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A SENSITIVITY ANALYSIS OF INVESTMENT INCENTIVE VALUES IN FOREIGN INVESTMENT PROJECTS

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Introduction

The degree of government involvement in business is one of the major characteristics that distinguishes international business from domestic business. This is even more true of less developed countries (LDCs) whose governments show a strong desire to influence and control business operations, both domestic and foreign. The firms located in LDCs face both the incentives and restrictions that are designed to direct and regulate their operations. This paper is concerned with the questions related to the incentives offered by host LDC governments to foreign manufacturing investments.

Unlike developed countries whose primary objective in offering incentives is to develop the depressed areas or to stimulate business investment in general, LDCs are primarily attempting to develop certain sectors of the economy, usually "strategic" manufacturing industries, and to promote exports in order to improve the balance of payment position. As in shown in Table 1 on the next page, almost all LDCs offer some types of incentives to domestic and/or foreign investors. In the table, three general types of incentives are

Table 1

TYPES OF INCENTIVES USED BY LESS DEVELOPED COUNTRIES
(Number of Countries)

Incentive Types	Latin America (11)*		Asia (10)**		Total (21)	
Fiscal incentives						
Tax holidays	8	11	7	9	15	20
Tax allowances	6		4		10	
Accelerated depreciation	2		3		5	
Financial incentives						
Capital grant	2		2		4	
Tariff incentives						
Duty exemptions	8		8		16	
Tariff protection	8		5		13	

*Argentina, Brazil, 5 Central American Common Market Countries, Chile, Colombia, Ecuador, Mexico, Panama, Peru, Puerto Rico, and Venezuela.

**Hong Kong, India, Indonesia, Malaysia, Pakistan, Philippines, Singapore, South Korea, Taiwan, and Thailand.

Source: Business International, Investing, Licensing and Trading Conditions Abroad, various issues.

identified. Financial incentives are found to be the most widely used incentive measure. The "tax holiday," a tax exemption on income or sometimes other taxes, is offered for the period of from 2 to as many as 30 years. The mean for 15 countries which used the measure was 7.25 years. The tax allowance makes provisions for a certain percentage (normally 15-35 percent) of capital investment to be deductible from taxable income for a specified period of time. Combining these two measures, 20 countries are using either one or both of them. (The only exception is Hong Kong.) Secondly, Table 1 shows that the capital grant is used by 4 LDCs. Two of them, Puerto Rico and Singapore, use the grant for manpower training purposes and the other two, India and Chile, for regional development programs. Import duty exemption is shown to be a measure widely used to stimulate certain types of activities, notably to promote exports. Lastly, thirteen countries indicated that they are willing to provide some kind of tariff protection to prospective foreign investors.

The question of measuring the effectiveness of investment incentives poses a difficult methodological problem, because the ultimate test of the effectiveness is to find out "how many new investments would have been made even without a particular incentive during a certain period." Apparently, it is almost impossible to answer this question in any scientific way. Most studies done in this area used

the survey method, asking the firms why they invested where they did or whether the incentives affected their location decision at all.[1] Most studies concluded that the tax incentives had at best only a secondary effect on the investment decision. Despite this body of evidence, although not conclusive, it was shown earlier that most LDCs offer some tax incentives.

This research is intended to provide further evidence to convince LDC governments of the inefficiency of tax incentives, especially to foreign investors. The effect of incentives is analyzed using the discounted cash flow framework. Thus it is assumed that firms make the investment decision based on the expected profitability of a project. More specifically, the premise is that a firm makes the investment decision so as to maximize a utility function positively related to expected returns and negatively related to risk. Throughout the paper, the effect of investment incentives on a project's expected cash flows is analyzed assuming that the expected value of the future cash flows is known for the project. This is tantamount to assuming that the project's risk is unchanged by the incentives. Alternatively, it can be assumed that the risk is reflected in the discount rate used in calculating present values.

Net Present Value Model

Assuming that income before tax is nonnegative, the net present value of a project can be expressed as:

$$NPV_0 = \sum_{i=1}^{n} [NS(1+g)^{i-1}(1-t_e) + t_e \cdot D_i]/(1 + r)^i - F$$

where NPV_0: net present value of a project without any incentive

NS: operating income before tax and interest in Year 1

g: expected growth rate of NS

t_e: effective tax rate

D_i: depreciation charge in Year i

F: investment outlay expressed in the present value.

This expression can be applied to both the subsidiary and the parent. If the cash flows are to a foreign parent, t_e would be the effective tax rate accounting for both host and home country taxation. If an incentive is offered, NPV will be calculated reflecting the incentive. If this new NPV is expressed as NPV_I, then the "incentive value" is simply ΔNPV, or $NPV_I - NPV_0$.[2]

In order to obtain the sensitivity of incentive values to various project characteristics and tax/accounting variations and also to compare the relative effectiveness of alternative incentive measures, a deterministic computer model was developed to be used as the basic

tool of the sensitivity analysis. Basically, the model will calculate net present values for the subsidiary and the parent, given various inputs describing project characteristics and tax/accounting methods. The model will calculate different NPVs for each input; NPV without any incentive, NPV with the tax holiday of M years, with the capital grant of $X representing the same cost as the tax holiday to the government, with the capital grant of Y percent of total capital investment, and with the accelerated depreciation (double declining balance) method. The model makes the following assumptions:

1. 100 percent ownership of the subsidiary by the parent
2. Only form of cash flow to the parent is dividend and repatriation of the capital
3. Net income (excluding depreciation charges) grows at a steady annual rate of G percent and that reinvested earnings make the return of R percent annually
4. There is no risk of repatriation blockade or currency fluctuation
5. The home country grants the foreign tax credit, but permits neither carryovers nor the overall limitation
6. Dividends are assumed to be repatriated from the latest earnings (LIFO) by the home country tax authorities
7. Salvage value to be the present value of (investment - accumulated depreciation)

These assumptions, though in some cases departing from the real life, do not systematically and consistently bias the results because the basic objective is to determine the sensitivity of net present values

to changes in incentives and other project characteristics. Concerning the fifth assumption, this is the system adopted by some European countries. As assumed, if neither carryovers nor the overall limitation are allowed, the usefulness of the foreign tax credit becomes relatively limited. Thus, this assumption represents the case in which the home country tax treatment is least favorable to direct investment income. If both these assumptions were relaxed, the investor would probably match tax credits to all of its foreign earnings and reduce taxes on foreign earnings significantly. The most favorable tax treatment of direct investment income by the home government is, of course, not to tax the foreign income at all. If this were the case, the parent NPV would come close to the NPV of the subsidiary, except for the dividend withholding tax imposed by the host country. Thus it is intended that NPVs to the subsidiary also represent the NPVs to the parent under the most favorable tax treatment by the home government.

Sensitivity of Incentive Values

In this section, the major interest lies in determining how incentive values respond to different project characteristics and tax/accounting rules. Three incentive measures are compared: a tax holiday of 5 years, a capital grant equivalent to 20 percent of capital

investment, and accelerated depreciation using the double declining balance method. Incentive values are measured in terms of the index of incentives, defined as follows:

NPV1; with no incentive
NPV2; with a tax holiday of 5 years
NPV3; with a capital grant of 20 percent of total capital investment
NPV4; with a capital grant equivalent to the tax holiday in terms of its cost to the government
NPV5; with accelerated depreciation

$$\text{Tax Incentive Index (TII)} = \frac{NPV2 - NPV1}{F}$$

$$\text{Capital Grant Index 1 (CGI1)} = \frac{NPV3 - NPV1}{F}$$

$$\text{Capital Grant Index 2 (CGI2)} = \frac{NPV4 - NPV1}{F}$$

$$\text{Accelerated Depreciation Index (ADI)} = \frac{NPV5 - NPV1}{F}$$

It can be seen that an Incentive Index measures the contribution of the incentive to the NPV_0 of the project. The purpose of this section is to compare the changes in Incentive Indices to various changes in variables, not to compare the absolute level of incentive values. (CGI2 will be discussed in the next section.)

The basic input set used in the analysis, if not assumed otherwise, is as follows:

1. Tax Rates;

   host country income tax (IJ); .40
   host country withholding tax (TW); .15
   home country income tax (TH); .48

2. The growth rate of net sales (G); .05
   Number of Reinvesting Years (WN); 0
   Number of Project Years (N); 10
   Number of Depreciation Years (DY); 10

3. Discount rates for all parties; .15
   (R, RG, RP)

In each of the four variations shown in Figures 1 through 4, incentive indices to the parent and subsidiary are shown separately. In each figure, four graphs are shown. Figures 1.1 and 1.2 show the sensitivity of incentive indices to different tax rates in the host country. To the subsidiary, as can be expected, TII_s (subscripts s and p refer to the subsidiary and parent, respectively) is a straight increasing function of the tax rate. To the parent, however, the tax incentive index is negative until the host tax rate reaches approximately 38 percent. This, of course, is due to the foreign tax credit system adopted by the home government. Together with the 15 percent dividend withholding tax rate, the host country taxation of approximately 50 percent determines the dividing point at which the tax holiday becomes of any value to the parent.[3]

In contrast to this, ADI_p shows a slightly increasing function to the host tax rate. $CGII_p$ is a decreasing function of the tax rate,

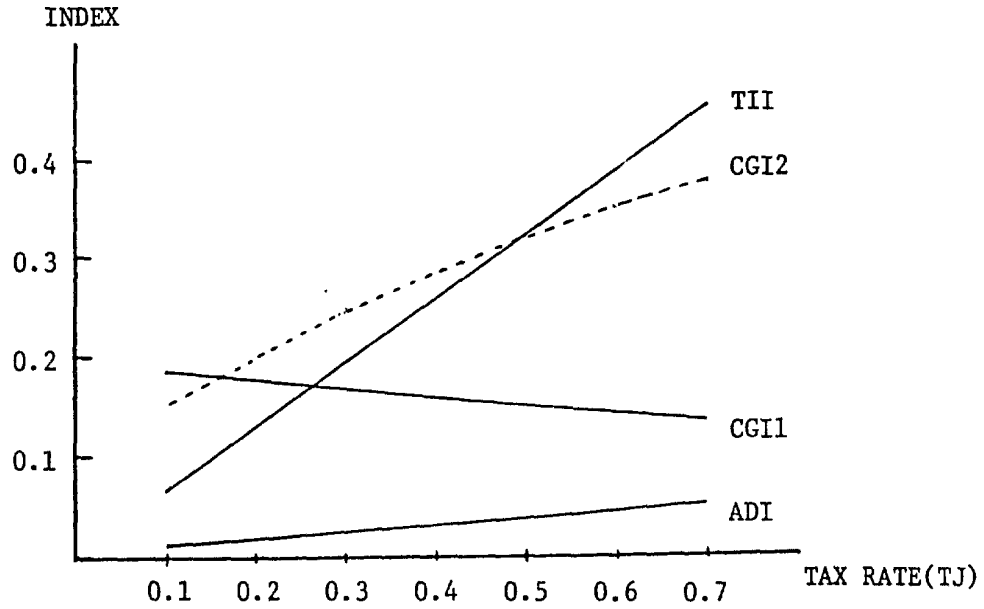

FIGURE 1.1 Incentive Index and Host Country Tax Rate (Subsidiary)

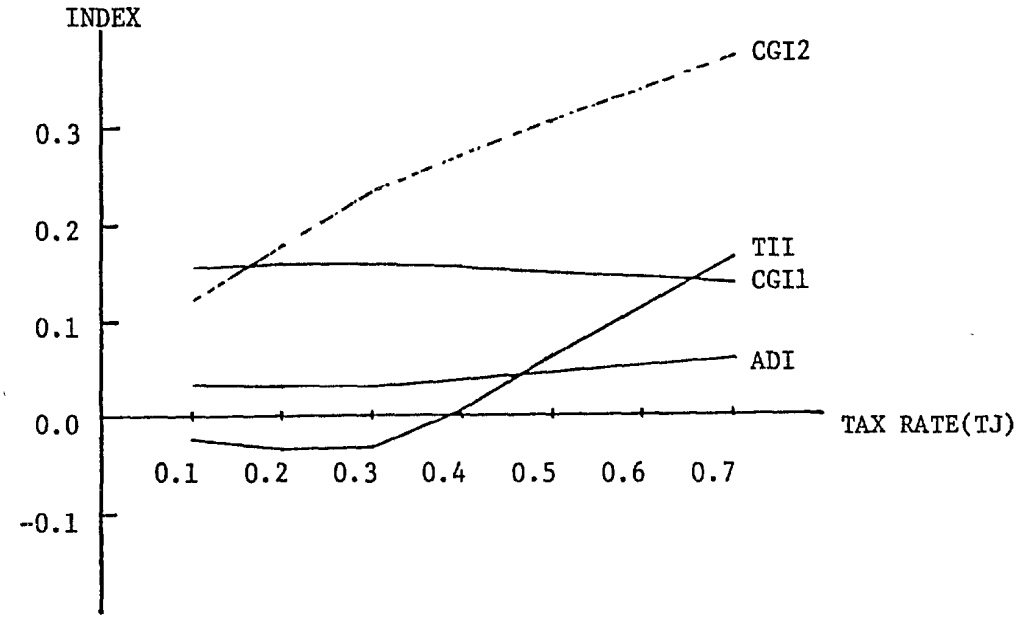

FIGURE 1.2 Incentive Index and Host Country Tax Rate (Parent)

as is the case with the subsidiary. Because of the decreased depreciation base, more income is subject to the income tax. It should be noted that ADI_p is greater than ADI_s; whereas in the other two indices, returns to the parent were always smaller than returns to the subsidiary. This results because accelerated depreciation increases cash flows which are not subject to taxation either in the host or home country. If, as is true in some countries, accelerated depreciation is not accepted for the home country tax purpose, ADI_p becomes dependent on the effective tax paid to the home country. If the tax credit is sufficient to absorb the taxes to the home country, the rule would not affect the ADI_p. If the parent pays additional taxes in the earlier years because of the rule, then the incentive value and index would decrease by that amount. Figure 1.2 shows that, under the conditions set here, the tax holiday is useless and even harmful to the parent in those countries where the effective tax rate (in this case the combined tax rate of income tax and withholding tax) is lower than the tax rate of the home country.

In Figures 2.1 and 2.2, indices are shown against the number of years the firm plans to reinvest in the host country, WN. If the firm reinvests earnings during the tax holiday period, those earnings are in effect an interest-free loan to the firm. Since the firm would pay the full burden of tax to the home government if repatriated during

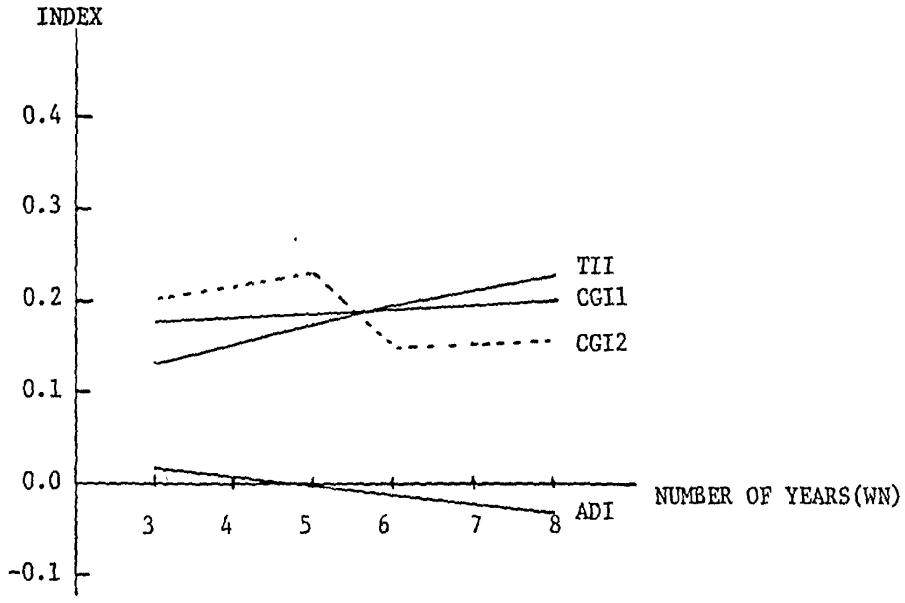

FIGURE 2.1 Incentive Index and Number of Reinvesting Years (Subsidiary)

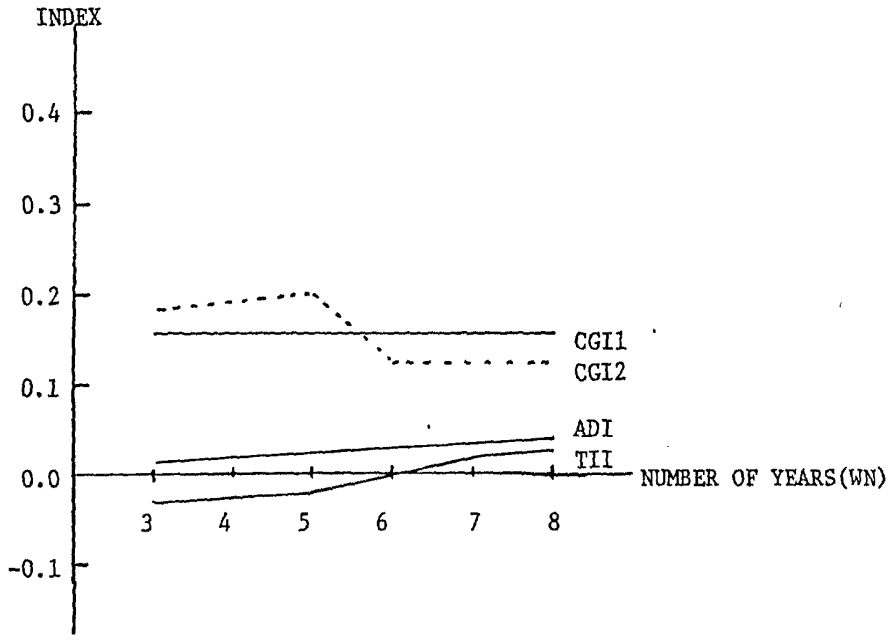

FIGURE 2.2 Incentive Index and Number of Reinvesting Years (Parent)

the tax holiday, there is added incentive to reinvest in the subsidiary as long as the return from the reinvestment is satisfactory. In Figure 2.2, it is shown that TII_p increases when WN exceeds M, the number of years in the tax holiday. This results because from Year M+1 the parent will be able to apply tax credit to the earnings repatriated to the parent, whereas up to Year M the parent will not pay any tax to the host country and thus has no tax credit to apply.

CGI1 is a slightly increasing function of the subsidiary and a slightly decreasing function of the parent. It is an increasing function because the capital grant with its decreased depreciation base allows more earnings to be reinvested during the period of W. However, to the parent, earnings from the reinvestment would be subject to additional taxation either in the host or home country, and together with the higher discount factor in a later year, the CGI decreases with higher WN.

ADI_s is shown to be a decreasing function of WN, because with accelerated depreciation comparatively fewer earnings are available for reinvestment purposes. However, for the parent, ADI is an increasing function because, with more years of WN and with accelerated depreciation, fewer earnings are affected by the adverse tax effect.

All in all, the effect of WN on the TII is the most dramatic, whereas the effect on the other two indices is rather insignificant. At least for the cases with the positive TII_s, a tax holiday provides an inducement to reinvest in the subsidiary. Although less dramatic, accelerated depreciation also provides the incentive to reinvest, whereas capital grant offers the incentive to repatriate earnings. It should again be noted that the effects on the last two indices are not as significant.

Figures 3.1 and 3.2 show the sensitivity of the indices to discount rates. First of all, TII_s is shown to be a decreasing function of the discount rate, evidently because some of the benefits of tax incentives accrue in some future periods and are therefore discounted more heavily. CGI_s, in contrast, is given in the first year, and therefore takes relatively higher values when the discount rates increase. ADI_s is affected little by the change in discount rates. Incentive indices for the parent show similar responses to changes in discount rates. Interestingly, the adverse effect of the tax holiday is reduced as the discount rate increases. In both cases (for the subsidiary and the parent), the higher discount rates mitigate the effect of tax holidays, causing absolute values of TIIs to decrease.

The same figures show that the higher the required rate for a project, the less important tax incentives become to the project. A higher required rate of return means either that the project is riskier

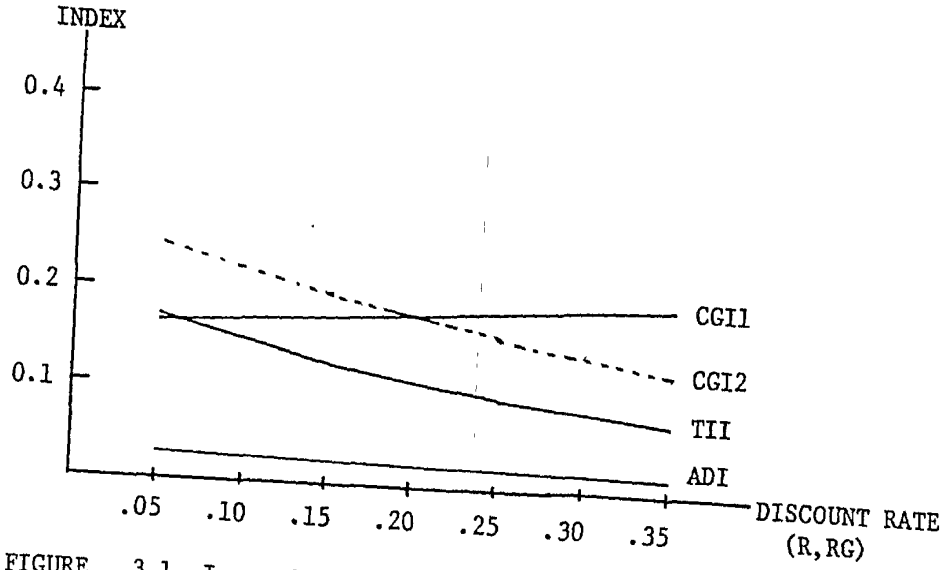

FIGURE 3.1 Incentive Index and Discount Rates(Subsidiary)

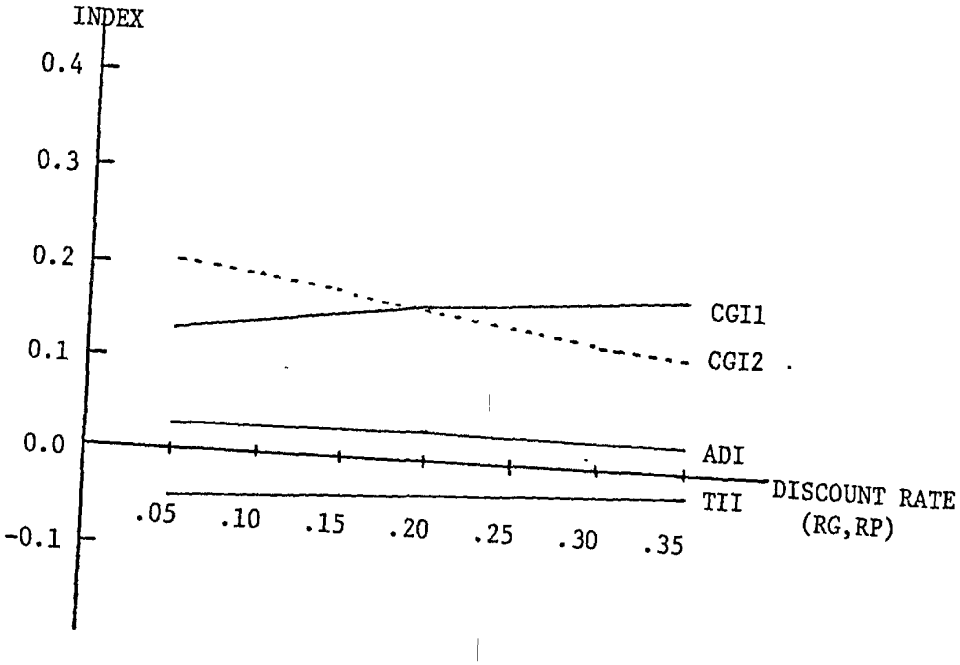

FIGURE 3.2 Incentive Index and Discount Rates(Parent)

or that it is in an industry where risk is greater due to rapid technological changes or other reasons. The riskier project would discount future earnings more heavily, and as a result the tax incentive becomes less important for such a project. In contrast, a capital grant is a "certain" sum of money available now, and naturally becomes more attractive to the investor as the discount rate increases. It should be noted that, if the government's cost of capital is the same regardless of a firm's discount rate, the cost of a tax incentive would remain the same for all these variations. In contrast to the last two cases (TJ and WN), in which the cost of tax holiday to the government actually increases with higher TJs and WNs, the tax incentive in this case costs the government the same amount while the effect of the tax holiday decreases.

Turning now to Figures 4.1 and 4.2, it is shown that the tax holiday assumes higher absolute values, both to the subsidiary and the parent, as the expected growth rate increases. As more profits are generated because of higher sales, more benefits will arise from the tax holiday. In contrast, the capital grant and accelerated depreciation values are independent of the expected growth rate of net sales. It can be seen that the tax holiday is less valuable to projects with a lower expected growth rate of net sales. The project with the higher growth rate will be profitable in the future even without the tax

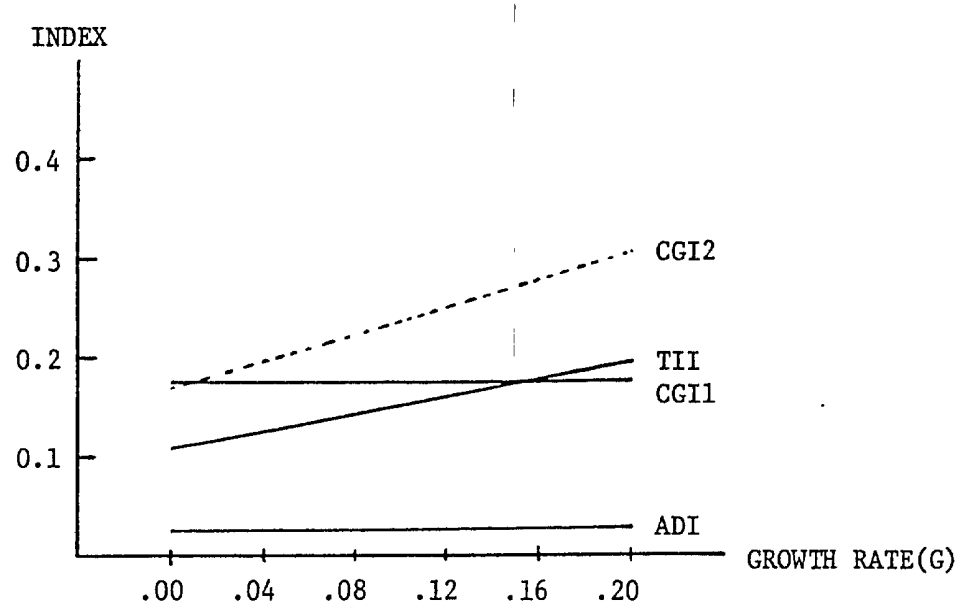

FIGURE 4.1 Incentive Index and the Growth Rate of Net Sales (Subsidiary)

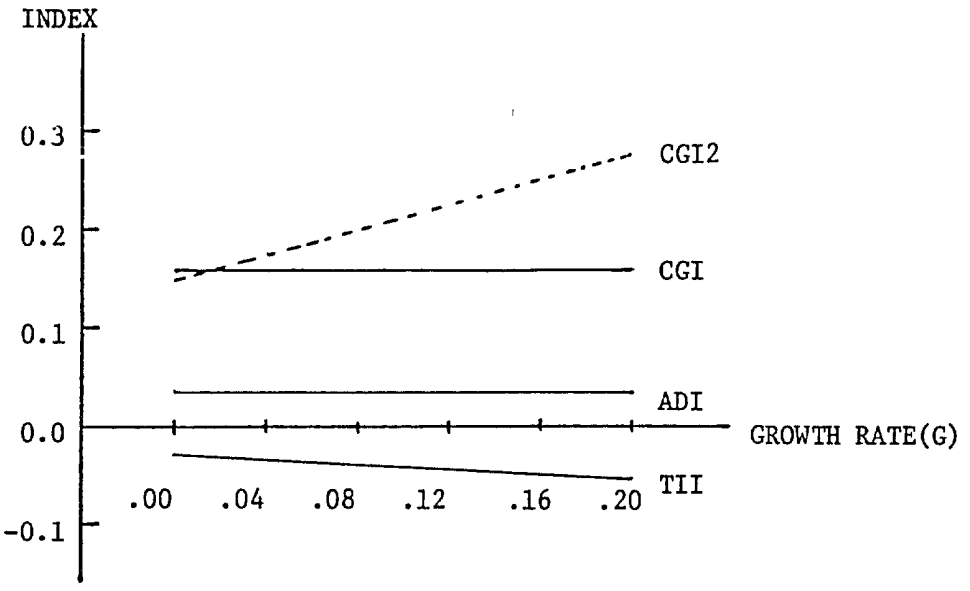

FIGURE 4.2 Incentive Index and the Growth Rate of Net Sales (Parent)

incentive. Thus it can be argued that the tax incentive is not really a "necessary" incentive in this case.

Comparison of Cost Effectiveness of Capital Grant and Tax Holiday

The objective of this section is to compare how two incentive measures with the same cost to the government affect incentive indices differently. One way of doing this is to calculate the present value of the revenue losses to the government because of the tax holiday, to assume that a capital grant equivalent to that present value be given to the investor, and to compare the incentive indices for two cases.

It should be pointed out that in practice a government cannot give the capital grant equivalent to the expected revenue losses. It would be difficult for the government to calculate expected revenue losses for all the projects. The usual capital grant would be some fraction of the invested capital or a certain sum for each person employed. The case of a fixed amount of capital grant is shown in $CGI1_s$ (not in $CGI2_s$) in all previous figures and was discussed in the previous section. The question naturally arises about the risk involved in calculating the present value of revenue losses. If a project turns out to be unprofitable, the tax holiday would not cost the government a dime. One can argue that in such a case the capital grant of a positive sum is more costly than the tax holiday. This is a self-contradictory argument, however. First of all, if the expected net present value

is negative, the project will never be undertaken. The tax incentive cannot make an unprofitable project into a profitable one, but the capital grant can. This leads to the second argument. The rationale for providing investment incentives is presumably to induce investments which would not otherwise have been undertaken in the absence of the incentives. If this be the case, comparing two incentives for projects with negative net present values does not have much merit.

In all the figures, each CGI2 represents the Incentive Index of the case when the present value of expected revenue losses is given as a lump-sum grant. First of all, CGI2 is greater than TII for all four cases of the parent cash flow. This, of course, is due to the home country tax treatment of the tax holiday. In all cases including the ones where TIIs are negative, CGI2 shows substantially higher positive values. Figure 2.1 shows that CGI2 decreases after the fifth year, a result of reinvested earnings being repatriated after the tax holiday period, in which case the government can impose a dividend withholding tax. In Figures 3.1 and 3.2 the cost of capital for all parties is varied at the same ratio. The cost of the tax holiday to the government thus decreases with the increasing discount rate.

Turning to the subsidiary, CGI2 is, interestingly, lower than TII when TJ becomes large. When tax rates are high, the advantage of having a cash grant is more than offset by the reduced depreciation

base, with more earnings subject to the higher tax rate. In Figure 2.1, CGI2 decreases when the government reduces revenue losses through the imposition of a dividend withholding tax starting after the tax holiday period. In all other cases, it can be seen that the capital grant is always superior to the tax holiday in terms of its effect on profitability. This part of the analysis thus supports the hypothesis: host LDC governments would be better able to influence the investment decision by providing capital grants than by tax incentives.

Conclusion

The objective of this paper was to determine how different investment incentives affect the profitability of different types of investment projects. One specific objective was to shed some light on the effectiveness of tax incentives and to compare them to other alternative incentive measures. A computer model was developed to calculate net present values and incentive values. Using a hypothetical case, it was determined that the incentive values changed depending on the variation of project and tax variables. The results of the research are summarized as follows.

Tax holiday

1. The tax holiday has no value to the investor if before-tax income is negative.

2. The tax holiday has a negative value if the effective host country tax rate is smaller than the home country tax rate and if the home country uses the foreign tax credit system with neither carryovers nor the overall limitation allowed.

3. Even when the effective host country tax rate is greater than the home country tax rate, the tax holiday would have an insignificant effect on profitability unless the effective host country tax rate is significantly higher than the home country tax rate.

4. Even when the overall limitation is allowed, the tax holiday has no effect on the profitability of the manufacturing companies that have excess foreign tax credits rather than excess foreign taxes. These conclusions indicate that the tax holiday would have its full effect only if the home government did not tax direct investment income at all. Of the major investing countries of the world, France and the Netherlands are the only countries which do not tax a substantial part of direct investment income. These findings support the statement that the tax holiday has a positive value to the foreign investor only in limited cases.

Sensitivity of the investment incentives to project characteristics and accounting methods

1. The higher the minimum required rate of return, the less valuable the tax holiday becomes.

2. The smaller the expected growth rate of net sales, the less valuable the tax holiday becomes.

It was also found that the more reinvestment requirements are expected, the more valuable the tax holiday becomes. In other words, the tax holiday has the effect of inducing reinvestment, other things being equal. This should be true only if the home country defers taxation on direct investment income until it is repatriated. Note that these sensitivity analyses would be meaningful only if the tax holiday

has a positive value. It was also found that the value of tax holiday is much more volatile compared to the other two incentives, capital grant and accelerated depreciation. Out of three incentives compared, however, only the capital grant had a constantly positive and relatively stable effect on the profitability of a project.

Cost effectiveness of the tax holiday and capital grant

1. The tax holiday is very costly to the government, given its limited effect on profitability. This is due to the fact that the revenue loss caused by the tax holiday is partly or wholly transferred to the home government, rather than the investor himself.

2. The capital grant has constantly a more significant effect on the foreign investor's profitability.

3. The cost of tax holiday to the government increases at the accelerating rate when the sales revenue increases, with the effect of the incentive remaining negative or negligible.

The immediate implication of the results is that host governments should reevaluate their incentive policy and remove the incentives that are ineffective but costly. If a government decides to stop offering the tax holiday, what would be an alternative incentive measure? There seem to be at least two incentive measures that are better in many ways than the tax holiday, the capital grant and import duty exemption. In terms of the effect on the expected profitability, it can be shown that the duty exemption has an effect similar to that of the capital grant. Given the generally high level of the tariff rate

in LDCs, the duty exemption will be a significant reduction in the total capital investment requirement of most capital-intensive, high-technology projects that are given a high priority in most LDCs. The grant, though similar in its effect on profitability, seems to present some problems in its implementation, which may be the reason why so few LDC governments are using it. First, in the short run the grant program might present cash flow problems to the governments. Whereas the tax holiday is the revenue foregone in some future periods, the capital grant requires budgeting a certain amount in the present year. Over the longer time span, however, it can be easily seen that the present value of $1 revenue foregone is the same as $1 provided as a free gift now, except for the uncertainty (or risk) in the realization of the tax exemption. Another problem of the capital grant, somewhat related to the above problem, seems to be psychological. It would seem unreasonable for many people in LDCs to give "hard and fresh" cash to supposedly "rich" multinational companies. It seems that the LDC governments would rather take an equity position than provide a grant.[4]

Seen in the global context, the question of the tax holiday is closely related to the problem of allocating tax revenues among the countries. Unless there is an equitable international tax system, host governments can only lose tax revenues by giving tax holidays without

really affecting the profitability of investing firms. Alternatively, as long as the home governments maintain a flexible foreign tax credit system, host governments can squeeze tax revenues from international companies as long as the effective tax rate does not exceed the home country tax rate. In the absence of an equitable tax system, it is certainly not wise for host governments to forego tax revenues without any tangible effect on the investment decision.

Notes

[1]The studies using this research method include the following: E.R. Barlow and I.T. Wender, Foreign Investment and Taxation, New Jersey: Prentice-Hall, 1966; S.G. Ross and J.B. Christensen, Tax Incentives for Industry in Mexico, Boston: Harvard University Press, 1959; H.J. Robinson, The Motivation and Flow of Private Foreign Investment, Menlo Park, Calif.: Stanford Research Institute, 1961; Yair Aharoni, The Foreign Investment Decision Process, Boston: Harvard University Press, 1966; H. Hughes and P.S. You, Foreign Investment and Industrialization in Singapore, Canberra: Australian National University Press, 1969; G.L. Grant, et al. Private Foreign Investment in Development, Oxford: Claredon Press, 1973; Hans Schollhammer, Locational Strategies for Multinational Firms, Los Angeles: Center for International Business, Pepperdine University, 1974.

[2]In mathematical forms, the values incentive to the parent for three incentives can be expressed as follows:

$$V_{AD} = \sum_{i=1}^{n} (\bar{D}_i - D_i)[1 - (1-t_j)(1-t_h+t_j)](1+r)^{-i}$$

$$V_{TI} = \sum_{i=1}^{m} EBT_i \cdot t_j \cdot p_i \cdot (t_j - t_h)(1+r)^{-i}$$

$$+ t(1+r)^{-m} \sum_{i=1}^{m} EBT_i \cdot t_j \cdot (1+r)^{m-i}(1-p_i)[1-t_h-(1-t_h)^{m-i+1}]$$

$$V_{CG} = C_g - \sum_{i=1}^{n} \frac{C_g}{n} [1-(1-t_j)(1-t_h+t_j)](1+r)^{-i}$$

where V_{AD}, V_{TI}, V_{CG} are the values of accelerated depreciation, tax holiday and capital grant respectively,

t_h: home country rate

t_j: host country tax rate

D_i: the stream of straight-line depreciation

$\overline{D}_i$: the stream of accelerated depreciation

EBT_i: earnings before tax of the subsidiary in year i

m: number of years in the tax holiday

p: proportion of after-tax earnings repatriated to the parent

C_g: the amount of capital grant.

[3]In this analysis, we are assuming that the home government taxes foreign source income based on the U.S. LDCC income treatment. The Tax Reform Act of 1976 has, among others, two changes which will alter the U.S. taxation of international business operations and also affect the analyses made in this paper. The first is the repeal of LDCC status, which will result in the elimination of a slight tax incentive in favor of investments in LDCs. The second change is the repeal of the per-country foreign tax credit limitation for all taxpayers. This aspect of the change is briefly discussed in page 7.

[4]It should be pointed out that an evaluation of different incentives should also include the effect on the resource allocation of the host economy. This can be done best in the framework of a social cost-benefit analysis which will be beyond the limit of this paper.