports and lowering exports, leading to a higher balance of trade deficit and a lower growth in gross national product and employment.

This outcome could be partially offset by a deliberate policy of reducing imports through altering the domestic (imported) share of purchases by the Defence industry. As shown by the (b) projections in Table IV, by forcing Defence to purchase all of its new acquisitions domestically, the gross national product and aggregate employment projections are made higher even though this policy would result in higher price increases.

The leakage to the rest of the world economy of increases in domestic absorption is lowered by the 'Buy Australian' policy. However, this is insufficient to fully match the lower projection in gross national product and aggregate employment brought about by restricting increases in defence expenditure to increases in the purchases of buildings and capital equipment.

The higher price increases are brought about by the large increase in demand for domestic commodities faced by domestic industries with upward sloping supply curves.

These higher price increases, as a result of a 'Buy Australian' policy, reinforce the higher price increases brought about by spending all of the increases in defence spending on buildings and capital equipment.

What can we say about the distribution of employment? A point that comes out of Tables III and V is that by holding employment levels in the armed services constant, the increase in defence spending would lead to a redistribution of employment in favour of blue collar workers (except skilled blue collar (other)). Except for Building (n.e.c.) and Communication, each of the industries that contribute to the increase in demand for the nine commodities has at least 57 *per cent* of its workforce consisting of blue collar workers (except skilled blue collar (other)). For most of them, the percentages range from about 66 to 71.

White collar worker employment rises under all the three scenarios. However, these rises are the lowest when armed services recruitment is ruled out and where there is no deliberate attempt to alter the share of imports of the nine specific commodities of building and equipment purchased by Defence.

Rural workers, their employment being concentrated in the export oriented agricultural sectors, are especially hit by rising domestic prices. Employment projections for them are the worst under the no armed services recruitment and 'Buy Australian' scenario where the growth in domestic prices is the highest.

IV. Conclusion

What general conclusions can we derive from the whole exercise that we have carried out? In particular, what can we say about the opportunity costs of increasing defence expenditure beyond the old cliche of "more guns less butter".

On the basis of our projections it appears that a uniform increase in real defence expenditure accommodated by corresponding reduction in real spending on either Health, Education or Welfare would leave the Australian economy very much unchanged in terms of aggregate employment and gross national product. However, once we allow for Defence to follow the world-wide trend of having increases in defence expenditure devoted mainly towards the updating of equipment and none for increasing armed services recruitment, the projections show an unequivocal loss in terms of aggregate employment and gross national product. Even if Australia is to adopt a 'Buy Australian' policy with respect to military procurement, the losses are unequivocal. In fact, it is doubtful whether Australia could adopt a 'Buy Australian' policy without either having to commit more resources to Defence for a given index of defence efficiency or to accept a lower index of defence efficiency for a given set of resources. After all, the reason for purchasing military equipment from abroad is that it is economical to do so.

Unless Australia is willing or able to move forcefully into the international armaments market like Singapore or Sweden, the small size of the Australian market will not make a 'Buy Australian' policy credible. Like the automobile industry, economies of scale are extremely important for defence related industries.

This paper has been narrow in its focus. For example, it has not been concerned with arguments about the impact of defence spending in Australia on research and development

(R and D)[5], or its impact on private investment and industry productivity growth. Our main concern has been on the impact of defence spending as a competitor for other areas of government spending. However, a report commissioned by the United Nations[6] into disarmament, covering, among other issues, the impact of military spending on research and development, private investment and industry productivity growth supports our general conclusion that increases in defence spending on new equipment and buildings compensated by reductions in other forms of government expenditure would lead to an unequivocal loss in both gross national product and aggregate employment.

While this is insufficient ground on which to argue against defence spending – we obviously have to take into account Australia's strategic and security considerations – we should seriously consider the costs of continued increases in defence spending. This is no need (even if it exists) that should be met regardless of cost.

Appendix

This appendix explains how the ORANI simulations are carried out. The choice of exogenous variables is the same as that listed in Table 23.3 of Dixon, Parmenter, Sutton and Vincent (1982).

Uniform increases in government spending on Defence, Education, Health and Welfare are simulated by imposing the relevant exogenous shocks on 'other final demands' of these four industries.

To simulate the effects of restricting defence spending to the nine specific commodities, we have to calculate the required percentage change in spending on these commodities such that it is consistent with a ten *per cent* increase in defence spending. Given that the nine commodities represent about 19 *per cent* of defence costs and that defence spending is to rise by 10 *per cent*, we can write

$$0.19a + 0.18b = 10 \text{ per cent}$$

where a is the required percentage change in the purchases of the nine commodities and b is the required percentage change in the other components of defence expenditure.

If $b = 0.0$, $a = 52.6$ *per cent*. In other words, to achieve a 10 *per cent* increase in defence expenditure requires a 52.6 *per cent* increase in the purchases of the nine commodities specified, with no change in the other components of defence expenditure.

However, at the moment the computing facility is not available to shock the individual purchases of each industry exogenously. To overcome this, we impose the equivalent shocks on 'other final demands' of the nine commodities. For example, assume that the share of 'other final demands' in the total demand for one of the nine commodities (called Z) is x while the share of the purchases of this commodity by Defence is y. So instead of shocking 'other final demands' of Z by 52.6 *per cent*, we impose a shock of $(52.6y/x)$ *per cent*.

For this same good, we can calculate the necessary shock for a 'Buy Australian' policy. We can write

$$Hc + Fd = (52.6y/x),$$

where H and F are the shares of home and foreign good Z respectively in the total purchases of good Z by Defence and c and d are the required percentage changes in spending to achieve a total spending change on Z of $(52.6y/x)$ *per cent*. If we impose $d = 0$, the solution for c is

$$c = (52.6y/xH) \text{ per cent}.$$

[5] This question may be more relevant to the U.S. or Japan rather than to Australia. Traditionally, Australia's expenditure on R and D has been insignificant.
[6] United Nations (1981).

References

Australian Treasury Budget Papers (1978-83).

Barro, Robert J. (1981). "Output Effects of Government Purchases". *Journal of Political Economy*, vol. 89.

Calleo, David P. (1981). "Inflation and American Power", *Foreign Affairs*, vol. 59.

Dixon, P.B., Parmenter, B.R., Sutton, J. and Vincent, D.P., (1982). *ORANI: A Multisectoral Model of the Australian Economy*. (Amsterdam: North Holland).

Hitch C.J. and McKean, R. (1967). *The Economics of Defence in the Nuclear Age*. Harvard University Press.

Huisken, Ron (1982). "Investing for Security in the Twenty-First Century", *Australian Outlook*, vol. 36.

Leontief, Wassily, Morgan, A., Polenske, K., Simpson, D., and Tower, E., (1965). "The Economic Impact-Industrial and Regional – of an Arms Cut". *Review of Economics and Statistics*, vol. 47.

Reich, Michael (1972). "Does the U.S. Economy Require Military Spending?", *American Economic Review*, vol. 62.

Rothschild, K.W. (1973). "Military Expenditure, Exports and Growth", *Kyklos*, vol. 26.

Schultze, Charles L. (1981). "Economic Effects of the Defence Budget", *The Brookings Bulletin*, vol. 18.

Smith, R.P. (1977). "Military Expenditure and Capitalism". *Cambridge Journal of Economics*, vol 1

Snow, Deborah (1982). "Industry, Unions want more of a Defence Dollar". *Australian Financial Review*. Dec. 16.

United Nations (1981). "Study on the Relationship between Disarmament and Development", *Review of the Implementation of the Recommendations and Decisions Adopted by the General Assembly at its Tenth Special Session: Development and International Economic Cooperation*, Document No. A/36/356, Oct. 5.