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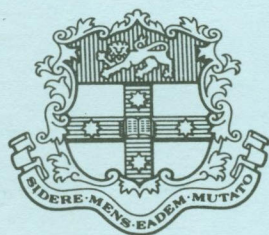
OFFSETS AND DEVELOPMENT OF DEFENCE
SUPPORT INDUSTRIES IN SMALL ECONOMIES

S.S. Joson

No. 108

June 1988

DEPARTMENT OF ECONOMICS



The University of Sydney
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Abstract

This paper provides an analysis of offsets, a measure employed by many small countries for the development of a local high technology/defence support industry. Offsets in government procurements involve seeking trade, technological or industry work-load benefits through negotiation of reciprocal sales between the purchaser and the foreign supplier of the equipment. A theoretical model capturing the nature of this protective measure is developed. Australian and Canadian data are used to show that both countries' experiences fit the pattern suggested by the model. Implicit protection costs and perceived benefits of the programme are thus put into perspective.

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OFFSETS AND DEVELOPMENT OF DEFENCE SUPPORT INDUSTRIES IN
SMALL ECONOMIES

S.S. JOSON

INTRODUCTION

This paper provides an analysis of offsets, a little understood but widely used measure of protection. Offsets in government procurements involve seeking trade, technological or industry work-load benefits through negotiation of reciprocal sales between the purchaser and the foreign supplier of the equipment. For instance, the Australian government with all its orders exceeding a threshold value, currently \$2.5m, requires the foreign supplier to give Australian industry a work-load worth at least 30 percent of the value of the foreign content in the contract price. The programme aims to stimulate the domestic development of high technology and/or defence support industries.

A theoretical model capturing the working of offset arrangements with special reference to the main objective of establishment of high technology/defence support industries in small economies is presented in the next section. It exposes the nature of offsets and helps point up the key variables involved in this bilateral arrangement. Various aspects of a country's policy affecting these key variables and thereby determining the protective element of offsets are discussed in Section II. Also treated are the circumstances under which that protective element can unwittingly get escalated. Australian and Canadian data are employed in

Section III to show that both countries' experiences fit the pattern suggested by the theoretical model. These experiences are used to put into perspective perceived benefits of the programme. This is followed by a summary of the policy implications and conclusions.

I. THE PROCUREMENT CURVE MODEL

The theoretical model, which may be called the Procurement Curve model, should be applicable to small economies generally, though it has been developed primarily to analyse offsets procedures followed in Australia and Canada. As with most small economies, the main objectives of the Australian programme, since its inception in 1970, have been (i) import substitution through the domestic establishment of high technology/defence support industries and (ii) employment creation.¹

A Procurement Curve is simply the locus of a falling External/Internal (Ext/Int) procurement ratio over time whose slope at each point represents the necessary Implicit Protective Element (IPE) required to lower the ratio per unit of time. Ext/Int procurement ratio is the ratio of government purchases from foreign and domestic sources. The IPE, reflecting the assistance provided local industry by offsets, is the percentage difference between the price paid for the equipment, with locally-produced substitutes for foreign components incorporated and the price payable in the absence of offset arrangements (for empirical estimation see Joson [1985]),

The model is based on the following assumptions:

- (a) The model deals with high technology industries, in which learning effects play an important role. However, learning here is a result jointly of the production process and large amounts of R&D

expenditures. Obviously, it is a realistic assumption about industries such as aircraft and computers which are constantly chasing technology. In these industries, while the earlier models are in production, new generation models are being developed through R&D.

- (b) It is essentially a long term analysis. That means advances in technology are taken into consideration (for a model relevant to short-run analysis see Joson [1986]).
- (c) The offset seeking country is a relatively small economy. The term 'small economy' in this analysis, however, does not refer merely to the inability of a country to influence its terms of trade. It also means that the country is looking at the global demand and supply for a product. In other words, it is a country having neither the industrial capacity nor the technology to produce the whole of a product such as advanced military aircraft. The aim is to produce, say under sub-contract from the foreign supplier, a certain proportion of the equipment, the demand for which is shared by many countries around the world. Hence the demand for this offset seeking country's output is a derived demand, being dependent upon the total demand for the final product.

In Figure 1, let $LABT_3$ be the more plausible convex form of the procurement curve for the industry protected by offsets, so that at any point of time T_1 , the Ext/Int procurement ratio stands at A. Further, that the domestic industry with a given capability is able to lower the ratio from A to B in a given period T_1T_2 , providing full benefits of the technological improvements (imported or locally developed) and learning effects are available to it, and X-efficiency is maintained. That means, under these ideal circumstances, the protection needed to lower the ratio further from B after time T_2 , would be much less than at time T_1 when

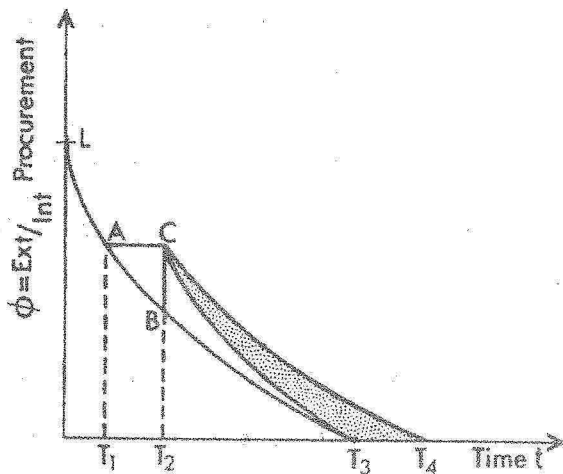


FIGURE 1

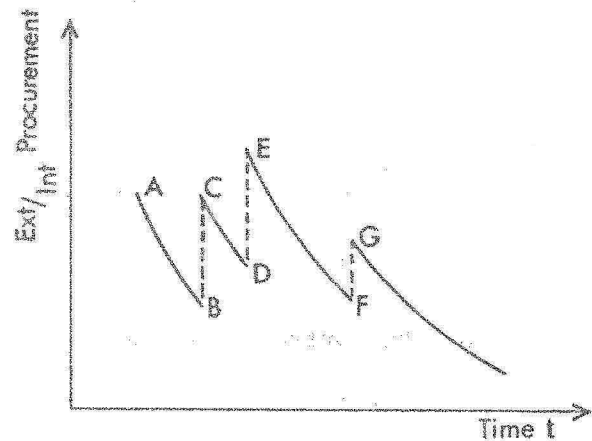


FIGURE 2

the ratio stood at A. This explains the convexity of the curve, i.e.

$$(1) \quad \frac{d\phi_B}{dt} < \frac{d\phi_A}{dt}$$

In reality, however, certain factors prevent the ideal circumstances from prevailing, consequently pushing the ratio upwards at time T_2 when more equipment is purchased. The most important reason for the upward push in the ratio stems from the fact that technological development is a dynamic process. At the same time a small country is adopting a certain imported technology, further improvements in it are very likely to be taking place overseas. Those foreign technological advances manifest themselves in the imported equipment being more sophisticated and R&D intensive than the locally-produced.²

Now suppose, at time T_2 , under the influence of these forces, the ratio rises from B to C, such that

$$(2) \quad \frac{d\phi_C}{dt} = \frac{d\phi_A}{dt}$$

Two limiting possibilities emerge:

- (i) extra time, equivalent to T_1T_2 , has to be allowed for the ratio to fall along CT_4 resulting in a procurement curve $LABCT_4$. Obviously, $T_1T_2 = T_3T_4$ by construction.
- (ii) a higher protection at each point of time between T_2 and T_3 has to be given, to enable the ratio to fall along CT_3 resulting in the procurement curve $LABCT_3$. Obviously, between T_2T_3 , the slope at every point on the curve CT_3 , representing the IPE, is greater than the corresponding point below it, on the curve BT_3 .

In practice, of course, there is real possibility for the curve to lie between the two extremes CT_3 and CT_4 , in the shaded area. The reason for the curve being below CT_4 is that most government contracts are lumpy in nature, so that a given number of a selected aircraft or a tank, are purchased at a time. As such, there is little chance that the local industry can be given extra time to develop the necessary technology and win the contract. Consequently, such contracts can only add to the protective element of government procurements. The divergence from the other extreme i.e. CT_3 , stems from the fact that there are some procurements in which either by nature of the contract, and/or by deliberate action of the government, the demand can be withheld or staggered to avoid flooding the market with a large contract beyond the current capability of the local industry. The Australian project DISCON, in which procurement takes place in many stages spanning a five year period, is a good example. Naturally, the protective element of such procurements will be comparatively small. The position of the procurement curve in the shaded area, therefore, represents a trade-off between time and the IPE of the purchase: the shorter the available time to develop or import technology, the greater the IPE.

Thus in the case of offsets protection two opposing forces influencing the procurement ratio may be identified. On the one hand, offsets provide the local industry with learning opportunities, and access to improved technology which in turn tend to lower the ratio. On the other hand, the widening technology gap tends to push the ratio upwards. These counteracting forces have a tendency to produce a Jagged Procurement Curve as shown in Figure 2. The outcome may be that the ratio either does not fall at all, or falls at a much slower rate than expected, despite the rigorous use of offsets.

This working of the offset arrangements, which by nature is slow, gives rise to the two opposing views one often finds expressed in small economies. Government and those local firms which receive offsets contracts express satisfaction with the working of the programme. They point to the work-load it provides the local industry. Interestingly, the authorities always point to the cumulative rather than relative value of the offsets work-load, as if to underscore the programme's beneficial effects. By pointing to its technological benefits they portray the programme as a vehicle whereby local industry keeps pace with foreign technological advances. Critics on the other hand, point to the implicit protection costs involved in this "misguided mercantilist notion", which exacerbates misallocation of resources in the economy (Lloyd [1973, p. 74]).

The model shows that over time a small country pursuing offsets policy in often lumpy overseas government purchases is likely to experience sudden jumps in its Ext/Int procurement ratio. Further, the IPE of offsets associated with these sudden jumps is also likely to be high. The underlying logic of this association is simple: ceteris paribus, the local

industry employing inferior technology has a certain cost disadvantage vis-a-vis the foreign supplier, and, IPE of offsets is nothing but a measure of the extent to which that cost disadvantage gap is bridged. A sudden rise in the ratio, reflecting an increased technology gap accompanied by an increased cost disability of local industry, therefore, implies a higher value of IPE used in forcing the foreign supplier to give work to domestic industry under offset arrangements.

The model also points up the key variables involved in offset arrangements. These are, the technology gap, the time available to close the gap and the international competitiveness of local industry. How various aspects of a small country's policy influence these key variables and thereby determine the IPE of offsets is discussed in Section II.

Also captured in the model is the essence of those variables which provide what seems to be the only justification for the use of this protective measure in small economies. Firms in small economies, even if X-efficient, are unable to benefit from economies of scale and learning effects because of shortage of domestic demand for high technology/defence products. To the extent that offset arrangements provide such firms with access to larger overseas markets, their use would seem justified.

II. DETERMINANTS OF IPE

In gauging the IPE of offsets, a country's policy objectives, the priority placed on each individual objective and the vigour with which each objective is pursued, all have to be considered. The following analysis however, rests on the assumption that the country's policy is

primarily aimed at the local development of high technology/defence support industry. A careful appraisal of various countries' policy objectives reveals that it is not an unrealistic assumption (Wolf[1976, pp. 7-14]).

(a) Technology Gap and Technology Transfer

A key determinant, and obviously the one over which the local authorities have no control, is the level of technology required for producing the contract item and the improvements incorporated with the progress of the work. This means that even if there is no existing gap between foreign and local technology at a given point in time, any improvements in foreign technology have to be matched by the local firms. Otherwise, in terms of Figure 2, the Ext/Int procurement ratio would tend to rise (say from B to C or from D to E) and the IPE of offsets would rise with it. The implication is that if a country's policy does not place first priority on bridging the technology gap, the IPE is likely to be high. Given that technological development did not receive priority as an objective in the Australian policy until 1986, it is not difficult to see why the programme has attracted so much criticism.

Now we can discuss unrelated (or secondary) offsets. These refer to the reciprocal purchase by the foreign equipment supplier of goods which are unrelated to and/or embody technology lower than that of the equipment. The situation arises when the foreign supplier, under offset obligations, finds it difficult to place orders for significant proportions of an item such as military aircraft with the small country's industry. The reasons may be many; for example, because work cannot be taken away from home country sub-contractors or the small country's industry is not capable of handling the work-load. Purchasing authorities also, being aware of this difficulty, often allow the supplier credit for

unrelated offsets. There are examples for instance, where the suppliers of military aircraft have been allowed credit for exports of meat, candy or tourism promotion by countries like Australia and Canada.³

For two reasons the provision of unrelated offsets can be shown to have a great potential for escalating the IPE of a country's programme. Firstly, in terms of the above model, giving credit for items of little technological significance implies that the protection is being accorded the wrong industries: industries (such as meat in Australia's case) which may need no protection to be competitive on the international market, or industries (e.g. candy) which the government may not be keen to protect in their own right. Secondly, they do not help lower the Ext/Int procurement ratio (say from A to B or C to D in Figure 2) in the industry being developed. It means they have no import substitution potential, and that, after all, is the ultimate goal of procurement policy.

Of course it can be argued that as these items have no import substituting potential, and if, as it may well be, the country's comparative disadvantage in these items is less than that of the defence support industry being promoted, their export promotion under offsets agreement makes the programme less, rather than more, protective. In fact this argument is implicit in the analysis of some American cost-benefit studies. For instance, it has been claimed that if offsets were restricted to military procurements from overseas, the cost of achieving a satisfactory offsets target would be substantial relative to the total cost of the equipment being exported without offsets. But the inclusion of non-military products as potential offsets reduces the inefficiencies of using offsets as a procurement strategy (Wolf et al. [1976, p.39]).

From the small country's standpoint too, it would be correct to conclude that the inclusion of items, which have low comparative disadvantage and have no military uses, can reduce the protective element of the programme. But this would be true if normal international trade criteria were employed and/or if the objective of the programme was to influence the country's balance of payments. However, the main thrust of this discussion is about the use of a protective measure for the explicit purpose of developing a local defence support capability. The implication is that where the primary objective of the programme is the development of high technology industries, rather than influencing the country's balance of payments or creating employment, policy is best confined to offsets credits for a small range of related products rather than chasing a high monetary value of the benefits via unrelated offsets.⁴

Another question arises. How is the IPE influenced when offsets are used to develop a narrow range of technologies which affect the Ext/Int procurement ratio in varying degrees? In other words the question is about the suitability of a technology to a country when that technology is being imported under the programme. In answering that, one simply has to refer to the country's resource endowment, natural and/or acquirable; the latter representing R&D expenditure and scientific knowledge. If imported technology is far removed from the country's factor endowment then it would be reasonable to conclude that the offsets had pushed private profit in excess of social profit so as to motivate acquisition of a certain foreign technology and was thus more protective than if imported technology bore directly upon domestic factor endowments (The argument is also applicable to technology transfer into less developed countries, see details in Johns [1978] and [1979]).

An example from the Australian Tactical Fighter Force (TFE) project, under which Australia contracted to purchase 75 F-18s from McDonnell Douglas, may help explain this feature. The Defence Department listed a number of technologies which Australia would like to acquire (Department of Defence [1978]). A titanium smelting facility was one of them. Because Australia is richly endowed with rutile and thus has the natural comparative advantage, it is easy to show that importation of that technology would tend to keep the IPE of offsets lower. Moreover, it is likely to be so, even if it uses up substantial dollar value of offsets while creating fewer jobs than any other technology on the list.⁵ Quite simply as long as the primary objective of the programme is import substitution capability, and not employment creation, and as long as the marginal reduction in the Ext/Int procurement ratio caused by that technology is greater than any other, its importation would keep the IPE of offsets lower.

Acquirable comparative advantage may in practice be slightly more difficult to comprehend but the inherent logic is the same. To elaborate, take the case of negotiated co-production projects, independent of any military sales and purchases between two countries. Such projects permit each country to choose production of those components best suited to its technological capabilities. Costs naturally are shared according to the agreement. As the final equipment is purchased by both countries, the exchange takes place at least cost between them. The arrangement is obviously not protective. But a co-production project clearly becomes protective if the allocation of tasks between the two countries does not reflect comparative technological advantage. An offsets agreement is protective when it does not allocate tasks between different countries in accordance with that principle. The magnitude of protection implied, i.e. the IPE of the programme, will obviously depend upon the degree of deviation from the optimum allocation.

IPE of offsets is likely to be high for another reason. In foreign military purchases most small nations including Australia, pursue a policy of "fly before buy". Presumably, in purchases of "off the shelf" fully developed equipment the sub-contractors would have already been selected overseas. There may thus be very few tasks that could be allocated to the local industry in accordance with its acquirable comparative advantage.

(b) Importance of Time

The procurement curve model has shown that the longer the time available for closing the technology gap (whether through importation or local development of technology), the smaller the IPE of offsets. The implication of this inverse relationship is that spreading of offsets over a reasonably long period can help keep the IPE lower. It also reduces the necessity to allow foreign suppliers credit for unrelated offsets. Moreover, it helps neutralise the negative impact of intermittent ordering on the learning curve by assuring demand for locally-produced components over a longer period. It is not surprising therefore, that the Canadian authorities allow foreign suppliers of major items up to 15 years to fulfil their offset obligations. Australian authorities also allow between three and 10 years. The policy ramification of this analysis is that the authorities have to be flexible in allowing time over which the foreign contractor may discharge his offset obligations if the IPE of the programme is to be kept low.

(c) International Competitiveness

Another important determinant of the implicit protection of offsets is the competitiveness of the components produced in the country vis-a-vis those produced by other sub-contractors of the foreign prime contractor. If the components are not competitive the unit costs of the final equipment would be pushed up.

Theoretically, the production of the final equipment is efficient firstly, if the offsets work is allocated among different countries in such a manner that each one of them produces those components in the manufacture of which it has the highest comparative advantage; and secondly, if the firm selected in each country is the most efficient one in that country's industry. Failure to meet either of these conditions would result in higher unit costs of the final equipment. In practice, however, due to the very nature of offset arrangements, the prime contractor may not have much choice in either of those allocations. In international allocation, the contractor has to contend with the market power of the equipment purchasing country. In the selection of the firm, he needs good knowledge of the local firms' capabilities which may not be easily ascertainable. Nor may he have many local firms to choose amongst. Furthermore, the misallocation may remain undetected as the offset arrangements are often based on confidential negotiations with the local firms. It is therefore largely upto the country demanding offsets that the components produced there are internationally competitive.

Purchasing authorities in a small country may well realise the importance of cost competitiveness of local firms. They may also try to reduce the influence of cost disabilities of local firms by allocating offsets work on a competitive basis (Department of Defence [1978, p.11]; Committee of Review on Offsets [1985, p.106]). But in practice there may be some impediments to their success in this matter. Collusive tendering by local firms can be a problem. Also firms located in different regions (states, under a federal system of government) are known to lobby for some kind of a regional balance to be maintained in the allocation of offsets work. Acceding to such requests on the part of the central government would tend to further stifle an almost non-existent competition and thus raise the IPE of the programme.

More importantly, various prongs of government policy may often be directed to conflicting ends. For instance, an important aim of government policy is to help establish large specialist firms (called 'houses of excellence' in Australia) by providing them continuity of work so they can benefit from scale economies and learning effects. This tendency erodes competition and concentrates work in a few firms. For instance, in the Australian aerospace industry, which accounts for 60 percent of the total offset commitments, there is evidence of one firm receiving 93.1 percent of the industry's offsets work (Bureau of Industry Economics [1986, pp. 303, 306]). The resultant monopoly power of these firms is likely to raise the prices of locally-produced components. Ostensibly, the foreign prime contractor appears to be subsidising local firms. Ultimately, however, the government ends up paying a higher price for the equipment.

Prevalent in most small countries is also a tendency to require a relatively high proportion of the contract's value as offsets work. For instance Australia requires offsets work upto 30 percent of the foreign content of the contract value. Of course such a tendency is but a corollary of the main objective of developing high technology/defence support industry within the country. Nevertheless, it has some important implications. Firstly, offset targets can remain frustrated, and there is ample evidence of that in Australia (Bureau of Industry Economics [1986, pp. 314-15]). Secondly, where the capacity and/or capability of local industry is limited, unrelated offsets remain an attractive proposition to both the foreign supplier and local authorities. Finally, even assuming there is no capacity/capability problem, increased offsets participation by local firms may raise the cost premium and thus the IPE of the country's programme. This may occur for two reasons. One reason is that the prime contract price has to absorb a greater share of this cost disability. The other reason is that with increased participation, the local cost disability itself could

increase. Quite simply, increased participation means finding more and more components of an item like aircraft, in the production of which there are no severe cost penalties amongst a small number of local firms.

Interestingly, most small countries' policies seem to aim for higher values of two variables, i.e. the proportion which offset orders constitute of the local industry's total work-load and the size of the specialist local firms receiving offset orders. And those are the main variables which determine the IPE of offsets.

III. AUSTRALIAN AND CANADIAN EXPERIENCE

The Ext/Int procurement (defence) ratios of Australia and Canada are depicted in Figure 3. Both countries' ratios show a sudden rise as expected, although it is purely coincidental that the rise occurred in both countries in the same year (1976). As explained earlier, such jumps are due to the lumpy nature of government purchases and the fact that the imported equipment may be more sophisticated and R&D intensive. Ignoring the 1976 jump, a comparison can be made of the two countries' experiences.

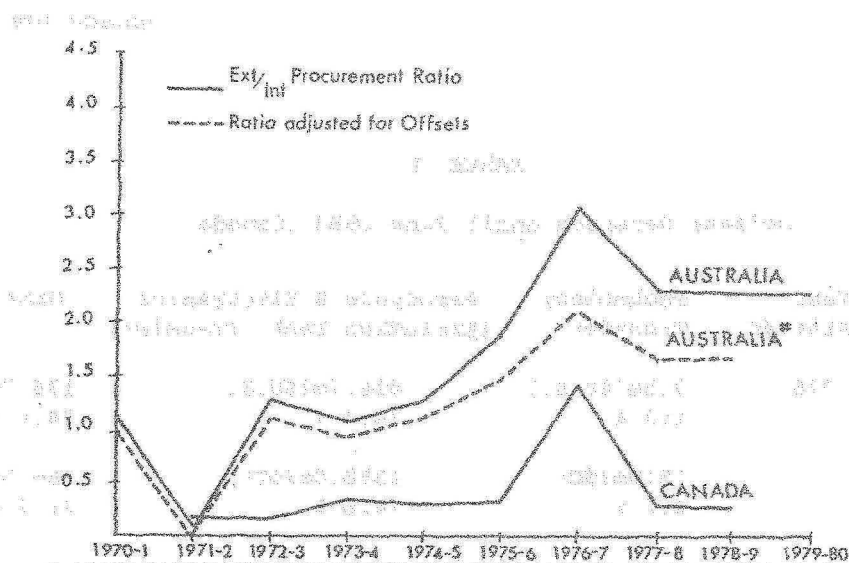


FIGURE 3

Source: Appendix

The Canadian ratio is notably lower than the Australian throughout the period. On this evidence, the Canadian industry seems to be more capable of meeting the country's defence needs than its Australian counterpart (for empirical evidence see Joson [1985]).

Figure 3 also shows the Australian ratio adjusted for offsets. Even ignoring the 1976 jump, two features of this ratio are noteworthy. First, the gap between the adjusted and unadjusted ratio is widening. This points to an increase in offset orders obtained by Australian industry over the period. Secondly, the ratio traces a rising trend. This is indicative of a possible increase in the IPE of Australian offsets over the period.

Data series on achieved offset levels for Canada are incomplete. However, committed offsets for some of the large projects are known: they are, Long Range Patrol Aircraft, 93.5 percent; Leopard Tank, 40 percent; Patrol Frigate, 100 percent; and F-18, over 100 percent. In two of these projects a break-down of offsets received is also available and is presented in Table I. Apparently in total, 74.6 percent of the work-load received was within the high technology industries (aerospace and electronics).

TABLE I
Offsets Received until June 1983 (Canada)

Project	Year Started	Technology Transfer	Aerospace & Electronics (Excluding Tech. Transfer)	Other
CP-140	1976	7.5m(\$U.S.) 1.3 %	416.7m(\$U.S.) 74.3 %	136.7m(\$U.S.) 24.4 %
CF-18	1980	75.8m(\$C) 4.2 %	1358.0m(\$C) 74.6 %	385.3m(\$C) 21.2 %
Total		3.5 %	74.6 %	21.9 %

Source: Data supplied by the Department of Regional Industrial Expansion, Canada, on request.

These three pieces of information, i.e., the Canadian Ext/Int procurement ratio being lower than the Australian, Canada's ability to offset sometimes up to 100 percent of major foreign procurements, and the fact of up to 74.6 percent of Canadian offset orders being within the high technology industries, suggest that the IPE of Australian offsets may be much higher than that of Canada. Additionally, to an extent they also point to the way in which Canada may have achieved this success. Partly of course, the Canadian Ext/Int procurement ratio may be lower than the Australian figure because Canada has had a Defence Production Sharing Agreement with the U.S. since 1960⁶, while the Australian offsets programme began in 1970. Thus Canada's relative success may be a reflection of its greater length of experience. However, other factors must apply. Most importantly, Canada has developed a few select technologies to an internationally competitive level. What is even more interesting is that it may have done so without much help from offset type arrangements.

Empirical estimates of implicit protection of the Canadian government's defence and civilian procurements, produced by using Input-Output data, have already indicated that Canada has some well developed defence support industries, although it is not self sufficient in its defence requirements (see Joson [1985]). A perusal of the Canadian defence procurement balance with the U.S. not only reinforces this assertion, it also suggests that the achievement may not have been made through offset type arrangements. Between 1960-71, both overall balance (including prime contracts and sub-contracts) at \$556.2m and the prime contracts balance at \$956.1m were in Canada's favour. Moreover, of the 12 years, in only one year (1960) was the prime contracts balance against Canada. Given the nature of offset arrangements, this is exactly the reverse of what could be expected: prime contracts balance should have been in favour of the U.S. and sub-contracts balance in favour of Canada. Moreover, that should have

been the dominant pattern over most of the years, especially as the data relates to the earlier years of the U.S.-Canada agreement.

The Canadian experience also suggests that perhaps the potential of offsets for purposes of technology transfer may be less. A similar suggestion emanates from the available evidence in Australia (Bureau of Industry Economics [1986, pp. 321-23]). Coupled with this, the fact that Canada has managed to receive a relatively high value (74.6 percent in Table I) of offsets in high technology industries has an important implication. It seems small countries cannot expect offsets to be a reliable vehicle for technology transfer. Their own efforts, viz. R&D expenditure and other measures to supplement offsets may be a necessity.

IV. POLICY IMPLICATIONS AND CONCLUSIONS

The protective element of offset arrangements, widely employed for the local development of high technology/defence support industries in small economies, is likely to be high. Through the development of the Procurement Curve model, technology gap, the time available to bridge the gap and international competitiveness of locally-produced components have been shown to be the main factors influencing that protective element.

The implication is that every effort has to be made to bridge the gap between the foreign and local technology in order to keep the protection costs of the programme low, especially because there is nothing inherent in the programme to guarantee technology transfer. Experiences of both Canada and Australia support this assertion. It has been shown that Canada manages to receive the bulk of offsets within high technology industries, not because of technology transfer through offsets, but because it has developed a few technologies to internationally competitive levels

through its own efforts. That means that technological development (locally produced or imported), has to be the primary objective of the programme.

If technology transfer is an objective, then offsets have to be aimed at developing a narrow range of technologies. Moreover, the selection of technologies for offsets targeting should be based on the country's natural or technological comparative advantage. One policy implication of the analysis is that allowing foreign suppliers offsets credit for unrelated items contradicts the country's main interest. The same appears to be true of the policy of "fly before buy", which most small countries tend to pursue in foreign military purchases.

Since the IPE of offsets and the time available for technological development are inversely related, allowing foreign suppliers reasonable time to fulfil their offset obligations seems to hold special benefits. Besides, it reduces the need to allow them offsets credit for unrelated items.

International competitiveness of locally-produced components is essential in keeping the protective element of the programme low. A prerequisite for this is competitive allocation of offsets work amongst local firms. Because practices such as collusive tendering, maintenance of regional balance in work allocation and endeavours to establish 'houses of excellence', prevalent in most small countries, work against competitive allocation, curbing these tendencies should help.

Finally, the pursued policy, procedures and the available data all indicate that the protective element and thus the protection costs of the Australian offsets have been on the increase. Available evidence also suggests that the protection costs of the Canadian programme would be much less than the Australian.

FOOTNOTES

* Discussions I had with Professors Robert Baldwin and Rachel McCulloch at University of Wisconsin, Madison, were greatly helpful in the preparation of this paper. Comments by Professors Brian Johns, Warren Hogan, Clem Tisdell and Viv Hall and Mr. Bruce Ross are also gratefully acknowledged. Usual disclaimers apply.

1. Recently though, on a recommendation from the Committee of Review on Offsets [1985], technology transfer has been made the prime objective (see Minister of Industry, Technology and Commerce [1986]).

2. Of course, the ratio can be pushed upwards if learning benefits are not available to local industry. And, there are factors which are known to affect learning adversely, viz. short production runs, uncertainty of production loadings of capital equipment and for the period needed for its amortisation, small and intermittent ordering, and introduction of modifications. Any one or more of these can produce what is known as "jagged learning" curves. None of these factors, except the last one, however is quite relevant to offset arrangements, because the presumption is that the offsets seeking country is acquiring the latest technology to produce certain components of the equipment being purchased. Learning effects are embodied in that technology. The exception is when the small country attempts to introduce modifications in the equipment or the components. In that event the country is likely to face the "jagged learning" curves (for a discussion of the "jagged learning" curves see Hartley [1965], [1969]).

3. The latter two items were reported to have been included in the Australian TFF project. According to the report, Allen's Sweets Pty. Ltd. of Sydney, was to export lollipops to every major U.S. Navy and Marine Corps installations including all McDonnell Douglas canteens in the U.S. (Australian, 29 October, 1980).
4. Sometimes a case is made in favour of protecting high technology industries on the ground that there are externalities in employing highly intelligent people in an economy. And even the critics of the protectionist policies concede that on that ground a case for protection may exist. But, it may exist only if the value of externalities is significantly greater in high technology industries than elsewhere in the economy. (For a comprehensive discussion of the types of externalities, the arguments and counter arguments about the employment of high IQ manpower see Corden [1974, pp.277-78]).
5. In fact the employment creative capacity of \$1m offsets in the titanium industry is believed to be only 2.8 workers as compared to 10 workers in the modern electronics (radar and computers etc.) industry. These figures are derived from the statements made by industry representatives (Australian Financial Review, 23 September and 2 December, 1980).
6. This is because the 1963 agreement had superseded two earlier agreements between the Canadian Department of Defence Production and the U.S. Departments of Army and Air Force dated July 26, 1960 and December 22, 1961 respectively (Department of Defense, U.S. [1980, p.101]).

APPENDIX

Data Sources and Preparation

The Australian Ext/Int procurement (defence) ratio was calculated from foreign defence purchases of capital equipment. Relevant data were taken from the Department of Defence reports for various years. The ratio was adjusted for offsets by taking the cumulated value of overseas purchases because offsets figures have always been quoted as cumulative values by officials. Because official figures included offsets received on civilian government purchases as well, the estimated offset percentages would be somewhat over-stated. Data sources on offsets are: Lloyd [1973, p.74]; Scott, W., 1975, Report of the Committee of Inquiry Into Government Procurement Policy (AGPS, Canberra) p.189; Prime Minister's Statement, 1976, Commonwealth Record, 1,13, 27 September - 3 October (AGPS, Canberra); CPD, House of Representatives, 23 November 1978, p.3351; Lusher Report [1981,p.46].

The data on the Canadian Ext/Int procurement ratio were provided by the Department of Supply and Services, Canada. Because the Canadian data included purchases of equipment and stores, which were excluded from the corresponding Australian data, the Canadian ratio may be slightly understated. The discrepancy, however, should not be so significant as to upset the conclusions.

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