

Calculating Shadow Prices in Pakistan

(Reflections on the Paper by Squire, Little and Durdag)

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The Paper, "Shadow Pricing and Macroeconomic Analysis: Some Illustrations from Pakistan"¹ by Lyn Squire, I. M. D. Little and M. Durdag (henceforth simply SLD) is an important contribution for two reasons. Firstly, it represents the first major step by the World Bank to provide a comprehensive set of shadow prices for Pakistan using a methodology [7] that while not as yet officially adopted by the Bank seems likely to have a pervasive influence on all future attempts to define and estimate shadow prices in the Bank's economic work. The Bank's methodology is a lineal descendant of the famous *Project Appraisal and Planning for the Developing Countries* by I. M. D. Little and J. Mirrlees [6]. Thus, in the SLD paper, two of the leading "shapers" of shadow price technology take Pakistan as one of the first test cases for the practical application of their theories.

Secondly, the SLD paper takes aim on the economic analysis of policies, not projects. One of the tenets of shadow pricing is that poor economic policies make it necessary to carry out economic as well as financial evaluations of projects. Implicit in the SLD approach is the notion that to the extent that shadow price analysis improves economic policies, the project analyst's job will be simpler as economic and financial returns will be brought more nearly in line with one another.

This paper is an extended comment on the methods employed by SLD to derive the shadow prices for use in examining some of Pakistan's economic policies. The SLD paper is quite clear that it does not purport to provide definitive estimates of shadow prices for Pakistan. Yet, once the utility of shadow price analyses of policies is demonstrated, as SLD convincingly does, the question remains whether shadow prices can be estimated with a degree of accuracy that permits meaningful judgements to be rendered on policy alternatives. In essence this paper asks two questions: how close to the truth are the SLD estimates of shadow prices, and how close to the truth can we come in Pakistan with the available data? An earlier version of the present paper [8, henceforth SLD*] concludes among other things, that the accounting rate of interest (ARI) in labour-abundant, capital-scarce Pakistan is

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¹This paper appears in the beginning of this issue.

between 1 and 2 percent. In the version prepared for this volume, the authors back away somewhat from their earlier estimate and choose to experiment with a variety of ARI's ranging from 2 to 8 percent. Yet, as is made clear in section III of the SLD paper, the social benefits of foreign borrowing are negative or positive depending on whether the ARI is close to 2 or close to 8 percent. It is obviously very critical for the future use of shadow prices in Pakistan to know whether the ARI is 2, 8 or some other percent.

The following is a "parameter-by-parameter" review of some of the conceptual and empirical problems in calculating shadow prices not addressed fully in either SLD or SLD* but which need to be sorted out before meaningful use of shadow prices can be made in both project and policy analysis.

The Value of Public Income (V)

As noted in footnote 4 of SLD, the value of public income relative to the marginal utility of consumption at the average level of consumption has been estimated on the basis of public expenditure data. In SLD* the authors estimated VC/IC on the basis of three types of public expenditure. To calculate V on the basis of public expenditures alone is to play *Hamlet* with only half a prince. In terms of economic logic, tax revenue and tax incidence must figure into the calculation of V in some way. It is difficult to conceive of a government that makes redistributive choices through the expenditure side while ignoring the incidence of taxes by income class. The government's attitude towards redistribution and the value that they attach to a rupee going to a particular income group can best be inferred from the net fiscal transfer. The net transfer would be the taxes paid (either implicitly through manipulated prices or explicitly) less benefits from the fiscal system (in either cash or non-cash forms). The empirical problems of such a calculation are admittedly immense and probably insurmountable at this stage of data availability in developing countries. Yet, the net transfer is the appropriate concept and there is no *a priori* reason to believe that the redistributive effects of public expenditures approximates the pattern of net transfers.

The basic logic behind V is found in Squire and van der Tak [7, p. 68] and the argument contained there, that the uses of public income in each expenditure activity is approximately the same, seems unconvincing. It is certainly not true for activities narrowly defined e.g. higher education as opposed to education in general. Indeed, the more narrowly defined are the activities (v_j 's in Squire-van der Tak notation), the greater will be the standard deviation of v_j . One could further possibly build a case for the argument that the higher the \bar{v} the government wishes to promote through taxation and expenditure, the greater will be the standard deviation of v_j . Upper income groups need to receive some visible "favour" from the government's fis-

cal system if they are called upon to support large redistributions to lower income groups.

The Accounting Rate of Interest

Unquestionably, the most unusual and potentially most controversial finding of SLD* is the extremely low value for the ARI — between 1 and 2 percent depending on the value of n that one assumes. If correct, an ARI so close to zero may mean that Islamic economists are right on both ethical and empirical grounds. However, other researchers have estimated higher discount rates for Pakistan — 10–13 percent [12] and 8 percent [4] — but their definitions of the ARI have also been slightly different. As shown in [7], the value of the ARI depends on the values of the social elasticity of the marginal utility of income (n), the consumption rate of interest (CRI) the social value of public expenditure (V_c), the marginal propensity to reinvest out of public profits (s) and the marginal product of capital in the public sector (q). The problems of estimating the most important of these parameters are examined below.

The Value of n

The social elasticity of the marginal utility of consumption (n) is not estimated but rather assumed by project analysts or asserted by policy makers. It is difficult to know what is a large or a small n except by working out what a particular value implies in terms of the weights or by observing its application in actual project work. An n of 1 implies that consumption by those at twice the average level of consumption is only one fourth as valuable as consumption by someone at half the average level in SLO, n is assumed to be either 1 or 2, but it would appear equally plausible for Pakistan in the range between 0.5 and 1.0.

The Value of the CRI

The CRI is the sum of two terms: the first, the pure rate of time preference and a second term that is the product of the elasticity of marginal utility (n) and the rate of growth in real per capita consumption. The pure rate of time preference is, like n , another subjective term about which it is difficult to have any prior notions of its likely range of values. As for the second term, the SLD estimate of the rate of growth of real per capita consumption (over the period 1972–1975) seems too low. Per capita income grew at more than 3 percent per annum in real terms during the decade of the 1960's and a similar growth is quite probable for the 1975–85 period. An even higher rate of growth is incorporated in the latest version of the Fifth Five Year Plan. The 1972–75 period used by SLD is both too short and too unrepresentative of the past and future patterns of real per capita growth.

If the value of n is halved and the value of g is doubled, the product of the two terms is unchanged and the CRI will not change in value. However, one can question why such a low pure time preference rate was selected. Bruce [2] concludes that the pure rate of time preference in both Thailand and the Philippines is 3 percent. There seems, however, to be no real practical basis for choosing a particular rate.

The Value of s

The parameter s , in principle, expresses the marginal propensity to reinvest out of the profits of public sector investments. In practice, however, it is estimated simply as the marginal propensity of the government to invest. The comingling of tax revenues with investment income of government firms renders the question of the source of investment funds meaningless. In SLD* [8], the authors obtained an estimate of $s = 0.52$ by regressing expenditure allocated to the Annual Development Plan on total expenditure (p. 19, Appendix I, footnote). If, however, the dependent variable is defined to exclude non-capital development (fertilizer subsidies?, etc.) the marginal propensity to invest drops to 0.35.

The Value of q

Perhaps the most critical variable of all in the determination of the ARI is q , the marginal product of capital in the public sector. In SLD*, the authors estimate q to be in the range of 5–7 percent based on data of the Board of Industrial Management (BIM) firms. The procedures used to calculate q from the BIM data appear to yield a downward bias but there is an even more important reason for questioning the use of the BIM data in the calculation of q . The BIM firms do not represent the total capital stock of public firms, nor even a representative sample of public firms. Also, the returns from these investments do not represent publicly appropriate revenues.

The firms under BIM management were taken over in 1972, initially without any compensation. Owners retained many of their rights, including the right to receive dividends, and the payout rate has been quite high — averaging more than 60 percent of net after-tax profits. The use of public funds for compensation or for capital improvements in the taken-over firms has been quite limited.

But even if the government had fully bought out the owners at market price, it would still seem short-sighted to consider the particular nationalization objectives of one political regime as representative of Pakistan's long term experience with public sector profitability. The firms nationalized in 1972 that constitute the bulk of BIM's investments were, by-and-large, in capital-intensive, low capacity utilization sectors. If the decision had been made to take-over the profitable cotton textile sector, for example, would it have been correct to conclude that q was much higher?

A good place to begin in arriving at an estimate of q is the average return to capital in manufacturing. An average return is clearly not a marginal return, but how in practice is a marginal return to be calculated? Is it literally the least profitable investment project — the whitest of the white elephants whose rate is surely to be negative in every country, developed or underdeveloped or is it an average of several "marginal" projects? Or do we assume that average and marginal returns are roughly equivalent? Shadow price theory sheds surprisingly little light on how a shadow price should be estimated in practice.

It would seem unlikely that planners would want to use a q which was markedly different from the average social return to capital in the private sector. One would certainly expect public investment to have a lower social return than private investments but not by a large margin. In the following an estimate is made of the average social return to private and public enterprise in Pakistan's large scale manufacturing sector for 1975-76.

The 1975-76 Census of Manufacturing Industries (CMI) reports a gross census value added (GCVA) for large-scale manufacturing (excluding defence and railway workshops) of 10,893 million rupees, of which 2939 represents total employment cost (including cash and non-cash benefits). The national income accounts report a total value added for the large-scale sector of 14,438 million rupees. The two figures for large-scale value added are not comparable because the CMI value is at market prices while the national income value is at factor cost. The 1975-76 CMI provides summary data only and the portion accounted for by indirect taxes is not directly given. An estimate of the ratio of total indirect taxes to value added at factor cost (VAFC) can, however, be made on the basis of the 1970-71 CMI. For 1970-71 the total indirect taxes collected amounted to 1,354 million rupees compared with a Gross Census Value Added (GCVA) of 5,261 million rupees. The implied incidence of indirect taxes on value added at factor cost in that year is 34.7 percent. There is no reason to believe that changes in sales and excise tax rates between 1970-71 and 1975-76 would have altered this ratio. If this ratio does hold, then indirect taxes collected from large-scale manufacturing should have totaled roughly 5,000 million rupees in 1975-76. This seems in line with reported collections for sales taxes on domestic production (313 million rupees), Federal excise duties (4,323 million rupees), the surcharge on petroleum (344 million rupees) and the portion of the fertilizer surcharge attributable to domestic production (345 million rupees). These total 5,325 million rupees.

Using the 1970-71 shares of indirect taxes in GCVA, we can estimate that 2,803 million rupees of the 10,893 million rupees are attributable to indirect taxes, leaving 8,000 million rupees as value added at factor cost. Plainly, the estimates of total indirect taxes paid by large-scale units made in this way fall short of the esti-

mates made above on the basis of the national income accounts data. This is because the CMI perennially understates the value added in the large-scale sector as a result of non-response, undercoverage and mis-reporting. It is possible, however, to use the ratios derived from the CMI's as sample estimates, albeit biased ones.

We can now estimate labour's share of 1975-76 VAFC as 0.363 (2939/8090). However, since SLD* conclude that the shadow price of urban labour is 80 percent of its market wages, the real contribution of labour is only 0.29 (0.8 x 0.363). Thus, the total wage bill in the large-scale sector, using the national income accounts' value for VAFC, can be estimated at 4,187 million rupees. This leaves 10,251 million rupees as the returns to capital (profit, interest and depreciation, all gross of direct taxes). Two points should be made regarding this figure. Firstly, 1975-76 was not an atypical year. A three-year average of VAFC centred on this year yields 14,282 million rupees and a trend line estimate covering FY70-FY77 gives a figure of 13,621, or only 6 percent below the actual level. Secondly, as noted by Khan [5], profits have been understated in Pakistan to avoid taxation. The official estimate of the under-statement is 18 percent but it is not known which concept of profits has been employed nor how overall value added would be affected by adjusting profits upward. On the other hand, two recent papers by Swati [10; 11] suggest that value added in industry has been overstated in recent years by as much as 20 percent because of the inclusion of some material inputs in the reported CMI value added and errors in the computation of industrial price indices.

The returns to capital are, of course, inflated because of tariff protection. Protection levels are not as great now compared to the pre-devaluation period because of the sharp reduction in the overvaluation of the rupee. Still, industry is protected and an estimate of the average level of effective protection for the industrial sector as a whole is needed for converting market-price returns to capital to world-price returns. In Table 1 of the Appendix III to SLD*, the rates of actual incidence of customs duties for FY76 are seen to be quite low, about 10 percent. Even if imports of POL, edible oil and wheat are excluded, and the full amount of sales taxes collected on imports of 886 million rupees is added to customs duties, the incidence rises only to about 20 percent.

One study [1] concludes that the average statutory protection (duties plus differential sales taxes) afforded industry in 1973 was about 50 percent. Because of various loopholes and customs practices, actual nominal protection afforded a producer falls short of the amount officially declared. In any event, it would appear that the average level of nominal protection is somewhere between 20 and 50 percent. One study² has shown that at high levels of aggregation nominal and effective

²See the paper contributed by Guisinger and Schydrowsky to [3].

rates are highly correlated. A linear regression of effective rates on nominal rates fitted to cross-section data for Pakistan produces an R^2 greater than 0.8, suggesting that effective rates can be predicted with a high degree of accuracy. The regression equation is $ERP = 11.4 + 2.15 NRP$, where ERP and NRP stand for the effective and nominal rates of protection, respectively. Thus, an NRP of 40 percent yields an ERP of 98 percent. Thus, it seems reasonable to assert, until more detailed evidence becomes available, that the average effective rate of protection afforded the large-scale sector is 100 percent.

It would, however, be inappropriate to deflate market returns to capital by the effective rate of protection to value added if protection affects the earnings of labour and capital differentially. If, for example, all the benefits of protection to an industry go to capital, then the returns to capital are raised by a greater percentage than its value added. A simple formula relating the rates of effective protection to individual factors to the rate of effective protection to value added is the following:

$$Z = s.Z_w + (1 - s)Z_p$$

where Z is the effective protection to value added,

Z_w, Z_p are the rates of effective protection to wages and capital returns, respectively, and

s is the share of wages in value added, both valued at world prices.

If it is assumed that Z_w is 0, Z is 100 percent and s is 1/3, then Z_p is 150 percent.

At this point, the question of indirect taxes arises once again. Since domestic prices in manufacturing are set by world prices plus customs duties, excise taxes and sales taxes on domestic goods act as direct taxes and fall at least in part on capital. As labour is certainly more mobile than capital between agriculture and manufacturing, the incidence of indirect taxes would seem to be borne more by capital than labour. The important implication of tax incidence is that indirect tax payments should be included in the calculation of capital's marginal social product for without these taxes capital's returns would expand. The next question is whether indirect taxes should be adjusted for the effects of protection. As effective rate studies for Pakistan have traditionally been carried out using VAFC, it would appear appropriate to add indirect taxes to VAFC at world prices. But, to be on the safe side, we make the adjustment before conversion to world prices, which will not understate capital's returns. Thus, value added at domestic market prices is 15,251 million rupees (5,000 + 10,251). The returns to capital measured at border prices would then appear to be roughly two-fifths of this amount on the assumption that effective protection to profits is 150 percent. Thus, capital's flow of returns measured in border prices of 1975-76 would appear to be 6,100 million rupees.

Now, the only remaining task is to work out the border price value of the stock of capital that generated this flow of returns. The CMI data are unable to provide a reliable guide to the stock of capital existing in 1974-75 – the stock responsible for the 1975-76 returns. Not only is the total level underestimated as a result of the reporting problems cited earlier, but also only book value is given which incorporates the effects of accelerated depreciation for tax purposes and does not reflect the economic value of the stock of capital.

Fortunately, a special survey of capital stock was undertaken by the government in 1967-68 and the results of this survey for large-scale manufacturing are shown in Table 1 below.

Table 1

Stock of Fixed Capital in Large-Scale Manufacturing: 1967-68, West Pakistan
(Rs. Million)

	Original Cost			Replacement Cost		
	Private	Public	Total	Private	Public	Total
Buildings	1164	83	1247	1946	104	2050
Machinery	3518	192	3710	5575	236	5811
Other	223	9	232	472	11	483
	<u>4905</u>	<u>284</u>	<u>5189</u>	<u>7993</u>	<u>351</u>	<u>8344</u>

Source: Estimates of Depreciation for West Pakistan. Undated, mimeographed.

For purposes of comparison, the CMI's for 1964-65 and 1970-71 show the value of fixed assets for these two years to be 3,109 and 5,173 million rupees, respectively.

The data on capital stock for 1967-68 at both original and replacement cost are shown in Table 2 along with data on investment in manufacturing for the period 1968-69 to 1974-75. These data need to be adjusted to 1974-75 prices and we have used the deflator for gross fixed investment for this purpose. By adding the value of the 1967-68 stock to the sum of the investment flows, we can arrive at a wholly undepreciated capital stock value for 1974-75 of either 50,438 million rupees, depending on whether replacement or original cost values are used for 1967-68. These values are multiplied by 0.8 to adjust for the tariffs and scarcity margins prevailing before the 1972 devaluation. Some capital goods items were not dutiable and most capital goods imports were directly used by the importer and not resold on the market where high scarcity margins could be demanded. Still, the cost of capital

Table 2
Capital Stock and Investment, Large-Scale Manufacturing

	Year	Private	Public	Total	Price Index 1975-76 = 100	Adjusted
1.	1967-68	Stock at replacement cost		8344	27	30,904
2.		Stock at original cost		5189	27	19,219
3.	1968-69	1003	94	1097	29	3,783
4.	1969-70	1208	179	1387	30	4,623
5.	1970-71	1224	68	1292	33	3,915
6.	1971-72	1016	99	1115	42	2,655
7.	1972-73	763	111	874	70	1,249
8.	1973-74	697	382	1079	86	1,254
9.	1974-75	990	1065	2055	100	2,055
				1 + (3 to 9)		50,438
				2 + (3 to 9)		38,753

Source: Col. 1: lines 1 and 2, Table 1.

goods was affected by the tariff system and some adjustment needs to be made. The adjusted capital values at border prices are 40,350 million rupees and 31,002 million rupees for replacement and original cost assumption, respectively.

Taking the higher of these two values, we can now estimate the rate of return on capital, at border prices of 1975-76, to be 15.1 percent. Over a 15 year life span, a 15.1 percent rate of return to capital implies a 12.5 percent internal rate of return to capital.

It would appear, then, that the *minimum* social return to capital in manufacturing, either on an annual average or an internal rate of return basis is well above 10 percent. If, for example, the original rather than the replacement cost of capital were used in the denominator of the last calculation, the average annual social rate would be 19.7 percent. If, in addition, taxes were added into the returns to capital, the rate would climb to 29 percent.

An Estimate of the ARI

If one takes the alternative values suggested above for the CRI (4.5 to 5 percent), s (0.35) and r (12.5 percent), the ARI ranges from 7.3 to 8.3 percent. An ARI of 8 percent is more in line with the market-clearing discount rate that would equate investment demand (the supply of economically profitable projects) with the supply of investible funds than the SLD estimate of 2 percent. Moreover, 8 percent also more nearly approximates the effective marginal real borrowing rate abroad than does the 2 percent rate. Some economists have argued that the marginal cost of

funds, in real terms, should set the lower limit of the ARI, and if commercial borrowing is viewed as the marginal source of funds, the real rate of interest seems likely to be above 2 percent.

CONCLUSIONS

The preceding review of problem in shadow price for Pakistan leaves the clear impression that considerable room for improvement remains in both the data and practical concepts involved in the calculation process. Shadow price analysis will only be effective when its users are convinced of the appropriateness of both the underlying data and the estimating equation for the various shadow price parameters. The assertion by Squire, Little and Durdag that the accounting rate of interest may be close to 2 percent in Pakistan is so counter-intuitive that some policy makers may conclude that shadow pricing is little more than mental gymnastics with little relevance to the real world. More attention must now be devoted to the practical problem of estimating shadow prices so that convincing project appraisals and policy analyses can be performed.

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