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This paper contains preliminary findings from research work still in progress and should not be quoted without prior approval of the author.

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A GENERAL EQUILIBRIUM ANALYSIS OF CANADIAN OIL POLICY

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A General Equilibrium Analysis of Canadian Oil Policy

In recent years perhaps no government policy in Canada has attracted as much public and academic attention as has the National Energy Program[1] and the recent Federal-Alberta energy pricing agreement.[2] While there has been considerable public debate and several academic discussions of the issues,[3] a systematic analysis of the policies from a general equilibrium point of view has not been undertaken. The purpose of this paper is to initiate such a discussion.

The National Energy Program (NEP) is a complex combination of objectives and policies, and no attempt will be made to analyze all of its components in this paper. Attention will focus on several of the principal elements of the program. Furthermore, in order to facilitate the general equilibrium framework the specific proposals examined are stripped of all their subtleties and presented as simple alternatives. Thus while the recent Federal-Alberta agreement proposes a gradual increase in oil prices to reach 75 percent of world prices by (or before) 1986, the analysis here simply assumes that the policy is to keep Canadian oil prices significantly below world levels. And while the proposals to encourage exploration and development are complex and depend, among other things, on the ownership of the oil companies and where exploration takes place, the approach here will be to treat such incentives as simple tax changes. Nor does the analysis make any distinction among old oil, heavy oil or syncrude.

There are also several important features of NEP that are not considered at all in this analysis. Many would regard the Canadianization of the oil industry as the cornerstone of the NEP, and that aspect is not

discussed here. This is not because such a policy is seen to have little consequence for the Canadian economy--it undoubtedly has--but rather because the consideration of this aspect of the program is not easily handled within the theoretical framework employed here. Among other components of NEP which are not considered are the treatment of natural gas, the various conservation programs and the regional initiative programs. While all are important components of the overall program, they are outside the scope of this discussion.

The analysis begins, in Section 1, with a brief description of the model, while Section 2 considers the international trade consequences of NEP. These are particularly important in light of the Government's objective of equating domestic demand and supply of petroleum by 1990. In Section 3 the effects of the energy incentive program and tax changes are examined. Section 4 considers the claim that lower oil prices in Canada will provide industrial benefits in export markets by providing Canadian firms with a price advantage. Some concluding remarks are provided in Section 5.

1. The Basic Model

It is assumed that two commodities, Y and X, which represent petroleum and other commodities respectively, are produced under conditions of constant returns to scale. Both use capital and labour, assumed to be in fixed supply, in their production processes. The production of petroleum also requires resources, R, as an input, while X uses Y as an intermediate input. Thus the two production functions are

$$Y_g = F(K_y, L_y, R) \tag{1}$$

$$X = G(K_x, L_x, Y_x) \ , \tag{2}$$

where Y_g represents the total or gross output of Y.[4] The constraints on K and L are $K = K_x + K_y$ and $L = L_x + L_y$. It will be assumed that $Y_x < Y_g$, although since trade in Y will be permitted this restriction is not required. The factor R is assumed to be in fixed supply and thus all the available quantity is used to produce Y. The underlying assumption here is that there are oil reserves, and that the application of capital and labour to these reserves will produce Y. The application of capital and labour to the oil-rich land could be either exploration or development. While this is an obvious simplification of the real world situation where there is uncertainty as to the existence of new oil pools, and dynamic problems associated with extraction, the approach seems adequate for the static problems to be considered. Furthermore, the complications introduced by a dynamic uncertainty model, while of interest in their own right, would mask the much simpler problems addressed here.

Equations (1) and (2) along with the factor constraints will define the gross production possibilities curve. In general, however, we are concerned with net outputs, defined as

$$Y = F_y(K_y, L_y, R) - Y_x \quad . \tag{3}$$

The gross and net output curves are constructed in Figure 1 following Warne (1971). The axis Y_x represents the input of Y in the production of X, and F* represents the total product curve for X where it is assumed that $K_x = K$ and $L_x = L$. TT_g is the gross curve and $TT'G$ the net curve. Production at points along $T'G$ would imply $Y_x > Y_g$, or in other words that domestic production does not even satisfy intermediate input demands. At T' domestic production just satisfies intermediate demands, and any consumption demand must be imported.[5]

It is clear that the net production point corresponding to a gross production point must lie vertically below it, for both points imply the

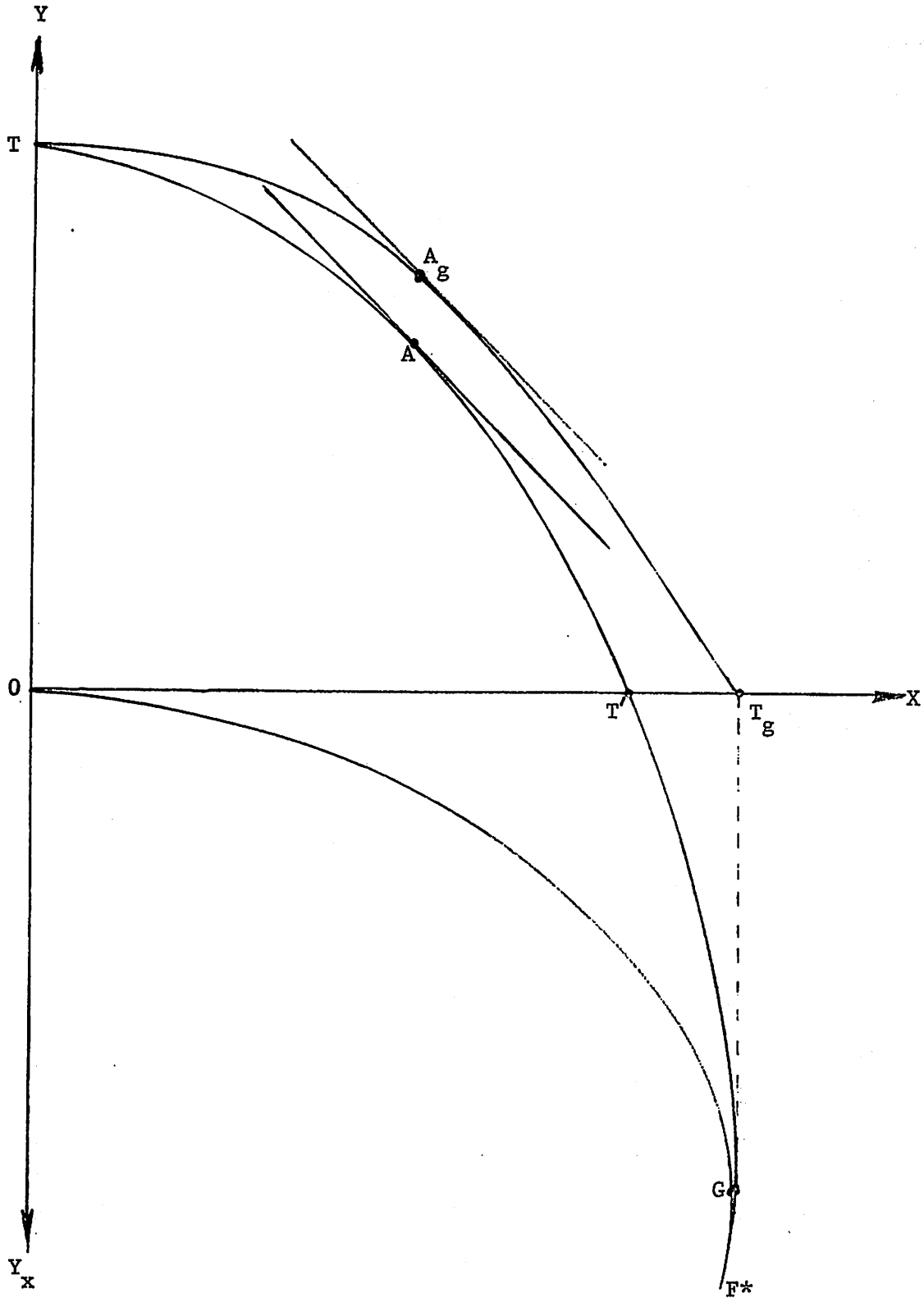


Figure 1

same output of X. The question arises as to whether the slopes of the two curves are the same at such points (A_g and A for example) for if they are not one cannot assume that the usual tangency conditions hold at equilibrium on the net curve. To illustrate that the slope of the net curve is the negative of the commodity price ratio, totally differentiate (2) and (3) to obtain

$$dY = F_1 dK_y + F_2 dL_y + F_3 dR - dY_x \tag{4}$$

$$dX = G_1 dK_x + G_2 dL_x + G_3 dY_x, \tag{5}$$

where F_i is the partial derivative with respect to the i^{th} argument. Differentiation of the constraints yields

$$dK_y = -dK_x \tag{6}$$

$$dL_y = -dL_x. \tag{7}$$

Define p, i, w and r to be the price of X, the return to capital, the wage rate and the rental rate respectively, all in terms of the price of commodity Y. The standard marginal conditions for efficient production are

$$F_1 = G_1 p = i \tag{8}$$

$$F_2 = G_2 p = w \tag{9}$$

$$F_3 = r \tag{10}$$

$$G_3 = 1/p \tag{11}$$

Substituting (6)-(11) into (4) and (5) we obtain

$$dY = [\frac{i}{p} dK_y + \frac{w}{p} dL_y - dY_x]p$$

$$dX = -[\frac{i}{p} dK_y + \frac{w}{p} dL_y - dY_x],$$

and thus

$$dY/dX = -p \tag{12}$$

It is assumed that both X and Y are tradable, and that Canada is small and takes world prices of both commodities as given. This not only fixes the relative prices of X and Y as outputs, but also fixes the price of Y_X. Furthermore, the marginal product of Y in the production of X is also determined from (11). Note that this will be true even when the government sets price at a level that differs from the world price, as long as these prices are assumed fixed.

2. International Trade Effects

A central feature of NEP is that Canadian petroleum prices are to remain significantly below world levels. Specifically, by the Ottawa-Alberta Energy Pricing and Taxation Agreement (OAPTA) the price of oil will rise until the end of the Agreement in 1986, but the price of conventional oil will not exceed 75 percent of the world price.

The policy of agreeing to provide all domestic consumers with whatever quantity of petroleum they demand at less than world prices is equivalent, from the point of view of relative price effects, to a subsidy paid to all domestic purchases, combined with an equal ad valorem tax on domestic producers. In practise, of course, the policy works somewhat differently. While domestic purchasers of foreign oil are paid a subsidy equal to the difference between Canadian and world prices, and while sales to foreigners are taxed to bring the price up to the world level, no tax or subsidy is paid on entirely domestic transactions. The overall effects, however, are identical. Mundell (1960) has shown that there is an equivalence between such a tax-subsidy arrangement and a tariff. This is most easily seen by reference to Figure 2, where it is assumed that in the pre tax-subsidy situation with world prices p, production is at A and consumption at B. For simplicity demand conditions are represented by a set of community indifference

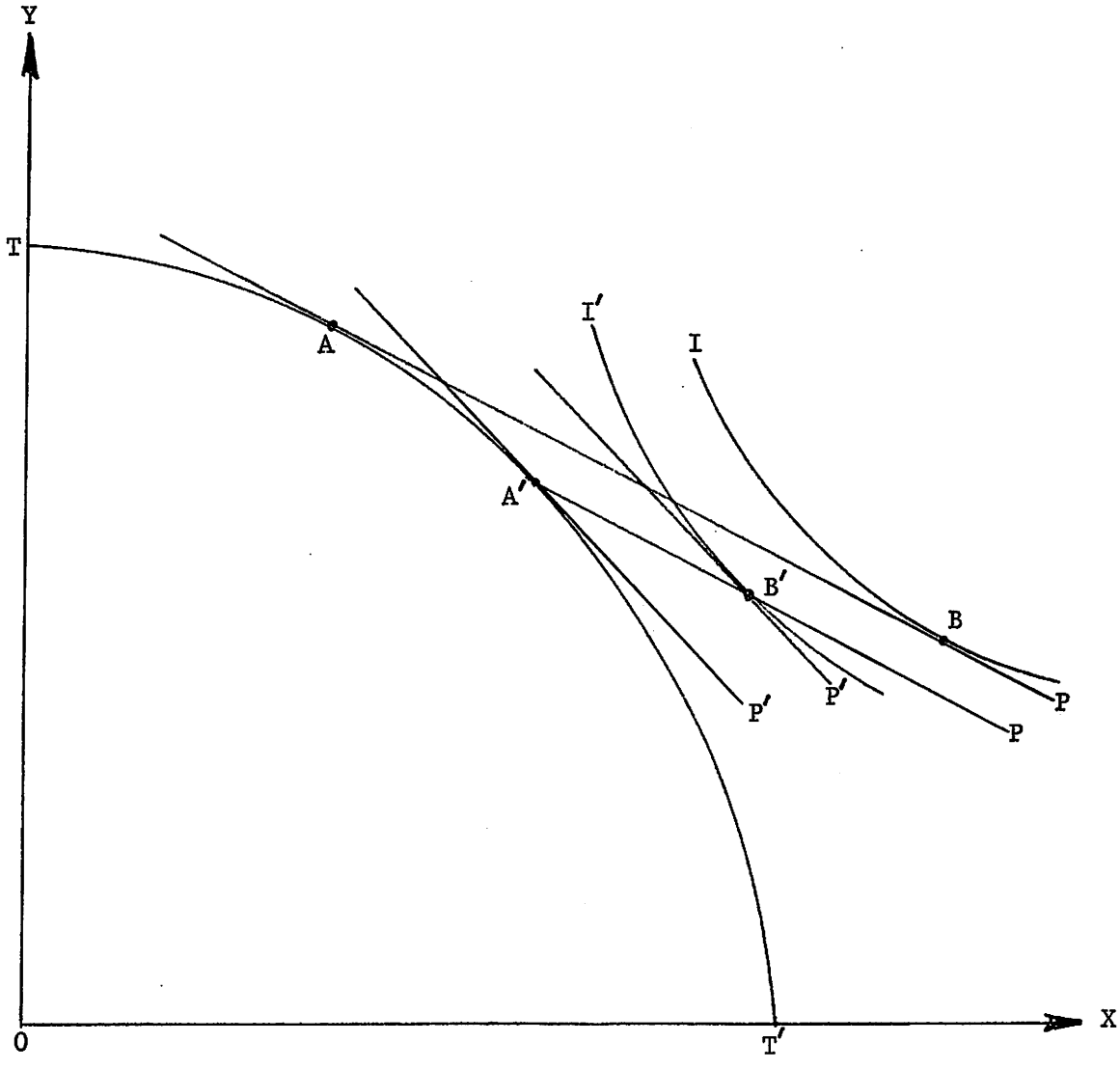


Figure 2

curves. Note that TT' is the net production set from Figure 1, and that the section in the fourth quadrant has been omitted.

Now assume that a tax at rate t is imposed on domestic producers and that a subsidy of rate t is paid to consumers. The tax lowers the effective return to producing Y and production will shift to a point such as A'. At the subsidized prices consumers will purchase relatively more Y, and at world terms of trade p, consumption will be at a point such as B'. The trade vector has been reduced from AB to $A'B'$. Consumers are worse off in the sense that they are on a lower community indifference curve. Indeed, the situation of Figure 2 is exactly equivalent to a tariff on X, and consequently all the implications are precisely the same.

The situation most relevant for the Canadian economy would have petroleum the import good. This is shown in Figure 3 where again A and B are respectively the pre tax-subsidy production and consumption points. As before, the tax on production encourages a shift away from Y and towards X and gives rise to production at a point such as A'. Consumers will respond to the subsidy by consuming relatively more Y and will move to a point such as B' on the world terms of trade line through A'.

A number of important conclusions can be drawn from Figure 3. First, it is clear that the tax-subsidy program has increased the imports of petroleum. The vector $A'B'$ is longer than AB both because production of Y has fallen and because consumption of Y has increased. Society is worse off in the sense that consumers are on a lower community indifference curve. Furthermore, in the situation shown, B' is interior to the production set, and thus this situation is not only inferior to free trade it is inferior to autarky. Welfare could be improved by the complete prohibition of trade, moving equilibrium to E, the no-trade position. Of course the

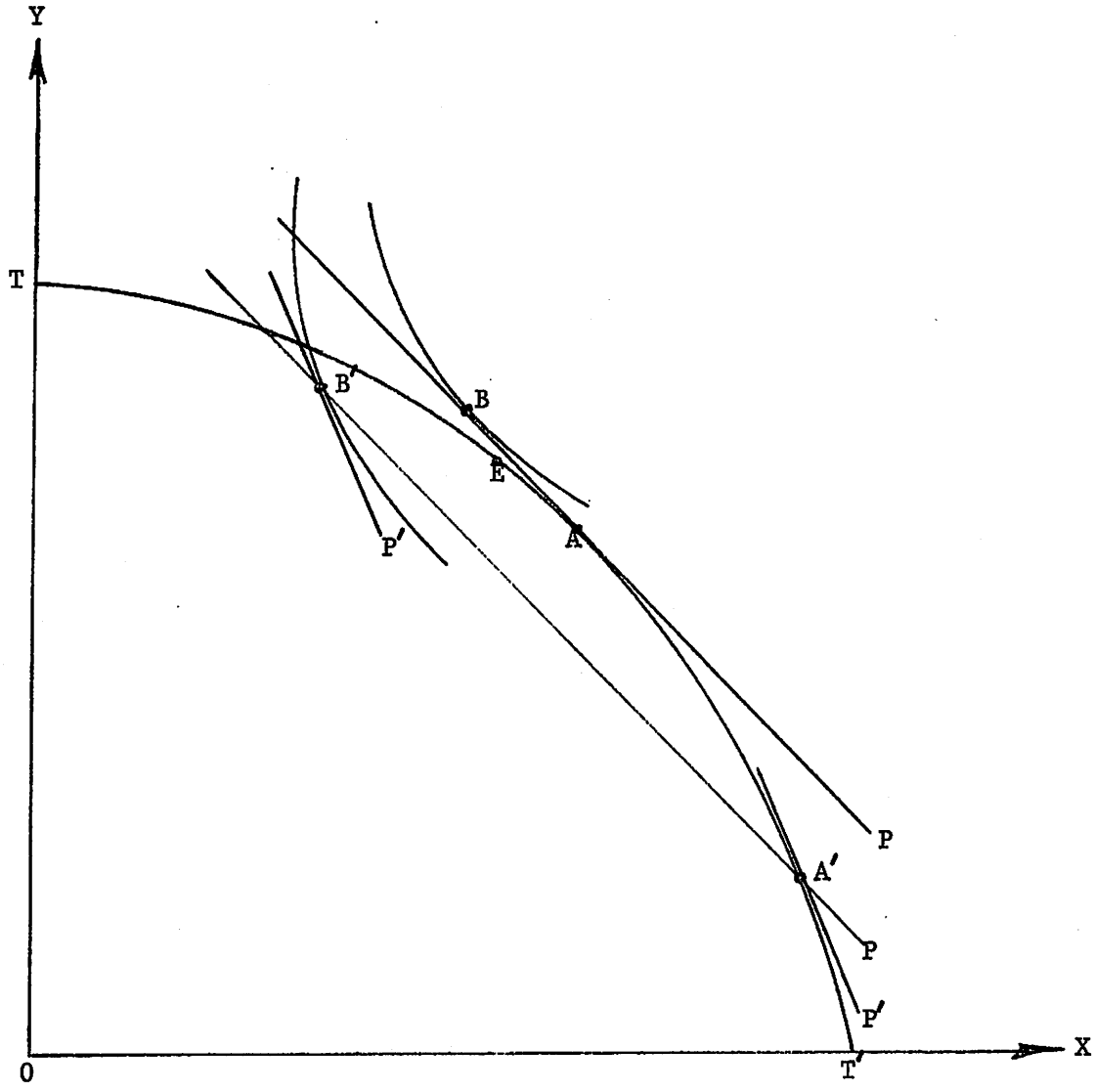


Figure 3

tax-subsidy program is not necessarily worse than autarky, for with a small enough difference between p and p' the indifference curve through B' could lie above E. On the other hand, Figure 3 has made no attempt to depict the worst possible case. Higher tax-subsidies than shown would move B' closer to the origin; indeed, A' could be on the segment $T'G$ of Figure 1.

A third possibility is worth consideration. In Figure 4 the pre tax-subsidy situation shows petroleum exported as was the case in Figure 2, although now the trade volume is small. The effects of the introduction of the tax and subsidy are now exactly as before except that the changes in production and consumption are larger than the initial volume of trade, so that in equilibrium petroleum is imported, and we have results similar to those of Figure 3. Again welfare has been reduced, and since B' lies inside the production set the tax and subsidy have reduced welfare below the autarky level. It can be seen that if the tax-subsidy policy reverses the pattern of trade, the equilibrium consumption point will <u>always</u> lie inside the production set. Utility is a monotonic decreasing function of the level of the tax-subsidy, and in Figure 4 one passes through autarky to move from consumption point B to B'. Note that for a tariff the welfare reduction stops when autarky is reached, for one cannot effectively impose a tariff on a commodity which is not being imported. Earlier in this section the relationship between tariffs and a tax-subsidy policy was noted. It can now be seen that while a tax-subsidy policy can always duplicate a tariff, a tariff cannot always duplicate a system of taxes and subsidies.

There are several implications of this analysis for the Canadian economy. One of the reported objectives of NEP is to make Canada self-sufficient in oil by 1990. Although to this point only one aspect of NEP has been analyzed, it is clear that the tax-subsidy policy very clearly moves the economy away from this goal. Furthermore the welfare costs of this

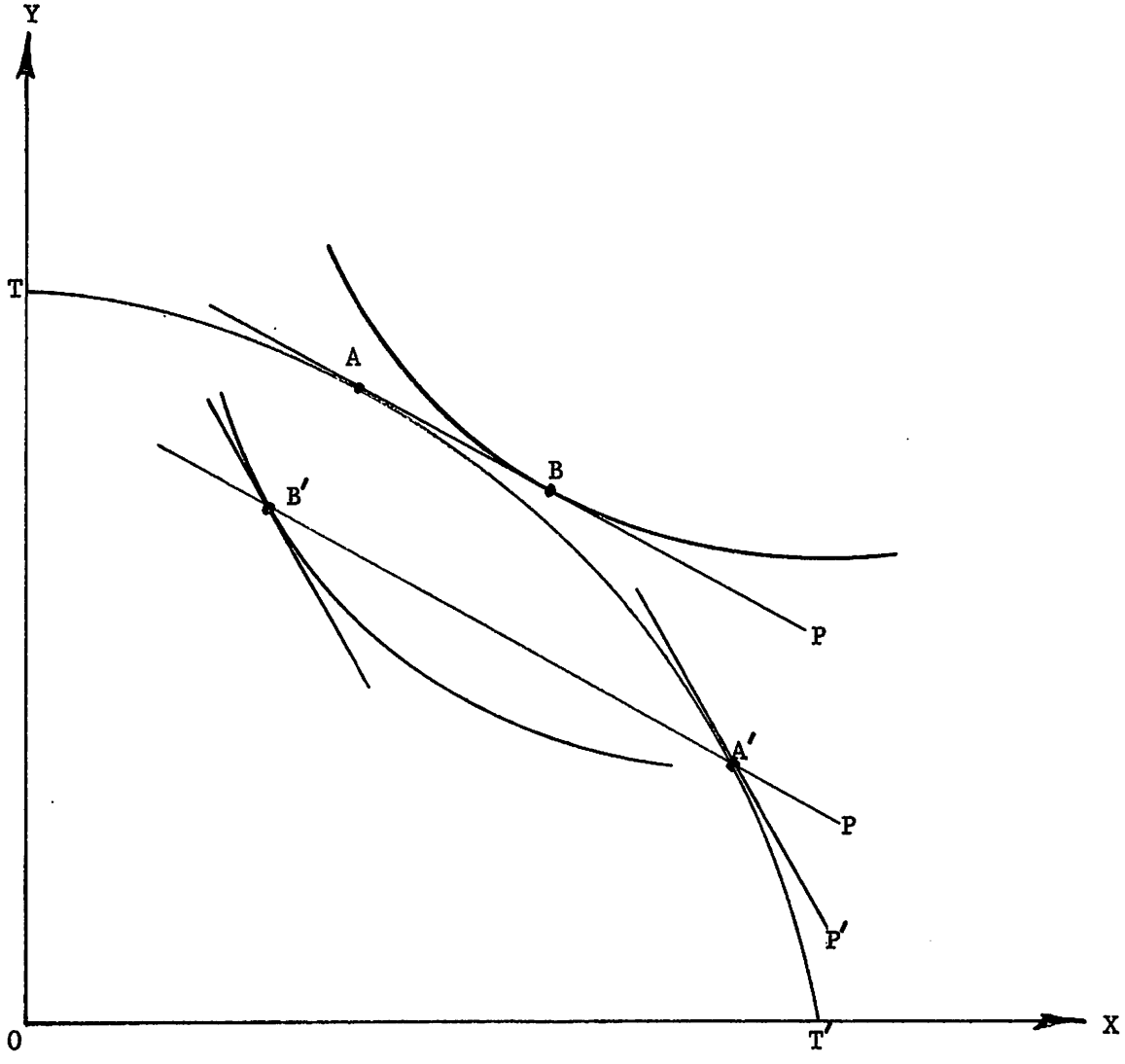


Figure 4

policy could be substantial. These conclusions come as no great surprise, of course, for a policy which reduces output and encourages consumption could hardly be expected to lead to self-sufficiency. Finally, it is interesting to recall that in the period 1970-1975, before the major increases in petroleum prices, Canada was a net exporter of oil. It is not difficult to believe that had prices in Canada been allowed to increase with world prices this export position could have been retained and even strengthened. Instead prices were maintained at well below world levels and Canada is now a substantial oil importer. It seems quite possible that the situation of Figure 4 is a reasonably accurate description of the Canadian case. Regardless of its stated objectives Canadian policy could well be the principal reason for the current dependence on foreign petroleum.

3. Incentives and Disincentives

The Petroleum Incentives Program (PIP) as contained in both NEP and OAPTA has three central features. First, the depletion allowances are reduced and completely eliminated by 1985 except on non-conventional and tertiary oil projects and crude oil upgraders. Second, these depletion allowances are replaced by a schedule of incentive payments. Third, the incentive payments are a function of the Canadian ownership rate. Thus by 1984 the Federal Government will pay 80 percent of all allowable exploration expenditures for any company that is over 75 percent Canadian owned. For a company less than 50 percent Canadian owned the maximum incentive payment is 25 percent of allowable expenditures. For development costs no incentive payment is provided for foreign controlled companies, while a company over 75 percent Canadian receives a 20 percent incentive payment.

It is clear that the incentive program provides a very substantial subsidy to exploration in the petroleum sector. Furthermore, because the subsidy is paid on the basis of expenditures rather than on income or on the return to capital, the program provides subsidies to firms whether they are successful in their exploration activities or not. If one could measure these subsidies in relation to the return on investment one would find a negative relationship between the rate of subsidy and the efficiency of the firm.

It seems clear that, by themselves, such subsidies would encourage firms to undertake exploration in areas which, by usual economic criterion, should not be explored. It should also be noted that insofar as such inefficient exploration is undertaken, 80 percent of the cost of the wasted resources is borne by Canadian taxpayers. The remaining 20 percent financed by Canadian corporations and individuals will be investment diverted from other, often more productive, uses in the economy. There remains, however, the question of the extent to which the PIP actually encourages activity in the petroleum sector. This question is addressed below.

Along with the incentives for exploration, the NEP has also imposed significant disincentives on the petroleum sector in the form of higher taxes. Thus while the government has made it less expensive to look for oil, they have made it significantly more expensive to find it. Three changes in the tax laws are important. First, as mentioned above, the generous 33-1/3 percent depletion allowance that previously applied to all petroleum production will, by 1985, be eliminated. Second, the Government has imposed a Petroleum and Gas Revenue Tax (PGRT) at a rate of 16 percent. This tax will apply to all oil and gas production revenue beyond a 25 percent resource allowance. Third, the Government has introduced an Incremental Oil Revenue Tax (IORT)

at a rate of 50 percent on incremental old oil revenues.[6] For this tax a deduction for royalties is allowed. Old oil is defined as any oil recovered by conventional means from a pool initially discovered prior to January 1, 1981. Thus the oil from new wells sunk in known pools is considered to be old oil.

Both the PGRT and the IORT are defined on a revenue base rather than on income. At the same time the Government, by fixing the price of both gas and oil, has eliminated the possibility of these taxes being reflected in higher commodity prices. Thus the taxes must be borne entirely by producers, and both taxes have the same economic effect on production as would a decrease in the price of output.

It is clear that PIP and the two new taxes tend to operate in opposite directions, and thus before an analysis of their possible consequences can be undertaken it will be important to determine the relative effects that the incentives and disincentives would be expected to have. As was observed, PIP is a subsidy based on exploration and development costs. For successful explorations where revenue is generated the same effect could be achieved by a price increase. An estimate of the magnitude of the price increase that would be required to be equivalent to PIP can be obtained from the OAPTA estimates of revenues for the petroleum industry for the term of the contract.[7] It was estimated that for the five years of the agreement total PIP payments to the industry will be 4.3 billion and that total revenue for the industry will be 212.8 billion. Essentially the same incentive to the industry could therefore be provided by a 2 percent increase in after-tax petroleum prices. Relative to the oil pricing policy which maintains Canadian oil prices at between one half and three quarters of world levels, the effect of the petroleum incentive program is insignificant.

The effects of the new taxes, however, are quite another matter. These two taxes together are expected to yield 20.5 billion dollars throughout the life of the contract, and from the point of view of the industry are equivalent to a 9 percent output price reduction. It is also interesting to note that the estimate of corporate taxes from the industry for this period is 19.7 billion dollars, or almost 4 billion per year as compared to the less than 2 billion collected in 1979 with depletion allowances in place.

The effects of both PIP and the tax changes can be illustrated geometrically in diagrams similar to those of the previous Section. PIP has been characterized as a subsidy to cost which would be equivalent to a small increase in the price of Y. The effects will be in the opposite direction to those of the tax-subsidy described earlier. Relative to the large changes associated with the pricing policy, however, the effects are insignificant. The taxes have the same kind of effect on production as does the pricing policy discussed earlier, except that only producers are affected, so that these taxes put a wedge between producer and consumer prices creating a commodity market distortion. The removal of the depletion allowance is somewhat different, however, for depletion is an allowance made against corporate income for tax purposes, and thus the depletion allowance involves a factor market distortion.[8]

It is assumed initially that a uniform rate of corporate tax applies to both industries X and Y so that there are no distortions. Here we consider only the corporate income tax and the revenue taxes, so that the effects of the tax-subsidy program discussed in the previous section are not included, but they will be reintroduced later to examine the total effects of the NEP.

In Figure 5 TAT' is the production possibility curve for the situation where the same rate of corporate income tax applies to both industries, so

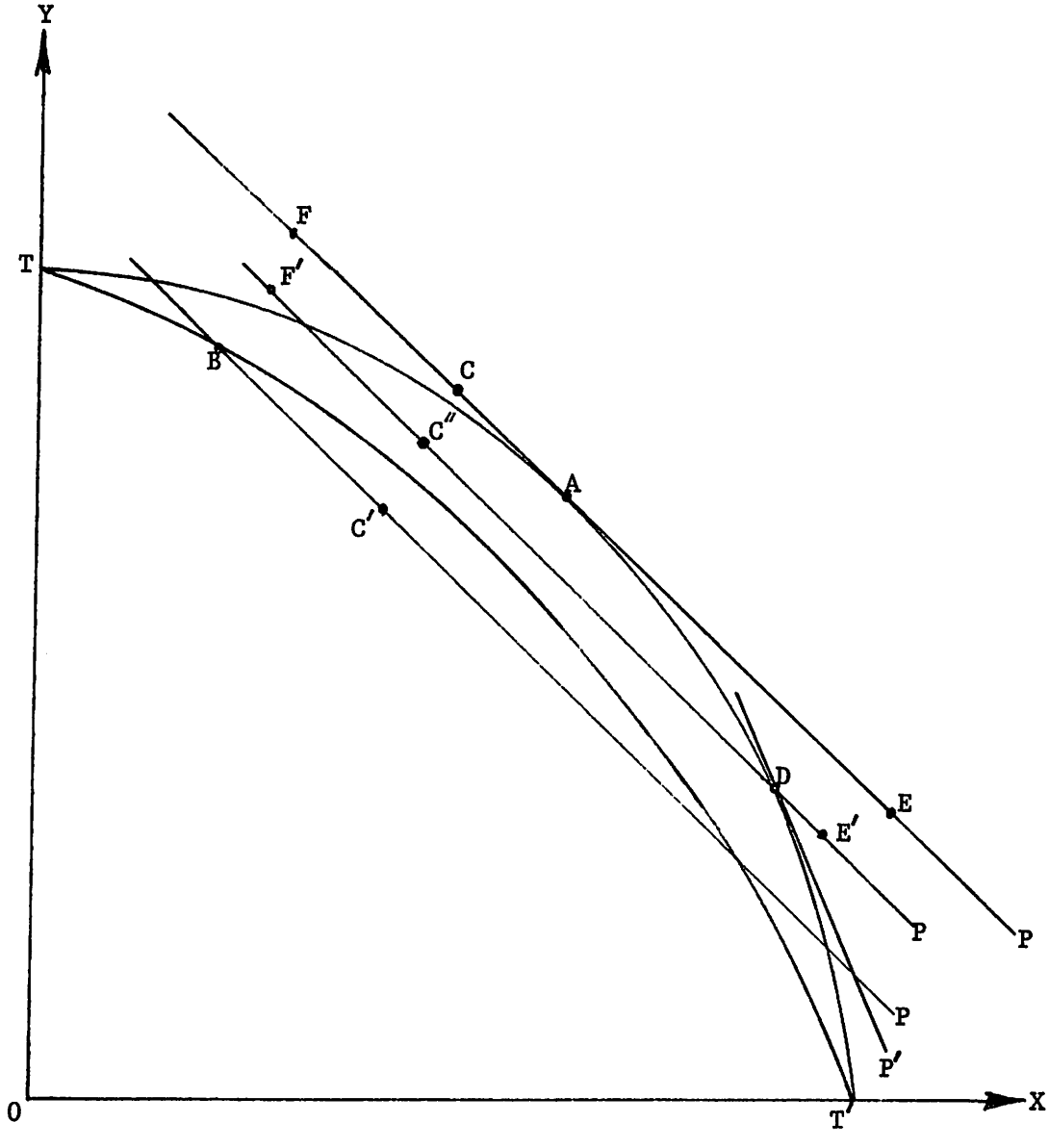


Figure 5

that there is no distortion. The world terms of trade are assumed fixed and equal to p. At this price ratio consumption is at point C implying that oil is imported. A depletion allowance is now introduced which reduces the corporate taxes paid by the petroleum industry. This will shift the output locus to a position such as TBT′ with production at B and consumption at C′. The imposition of the depletion allowance has changed the economy from an importer to an exporter of oil, but has done so at a substantial welfare cost. Of course this reversal of trade is a consequence of the initial choice of consumption point C. But wherever is C the depletion allowance will increase exports (or reduce imports) of commodity Y. The situation with production at B and consumption at C′ could represent the Canadian economy for the period 1970-1975.

Now consider the removal of the depletion allowance and the introduction of the PGRT and IORT. The removal of the depletion allowance will eliminate the factor market distortion and move the economy back to producing at A. The introduction of the two taxes on revenue will lower the price of Y for producers to p′ and move production to a point such as D. Prices to consumers will be unchanged and consumption will be at a point such as C″. It is clear that the removal of the depletion allowance will raise welfare while the new taxes will lower it, and the net effect is indeterminate. Both changes will increase imports (or reduce exports) of Y, and thus both policies act against the goal of self-sufficiency in oil.

In general the new taxes need not result in the final consumption point being in the interior of the production set, for if consumption had initially been at E, consumption after taxes would have been at E′. Alternatively F and F′ could have been the two consumption points. Note, however, that if the policy change reverses the pattern of trade then the consumption point must lie inside the production set.

It has been shown that the welfare effects of the removal of the depletion allowance and the introduction of the new taxes have opposite effects on welfare. The relative magnitudes of these two shifts will depend on the extent to which the depletion allowance would have been expected to shift the production possibility curve. The inward shift of the production possibility curve results from the fact that a factor of production receives a different return in the two industries resulting in the production point not being on the efficiency locus. The extent to which such a distortion will reduce output will depend on the degree of substitution among factors in the two industries and the size of the factor market distortion. In general the less substitution there is among factors in production the less will a factor market distortion reduce output. Indeed with Leontief isoquants (no substitution) such factor market distortions will create no output inefficiencies, and this will be true regardless of in which industry there is no substitution. It seems reasonable to suppose that in the production of petroleum, the extent to which capital can be substituted for other factors is small, and thus it seems likely that the original production distortion due to the depletion allowance was small.

Another factor affecting the degree of the distortion will be the extent to which depletion actually lowered the corporate tax liability in the petroleum sector. In estimating the effects of the corporate income tax on trade, Melvin (1979) has estimated corporate taxes paid as a proportion of the value of output for all industries in the Canadian economy. The average rate, weighted by value of output, for the 110 industry input-output table for 1969 was 1.59 percent. Thus on average approximately 1.6 percent of the value of output was paid in corporate income tax. For the

petroleum sector the rate was 1.96 percent, indicating that even with the depletion allowance the petroleum sector paid higher than average corporate taxes measured as a proportion of sales. Of course this will only give an indication of the relative rate of tax on capital if the petroleum sector has a capital-labour ratio not much different than the average for the rest of the economy. But even if one assumes that petroleum is relatively capital intensive it does not appear that the petroleum sector has had much of an advantage relative to other industries.

If one accepts the proposition that there is very little scope for factor substitution in the petroleum sector and that the depletion allowance has not resulted in the petroleum sector paying a significantly lower rate of corporate tax than other industries, then one must conclude that the overall production distortion introduced by the depletion allowance was relatively small. Similarly, removal of the distortion would result in only a modest welfare gain. It thus seems probable that the welfare reductions associated with the tax increases have dominated the welfare gain associated with the removal of the depletion allowance.

In Figure 6 the effects of both the oil pricing policy and the tax policy are combined. Beginning with the taxes, the removal of the depletion allowance will move the economy to A and the new taxes will move production and consumption to D and C'' respectively. The shifts due to taxes shown here are assumed to be net of the effects of PIP. The introduction of the pricing policy will reduce the price of Y for both producers and consumers and the production and consumption points will be E and F respectively. It is clear that the two policies are reinforcing, for both reduce welfare and increase imports.[9]

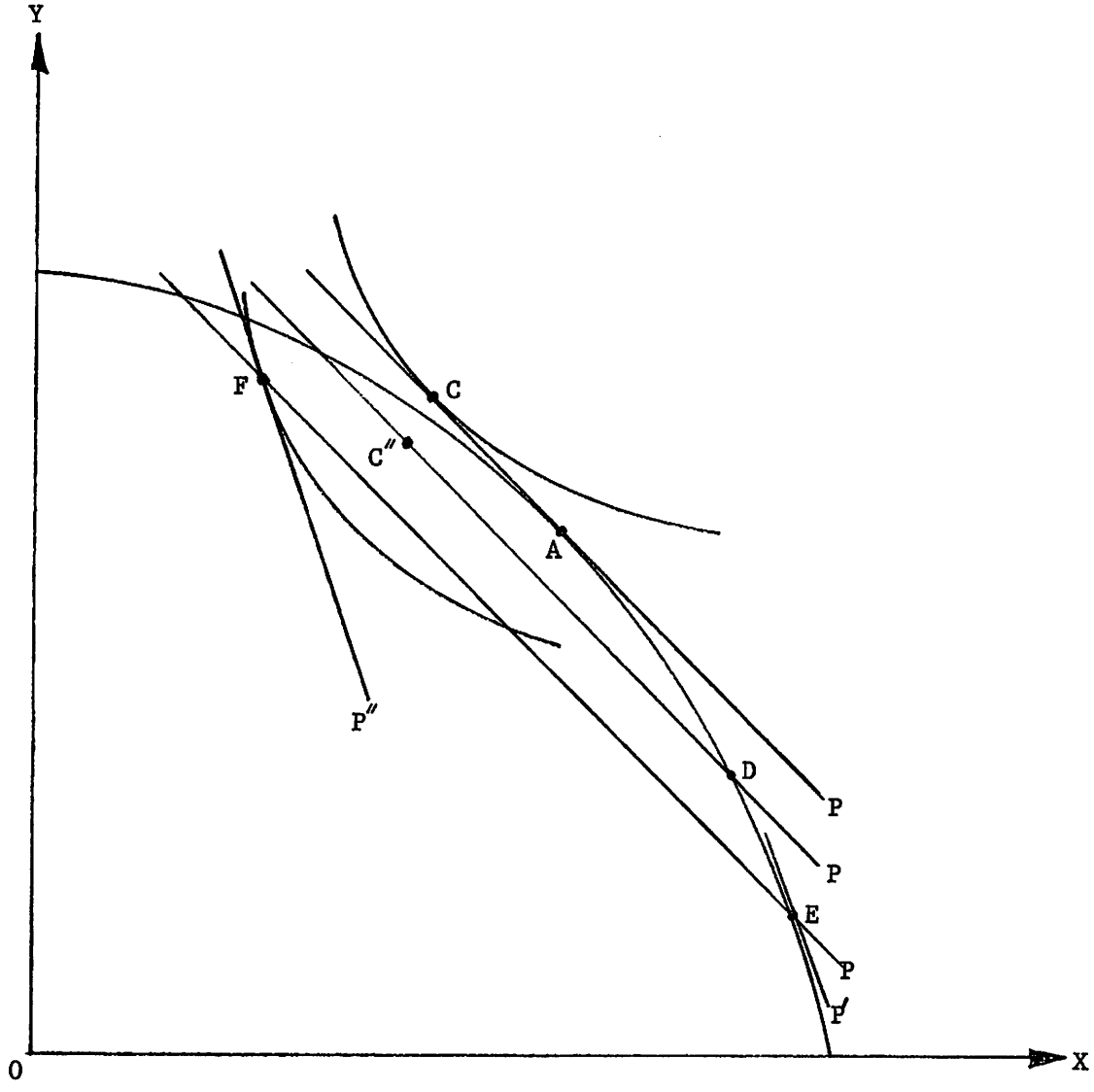


Figure 6

4. Intermediate Good Effects of NEP

One of the purposes of the National Oil Program was to keep Canadian production costs low by keeping oil prices low and thus assisting Canadian manufacturers in foreign markets. To quote, "In addition, oil and gas prices under the Program will have relatively moderate effects on the costs of production and transportation, thus providing a significant competitive advantage to Canadian industries."[10] There would seem to be a number of difficulties with this argument however. First, petroleum is used so widely throughout the economy, both as a fuel and as an intermediate input, that literally no sector of the economy can escape the effect of a petroleum price change. Even for those industries which do not use petroleum directly as a fuel or as an input, price increases will result from the indirect effects of price increases on other inputs. This means that, to some extent at least, a petroleum price increase results in a kind of general inflation, and in a country such as Canada with a floating exchange rate, differential inflation rates across countries will be taken care of by exchange rate changes. Thus insofar as Canadian oil price policy prevents the prices of Canadian goods from rising as fast as they are rising elsewhere the exchange rate will adjust to maintain equilibrium in the foreign exchange market. There will, of course, be relative price differences and these are discussed below.

It is also important to note that while petroleum price increases result in pervasive price increases throughout the economy, the commodity price increases associated with relatively large petroleum price changes are quite modest. Melvin (1976), using an input-output model, has calculated that a doubling of the price of crude oil would result in an average price increase across all industries of less than three percent. Given that

Canadian crude oil prices are presently about one-half the world level, this suggests that moving immediately to world prices would only increase prices, on average, by about three percent. Such an increase seems very modest relative to the high rate of inflation that presently exists in the economy.

From the point of view of individual industries it is not the average price increase associated with oil price increases that is important, but rather the dispersion of individual commodity prices around the mean. Again the empirical estimates of Melvin (1976) show a surprising consistency of price changes across industries. Leaving aside petroleum products themselves, only 6 of 65 industries show price changes of less than one percent. These six include Communications, Finance, and Clothing, industries which would not be expected to be heavy users of petroleum products. Furthermore, only two industries, Other Chemicals and Electrical Appliances, show a price increase in excess of 4 percent.

Even if keeping Canadian petroleum prices significantly below world levels does provide some small advantage to several Canadian industries, it is not clear to what extent this will increase exports. There is no obvious relationship between industries which are heavy users of petroleum and those which have established export markets. Furthermore, it is not at all clear that Canada should be encouraging industries which are heavy energy users at a time when many of such industries are contracting or being phased out completely elsewhere in the world. Canadian oil pricing policy would seem to be encouraging industries of the past rather than industries of the future.

5. Summary and Conclusions

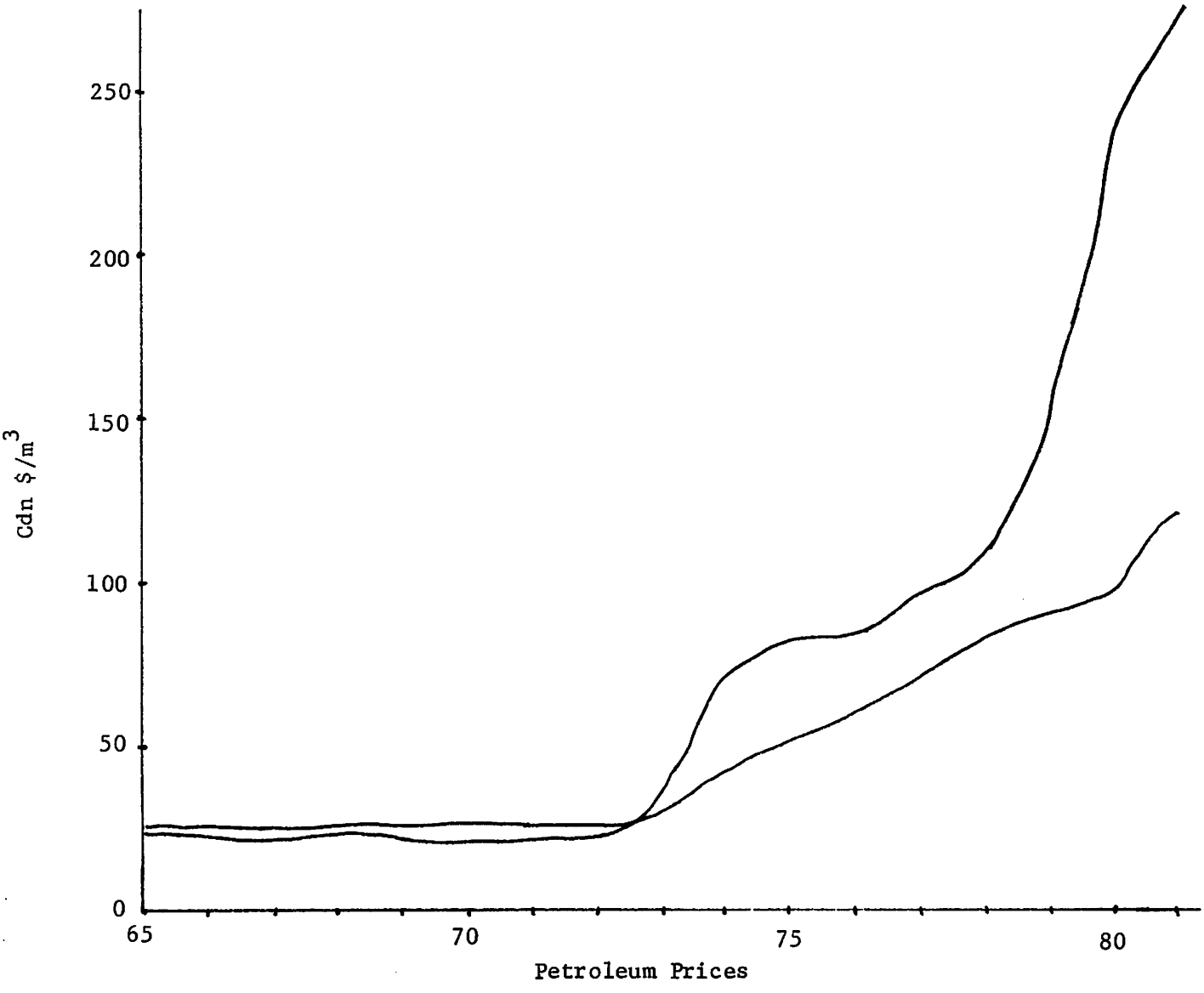
The purpose of this paper has been to examine several aspects of Canadian oil policy in terms of their general equilibrium consequences. The effect of keeping Canadian petroleum prices lower than world levels was shown to be equivalent to a tax-subsidy system. For the case in which petroleum was initially exported this pricing policy was shown to be equivalent to a tariff on the other industries. When the initial situation has petroleum imported at world prices the tax-subsidy program acts as an export subsidy. There is also the possibility of the tax-subsidy program reversing the pattern of trade. In this case the final equilibrium position will necessarily be worse than autarky. In all of these situations welfare is reduced below the free trade position, and in some cases below the autarky level. Imports of petroleum are always increased (or exports reduced).

The petroleum incentive program and the tax changes were then considered, and it was argued that because removal of the depletion allowance removed a factor market distortion, this aspect of the program would be welfare improving but would also increase imports of petroleum. The new taxes, because they are levied on income, have the effect of a further price reduction. The PIP can be considered as a price increase, but is small relative to the tax increases, thus resulting in a net effect equivalent to a substantial price reduction for petroleum. Thus welfare will be further reduced and imports of petroleum increased. The combination of the incentive program and the tax changes are clear with their effect on trade, for all act to increase imports of petroleum. The effect on welfare is less clear, however, for the removal of the depletion allowance increases welfare while the other changes reduce it.

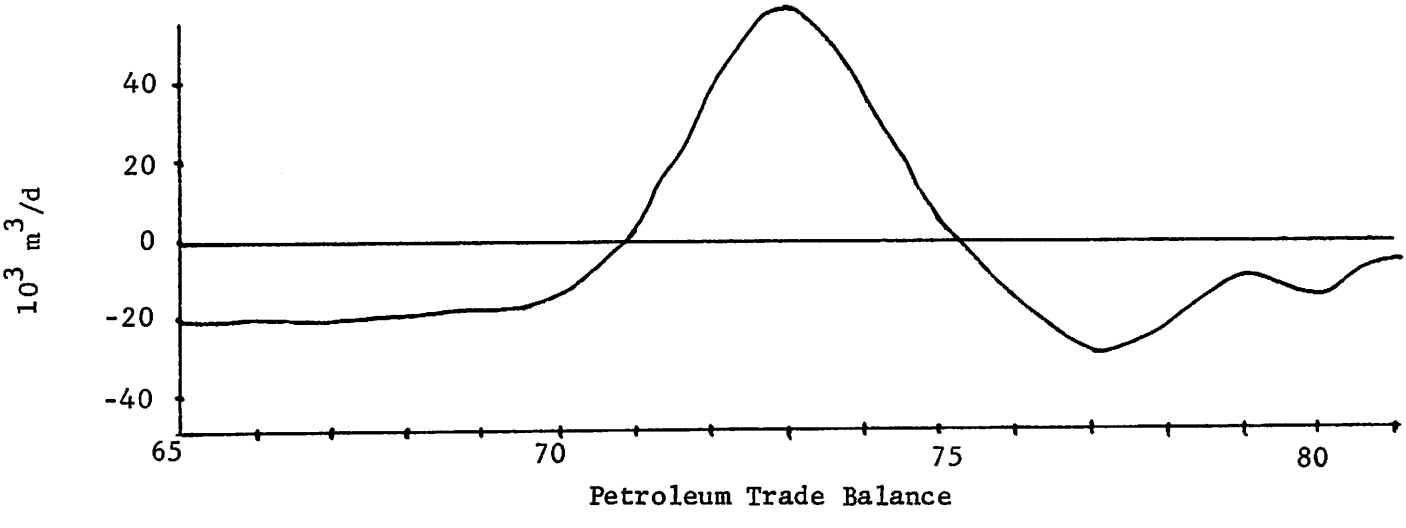
All of the policies which have been discussed in this paper have been shown to increase petroleum imports and thus all act against the Government's stated goal of self-sufficiency in petroleum. Some indication of the extent to which pricing policies of the past have affected the trade balance in petroleum can be seen from Graphs 1 and 2 which show Canadian and world oil prices from 1965 to 1981 and the imports and exports of oil for this same period. It can be seen that during the 1970's Canadian oil prices were slightly above world prices, and imports were positive and quite constant. World prices began to increase in 1970 and Canadian production began to increase. Indeed, over the two year period 1971-73 Canadian production of petroleum rose over 33%. By 1971 Canada was a net exporter of petroleum, and by 1974 had a trade surplus in petroleum of over 1 billion dollars. By 1973 world prices were above Canadian domestic prices and it became clear that the Canadian Government would not allow Canadian prices to follow world prices. Exports peaked in 1973 and by 1976 were back to 1971 levels. These production shifts, along with steadily rising domestic demand in this period, resulted in a substantial balance of payments deficit in petroleum by 1977.

It seems clear that there have been very significant supply responses to past oil pricing policy, and modest demand responses. One cannot help but wonder what the Canadian balance of trade in petroleum would now look like had Canadian prices been allowed to increase with those of the rest of the world. It certainly does not seem unreasonable to speculate that there would still be an export surplus.

In terms of the Government's own stated objectives it is difficult to see how current oil pricing and tax policy could have any chance of success.



Graph 1



Graph 2

Indeed the policy is counterproductive in that it will lower welfare and increase petroleum exports. Nor can any significant secondary benefits from artificially lower prices be expected, for the effects on manufacturing costs are small and in any case will be wiped out by exchange rate adjustments. The only real effect of maintaining oil prices substantially less than world prices would seem to be the significant transfer of wealth from Alberta to the rest of Canada that is generated. It is difficult to escape the conclusion that this, in fact, is the real purpose of the National Energy Program.

One final argument remains to be considered. It has been suggested that the National Energy Program may have increased the welfare of Canadian citizens because it has resulted in a transfer of income from foreign owners of oil companies operating in Canada to the Canadian Government. It is certainly clear that the recent pricing agreement has resulted in a larger share of petroleum revenue for the Federal Government, and <u>some</u> Canadians are therefore almost certainly better off (Easterners, for example). Equally as clear is the fact that the welfare of some other Canadians has been lowered (Albertans, for example).

Even putting aside the difficulties of interpersonal utility comparisons it is not clear that the pricing policy has resulted in a larger share of total industry revenue for the government. One might ask, for example, how tax revenues under the new pricing policy would have compared to those which would have existed had the policy simply been to allow Canadian oil prices to go to world levels. The Government of Canada has estimated that in 1979 almost 60 percent of oil and gas production income was collected by the Federal and

Provincial Governments.[11] Of this 60 percent, 51 percent was Provincial and 9 percent Federal. The Government's explanation for the low Federal share is the substantial incentives, in the form of resource allowances, exploration cost write-offs, depletion allowances and so on, which were given to the petroleum sector. It is argued that while the nominal Federal corporate tax rate is 36 percent, the effective rates for the petroleum industry are 10 percent. It is clear, then, that the elimination of some of these "incentives" could have resulted in a significant increase in the Federal Government's share at the expense of the industry. Furthermore, these estimates were for 1979 when Canadian oil prices were significantly below current world oil prices. Historically, the government's share of revenues has been an increasing function of total revenue, and this would have been expected to continue with further price increases. Thus one might conservatively estimate that had some incentive programs been removed, and had Canadian prices been allowed to go to world levels, the total government's share of industry revenue could easily have risen to 70 to 75 percent.

According to the calculations in the Pricing Agreement, the total federal plus provincial share of total revenue for the period 1981-86 is expected to be 56 percent.[12] If one accepts the argument that the Agreement has reduced the size of the petroleum sector in Canada, one must conclude that the Agreement has resulted in a much smaller share of a smaller pie for the government sector.[13] Thus while it is clear that the Agreement has resulted in a substantial transfer of income from Alberta to Eastern Canada, it is difficult to see how one could support the argument that there has been a transfer from foreigners to Canadians.

Footnotes

[1]For a description of the National Energy Program, see Energy, Mines and Resources (1980).

[2]For this agreement, see Energy, Mines and Resources (1981).

[3]Two examples are J. F. Helliwell (1981) and J. F. Helliwell and R. N. McRae (1981). See also issue VI:3 of Canadian Public Policy.

[4]This model has been carefully analyzed by Burgess (1980). His purpose was somewhat different than ours, however, and he concentrated his attention on the effect a tariff on commodity X would have on factor returns. Nevertheless many of Burgess's results have relevance for the discussion here.

[5]Of course only total net demand is important, and there is no reason to assume that intermediate use comes from domestic production and final consumption from imports.

[6]The increment to which the tax is applied is the difference in the price of old oil between the NEP proposal and the schedule agreed upon in OAPTA.

[7]The estimates of tax and subsidies are from Energy, Mines and Resources (1981).

[8]The discussion of factor market distortions was initiated by Johnson (1966), and a significant literature has developed since that time. Among the important contributions are Herberg, Kemp and Magee (1971), Jones (1971), Kemp and Herberg (1971) and Magee (1971 and 1973). Melvin (1982) has discussed the corporate income tax as a factor market distortion in an open economy. Such distortions have several consequences. First, the locus of possible

production points will lie inside the efficient production possibility curve, and this new locus of production points may have sections which are convex to the origin, or may be convex over its entire length. Furthermore, the equilibrium price line will no longer be tangent to the output locus in equilibrium, and under certain circumstances commodity price changes (or changes in the distortion) may result in perverse output changes.

The effects considered here will be limited to the inward shift of the locus of production points and the non-tangency of the price ratio and the output locus.

[9]Again, consumption need not be interior to the production set.

[10]Energy, Mines and Resources (1980), p. 114.

[11]See Energy, Mines and Resources (1980), p. 13.

[12]See Energy, Mines and Resources (1981), p. 22.

[13]Note that the government's share in 1979 with the lower price was 60%, already larger than the projections for 1981-86.

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