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## Capturing the Effects of Capital Subsidies

DAVID LIM

*Most developing countries provide fiscal incentives to encourage domestic and foreign investment. This study shows that these schemes subsidise significantly the use of capital and produce greater capital intensity in Malaysian manufacturing. These results were obtained by conducting the analysis at the establishment level, which avoids the artificial aggregation of establishments with different production structures into an industry-group and having to choose an appropriate weighting system in the aggregation process.*

### INTRODUCTION

Most developing countries provide quite elaborate tax incentive schemes to encourage local and foreign investment in industry. These include investment tax credits, accelerated depreciation, preferential treatment of capital imports and income tax holidays whose duration may or may not depend on the level of capital expenditure.

Most of the incentives, *prima facie*, result in net subsidies to capital. If, at the same time, government labour regulations produce wage rates which exceed the opportunity cost of labour, then the resulting prices of capital and labour affect the capital intensity of manufacturing by influencing the choice of technique, the choice of industry, or both. While the theoretical literature on the effect of capital subsidies on capital intensity is well developed, the empirical literature is much less so. The problems emanate from the difficulty of measuring the extent of capital subsidy at a level of disaggregation which allows for a meaningful empirical verification of the hypothesis that the provision of capital subsidies increases capital intensity. This problem will be illustrated by examining the Malaysian case.

The first tax legislation in Malaysia was the Pioneer Industries (Relief from Income Tax) Ordinance of 1958, where firms granted pioneer status were exempted from the company tax. The duration of the tax holiday varied directly with the level of capital invested. The latest investment incentive legislation is the Promotion of Investment Act of 1986. Between this and the 1958 ordinance a number of incentives apart from the tax holiday for pioneer firms have been introduced. These include an investment tax allowance, which is an alternative to the tax holiday, an accelerated depreciation allowance, a reinvestment allowance and preferential treatment of capital imports.

The first tax holiday introduced provided for tax exemption for two years for companies which invested less than \$100,000 (Malaysian dollars). For those investing more than \$100,000 but less than \$250,000 the exemption was for three years, while those investing more than \$250,000 were given a five-year holiday. What was offered was thus a capital investment-based and not a profit-based tax holiday. This arrangement continued until 1986 when a tax holiday of five years became available regardless of the level of investment.

At present the investment tax allowance can be up to 100 per cent of the qualifying capital expenditure incurred during the first five years. The accelerated depreciation allowance permits an initial allowance of 20 per cent and an annual allowance of 40 per cent. In the past it was even more generous since with an initial allowance of 20 per cent and an annual allowance of 80 per cent it amounted to an immediate write-off of the capital expenditure. The current reinvestment allowance is 25 per cent of the capital expenditure incurred in expanding plant, machinery and factory building. It used to be 40 per cent. The preferential

treatment of capital imports takes the form of the exemption of customs duties on raw materials and machinery not available locally. The level of exemption depends on the extent to which the finished products are sold domestically or overseas.

It can be seen that these incentives attempt to encourage investment by subsidising the cost of capital, the tax holiday indirectly by linking the duration of the tax exemption to the level of investment, the others directly by reducing the cost of capital expenditure.

In a recent study Agell [1986] attempted to estimate, at the country level, the level of subsidy provided to capital through the granting of tax incentives in Malaysia and other countries in ASEAN. The model used assumes that the firm aims to maximise its value to the shareholders when planning to invest a dollar in new machinery and equipment. The firm operates under perfect certainty and finances its investment by some exogenously determined combination of retained earnings, new issues and borrowing.

The study shows that a very high subsidy rate is provided to capital. With an inflation rate often per cent and the funding consisting of 10 per cent of new issues, 30 per cent from borrowing and 60 per cent from retained earnings, the subsidy rate is no lower than 79 per cent for pioneer firms and 120 per cent for non-pioneer ones (Table 1). The generous scheme for accelerated depreciation has accounted for the high subsidy rates for non-pioneer firms. The provision for an immediate write-off has since been replaced by a less generous one which permits an initial allowance of 20 per cent and an annual allowance of 40 per cent. Pioneer firms face lower capital costs than non-pioneer firms when the inflation rate is zero. However, the reverse holds with increases in the inflation rate, as 'inflation sets a profitable tax holiday firm at a relative disadvantage owing to its inability to make leverage gains via the deductibility of nominal interest payments during the tax-exempt period' [Agell, 1986: 71].

This finding of a high subsidy rate for capital in Malaysia is supported by a recent World Bank study [1988]. It uses a simulation model to estimate the before-tax cash flow and the after-tax cash flow that can be expected from an investment project. The after-tax cash flow is the before-tax cash flow less any taxes paid but plus any tax credits provided by the investment incentives (for example, deductions for interest rate payments, accelerated depreciation allowance and loss offsets). The percentage difference in the rate of return generated by the before-tax cash flow and the after-tax one shows the level of capital subsidy. The larger the percentage difference the greater will be the capital subsidy. The World Bank calls the percentage difference the marginal effective tax rate (METR).

**TABLE 1**  
**SUBSIDY RATE FOR CAPITAL IN MALAYSIA, 1982 (%)<sup>1</sup>**

<i>Inflation rate</i>	<i>Pioneer firms</i>	<i>Non-pioneer firms</i>
0	57	52
5	84	94
10	79	120
15	63	147
20	36	183

**Source:** Agell [1986: 70].

**Note:** 1. This is the capital subsidy as a percentage of the cost of capital without the tax incentives.

The calculations for METR were carried out at the country level for nine developing countries in East Asia, including Malaysia. The results for Malaysia, given in Table 2, show that its METR is significantly below its statutory corporate income tax rate of 40 per cent, the difference depending on the level of debt financing. While its statutory rate makes it, together with Singapore, the highest taxed nation, its METR is ranked only fifth, with all equity financing, and sixth, with a 50 per cent debt financing. The calculations were based on minimum allowances. When other allowances are included the METR drops markedly. Thus for a pioneer firm with a debt financing of 50 per cent, a tax holiday of ten years accompanied by various loss offsets can result in a METR of only four per cent.

Various investment incentives tend to provide substantial subsidies to capital. Various laws tend to make labour relatively more expensive in Malaysia than the market rate.

Minimum wage legislation in Malaysia (as reflected in the Wage Councils Act of 1947) is limited to only a very small section of the labour market. Other laws have more impact on labour costs, the most important of these being the Employees Provident Fund (EPF) Act and the Employment Act of 1955 with its stipulations with regard to overtime and termination (severance) benefits. The EPF Act provides a provident fund at the disposal of an employee when he retires, emigrates, dies or is incapacitated. Once continuous employment of over a month with the same employer has been established, both the employee and the employer have to contribute monthly to the EPF, the former at nine per cent of the wage and the latter at 11 per cent. The operation of the EPF thus adds significantly to the cost of labour as far as employers are concerned.

So, too, does the operation of the Employment Act of 1955. Under this, any overtime work in excess of the nominal work programmes has to be paid at a rate which is at least equal to one and a half times the hourly rate. The normal work programme is defined as one not exceeding eight hours per day spread over a continuous period of ten hours inclusive of any period of

leisure, rest or break. The act also provides that an employee who has been continuously employed for not less than 12 months is entitled to receive termination or lay-off benefits. The minimum termination benefit is equivalent to between four and eight per cent of the salary.

**CAPITAL SUBSIDIES AND CAPITAL INTENSITY** The Malaysian government thus provides substantial capital subsidies and operates labour legislation which further decreases the cost of capital relative to that of labour. This much is clear. What is not quite so clear is the effect that the provision of capital subsidies has on capital intensity. The existing empirical studies are unsatisfactory [Agell, 1986; World Bank, 1988; Lint, 1980; 1981] and claims that government policies have encouraged firms to use socially non-optimum capital-intensive processes are based largely on a priori and qualitative analyses.

**TABLE 2**  
**MARGINAL EFFECTIVE TAX RATES IN SELECTED EAST ASIAN COUNTRIES (%)**

<i>Country</i>	<i>Statutory rate</i>	<i>Marginal effective tax rate</i>	
		<i>All equity</i>	<i>50% debt financing</i>
Malaysia	40.0	32.0	20.5
Singapore	40.0	28.4	15.2
Philippines	35.0	40.4	31.9
Indonesia	35.0	41.6	34.1
Thailand	35.0	24.9	18.6
Japan	33.3	39.2	29.4
South Korea	30.0	33.1	24.6
Taiwan	25.0	31.9	28.2
Hong Kong	18.5	17.3	9.6

*Source: World Bank [1988, Vol. 1: 72].*

A survey of the existing studies suggests that the most appropriate way to capture the effect of capital subsidies on capital intensity would be to have a study which is conducted at the establishment level and which uses a direct measure of the relative costs of capital and labour. A study at the establishment level would have a much bigger sample of observations and therefore produce results that are more meaningful statistically. It would also not artificially combine firms from technically different production lines into one industry-group and so avoid producing results that have little use for policy-makers. The biggest sample used

in the existing studies is 28 and serious doubts can be raised about the usefulness of any study that treats, for example, the food industry-group, with its multi-faceted activities, as only one observation. A study at the establishment level would also eliminate the difficult problem of deciding what weight to use in deriving variables at the industry-group level. The use of a direct measure of the relative costs of capital and labour would avoid the problems associated with the use of proxy variables. However, the possibility of obtaining reliable data on the price of capital at the establishment level is very small and the use of proxy measures of capital subsidies cannot be helped.

The data required for using the formula proposed by Agell [7956] to estimate the cost of capital to an establishment are simply not available. Data are needed for the different tax rates (for example, the corporate tax rate and the capital gains tax rate), the tax incentive parameters (for example, the tax holiday rate and the initial investment allowance), the macroeconomic variables (for example, the inflation rate), and the establishment-specific variables (for example, the depreciation rate and the percentage of the project financed by new issues). While data on the macroeconomic variables and the tax rates apply to all establishments and are easily available, the same cannot be said of the tax incentives granted to individual establishments and the establishment-specific variables. Agell conducted his analysis only at the country level and even at this level of aggregation somewhat heroic assumptions had to be made about the types of incentives available in each country and the methods of financing the investment project for each country. The World Bank study [29SS] was also at the country level. Analysis at a less aggregated level was not possible because data do not exist on the diversity of incentives that have been granted to individual firms. The study had to use hypothetical data.

Two formulae for estimating the cost of capital which require less data are available. One is to define the cost of capital ( $P_k$ ) as the cost of owning one 'unit' of productive capital stock for a year, where the 'unit' of productive capital is a dollar's worth of imported capital equipment. then given by

$$P_k = E_k (1+T_k)(1 - S_u)(r- s + d) \quad (1)$$

where  $E_k$  is the rate of exchange applicable to capital imports,  $T_k$  the average tariff applicable to capital imports,  $S_u$  the percentage subsidy on the price of capital,  $r$  the real rate of interest,  $s$  the percentage rate of subsidy on the interest rate and  $d$  the real rate of depreciation.  $P_k$  consists therefore of two parts, the first showing the cost of purchasing the capital equipment, the second the opportunity cost of owning it.

Malaysia does not have a separate exchange rate for the import of capital goods so that  $E_k$  can be eliminated from the formula. Provided that the capital goods imported are shown to be critical to the production process and are not available locally, they are not subject to any import duty. This means that  $T_k$  can also be dropped from the formula. While technically Malaysia does not provide for concessional pricing for the purchase of imported goods by administering such schemes as bonus vouchers or investment permissions systems, it does provide investment incentives which subsidise capital and therefore capital goods. This means that  $S_u$  will have to be retained in the formula, which then becomes:

$$P_k = (1 - S_u)(r- s + d) \quad (2)$$

The data required for estimating  $P_k$ , with this reduced formula, at the establishment level are not available. Nor are they available at the industry-group level. It is possible to obtain rough

estimates of  $S_u$  with data from the Department of Statistics and the Malaysian Industrial Development Authority (MIDA). However, there are no data on the price index of capital goods by industry-group so that the real rate of interest and the real rate of depreciation by industry-group cannot be calculated. Also, there are no data which would allow reliable estimates of the percentage rate of subsidy on the interest rate to be obtained. Data on the rate of depreciation are also not available.

Even if data for all of the variables in equation (2) were available, the estimate for  $P_k$  would still not give an accurate picture of the cost of capital. The formula is designed for estimating the cost of imported capital, partly because a significant part of the capital equipment used is imported and partly because data on the cost of domestically produced capital equipment are not available. As an important part of the capital is domestically produced (for example, plants), the cost of capital estimated using equation (2) will not be reliable.

The other formula comes from Jorgenson [1967] and is given by

$$P_k = (1/1-t) (rp + dp - pt) \quad (3)$$

where  $P_k$  is the 'user' cost of capital,  $t$  the corporate tax rate,  $r$  the interest rate,  $p$  the price index of capital goods,  $d$  the real depreciation rate and  $\alpha$  the depreciation allowance rate which is deductible before tax.

This formula has been used for estimating  $P_k$  for broad economic sectors, as, for example, in the study by Guisinger and Kazi [7975] on the rental cost of capital for the manufacturing sector of Pakistan. However, the data required for estimating  $P_k$  at the establishment or industry-group level are not available in most developing countries, including Malaysia. Data on the rate of depreciation and on the price index of capital goods for the different industry-groups are not available. As the rates of depreciation and price increases vary between industry-groups, the absence of data for them would render any estimate of the cost of capital by establishment or industry-group rather unreliable.

Under prevailing conditions in Malaysia a proxy measure of capital subsidy is necessary. The dummy variable  $PS$  is used where a value of 1 is given to each of the establishments which was granted pioneer status and a value of 0 to each which was not granted or did not seek pioneer status. It is true that the study by Agell [2986] shows that a pioneer establishment, with the maximum tax holiday of eight years, receives less capital subsidy than a non-pioneer establishment enjoying an immediate capital expenditure write-off, when the inflation rate is more than five per cent. Thus where non-pioneer establishments are more important than pioneer ones in terms of fixed assets, value added and employment, and where the inflation rate exceeds five per cent, the use of  $PS$  at the industry-group level would understate the level of capital subsidy. However, inflation has never been high for a lengthy period in Malaysia. Also, pioneer establishments greatly outnumber non-pioneer ones with incentives and are also far more important in terms of fixed assets, value added and employment. Thus the problem of understating the level of capital subsidy at both the establishment and industry-group levels is not a serious one.

The analysis was carried out for Peninsular Malaysia at the establishment level for 1979, the last year when the Malaysian Department of Statistics collected data on pioneer establishments. There were 4985 manufacturing establishments in that year and the following equation was estimated to explain the variation in capital intensity between them.

$$K/L = f(PS, F, S, I) \quad (4)$$

Capital intensity was measured by K/L, in thousands of Malaysian dollars, where K is the replacement value of the fixed assets and L the total number of full-time employees. PS was measured by giving a value of one (zero) to each of the establishments which were (were not) granted pioneer status. If the provision of capital subsidies resulted in greater capital intensity, K/L and PS would be positively and significantly related.

The estimating equation contains three other determinants: F, the degree of foreign ownership and control, S, the scale of operation and I, the degree of incorporation. Some of the pioneer firms which are foreign and large may have been able to obtain capital subsidies, even without enjoying pioneer status, simply because of their foreign status and size. To isolate the separate influences of pioneer status, foreign ownership and size on capital intensity, F and S were also entered as determinants in the estimating equation. F was measured by giving a value of 1(0) to each of the establishments which were (were not) foreign-owned or controlled. F is expected to be positively related to K/L. Another reason for expecting a positive relationship between F and K/L is the possibility that foreign firms prefer using their home-based, and usually capital-intensive, technology, regardless of the relative factor prices. S was measured by the sales of the establishment in thousands of Malaysian dollars and was expected to be positively related to K/L. Another reason for expecting such a relationship is the lumpiness of capital which limits the scope for using capital-intensive techniques by small-scale firms. I was measured by giving a value of one (zero) to each of the establishments which were (were not) incorporated. As unincorporated establishments are much less likely to be granted capital subsidies and more likely to pay below-award wages, K/L and I are expected to be positively related.

The results are given in Table 3. The PS variable came out with the expected positive sign and is statistically significant in both of the equations. The results are therefore unambiguous in suggesting that the provision of capital subsidies, as measured by the PS variable, did encourage greater capital intensity in Malaysian manufacturing in 1979. The I variable also appeared with a statistically significant and positive coefficient. As incorporated establishments are more likely to be granted capital subsidies, this result may be said to lend further support to that for the PS variable.

The scale of operation, S, also had a positive effect on capital intensity. On the other hand, it appears that the presence of foreign ownership and control had no effect, as the coefficient of F was not statistically significant in either of the two equations.

The estimating equations were statistically significant with the F-ratios obtained. The adjusted coefficients of determination are also relatively high, when compared to those obtained at the establishment level for such a large sample.

It is unfortunate that the Department of Statistics stopped collecting data on pioneer firms after 1979 and that the data required for a similar analysis are not easily available for a more recent year. In order to ensure that the results obtained for 1979 are not peculiar to that year, the same analysis was carried out for 1976 for 3995 establishments. The results are also given in Table 3. They show, also quite clearly, that the provision of capital subsidies had led to greater capital intensity among manufacturing establishments. The PS variable came out with positive and very statistically significant coefficients as did the F, I and S variables. The equations as a whole are also statistically significant and the adjusted coefficients of determination are slightly larger than those obtained for 1979.



TABLE 3  
 LINEAR REGRESSIONS EXPLAINING CAPITAL INTENSITY OF PENINSULAR  
 MALAYSIAN MANUFACTURING, 1976 AND 1979

<i>Independent variables</i>	1979		1976	
	<i>K/L</i>	<i>K/L</i>	<i>K/L</i>	<i>K/L</i>
Constant	9.1952 (27.1050)*	4.2156 (8.4920)*	6.4020 (17.3920)*	2.9923 (6.1880)*
PS	9.1900 (8.6500)*	6.2149 (5.8280)*	9.8665 (9.0360)*	6.7721 (6.0730)*
F	0.8834 (0.7930)	-1.1999 (-1.0850)	5.3162 (5.0250)*	3.0888 (2.9030)*
S	0.0002 (15.8390)*	0.0002 (15.3400)*	0.0003 (14.4170)*	0.0003 (13.9490)*
I		8.9580 (13.5330)*		7.6037 (10.6730)*
$\bar{R}^2$	0.0806	0.1131	0.1061	0.1307
F - ratio	146.7340	159.8640	159.029	151.1230
N	4985	4985	3995	3995

*Notes:* K/L = replacement value of fixed assets/number of full-time employees (M\$'000)  
 PS = 1(0) for pioneer (non-pioneer) establishment  
 S = sales of establishment (M\$'000)  
 I = 1(0) for incorporated (unincorporated) establishment  
 Figures in parentheses are t values and \* denotes statistical significance at the 0.0005 level of confidence.

## CONCLUSIONS

There are many good reasons for preferring the results estimated at the establishment level to those estimated at the industry-level. These include using a far larger number of observations, avoiding the artificial aggregation of establishments with different production structures into an industry-group and not having to decide on an appropriate weight in the aggregation process. These reasons strongly suggest that the results obtained in this paper should be taken more seriously than those obtained earlier at the industry level. The fact that they are also unambiguous should further strengthen their case. An important lesson, therefore, for work on the impact of capital subsidies on capital intensity in other countries is that the analysis should be carried out at the level of the establishment and not the industry-group.

This then leads to the other important issue, that of obtaining reliable data on the value of the capital subsidy given to an establishment. Both the new and the old analyses can be criticised for using a measure which is only a proxy for the presence of capital subsidy. A direct measure would have been preferable as it would have avoided all the problems associated with the use of a proxy. Also it would have measured the level of the capital subsidy.

However, the chances of obtaining reliable data on the value of the capital subsidy at the establishment level are remote, no matter what formula is used. Realistically, empirical studies on the effect of providing capital subsidies on capital intensity will have to depend either on the qualitative responses of business obtained by questionnaire or on the quantitative analysis obtained by using proxy measures for the presence and/or level of capital subsidy. The study of Malaysian manufacturing suggests that it is possible to carry out the latter and produce results which are statistically and economically meaningful.

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