ESTIMATING THE SHADOW EXCHANGE RATE, THE SHADOW WAGE RATE AND THE SOCIAL RATE OF DISCOUNT FOR THE PHILIPPINES

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1. Introduction

A major task in the economic evaluation of projects is the valuation of goods and resources used and produced. If markets function efficiently and freely, observable market prices should sufficiently indicate this valuation. However, market imperfections do exist -- especially in the less developed countries. They arise partly from genuine market failures such as the existence of non-competitive elements, externalities, etc., but more pervasively from government policies themselves, e.g., and, most notably, the protection structure. In such cases, market prices are distorted, i.e., not reflective of true relative scarcities of goods and resources. An alternative method of calculation is required which would reflect real costs and benefits to society. This is the so-called "shadow" pricing of goods and resources.

In the Philippines, there have been attempts, perhaps more than in any other LDC, to estimate these shadow prices for use in project evaluation. The most recent and substantive is in the Bautista, Power and Associates volume Industrial Promotion Policies in the Philippines (IPPP, 1979). The study provides estimates of the shadow price of foreign exchange or the shadow exchange rate (SER) for 1974, the shadow price of labor or shadow wage rate (SWR) for 1977 and the social discount rate and the shadow price of capital based on 1974 data. It is the main purpose of this paper to review the methodologies used in estimating shadow prices and obtain more recent estimates of these shadow prices.

This paper is divided into three parts, namely: (1) the shadow price of foreign exchange; (2) the shadow price of saving and the social rate of discount; and (3) the shadow price of labor. Each section contains a discussion of the methodology and the data - sources, limitations and use.

2. The Shadow Price of Foreign Exchange

The shadow price of foreign exchange, also referred to as the shadow exchange rate (SER), is an often misunderstood concept. For example, an SER higher than the official exchange rate (OER) might be mistaken for a signal for a corresponding devaluation to achieve equilibrium in the trade balance. The wedge between the SER and the OER, however, can be attributed to a combination of two factors: (1) a disequilibrium in the balance-of-payments (BOP) and (2) the protection structure. For the former, a devaluation may be required up to the point where the level of foreign borrowing is deemed to be acceptable by a policy maker. The latter, however, calls for a reform in the protection structure, and not necessarily a devaluation.

An SER higher than the OER (as would usually be the case in LDCs) simply reflects the premium we are placing on foreign exchange (used or produced) when evaluating projects to correct the distorted relative prices between traded and non-traded commodities. It does not, in itself, suggest a need for a devaluation, much less, a devaluation to the exact degree indicated by the SER estimate. This distortion in relative prices arises from the protection system (and BOP disequilibrium) and affects not only price relationships among tradable commodities but also the prices of tradables, in general, relative to non-tradables. Among tradable commodities, relative price distortion may be corrected in project evaluation by using their relative border prices. We would need further correction, however, for the price distortion between tradables and non-tradables. This is the role of the SER in project evaluation. It serves as the conversion factor for non-tradables to make their prices consistent with border prices of tradables.[1/]

In this connection, there have been arguments in the project evaluation literature regarding the use of a standard conversion factor such as the SER, as against a specific conversion factor for each non-tradable. There is general agreement on the superiority, in theory, of the latter over the former.

[1/] Or, alternatively, if evaluation is done in domestic currency, the SER, in its reciprocal, is used as the conversion factor to bring border prices of tradables consistent with domestic prices of non-tradables.

In practice, however, it is often not convenient or practical to compute specific conversion factors, as it is often difficult to decompose non-tradables completely into their tradable and primary factor components (see Medalla, 1979). Thus, we would need an SER estimate for domestic primary factors (except for those with a single alternative use[2/]) and for non-tradable goods where it is not possible or convenient to derive specific conversion factors.

There are, however, other applications of the SER, besides this role in project evaluation. First is its use as a cut-off point in the Domestic Resource Cost (DRC) criterion in selecting projects. For instance, a project with a DRC less than the SER implies that it is producing or saving foreign exchange efficiently. Second, it is used in deriving the <u>net</u> effective protection rate (EPR). The EPR measure, by itself, can be used to rank industries according to the degree of protection it receives, but it does not indicate the absolute protection or penalty. A net EPR measure shows if the industry is actually protected or penalized by the protection system. Finally, the SER estimate can be interpreted as the general penalty on exports imposed by the protection system. By creating a wedge between the SER and the OER, (specifically, a lower official exchange rate than its true value, the SER), exporters in effect get less for their foreign exchange earnings.

[2/] If the primary factor has only a single alternative use, it is easy to determine what marginal product (hence its shadow price) is foregone. If it is a tradable, deriving a specific conversion factor is simple — it would just be the border price of the product.

2.1. Methodologies for Estimating the Shadow Exchange Rate (SER)

In the estimation of the SER, we use the three methodologies employed by Medalla (1979) in her study on shadow pricing foreign exchange. These are: (1) the UNIDO method which measures the marginal social value of the last unit of foreign exchange given the present protection structure; (2) the Bacha-Taylor method which derives the free trade equilibrium exchange rate as the shadow exchange rate; and (3) the Optimal Intervention System (OIS) exchange rate. The difference in the three approaches lies mainly in their respective assumptions regarding what trade policy would be.

The first (UNIDO) method takes the present constraints as given, inherently assuming that the present protection system will remain (at least throughout the lifetime of the project being evaluated). Although this approach is appropriate when used in evaluating small projects in isolation, from a more comprehensive viewpoint, it becomes inconsistent since project evaluation is designed to identify the projects that possess real and long-run comparative advantage. This implies that at least in the long-run, the need for continuing protection would be eliminated. Furthermore, the fact that we need to shadow price goods and resources implies that the present policy is non-optimal[3/] and vice-versa. Thus, it would not be logical

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[3/] Otherwise, if intervention policy is optimal, market prices should reflect shadow prices.

nor advantageous from an economic standpoint to stick with present policy. Hence, the UNIDO estimate is considered a "second-best" estimate of the SER.

The second approach (Bacha-Taylor), on the other hand, assumes that the economy will move toward free trade. Furthermore, it implicitly assumes that free-trade is the optimal trade regime. This would be true where there is perfect competition and no market failures such as externalities, terms-of-trade effects, economies of scale, interdependent investment decisions, etc. For most countries, however, especially the LDCs, there would be market failures, requiring some form of an optimal government intervention.

In the IPFP study, a modification of the free-trade assumption is suggested. It recommends a set of policies which would provide (1) government revenues, (2) correction for terms-of-trade effects; and (3) real protection via subsidies, correcting distortions at the source for those projects which are socially desirable but not commercially profitable due to genuine market failures. Such a set of policies (see Power's paper on rational protection in the IPFP volume) is referred to as an optimal intervention system. It forms the basis of our third estimate, thus referred to as the "first-best" estimate, which derives what would be the equilibrium exchange rate under such an optimal trade regime.

These three approaches yield the following formulas for estimating the SER:

(1) The UNIDO Estimate

(a) $$\frac{SER_1}{OER} = \frac{\sum_i dM_i\,(1+T_i) + \sum_j dX_j\,(1+S_j)}{\sum_i dM_i + \sum_j dX_j}$$

where dM's and dX's are marginal changes in imports and export respectively arising from an additional unit of foreign exchange. The T's and S's are implicit tariffs and subsidies (export taxes) on importables and exportables, respectively. This formula can be rewritten in terms of trade elasticities as,

(b) $$\frac{SER_1}{OER} = \frac{\sum \eta_{mi}\,M_i\,(1+T_i) + \sum \epsilon_{fj}\,X_j\,(1+S_j)}{\sum \eta_{mi}\,M_i + \sum \epsilon_{fj}\,X_j}$$

where

ϵ_{fj} = the elasticity of supply of foreign exchange from export of commodity j

$$= \frac{\eta_{xj}\,(\epsilon_{xj} - 1)}{\eta_{xj} + \epsilon_{xj}}$$

η_{xj} = export supply elasticity for commodity j

ε_{xj} = export demand elasticity (in absolute value) for commodity j

η_{mi} = import demand elasticity (in absolute value) for commodity i

and M_i and X_j are imports and exports, respectively. (It is assumed that the import supply elasticity is infinity.) The actual formula used in this study lumps all major exportables together, all minor exportables together and all importables together. This is represented by:

(c) $$\frac{SER_1}{OER} = a_1 (1+S_1) + a_2 (1+S_2) + a_3 (1+T)$$

where $$a_1 = \frac{\varepsilon_{f1} X_1}{\varepsilon_{f1} X_1 + \varepsilon_{f2} X_2 + \eta_m M}$$

$$a_2 = \frac{\varepsilon_{f2} X_2}{\varepsilon_{f1} X_1 + \varepsilon_{f2} X_2 + \eta_m M}$$

$$a_3 = 1 - a_1 - a_2$$

and

subscripts 1 and 2 refer to major and minor exportables respectively

(2) The Bacha-Taylor Estimate

The general formula is given by:

(a) $$\frac{SER_2}{OER} = \prod_i (1+T_i)^{a_i} \prod_j (1+S_j)^{a_j}$$

where $\prod_i$ refers to product over all i's and $\prod_j$ the product over all j's.

$$a_i = \frac{\eta_{mi}\ M_i}{\sum\limits_i \eta_{mi}\ M_i + \sum\limits_j \varepsilon_{fj}\ X_j} \quad \text{and}$$

$$a_j = \frac{\varepsilon_{fj}\ X_j}{\sum\limits_i \eta_{mi}\ M_i + \sum\limits_j \varepsilon_{fj}\ X_j}$$

For the study, the formula used is

(b) $$\frac{SER_2}{OER} = (1+S_1)^{a_1}\ (1+S_2)^{a_2}\ (1+T)^{(1-a_1-a_2)}$$

All notations are the same as before.

(3)The OIS-SER Estimate

The formula used for the study agains lump all major exportables together. Thus,

$$\frac{SER_3}{OER} = \left[\left(\frac{1+S_1}{1+S_1'}\right)\left(\frac{1+v_{x_1}}{1+v'}\right)^{c_{x_1}}\right]^{a_1}\left[\left(\frac{1+S_2}{1+S_2'}\right)\left(\frac{1+v_{x_2}}{1+v'}\right)^{c_{x_2}}\right]^{a_2} \cdot$$

$$\left[\left(\frac{1+T}{1+T'}\right)\left(\frac{1+v_m}{1+v'}\right)^{-c_m}\right]^{(1-a_1-a_2)}$$

where S_1', S_2' and T' are the subsidy (export tax) for major exportables, subsidy (export tax) for minor exportables and implicit tariff for importables, respectively, and v' the domestic sales tax all under the optimal intervention system. For the rest of the notations.

v_x = domestic sales tax on exportables

v_m = domestic sales tax on importables

$$c_{xi} = \frac{e_{dxi}\ D_{xi}}{\eta_{xi}\ X_i} \quad \text{for } i = 1, 2$$

and

$$c_m = \frac{e_{sm}\ Q_m}{\eta_m\ M}$$

where e_{dxi} = elasticity of home demand for exportable i

e_{sm} = elasticity of home supply for importables

D_{xi} = home demand for exportable i

Q_m = home supply for importables

For our OIS, we draw from Power's framework for rational protection (IPPP, 1979). This is basically:

1. A uniform tariff rate, t, equal to $\frac{1}{m-1}$, where m is the estimated average elasticity of demand for minor exports. This would reduce the ratio of domestic prices of minor exports to import substitutes to the ratio of marginal revenue [$= \pi_x (1 - \frac{1}{m})$] from minor exports, in border prices, to the border price of imports. This adjusts for the general terms of trade effects that arises from the fact that demand elasticities are not infinitely great even for minor exports. (It is assumed that these elasticities are generally high and do not differ greatly from each other).

2. An export tax, t_x, on individual major exports equal to $1 - \frac{M-1}{M}(1 + t)$, where M is the elasticity of demand for the major export. This would reduce the relative domestic prices after the tax to the ratio of marginal revenue from the major export in border prices to the border price of the import substitute. In effect, the specific terms-of-trade effects arising from a (less than infinite) demand elasticity for major exports which differs from that for minor exports. It is generally expected that M would be much lower than m.

3. A general destination principle value added tax, v, on imports and domestic sales for revenue purposes. This tax is included in the selling price at any stage of the production process. However, the sellers at any stage of the production are given credits for taxes paid in the inputs. Thus, the effective tax is equal to $vP_j - \sum_i a_{ij}P_iv = v\ (P_j - \sum_i a_{ij}P_i)$ where P_j is the price before tax of the output, P_i (1+v) is the selling price of the input (thus vP_i is the amount of domestic sales tax paid), and the a_{ij}'s are the input coefficients. Thus, only value added is taxed. Moreover, the effective uniform value added tax across industries would provide a neutral means for generating revenues.

4. Refund to exporters of duties on imported inputs and a tax credit equal to t proportion of the value of domestic tradable inputs. This would reduce the effective protection for minor exports to zero (since the v's and t's would be zero) while avoiding discrimination against the use of domestic substitutes.

5. Direct subsidies (or tax credits) to correct for other market failures such as those discussed above.

2.2 Estimating Implicit Tariffs

The major task in the estimation of the SER is the derivation of implicit tariff for each commodity. The implicit tariff (T) on a particular commodity is the percentage difference between its domestic price and its border price to buyers (consumers), i.e.,

$$T = \frac{P_d}{P_b} - 1$$

where P_d is the domestic price (to buyers) of the commodity, and P_b is its border price.

There are two approaches to measuring implicit tariffs. The first is by comparing prices directly, i.e., domestic and border. For exports and imports of significant quantity, we can use CIF import unit values and FOB export unit values as border prices. Where trade is insignificant, the trade unit values of other countries in the region may be used.

The second approach uses the known tariff and tax rates as representing the proportional difference between domestic and border prices. Assuming perfect competition for homogeneous goods, the two approaches should yield the same results.

Since price comparison takes the effects of all price intervention policies besides the tariff and tax rate (e.g., quotas, government marketing policies), this approach is preferred in the case of homogeneous commodities and for commodities where quality differentials between imported and domestic product could be measured.

Usually, however, especially for manufactured products, commodities are heterogenous, i.e., either involving domestic import substitutes differing in quality from the imported product, or involving a group of heterogeneous but closely substitutable products. For these cases, known tariff and tax rates are preferred since for the non-homogeneous goods, the wedge arising from protection is a combination of both quality and price differentials (See Medalla and Power, 1979).

Thus, if we use the known tariff and tax rate, the implicit tariff, T, for importables is given by

$$T = (1+t)\left[1+f\ (1+m)\right]-1$$

where t = the nominal tariff rate

f = the percentage tax (advance sales tax rate)

m = mark-up rate

and for exportables, the implicit tariff will be the (negative) export tax.

2.3 Weighting Implicit Tariffs

All three estimates of the SER are weighted averages of implicit tariffs -- the UNIDO estimate, a weighted arithmetic average; Bacha-Taylor, a weighted geometric average; and the OIS-SER, also a weighted geometric average but of implicit tariffs deflated by what they ought to be in the optimal intervention system.

For all three approaches, the ideal weights to use are the marginal imports and exports. These depend on trade elasticities and the levels of exports and imports. Taking world prices as given, the marginal changes in exports and imports can be expressed in terms of the domestic supply and demand elasticities, together with the values of production, exports and imports. For instance, for imports,

$$-\eta_m = \frac{dM/M}{dr/r} = \frac{Q+M}{M} \quad (-e_{dm}) - \frac{Q}{M} \quad e_{sm}$$

where e_{dm} is the elasticity (in absolute value) of demand for importables, and

$$dM = \frac{dr}{r} \left[(Q+M) \quad e_{dm} + Q \quad e_{sm} \right] .$$

For exports

$$dX = \frac{dr}{r} \left[(Q-X) \quad e_{dx} + Q_{sx} \right]$$

where e_{dx} is home demand elasticity for exportables and e_{sx}, the supply elasticity for exportables. Q refers to domestic supply. Hence Q + M denotes total demand for importables and Q - X, home demand for exportables. The percentage change in the exchange rate, $\frac{dr}{r}$, given world prices, would also denote percentage change in domestic prices, dP/P.

For our weighting system, we simplify further by assuming all of these elasticities to be equal. We get weights determined by relative sums of supply and demand. But since demand for importables equals supply plus imports (Q + M) and demand for exportables supply minus exports (Q - X), this comes to weights of 2Q + M and 2Q - X, respectively, for importables and exportables.

The weighting system used in Medalla (1979) assumes supply elasticities to be equal and universally one half the value of equal demand elasticities. This yields the weights of 1.5 Q+M for importables and 1.5 - X for exportables.

Setting supply elasticities at one-half the values of demand elasticities was influenced by elasticity estimates for various categories of goods given by Balassa (1971) and often used by the World Bank. If we take a long-run view, however, it is not clear why supply elasticities should generally be lower than demand elasticities. Indeed, it may be easier in the long-run to restructure output rather than to restructure demand. Accordingly, 2Q + M and 2Q - X may represent a more realistic first approximation.

For future work in estimating the SER, our elasticity assumptions could be diversified for further disaggregation. For example, future studies might be able to find that supply elasticities in manufacturing would generally be greater by some factor than in agriculture and mining; and that demand elasticities would generally be greater by some factor for non-essentials than for essentials.

4 Empirical Results

To estimate the SER, we need estimates of implicit tariffs and their corresponding weights for averaging. To derive the weights to be used, we need data on Q, value of production (in border prices), X, value of exports, and M, value of imports. For implicit tariff estimates, we need (1) the book tariff and tax rates and (2) in special cases, domestic and border prices. The former is readily available from the Tariff and Customs Code and the National Internal Revenue Code. The latter is used for homogeneous products where price intervention policies other than tariff and taxes are in effect. These include mostly agricultural and related products (e.g., logs and lumber), and some manufactured products (e.g., automotive assembly and parts). Estimates of price comparison relatives were mostly derived from other works -- e.g., C. David (1983) for agricultural products and the Board of Investments (BOI) study on PCMP for automotive products.

Ideally, we would want to cover all tradable products. Thus, Medalla (1979) made use of the 1974 I-O Transactions Table which gives Q, X, and M directly. To get an average $\hat{T}$ for each I-O sector, a rule-of-thumb was used to determine which part of (Q-X) is exportable, Q_x, and which part is importable, Q_m, ($Q_x + Q_m = Q - X$). The ratio X/Q was computed, multiplied by five and rounded down to the nearest decile. The result, say denoted by a, is taken to be the proportion exported, hence, $Q_x = a\ (Q-X)$ and the rest is taken to be importable. Hence, a sector exporting 20 percent of its output is considered a pure exporter. Using the resulting X, Q_x, M and Q_m to derive weights, an average implicit tariff can be computed. For X and Q_x, the implicit tariff would be the corresponding export tax. For Q_m+ M, it was generally assumed that high to middle tariff rates would correspond with Q_m and the low tariff rate with M -- implying that (1) domestic production of the sector would be importables subject to higher tariff (imports is negligible) and (2) actual imports of the sector would be for those subject to lower tariff (domestic production is negligible).

At the time this project was being done, a newer version of the I-O table has not been constructed. Thus, we decided to use only a sample of commodities to include in the derivation of an average implicit tariff for importables and an average export tax for exportables. The commodities are selected on the basis of whether (1) it is a major import -- a minimum level equivalent to one percent of total imports for the year is set, or (2) it is a major export — a minimum level to one percent of total exports for the year is set, or (3) it is a major local production -- the top 20 (or so) at the 4-digit (ASM) classification in terms of gross output is set.

The first two lists make use of the Foreign Trade Statistics. The third makes use of the Annual Survey of Manufactures (ASM). Since the most recent ASM is for 1979, this was used as the base year for computing the weights. The three lists are then combined (see Table 1 for the list of commodities used) to form the final list of selected commodities.

In the list, there would still be cases where a sector would have both X and M. For these cases, we follow the method used by Medalla as described above. Instead of multiplying $X/_Q$ by 5, however, to come up with proportion exportable, and we multiply by 3.[4/]

Finally, we need values for trade elasticities. Again, for this study, we have the elasticity estimates of Balassa (1971). We use a range of values for elasticity of demand for imports, η_m, ranging from 2 to 6, elasticity of supply for exportables from 3 to 6 (both minor and major exports) and elasticity of

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[4/] We took a sample of export sectors (e.g., coconut oil, plywood and veneer, etc.) and computed the X/Q ratio using 1974 I-O data. This was found, in the average, to be close to 33 percent.

demand for major exports from 6 to 11. World supply elasticity for imports and world demand elasticities for minor exports are assumed to be infinite. Correspondingly, we get a range of values for SER/OER (See Table 2). Hence, for the UNIDO estimate, taking consistently low values of trade elasticities to consistently high values, we have $\frac{SER_1}{OER}$ ranging from 1.269 to 1.314. Similarly, for Bacha-Taylor method, $\frac{SER_2}{OER}$ ranges from 1.245 to 1.291. The OIS-SER estimate ranges from 1.09 to 1.114. These estimates are based on the scheduled 1983 tariff rates. It views the present foreign exchange and other trade controls as temporary emergency measures.

Table 1. List of Selected Commodities to be Included in SER Calculation with Corresponding Implicits Tariffs, Production, Exports and Imports

Commodity	Production ₱ in border prices* 1979	Exports ₱ FOB 1979	Imports ₱ CIF 1979	Implicit Tariff 1983	Indirect Tax 1983
Abaca	357.3	183.1	.	-.04	.01
Copra	860.6	652	.	-.075	.01
Coconut Oil	7,025	,434	.	-.04	.02
Desiccated Coconut	1,012.5	784	.	-.04	.02
Centrifuge & Refined Sugar	4,003.2	1,552	.	-.06	.02
Lumber	2,688.8	1,450	.	-.04	.10
Plywood & Veneer	1,907.08	1,149.7	.	-.04	.10
Copper Concentrate	3,765	3,222	.	-.02	.
Chromite Ore	237.5	168	.	-.04	.
Pineapple	766.6	703	.	-.04	.01
Banana	2,077.08	732	.	-.03	.01
Tuna	252.4	252.4	.	.	.05
Shrimps	263.6	263.6	.	-.04	.05
Wheat	932.04	.	922.8	+.25	.
Fertilizer	936.4	.	752.6	+.32	.10
Mfg. & Assembly of Motor Vehicles					
CKL (M)	.	.	755.5	+.25	.
CBU (Assembly)	545.7	.	.	+1.00	.30
LC (Components) (20%)	630.6	.	.	+.50	.
Textile					
$Importables_1$	.	.	111.7	+.10	.
$Importables_2$	2,925.07	.	.	+.69	.10
Exportables	463.5	154.5	.	.	.10
Paper & Paper Products	.				
$Importables_1$	.	.	505.4	+.10	.
$Importables_2$	1,935.8	.	.	+.80	.10

Commodity	Production ₱ in border prices* 1979	Exports ₱ FOB 1979	Imports ₱ CIF 1979	Implicit Tariff 1983	Indirect Tax 1983
Wood Manufacture	4,808.7	260.7	.	-.08	.10
Petroleum Refineries					
Importables:					
- Gasoline & other light oils	5,894.5	.	469.2	+.46	.22
- Diesel oil & others	2,390	.	1,429	+.20	.02
Exportables	79.5	79.5	.	.	.
Products of Petroleum & Coal					
Importables_1	15.3	.	122.9	.10	.
Importables_2	15.3	.	44.9	.26	.05
Mfg. of Wearing Apparel Exclusive of Footwear					
Importables		.	21.5	+.91	.10
Exportables	881.6	1,591.3	.	.	.10
Mfg. of Glass & Glass Products					
Importables_1		.	143.6	+.10	.
Importables_2	346.8	.	.	.91	.10
Exportables	118.5	39.5	.	.	.10
Mfg. of Pesticides, Insecticides, etc.	750.1	.	132.5	+.35	.
Flour Milling & Other Mfg. Grains					
Importables_1		.	39.2	+.20	.
Importables_2	880.2	.	.	+.69	.05
Canning & Preserving of Fruits & Vegetables					
Importables	.	.	40.7	+.80	.10
Exportables	1,016.9	730.8	.	.	.10
Mfg. of Processed Mild & Dairy Products					
Importables_1		.	809.6	+.05	
Importables_2	925.7	.	.	+.69	.10
Mfg. of Soaps & Cleaning Preparations					
Importables_1		.	240.5	+.20	

Commodity	Production ₱ in border prices* 1979	Exports ₱ FOB 1979	Imports ₱ CIF 1979	Implicit Tariff 1983	Indirect Tax 1983
Mfg. of Soaps & Cleaning Preparations					
Importables$_2$	478.2	.	.	+.69	.10
Exportables	189	63	.	.	.05
Iron & Steel Basic Industry					
Importables$_1$	.	.	1,363.8	+.05	.
Importables$_2$	464.2	.	.	+.69	.10
Canning, Preserving & Processing of Fish					
Importables	.	.	156.1	.	.
Mackerels & Sardines	135.5	.	141.0	+.24	.05
Others	9.4	.	15.1	+.69	.05
Importables	209.7	69.9	.	.	.05

Average Implicit Tariff	
Exportables	
Major Exports	-.04
Minor Exports	0.0
Importables	+0.48

Footnotes:

1. symbol m
2. ± symbol meaning (-) export tax and (+) for import tar
3. For exportables, quantity of production is approximately three times the value of export based on average Q/X ratio of sample pure-exportables from the 1974 I-O tables.
4. Importables$_1$ include intermediate inputs with the lower tariffs
5. Importables$_2$ include products at their higher stage of production.
6. *Production in border prices was derived by deflating 1979 value of production by 1979 implicit tariff.

Table 2. Estimate of SER/OER, Varying Trade Elasticities

ε_{fx1}	ε_{fx2}	η_m	UNIDO $\frac{SER_1}{OER}$	Bacha-Taylor $\frac{SER_2}{OER}$	$\frac{SER_3}{OER}$
1.67	3	2	1.269	1.245	1.090
		4	1.346	1.326	1.132
		6	1.382	1.365	1.151
	6	2	1.185	1.162	1.047
		4	1.288	1.264	1.100
		6	1.332	1.311	1.124
2.14	3	2	1.260	1.235	1.086
		4	1.338	1.317	1.127
		6	1.376	1.358	1.148
	6	2	1.199	1.175	1.054
		4	1.282	1.258	1.097
		6	1.327	1.306	1.121
2.5	3	2	1.253	1.228	1.082
		4	1.332	1.311	1.124
		6	1.371	1.353	1.145
	6	2	1.194	1.171	1.052
		4	1.278	1.254	1.095
		6	1.324	1.302	1.119
3.53	3	2	1.235	1.209	1.073
		4	1.317	1.294	1.116
		6	1.358	1.339	1.138
	6	2	1.183	1.160	1.046
		4	1.267	1.242	1.089
		6	1.314	1.291	1.114

Notes: ε_{fx1} = supply elasticity of foreign exchange, from major exports

ε_{fx2} = supply elasticity of foreign exchange, from minor exports

η_m = demand elasticity for imports

$$\varepsilon_{fj} = \frac{\eta_{xj}(\varepsilon_{xj}-1)}{\eta_{xj} + \varepsilon_{xj}}$$

η_x = supply elasticity for exports

ε_x = world demand elasticity for exports

Assumptions
1. World supply elasticity for imports is infinite
2. World demand elasticity for minor exports is infinite

Although depending on the purpose of the evaluator, any of the three estimates may be deemed appropriate, the study recommends using the first-best highest elasticities[5/] estimate of 1.114 times the OER (See Medalla 1979). This, however, measures only the wedge arising from the tariff structure. For the period considered in the IPPP study (1974), the SER distortion arising from a BOP disequilibrium was considered to be minor. It was estimated to be at most equal to 5 percent. Hence, the NEDA has been recommending using 1.2 x OER as the SER. (The SER/OER estimate for 1974 is around 1.16, plus 5 percent yields around 1.2.)

The estimate of the wedge between SER and OER created by a BOP disequilibrium is calculated by $e^{\Delta/\mu - \Delta^{*}/\mu^{*}}$ where Δ is the present trade deficits, Δ^{*} the desired level and μ is equal to $\varepsilon_f X + \eta_m M$. For 1983, the outstanding foreign obligation has been conservatively estimated at $25 billion. For 1982, the trade deficit reached $3.2 billion. Thus, putting Δ^{*} to as low as zero may not even be enough to external debt goals. For our study, then, we conservatively put Δ^{*} at zero.

[5/] Since our concern is with the long-run effects of a particular policy regime, the highest elasticities may be most relevant.

Using the formula above, the required exchange rate adjustment is estimated to range from 1.044 to 1.118 corresponding to high trade elasticities assumption and low trade elasticities assumption, respectively. The higher the trade elasticities, the lower the exchange rate adjustment required. The longer run the period considered, the higher would the trade elasticities be. Thus, the longer we can wait for the BOP adjustments, the lower the required change in the exchange rate is. Although we can perhaps sustain a BOP difficulty in the short run, given the high level of foreign obligations, a very long-run solution may not be viable. Hence, we take the middle value, 1.081, as our estimate of the wedge arising from the BOP disequilibrium.[6/]

The combined effect of protection structure and the BOP disequilibrium is then equal to (1.114) (1.081) = 1.204, that is SER/OER equals 1.204.

3. The Shadow Price of Saving (Investment) and the Social Rate of Discount

3.1 Deriving the Social Rate of Discount and the Shadow Price of Saving

The shadow price of saving (SPS) is the net present value of the aggregate income stream generated by ₱1 of marginal investment. It has been referred to also as the shadow price of capital (SPK) and the shadow price of investment (Manalaysay in Bautista, et al., 1979). Similar concepts are found in the UNIDO manual (Dasgupta, et al., 1972), Little and Mirrlees, and Squire and Van der Tak.

[6/] This differs from our procedure in the case of the protection induced distortion because we consider the effects of a policy regime as if it were permanent, while the BOP deficit is something that must be corrected at least in an intermediate run.

The formula (Manalaysay) is:

$$SPS = \frac{q - sq}{i - sq}$$

where q is the marginal product of capital, i is the social rate of discount, and s is the saving ratio.

In Manalaysay's study, q was estimated empirically and then adjusted for consistency with the shadow wage rate (SWR). The Keynes-Ramsey (K-R) rule

$$i = \frac{q - n}{1 + n}$$

where n is the expected rate of population growth was used to estimate an upper limit to i. A lower value was estimated from a projected rate of growth per capita of consumption (g) and an arbitrary assumption about the elasticity of marginal utility of consumption (h)

$$i = gh .$$

The q used in the K-R rule was the adjusted q. However, the K-R rule is derived from the actual marginal product of capital, not a hypothetical equilibrium value, adjusted for consistency with the SWR.

This led to the questioning of the need for any such adjustment of q for any purpose. We want an SPS and an i that reflects the real returns from investment and reinvestment. This would be represented by the actual unadjusted q. The rationale for previously following the adjustment procedure was that since we were assuming surplus labor to be consistent, we must assume scarce capital. The economy is in disequilibrium. It was thought that if we move the wage rate toward its equilibrium value, we should also adjust q in accordance with an assumed aggregate production function. But our SWR is not an equilibrium wage rate. It is the social cost of hiring labor, based mainly on the (distorted) marginal product of labor. For SPS and i, again, we do not want equilibrium values but values based on the actual (distorted) marginal product of capital.

Thus, for this study, we eliminate the adjustment for consistency with the SWR from the estimation of q, i and SPS.

If we use the K-R rule, we are implicitly assuming that the government has implemented an optimum saving program, or at least a constrained optimum program. This means that the government is satisfied that it is doing its best in this regard, i.e., the savings level is sufficient given political and other constraints. Still, using K-R, we get an i that is less than q implying an SPS greater than one. This apparent contradiction (saving is optimum and yet we place a premium on it over consumption) led us to think some more about the role of population growth in project evaluation.

The derivation of the K-R rule takes into account the fact that while there may be more consumption in the future if present consumption is postponed, there may also be more people to share it. Hence, although ₱1 of investment will yield q in the future, the actual rate of growth of per capita consumption is only $\frac{1+q}{1+n} - 1$.[7/] If the saving program (and thus the consumption path) is optimal, this must be exactly offset by the rate of discount applied to value of future consumption.[8/] Thus, the K-R rule derivation of the social rate of discount is

$$i = \frac{q-n}{1+n} = \frac{1+q}{1+n} - 1.$$

What the above argument also points out is that we cannot compare the values of future and present consumption directly. We must adjust them for population differences, since the values will differ in accordance with the number of people who share in the consumption. If, for example, a loaf of bread is shared by two, each gets half a loaf which has a marginal utility greater than half that of a whole loaf.

[7/] We assume a constant ratio of saving to GDP.

[8/] Otherwise, the marginal social value of consumption foregone in one period will not equal the marginal social value of consumption gained in another period, implying that social welfare can still be improved by a redistribution of consumption among different periods.

A problem arises, however, because conventional project analysis does not take into consideration the fact that future income will be shared by more people. Yet future incomes will have a value different from that which would apply if population growth were zero. We must put them in per capita terms. Hence, we must discount them by the rate of population growth (n). If we then discount future benefits (B) both by n and i, and define $\hat{i}$ equal to (1+i) (1+n) -1, we get

$$\frac{B}{(1+\hat{i})} = \frac{B}{(1+n)\ (1+i)} = \frac{B}{(1+n)\ \left(1+\frac{q-n}{1+n}\right)} = \frac{B}{1+n+q-n} = \frac{B}{1+q} .$$

Thus, under an optimum saving program, the appropriate social rate of discount $(\hat{i})$ for a stream of absolute income flows (i.e., unadjusted for population growth) is equal to q. That is, setting $\hat{i} = q$ is equivalent to discounting by both i, the social rate of discount defined as the rate of fall in the value of the numeraire (consumption), and the population growth. This is very convenient since the conventional practice is not to discount future values by the rate of population growth. We can follow that procedure and adjust the value of i instead, i.e., we add to i, n plus in. Thus, under an optimum saving program,

$$\hat{i} = i + n + i\,n$$

$$= \frac{q-n}{1+n} + n + \frac{q-n}{1+n}\,n$$

$$= \frac{(q-n)\ (1+n)}{1+n} + n$$

$$= q - n + n = q$$

We now substitute $\hat{i}$ for i in the formula for SPS, and since $\hat{i}$ equals q, SPS is equal to unity. This is what it should be if we assume under the Keynes-Ramsey rule that saving is optimal. The apparent contradiction noted above disappears.

The question as to whether or not we assume the existence of an optimum saving program is a very important one. Among others, the following considerations should be addressed:

(1) The official national income data indicate a very high saving ratio for the Philippines, despite its relatively low per capita income. This might suggest that for a poor country, the Philippines is saving as much as it should. The problem seems to be inefficiency of the use of that saving in investment. Thus, efficiency considerations should predominate in project evaluation, rather than the distribution of income between consumption and saving.

(2) On the other hand, a recent study by the IMF suggests that saving and investment are over-estimated in the official figures. Moreover, the trade balance is badly in deficit, suggesting a need for more saving.

(3) Finally, even if we grant the need for more saving, a question remains as to whether we should use project evaluation as means of increasing saving (at the expense of efficiency of investment). Fiscal and monetary policies may be more appropriate as instruments for increasing saving.

The first justifies an assumption of an optimum saving program. Hence, we use $\hat{i} = q$ and SPS equal to unity. The third implies, however, that although saving may be sub-optimal, we need not use a social discount rate different from the marginal productivity of capital if project selection would not be used to increase saving. Thus, efficiency consideration should again predominate in project evaluation so that $\hat{i}$ equals q and SPS must be unity.

If we assume, on the other hand, that project evaluation can be used to increase saving, the second implies that we would need to estimate a social rate of discount $\hat{i}$ which is different from q (and thus an SPS different from unity).

To do this, we can use two approaches. One, we could get an independent estimate of the social rate of discount, i, and add to it, i plus in, i.e.,

$$\hat{i} = i + n + i\,n$$

This, in effect, discounts future incomes by both i and n. The independent estimate i could be g h, as noted above. This however entails an arbitrary assumption regarding the value of h (Squire and Van der Tak suggest a value between one and two).

Second, one could independently assume an arbitrary premium on saving and investment (i.e., an SPS) and then derive $\hat{i}$ from an empirical estimate of q using the formula for SPS above. Hence,

$$\hat{i} = \frac{q(1-s)}{SPS} + sq$$

(We can work backwards to derive the implied h. First $i = \frac{1+\hat{i}}{1+n} - 1$. Then setting $i = gh$, we could derive h, knowing g.)

The conclusion, then, is that only if we assume that saving is not optimum and that the government wants to increase saving through project selection can we get an SPS greater than one. In that case, either we derive i from gh, where our assumption about h is bound to be quite arbitrary, or we assume directly an arbitrary SPS and, as noted above, derive $\hat{i}$ from this.

3.2 Estimating the Marginal Productivity of Capital

The study employs basically three approaches to estimate q -- by estimating:

1) the rate of return in manufacturing
2) the inverse of the incremental capital output ratio (ICOR), plus an estimate of factor shares, and
3) the international (private) rate of borrowing.

3.2.1. The rate of return to manufacturing and the ICOR.

The first two methods are discussed in detail in Manalysay (1979) and will only be described briefly here. A third approach -- Stock yields, is also suggested in Manalysay (1979) but is not done for the study due to worsening, in terms of quality and availability, of data for the more recent years.

Since the rate of return to capital for all sectors should equalize in the long run, the rate of return in manufacturing should be an estimate of q for the whole economy.

The method involves taking out from the total value-added in manufacturing contributions of all other factors (mainly rent and labor compensation). This is then divided by a measure of replacement cost of capital (using a method developed by Power, also in IPPP).

The second method employs a Cobb-Douglas production function represented by

$$Y = A K^{\alpha} L^{1-\alpha}$$

where Y is the output, K is capital, L is labor, α is the share of capital in output and $(1 - \alpha)$ is the share of labor. (A is a constant.) The marginal productivity of capital is then simply the partial derivative of Y with respect to K, i.e.

$$q = \frac{\partial Y}{\partial K} = \alpha \frac{Y}{K}$$

$\frac{Y}{K}$ is then approximated by $\frac{\Delta Y}{\Delta K}$, i.e., the inverse of the incremental capital-output ratio (ICOR), where data are available from national income accounts. Specifically,

$$\frac{\Delta Y}{\Delta K} = \frac{NDP_t - NDP_{t-1}}{I_{t-1}}$$

where NDP is net domestic product and I is net investment.

3.2.2. The International (Private) Rate of Borrowing

In Figure 1, let MEI be the marginal efficiency of investment schedule and S, the domestic supply curve of investible funds. The horizontal axis gives the amount of investible funds (IF) and the vertical axis the rate of interest and MEI .

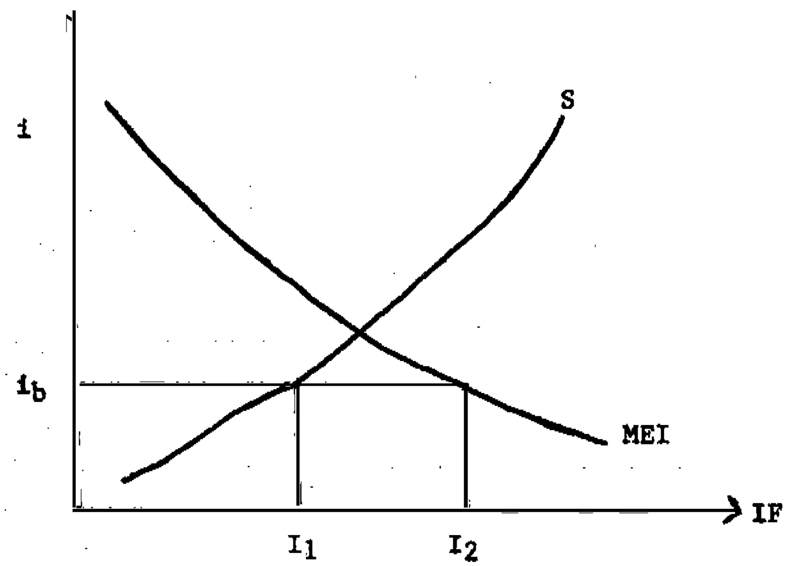

Figure 1

If we assume a perfect market and perfectly mobile (internationally) capital at an international borrowing rate i_b, then investment will be where i_b equals MEI. In the figure, I_2 would be amount invested, I_1 the amount supplied domestically, $I_2 - I_1$ the foreign borrowings (FB) supplied at rate i_b and the marginal efficiency of investment (which will also then be the marginal productivity of capital) will equal i_b.

Suppose, however, that foreign borrowing is rationed, i.e., the country cannot borrow as much as it wants at rate i_b. Outstanding external debts may have reached an alarming level so that supply of foreign capital becomes inelastic. Or the country itself may seek to regulate further accumulation of foreign debts. In any case, we can represent this by Figure 2.

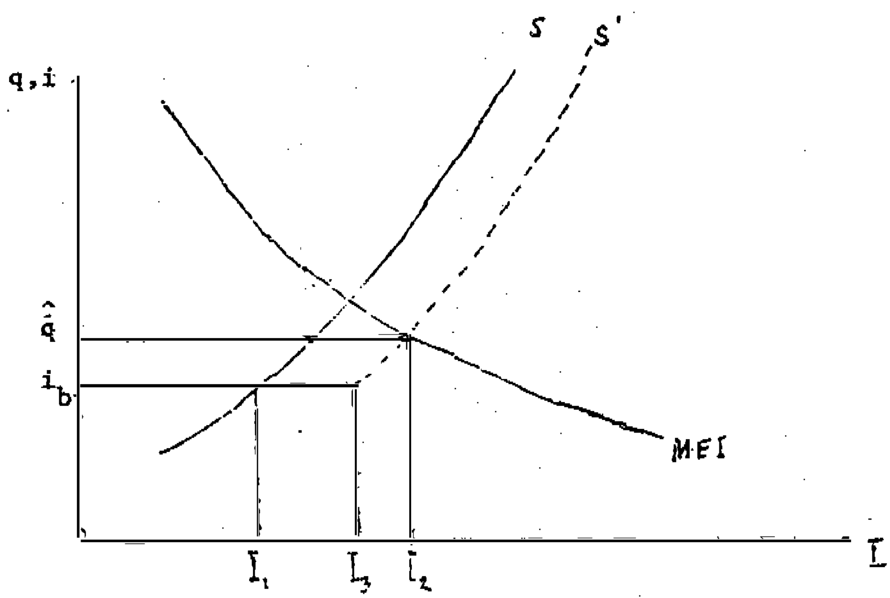

Figure 2

Suppose the economy can borrow only $I_3 - I_1$. Then SS' will represent the aggregate supply of investible funds. Investment will proceed up to I_2 where demand equals supply. With FB rationed, i_b will be less than q.

What the above discussion suggests is that the international (private) rate of borrowing could be an estimate of q. However, it should be considered a lower bound.

Still, some adjustment in i_b is necessary. Suppose X is the amount of foreign capital borrowed, in foreign currency, and E_t is the real exchange rate during the period. Hence, the amount borrowed in real terms, in domestic currency, is E_t X. If the real exchange rate in t + 1 becomes E_{t+1}, after the end of the period, interest payment would equal $i_b\ E_{t+1}X$ which yields an effective rate of interest equal to

$$\frac{i_b\ E_{t+1}\ X}{E_T X} = i_b\ \frac{E_{t+1}}{E_t},$$

i.e., the international rate of borrowing should be adjusted by real exchange rate changes.

3.3 Empirical Results

3.3.1. The Rate of Return to Manufacturing

To calculate the net returns to manufacturing, we deduct the following items from gross manufacturing output - 1) indirect taxes, 2) operating costs, 3) cost of resale goods sold,

4) total payrolls and benefits, 5) imputed labor income of unpaid workers, 6) depreciation and 7) imputed returns of land. The main source of data is the Annual Survey of Manufacturers (ASM) published by the National Census and Statistics Office (NCSO). The ASM for 1979 and 1980 are available. However, for the study, we use only the 1976 and 1977 ASM due to lack of more detailed data for the later years(for example, inventory figures are no longer available for 1979 and 1980: fixed assets are already aggregated, etc.). For the rest of the data requirements, we follow Manalysay (e.g., in imputing labor income of unpaid workers and returns to land).

The net returns to manufacturing is then divided by a measure of the replacement cost of capital. Again, the main source of data is the ASM which gives (1) beginning and ending inventories, (2) depreciation, (3) gross investments, and (4) book value of fixed assets. Using the method by Power, the replacement cost of capital is estimated. (Again see Manalysay for more detailed discussion of the data.)

The rate of return net of indirect taxes is estimated to be 10.75 for 1976 and 16.17 for 1977, while the gross rate of return is estimated to be 18.73 for 1976 and 25.42 for 1977. Though the divergence estimated for the two years is not as great as observed by Manalysay, the difference is still substantial.[9/] We have the

[9/] See Manalysay for a discussion of the indirect tax issue.

choice of whether to take the average between the two years or choose the estimate for a particular year. From observations by Manalysay, the rate of return in manufacturing is generally lower than other sectors. Furthermore, the estimate is an average rate of return. With very divergent rates among firms and among industries, it seems reasonable to assume, as noted by Manalaysay, that new investments would go to industries yielding higher returns. Hence, we simply choose the higher estimate of q -- the rate of return to manufacturing for 1977.

We still need to adjust our estimates to border prices (to shadow price inputs and outputs). For example, manufacturing output is deflated by one plus an estimate of an average implicit tariff for manufacturing for 1977 (this is still taken to be the same as in 1974 since no major tariff reforms have occurred), estimated to be around .385. This gives a conversion factor of .72. This differs somewhat from Manalysay -- she used the EPR as a proxy for implicit tariff. Similarly, replacement cost of capital, operating costs, labor income, returns to land and others are converted to border prices. The rate of return thus estimated for 1977 is 9.26 percent net of indirect tax and 18.83 percent inclusive of indirect tax. Taking the middle value as in Manalysay (1979), this suggests an estimate of q equal to 14.05.

3.3.2. The ICOR method

Using the ICOR method, the marginal productivity of capital is estimated by using the formula

$$q = \alpha \frac{\Delta Y}{\Delta K}$$

where α is the share of capital in output and

$$\frac{\Delta Y}{\Delta K} = \frac{NDP_t - NDP_{t-1}}{I_{t-1}}$$

To estimate $\frac{\Delta Y}{\Delta K}$, we use the data from the national income accounts. An average for period 1973 to 1982 is taken. (See Appendix 2.) This yields an estimate for $\frac{\Delta Y}{\Delta K}$ equal to .29.

To estimate α, We again follow Manalysay. The main source of data is also the national income accounts. The upper limit of α is taken to be one minus the percentage share of compensation of employees in national income. Then entrepreneurial and property income net of estimated rent and dividend payments is added to compensation of employees to arrive at an upper limit estimate of labor share and hence a lower limit estimate of α. This procedure yields an estimate of α ranging from .298 to .601. As our final estimate, we use the middle value which still turns out to be near .5, as used in Manalaysay.

Furthermore, $\Delta Y/\Delta K$ must be adjusted to border prices. This is done by multiplying $\Delta Y/\Delta K$ by SCF/CCF where SCF is the standard coversion factor for manufacturing output and CCF is the capital conversion factor. From Medalla (1979), the SCF (which is the reciprocal of one plus the implicit tariff on manufacturing output) is around .72 while the CCF is around .76. Hence, the estimate of q using the ICOR method is calculated to be equal to 13.82.

3.3.3. The International Borrowing Rate

We look at the US Prime Rate and the London Interbank Borrowing Rate (LIBOR) for an estimate of the international rate of borrowing. To reduce the impact of random variation, the average for the last five years (1978-1982) is computed. (Furthermore, we want a long-run q to be used for future projects). The figures are presented in Table 3. Since these rates are prime rates of borrowing, we choose the higher rate of 14.12 percent, the average US prime rate. Likewise, the five-year annual average real exchange rate change (1976-1980) is computed (See Table 4.) This is around 0.38 percent. This brings our estimate of q to around 14.5 percent.

Table 3
Interest Rates

YEAR	U.S.PRIME RATES	LIBOR
1969	9.62	8.77
1970	8.56	7.80
1971	5.96	5.43
1972	5.72	5.22
1973	10.15	9.26
1974	11.98	10.93
1975	7.15	6.52
1976	6.79	5.59
1977	6.80	6.11
1978	9.07	8.85
1979	12.60	12.07
1980	15.24	14.11
1981	18.88	16.89
1982	14.81	13.20
Average annual interest rate 1978-1982	14.12%	13.02%

Source:

International Currency Review 1983

Economic Planning and Research Staff of the National Economic and Development Authority

Table 4. Real Exchange Rate Changes: 1971-80

	GDPIPI[4]	$\frac{Pw}{GDPIPI}$[5]	R	$\frac{Pm}{GDPIPI}R$	ZA
70	81.765	1.250	3.2541	4.069	
71	93.385	1.075	3.6275	3.900	-4.151
72	100	1.000	3.7354	3.735	-4.23
73	117.915	1.170	3.652	4.272	14.38
74	154.645	1.4605	3.8558	5.631	31.82
75	167.37	1.248	3.732	4.658	-17.27
76	182.93	1.077	4.0566	4.371	- 6.15
77	196.525	1.068	4.0898	4.370	- 0.04
78	214.61	1.04	4.0687	4.231	- 3.16
79	247.22	1.078	4.2123	4.542	7.35
80	285.62	1.0867	4.3422	4.718	3.886
			Average from 1971 to 1980 -		.3772
			Average from 1976 to 1980 -		4.112

Sources:

[1]NEDA National Income Accounts (computer print out).

[2]Central Bank Thirty-Second Statistical Bulletin 1980.

[3]R is the weighted average of exchange rates of the currencies of the different countries with which the Philippines does trade. The weights are the ratios of the volume of trade between the Philippines and a particular country and the total volume of trade between the Philippines and the world. Data source is the International Financial Statistics of the International Monetary Fund (IMF).

[4]GDPIPI is the implicit price index of GDP taken from the National Accounts Staff of the National Economic and Development Authority (NEDA).

[5]Pw is the weighted average of the import and price indices weighted by shares of imports & exports in the Philippines total trade. The price indices were taken from the Central Bank's Statistical Bulletin 1980 and the trade shares from the Foreign Trade Statistics of the Philippines 1980.

3.3.4. The Social Rate of Discount and the Shadow Price of Saving Assuming Saving Is Not Optimal

If we assume that saving is not optimal and that the government wants to increase saving through project selection, we would need to estimate a shadow price of saving (SPS). As noted above, the formula is $SPS = \frac{q - sq}{\hat{i} - sq}$.

As suggested in section 3.1, we could derive, first, an independent estimate of the social rate of discount, i, from g h and then add to it n plus i n. The growth rate of per capita consumption, g, the saving rate, s, and the population growth rate n, are based on their projected rates from the NEDA development plan. These values are $g = .05$, $s = .20$ and $n = .025$. The value of h, however, is bound to be arbitrary. Squire and Van der Tak (S-T) put the upper limit at two and the lower limit at one. Setting h at 1, 1.5 and 2, we get the following estimates:

h	i	$\hat{i}$	SPS
1	.05	.076	2.47
1.5	.075	.102	1.59
2	.10	.127	1.18

The second approach sets, instead, an arbitrary value for SPS (based on what government feels the premium on saving should be.) For example, we could set the value of SPS at 1.3, 1.5 and 2. We can then derive $\hat{i}$, using our estimate of q from the formula for SPS.

$$\hat{i} = \frac{q(1-s)}{SPS} + sq$$

Thus, we get the corresponding set of values for i and $\hat{i}$ and implied value for h.

SPS	$\hat{i}$	i	h
1.3	.118	.091	1.82
1.5	.106	.079	1.58
2	.087	.061	1.21

3.4 Summary and Conclusions

An innovation in project evaluation is suggested in the study -- that we ought to adjust costs and benefits accruing over time for population differences since their values will differ depending upon the number of people who share them. A convenient way to do this (which avoids directly discounting future income by population growth) is to adjust the value of i, the social discount rate (as usually defined -- i.e., the rate of fall in the value of the numeraire-consumption) by adding to it n plus i n. Such a method yields, as it should, a value of $\hat{i}$ equal to q and SPS equal to unity under an optimal saving program. Otherwise, we need estimates for SPS and a social rate of discount, not equal to q.

To summarize, we have the following cases:

I. Saving program is optimum or that project selection would not be used as a means of increasing saving. Then

$$\hat{i} = q \quad \text{and} \quad SPS = 1$$

Three approaches were used to estimate q. Results are tabulated below.

Method	q
Return to manufacturing	14.04
ICOR method	13.82
International borrowing rate	14.5

We choose the higher estimate of 14.5 percent from international borrowing rate since, as discussed earlier, this should represent a lower bound.

II. Saving is not optimum and the government wants to use project selection to increase saving.

A. Derive an independent estimate of $\hat{i}$ from gh. Then,

$$\hat{i} = i + n + i\,n, \text{ and}$$

$$SPS = \frac{(1-s)\,q}{\hat{i} - sq}$$

Depending on the value of h, $\hat{i}$ ranges from 7.6 to 12.7 percent while SPS ranges from 1.18 to 2.47. For h = 1.5 (the middle value), $\hat{i}$ = 10.2 percent while SPS = 1.59.

B. Set an arbitrary premium on SPS.

Thus

$$\hat{i} = \frac{(1-s)\ q}{SPS} + sq.$$

For example, for SPS equal to 1.3, 1.5 and 2.0, $\hat{i}$ would correspondingly equal 11.8 percent, 10.6 percent and 8.7 percent.

4. The Shadow Price of Labor

4.1 Determining the Shadow Price of Labor

The shadow price of labor (more specifically unskilled labor for urban project employment,) or the shadow wage rate (SWR), is estimated in Medalla's study (Bautista, et al., 1979) as

$$SWR = \alpha z \frac{L}{N} + (w-z)\ B\ (s-s_w)\ (SPS-d) - (w-z)$$
$$B\ (1-s)\ (d-1)$$

where α is the conversion factor for agricultural output, z is the marginal product of labor in agriculture, L/N is the ratio of labor force to employment in urban areas, w is the wage rate in the project, s is the average saving ratio, s_w is the worker's saving ratio, SPS is the shadow price of saving, d is the income distribution weight and B is the ratio of OER to SER.

The first term of the formula, $\alpha z \frac{L}{N}$, indicates the direct opportunity cost of hiring unskilled labor for project employment. For each (fairly permanent) job created in the urban sector, migration theories suggest that rural-urban migration will be induced to restore an equilibrium unemployment rate, given the rural-urban wage differential. L/N workers will migrate from rural sector thus foregoing $\frac{L}{N}$ z output. This is multiplied by α to convert to border prices.[10/] The conversion factor α, should then be appropriate to agricultural output foregone.

The L/N factor is applicable only for urban projects. For non-urban projects, direct opportunity cost would be z. This should perhaps be a regional z since labor would probably be drawn from surrounding areas. The implicit assumption here, however, is that all migration is rural to urban and that there is no migration regionally from rural to rural.

[10/] We first derive SWR in border prices then multiply this by SER/OER to convert to domestic prices which is what is compared with the market wage.

The last two terms of the formula, which are

$$(w-z)\ B\ (s-s_w)\ (SPS-d) - (w-z)\ B\ (1-s)\ (d-1)$$

indicate the indirect cost or the cost of additional consumption (resulting from project employment of rural labor). Primary factors, except surplus labor, will be paid by their marginal product. Thus, in hiring these other resources, there is no increased consumption cost involved. Surplus labor, however, will be paid by an industrial wage higher than its marginal product.

However, a basic assumption in deriving the indirect cost of labor, above, is that the increased income of the worker (w-z) would be at the expense of someone else's income through taxation, inflation, or some other means. That might be true if we were considering a government project that did not produce consumption goods. Otherwise, however, we now think that it is reasonable to assume that other incomes will not be affected, so that the extra consumption of the worker will have to be provided for by the output of more consumption goods at the expense of investment. Moreover, the benefit to the worker is not in this case offset by a disbenefit to someone else. This is also the general assumption of Squire and Van der Tak, as well as of Little and Mirrlees. The difference is simply that we count the whole increase in worker consumption as a cost and a benefit rather than this less the amount by which the consumption of others is reduced.

The result is a much simpler expression for the SWR

$$SWR = \alpha z \frac{L}{N} + B\ (w-z)\ (1-s_w)\ (SPS-d)$$

This is SWR in border prices. To convert to domestic prices in order to compare with the market wage rate, we simply multiply this by 1/B (i.e., SER/OER).

The reason for incorporating SPS and d into the calculation of the SWR is to encourage projects that produce relatively more saving and more income to the poor. But if these considerations are valid they should apply to all incomes, not just wage income. Accordingly, we devised an alternative way in which the indirect cost of labor can be incorporated when evaluating a project.

If a particular project being proposed and evaluated is not carried out, assuming full employment (except for unskilled labor), resources will be used somewhere else. Everything, except surplus unskilled labor, will be paid by its marginal product. Thus, any project which hires proportionately more labor than an <u>average</u> project,[11/] would involve a higher cost of increased consumption and it is this gap that we really want to measure.

[11/] This is taken to be the alternative project.

Hiring proportionately more or less labor has two effects. One, it would affect the proportion of income saved by the project, s_j, since the worker's saving rate, s_w, is assumed to be lower than others. Two, it would affect the proportion of the project's income going to the poor, p_j. The effects on s and p are opposite. The more unskilled labor would be employed by the project, the lower is s_j but the higher is p_j. Suppose that for an average project, $\bar{s}$ is the proportion of income that would be saved and $\bar{p}$ is the proportion of income that would go to the poor. Then we should adjust the income of a particular project j by multiplying accordingly by

$$(1) \quad \frac{s_j\,(SPS) + (1-s_j)}{\bar{s}(SPS) + (1-\bar{s})} = \frac{1 + (SPS-1)\,s_j}{1 + (SPS-1)\,\bar{s}} \text{, and}$$

$$(2) \quad \frac{p_j d + (1-p_j)}{\bar{p}d + (1-\bar{p})} = \frac{1 + (d-1)p_j}{1 + (d-1)\,\bar{p}}$$

The effect of the additional cost and benefit of increased consumption is thus incorporated in s_j and p_j (given $\bar{s}$ and $\bar{p}$).

Hence, to estimate SWR, we need only to estimate $\alpha z \frac{L}{N}$.

4.2. Estimating the SWR when all incomes are adjusted for saving and income distribution.

From the above discussion, the SWR estimate has been reduced to (in border prices)

$$SWR = \alpha z \frac{L}{N} .$$

The most important element is z. To estimate z, we take the agricultural market wage rate to reflect marginal product (i.e., as several studies show, the rural labor market is fairly competitive) foregone. We found adequate data for three major agricultural crops-palay, corn, and coconuts. For these crops, data for wages (without meals) by farm activity (i.e., plowing, planting, harvesting, etc.) for the whole Philippines and by region are provided in the BAEcon surveys. Data for number of days worked for each activity can also be obtained from BAEcon. A weighted average wage rate was then estimated. Computations yielded an estimate of z equal to ₱10.56 a day for 1980 and ₱12.16 a day for 1981.

As mentioned earlier, for non-urban projects, the opportunity cost of labor would simply be z and should be for the appropriate region. Regional z's are also given in the appended tables.

The conversion factor, α,[11/] should therefore be for palay, corn, and coconut. Although these are the unprocessed farm products which are not directly tradable, they are however basically intermediate inputs into highly tradable outputs -- rice, corn and various coconut products. Their prices are thus constrained by the prices of these tradable products and thus affected by the same protection. Hence, we take the same implicit tariff as those for the processed product. From C. David (1983), the implicit tariff for rice and corn is close to zero.

11/ Coversion factor to bring value to border prices. Hence $\alpha = 1/(1+T)$ where T is the relevant implicit tariff.

For coconut oil, copra and desiccated coconut, the implicit tariff is negative (an average of the three close to -.04). Since in the weighting of wage rates, palay and corn dominate, we simply took $\alpha = 1.0$.

The factor $\frac{L}{N}$ is derived from the Labor Force Survey (4th Quarter 1980 and 1981). Counting the employed wishing more work as 50 percent unemployed, total employment is computed. Dividing the labor force by this estimate of total employment, L/N is computed. This is 1.26 for 1980 and 1.30 for 1981.

Estimates of the SWR for 1980 and 1981 are given in the following table, together with an estimate for 1977 using the raw data from Medalla's earlier study. Results are tabulated below.

Year	SWR in border prices	SWR in domestic prices	$\frac{SWR}{W}$
1977	9.28	11.14	.66
1980	13.33	16.00	.54
1981	15.81	18.97	.60

4.3. Estimating the additional consumption cost of hiring labor

We still tried to see what happens if we include the cost of increased consumption in the SWR. This requires consistent estimates of SPS and d, the income distribution parameter.

In the Technical Notes of the IPPP project, a method of estimating the income distribution parameter (d) is shown. The latter is defined as the ratio of the marginal utility of consumption of a particular class (in our case the newly hired workers), to the marginal utility of consumption at the average level. Assuming a social welfare fonction implied by $MU(c) = c^{-h}$,

$$d = \left(\frac{\bar{c}}{c} \right)^{h}$$

where $\bar{c}$ is average consumption, c is workers' consumption and h is the elasticity of marginal utility of consumption. MU is marginal utility function.

Assuming all of the income of the worker is consumed, we have the range of values of c from c_o (his former wage in agriculture) to c_n (his new wage in the project). Our preliminary data give these as ₱12.16 and ₱31.82 per day, respectively. If we multiply these by 250 days per year and again by 0.4 to account for the consumption of his dependents, we get ₱1,216 and ₱3,182, respectively, for annual consumption.

Then we must ask what we mean by average consumption. In the IPPP project we selected median consumption as our "average" rather than mean consumption, which is about 50 percent higher. We are not sure that this is right, but we will nevertheless follow the same procedure here.

We have data for overall per capita consumption, which was ₱4,152 in 1981 (the year of our other data). To estimate median consumption, we multiply this by the ratio of median to mean income from the 1971 household survey. This involves two heroic assumptions -- first, that the skewness in the two distributions is about the same and, second, that the shape of the distribution did not change much over a decade. We hope we can do better, but we will proceed now on that basis. Our estimated value of $\bar{c}$ is, then, ₱2,727.

Integrating our expression for d over the whole range of values from c_o to c_n

$$(c_n - c_o)\ d = \int_{c_o}^{c_n} \left(\frac{\bar{c}}{c}\right)^h \ d_c$$

$$= \bar{c}^h \int_{c_o}^{c_n} c^{-h} \ dc$$

$$= \bar{c}^h \left(\frac{c_o^{1-h} - c_n^{1-h}}{h-1} \right) \quad h \neq 1,$$ [12/]

If we put h = 2 (the upper limit for Squire and van der Tak (S-T) and the lower limit for the IPPP project), we get d = 1.92. S-T recommend setting h arbitrarily at unity in the absence of any information that would throw light on the question. That would yield d = 1.31. In between, h = 1.5 gives d = 1.56.

[12/] for h = 1,

$$(c_n - c_o)d = \bar{c}\ \ln \frac{c_n}{c_o}$$

If we do not assume an optimal saving program and want to use project evaluation to increase saving, we need corresponding values for SPS which also depends on h. We have 2.47, 1.59 and 1.18 for h equal to 1.0, 1.5, 2.0, respectively. (This uses $q = .145$, $s = .20$, $g = .05$, and $n = .025$.) All of the values for d are much higher than the 1.0 used in the IPPP project and confirmed by a procedure similar to that used above. The principal reason seems to be that farm wage rates have risen far less than overall per capita consumption. The same is true also (though to a lesser degree) for the urban minimum wage rate; so this is a second contributing cause.

What are the implications for the estimation of the SWR? Recall that

$$SWR = \left[\alpha s\left(\frac{L}{N}\right) + B(w-z)\ (1-s_w)\ (SPS-d) \right] \frac{1}{B}$$

The results for three different guesses for h are:

h	d	i	SPS	SWR
1.0	1.31	.076	2.47	41.78
1.5	1.56	.102	1.59	19.56
2.0	1.92	.127	1.18	4.42

Obviously, the SWR is very sensitive to the assumption about the value of h. Moreover, we seem to face a dilemma. If we set h at the higher end of the range to be consistent with a plausible social rate of discount (i) and SPS, we get a very high value for d that puts the SWR very low. At the other end, we get an i of only 7.6 percent, an extremely high SPS and an SWR above the minimum wage rate.

We would all agree that i should be at the upper end of the range, consistent with the upper value for h. But because this yields a very high d (we are valuing very highly a transfer of income to poor farm workers), we get an implausibly low value for the SWR. If there were an upward bias in our method of estimating d, we could adjust d downward for that reason. In fact, however, our method probably biases downward the estimate of d for any given h. First, we have taken median income, rather than mean as the average. Second, the skewness of the consumption distribution is probably less than that of income, so that the median for consumption should be closer to the mean. Thus for two reasons our "average" consumption may be too low. Finally, we have assumed that the farm workers are working full time throughout the year. If this is not true, we have set their income and consumption too high. So we cannot blame the method for the high values for d,

It seems that of the range of values for h, the middle value, 1.5, gives the most plausible result so far as the SWR is concerned. The corresponding i of about 10 percent seems on the low side, however. It is always open of course to add a pure rate of time discount to make it higher. This would have to be justified by some argument as to why future generations should be discriminated against. If we are concerned that a discount rate of 10 percent would be too favorable to capital-intensive investment, we should note the corresponding SPS of about 1.5. This means that the initial investment cost in a project should be raised 50 percent if we judge that new investments are at the expense of other investments, rather than at the expense of consumption. If this were done in project evaluation, it would represent a strong deterrent to excessive capital intensity. What might worry us, however, is the possibility that an i of 10 percent would be accepted and the SPS ignored.

4.4. Conclusion.

All of the above difficulties are avoided, however, if we incorporate saving and income distribution considerations more completely (i.e., all incomes, not just wage incomes) as in section 4.2 above. Then the appropriate social rate of discount, $\hat{i}$, is equal to q, the marginal product of capital, and the SWR is equal to $\alpha z \frac{L}{N}$. Note that this would be true either if we chose to ignore saving and income distribution parameters entirely in project evaluation, or if we incorporate them in the more complete manner described in section 4.2. The latter represents a real innovation in project evaluation and we recommend that it be carefully considered.

TABLE 5: WEIGHTED AVERAGE FARM WAGES, BY CROP AND BY COMBINED REGIONS: 1979-1980
(P)

	PHIL	I	II	III	IV
PALAY					
1979	10.87	10.90	11.17	10.85	10.52
1980	10.73	10.26	12.04	10.04	10.61
1981	12.51	12.19	15.45	11.37	10.91
CORN					
1979	10.07	9.91	10.02	10.09	10.40
1980	10.14	9.62	12.49	9.27	10.20
1981	11.19	12.35	12.00	9.99	11.26
COCONUT					
1979	10.52	10.00	10.89	9.83	10.63
1980	10.54	-	12.27	9.43	9.64
1981	12.23	-	15.25	11.02	10.61

TABLE 6: AVERAGE WAGE RATES, BY COMBINED REGIONS: 1979-1980

	PHIL	I	II	III	IV
1979	10.61	10.71	10.99	10.51	10.50
1980	10.56	10.13	12.15	9.80	10.22
1981	12.16	12.22	15.09	11.10	10.96

Appendix 1: The Inverse of the Incremental Capital-Output Ration (ICOR)

Year	ΔNDP (ΔY)	ΔK_{net}	$\frac{\Delta Y}{\Delta K_{net}}$
1973	4,633.33	7,354.67	.62998
1974	2,851.67	8,383.00	.34017
1975	3,908.33	10,935.67	.35739
1976	4,993.33	14,107.00	.35396
1977	4,165.00	16;532.33	.25193
1978	3,983.00	16,134.33	.24686
1979	4,661.67	17,607.33	.26476
1980	4,218.67	19,655.00	.21464
1981	2,834.00	20,315.67	.1395
1982	2,491.66	20,190.67	.12341

Appendix 2: The Share of Labor and Capital

	CE	CE/NI	EPI+CE	X	EPI+CE-X (Y)	Y/NI (1-α)
73	23,658.75	.39838	54.791	12,903.17	41,887.83	.70532
74	32,721.80	.40326	75,780	18,134.07	57,645.93	.71042
75	37,187.48	.40433	86,122	20,812.57	65,309.43	.71009
76	44,192.14	.40341	102,344	24,272.53	78,071.47	.71268
77	50,911.38	.40712	117,905	26,993.80	90,911.20	.72698
78	57,933.74	.40397	134,168	31,290.37	102,877.63	.71736
79	68,350.05	.39032	158,291	40,792.63	117,498.37	.67098
80	83,666.00	.39058	193,761	48,124.30	145,636.70	.67987
81	96,419.64	.39139	223,297	54,557.13	168,739.87	.68495
82	107,580.81	.395	249,145	58,841.87	190,303.13	.69872
Average from 1973-82		.39878				.70174
α (average share of capital)		.60122				.29826

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