APPENDIX C

ALTERNATIVE ANALYSIS AT NATIONAL LEVEL USING A DIFFERENT SET OF CAPITAL STOCK DATA

An Alternative Set of Data on Capital Stock

Since the analyses in this study use a capital stock series from a secondary source (Alam et. al. 2005), it seems necessary to conduct an alternative analysis using an alternative series of capital. For this purpose, an alternative analysis using a series of capital stock estimated from Nehru and Dhareshwar (1993) data set is conducted here.

Nehru and Dhareshwar (1993) estimated capital stock for 93 countries of the world including Bangladesh for the years from 1960 to 1990 using perpetual inventory method. This data set has been used in several working papers of World Bank and considered as best among currently available data sets (Papageorgiou, 2003). But this data set has certain limitations, for which special remedies has to be taken.

First, the original set of data is presented for calendar years, so that the calendar year data is assumed as data for the financial year ended in middle of same calendar year (e.g. data presented for the calendar year 1985 is assumed as data for the financial year 1984-85) for the purpose of this study.

Second, the original set of data is presented in constant 1987 price series, so that the calendar year price (i.e. 1987 price) is assumed as price for financial year (i.e. 1986-87 price) ended in middle of same calendar year.

Third, the Nehru and Dhareshwar (1993) data does not include the years after 1990. Hence, this study has to estimate a series of capital stock for the years from 1984-85 to 1999-2000 taking taking the 1985 capital stock value of this Nehru and Dhareshwar (1993) data set as the base year capital stock for the year 1984-85 and adding up the yearly national investment volume obtained from national censuses. The procedure of estimation is the same as the procedure described in details in Appendix A.

Estimation of an Alternative Capital Stock Series

Two assumptions has to be made for making the Nehru and Dhareshwar (1993) data stet usable for the purpose of this study.

    i) As the data is available for calendar years, every reported calendar year is considered as the financial year ended in the middle of the same calendar year.

    ii) The 1987 price is considered as 1986-87 price, so that the deflator for 1986-87 as estimated in Table A1 can be used for the converting the series to a 1984-85 series.

Then, two steps have to be followed to estimate a series of capital stock after considering capital stock figure of any one year from Nehru and Dhareshwar (1993) as base year capital.

First, the capital stock data estimated by Nehru and Dhareshwar (1993) is converted from constant 1987 prices to constant 1984-85 prices, as shown in the third column of Table C1.

Second, a series of capital stock using the model A1 described in Appendix A has to be estimated, as shown in the last column of the same table. Here, base year is the year 1984-85, initial stock of capital is the 1985 value of Nehru and Dhareshwar (1993) data converted to 1984-85 price and investment is the gross real national investment including both private and public sector investment, with a depreciation rate of 4% applied as suggested by Nehru and Dhareshwar (1993).

The same table can be used to verify the validity of the series estimated by this study. The capital stock series obtained directly from Nehru and Dhareshwar (1993) and converted to 1984-85 price from 1984-85 to 1989-90 is shown in the third column of Table C1. On the other hand, the estimated series of capital stock by this study in 1984-85 price from 1984-85 to 1999-2000 is shown in the last column of the same table. The figures for the years which are common to both series, i.e. the figures for the years from 1984-85 to 1989-90, can be compared to verify the figures of the estimated series. A careful observation will find the estimated series reasonably close to the series estimated by Nehru and Dhareshwar (1993) for the common years. The

small difference may be due to the difference of the deflators estimated by this study with those used by Nehru and Dhareshwar (1993).

However, the same sort of estimation for the division level data is not possible, since neither reliable estimation of capital stock data for the divisions is available nor any investment series for the divisions is available from the national publications. Therefore, no analysis verifying the main analysis using an alternative capital stock series for the divisions is possible in this study.

Alternative Analysis for the National Economy

The results of the analysis using the mentioned alternative series of capital stock are shown in Table C2. Similar to the main analysis, this analysis also shows positive trend in TFP for the national economy. The results show highest achievement in terms of TFPG in the early nineties. Table C3 shows the contribution of each factor of production to output growth. Similar to the main analysis, this analysis (involving the whole period) also shows the major portion of the output growth (44%) to be coming from TFP and capital stock having significant contribution (42%) to output growth during the period.

Alternative Analysis for the Non-Agricultural Sector

The results of the analysis using capital stock series estimated using capital stock data from Nehru and Dhareshwar (1993) are shown in Table C4. Similar to the main analysis, this analysis also shows positive trend in TFP for the non-agricultural sector. The results show highest achievement in terms of TFPG in the early nineties. Table C5 shows the contribution of each factor of production to output growth. This analysis shows the major portion of the output growth (40%) to be coming from capital stock while TFP having significant contribution (35%) to output growth during the period.

Table C1

Estimation of National Capital Stock using Investment Series

Year	Nehru and Dhareshwar (1993) Capital Stock		National Census reports of Production Investment		Estimated
	86-87 price [a] (mill.tk.)	84-85 price [b] (mill.tk.)	Current price (mill.tk.)	84-85 price (mill.tk.)	Capital [c] (mill.tk.)
1984-85	935214	815047	52012	52012	815047
1985-86	959263	836005	57267	53019	834457
1986-87	988469	861459	67577	58894	854098
1987-88	1017418	886688	71857	63873	878828
1988-89	1039595	906016	85191	71643	907547
1989-90	1062053	925588	94427	69227	942889
1990-91	n.a.	n.a.	95955	67051	974400
1991-92	n.a.	n.a.	109851	66185	1002475
1992-93	n.a.	n.a.	135214	84050	1028561
1993-94	n.a.	n.a.	158927	94978	1071468
1994-95	n.a.	n.a.	194651	110643	1123587
1995-96	n.a.	n.a.	221200	129551	1189286
1996-97	n.a.	n.a.	242427	138860	1271266
1997-98	n.a.	n.a.	275863	155283	1359275
1998-99	n.a.	n.a.	315513	181415	1460187
1999-00	n.a.	n.a.	355149	176801	1583194

Note:

a   The original set of data is presented for calendar years and in constant 1987 price series. In this study, calendar year data is assumed as data for financial year ended in middle of same calendar year (e.g. data presented for the calendar year 1985 is assumed as data for the financial year 1984-85). Also the calendar year price (i.e. 1987 price) is assumed as price for financial year (i.e. 1986-87 price) ended in middle of same calendar year.

b   86-87 price series is deflated using 1972-73 series of wholesale index for capital goods

c   Data for the year 1984-85 is taken from Nehru and Dhareshwar (1993) estimates, data for other years are estimated using national investment series using perpetual inventory method.

Table C2

Alternative analysis at aggregate national level

Period		Percentage Growth Per Annum				
From	To	GDP	Capital	Land	Labor	**TFP**
1984-85	1989-90	4.44	3.14	1.39	2.26	**1.913**
1989-90	1995-96	4.85	4.36	-0.65	1.48	**2.398**
1995-96	1999-00	6.39	8.28	1.40	1.59	**1.911**
1984-85	1999-00	6.54	6.28	0.57	1.92	**2.895**

Table C3

Contribution of factors in second analysis at aggregate national level

Period		Percentage Contribution			
From	To	Capital	Land	Labor	**TFP**
1984-85	1989-90	30.76	4.03	22.13	**43.08**
1989-90	1995-96	39.06	-1.73	13.27	**49.41**
1995-96	1999-00	56.42	2.84	10.83	**29.91**
1984-85	1999-00	41.81	1.12	12.81	**44.26**

Table C4

Alternative analysis of the non-agricultural sector

Period		Percentage Growth Per Annum			
From	To	GDP	Capital	Labor	**TFP**
1984-85	1989-90	5.90	3.14	8.66	**0.333**
1989-90	1995-96	6.95	4.36	2.36	**3.476**
1995-96	1999-00	6.42	8.28	1.66	**1.062**
1984-85	1999-00	8.71	6.28	4.96	**3.013**

Table C5

Contribution of factors in the alternative analysis at non-agricultural sector

Period		Percentage Contribution		
From	To	Capital	Labor	**TFP**
1984-85	1989-90	29.73	64.64	**5.63**
1989-90	1995-96	35.05	14.96	**49.99**
1995-96	1999-00	72.11	11.36	**16.53**
1984-85	1999-00	40.34	25.09	**34.57**