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NOTE 90.1

Agriculture-Industry and Spatial Linkages and
Economic Development

Agriculture-Industry and Spatial Linkages and Economic Development

Theory of agricultural- Industrial linkages

The agricultural sector is linked to the industrial sector both through the industries that supply inputs to the agricultural sector and to the industries that transport, process and market the production of the agricultural sector. These linkages reflect the derived demands of consumers as they feed back through the processing and marketing industries to farmers and then from farmers to the farm supply industries. They also reflect supply conditions including technological factors in each sector. Thus changes in demand affect production and employment in all three sectors and productivity or supply changes in one sector will affect production and employment in the other sectors.

In the early stages of development, when wages are low and market and transactions costs are high, farm units actually perform many of the functions that industries take over at later stages. Thus, one of the problems raised by cottage industries is that the middleman takes away a big chunk of their sale value. The same sentiment applies a fortiori to agricultural products. The fact is that transport, marketing other than in situ and local sales, marketing intelligence, warehouse and storage cost,

and similar middleman's services are costly even in a thickly populated country like Bangladesh. Pari passu urban-rural linkages are in general, weak in relation to those that prevail in developed countries.

Many inputs are farm produced (e.g., hand built tools, hand dug irrigation ditches even farm produced manure), much of the product is processed for consumption in the home. In lower income countries today the farm supply sector might provide 10 to 20 percent of the total production cost at the farm level. The value added by processing and marketing might be as high as a quarter of the farm value of production.

Contrast this with the U.S. and other highly developed countries. Farmers are highly specialized and they have given up many home production activities. They buy fertilizer and fuel. Machines replace work animals. The contract with industries for many services. Processing industries are large. Farm products are transported long distances to serve specialization and urban populations. Farm supply industries provides more than half of total farm inputs by cost. The ratio of value added by processing and marketing (not including cotton and woollen textiles) is 4 to 5. Dairy farmers no longer consume their own milk. They buy it in the supermarket.

The changing pattern of specialization and transfer of functions is both a consequence and a cause of development. Lowering transactions, marketing and transport costs produces large efficiency gains to the economy. It also opens up new

employment opportunities in the agribusiness sector while the process of change is reducing demand for labor at the farm level. The locations of the agriculturally related industries is an important function in the process.

Indeed, the agriculturally related industries are very important in the early stages of economic growth. The income elasticities for the processing services provided by industries are actually quite high even though Engel's law holds for most food products. The food, beverage and tobacco industries in Bangladesh account for 13 percent of industrial employment and it is likely that this will rise as development takes place (India and other countries have 20 percent or more in the food industries.) Textiles and apparel account for 65 percent of industrial employment in Bangladesh - attesting to the important role of jute. Not surprisingly, agrobased, particularly food-processing industries, emerge as one of the dynamic industries of Bangladesh.

It is important to note that productivity change in one of the three sectors importantly affects the others. Productivity growth in the important supply industries shifts the supply curve of these industries - presenting farmers with lower function prices. This in turn shifts farm supply to processors and ultimately consumers benefit. When industrial and intellectual property policies allow private firms to capture returns to invention and innovations this "passing of benefits along to

consumers" is altered, but only temporarily. Most such benefits are not captured.

This is all relevant to income distribution because of the weight of food in the budgets of the poor. Lowering the real cost of food is important and all three sectors contribute. In addition the realization of scale and specialization economies contributes to these gains. Policy makers have to predict the nature of these changes and invest to facilitate them. Communication, grades and standards, market information and transport support are generally provided by public enterprises. The services are critical to efficiency gains (as in R&D in the early sector).

Some empirical estimates of spatial linkages

Related to sectoral linkages are spatial factors.¹ Much of cottage and a good deal of small industries, for instance, are located in rural areas, while the bulk of medium and large industries is located in urban areas. In the process of economic development, industrial-urban centers have played dynamic role. With a view to gauge the effect of spatial factors on industrialization, an integral part of the HIID/IND survey was the generation of data on locational and environmental variables, such as distance from paved road, from Dhaka, from the nearest bank, and so forth. As noted in the preceding section, these variables affect costs, prices, incentives, marketability of product, availability of inputs, type of products demanded, and

so forth. Nearer is a mouza to an urban-industrial center, the more competitive are the factor and product markets, and the higher is the potential for the growth of rural and small industries in mouza.

Remittances by expatriate Bangladeshis are directly dependent upon the number of emigrants to the Middle East and other countries. With a view to generating a surrogate for remittances, a variable on the percentage of homes from which at least one person had recently migrated abroad was generated. It is surmised that remittances enrich the home town/mouza first and through that the nation as a whole. Although a good part of remittances is believed to be spent on real estate and buying agricultural land, savings and investment in productive ventures also go up, as does demand in general.

Likewise nearness to social overheads, such as school, college, hospital, health unit, police station, apart from promoting education/health/law and order, reduces the attraction to entrepreneurs and educated families to migrate to cities and thereby cause backwash effects in rural areas. Naturally, easy access to economic overheads and services--paved roads, banks, market town, availability of electricity, and the prior existence of industrial units--is growth-promoting.

A few tests of these variables are provided in the regressions reported in Appendix Tables HA1. They are summarized in the Text Table H1. It may be noted that not all variables are

causally related; a few may reflect some sort of association.

It may be seen that, as expected, the composite distance from various infrastructural facilities, ceteris paribus influences VA/Q ratio and rates of return negatively. The rural industries which are situated away from the infrastructural facilities are resource-intensive (have low VA/Q ratio). The capital, tools and implements, of these areas are primitive, traditional, and so produce less output per taka of cost than the areas nearer industrial urban complexes. Remotely located people work longer hours and more shifts per year (observe the sign of the coefficient of DIST with respect to the dependent variable SHIFT).

The CENTIV (incentives through high tariffs) variable was generated by asking the question : "Do you think tariff on your product benefits you?" The variable is positively correlated with O/KK and RR. The result is at variance with some of the other findings of this study where protection has created high cost, low profit industries. In these industries, however, profits would evaporate without protection.

Age of the entrepreneur, a proxy for experience, impacts exports and the investment ratios positively. Note from the appendix table that the size effect of firms is being held constant, although the coefficient of SIZE DUMMY is not significant.

As expected, the mouza migration, a proxy for remittances, is positively and significantly related to the area's

productivity, wage rate, export ratio, and rate of return. Remittances seem to be not only a source of investible funds but probably also carrier of some technological know-how and entrepreneurial training of the migrant. The education of entrepreneur has somewhat similar influence. Industrial estates probably have positive affect on productivity, value-added ratio, and exports. Alternatively stated, the units with these characteristics tend to locate in industrial estates.

Those enterprises which pay relatively higher wages naturally seem to feel the lack of working capital more than others. Entrepreneurs who were schooled in urban centers have a higher investment propensity than others. Public sector firms do not come out creditably in respect of the number of whifts per year and exports. Yet, other things being equal, they tend to earn higher rate of return.

In summary, nearness to markets and infrastructural facilities, experience of entrepreneurs, export of labor, entrepreneurs' schooling, quality of education, and industrial estates promote industrialization. The construction of roads and other infrastructure in the country side, therefore, is likely to yield a relatively high payoff in terms of the growth of rural industries as well as agiculture, with growth-promoting feedbacks to the rest of the economy.

Table H 1.—Efficiency functions, Factory Establishment Survey

Desir- able Ratio Dep.Var	Indep. Variable										R ² Adj		
	DIST	CENTIV	FLOOD	AGE	MIG	PUB	EDU	ESTAT	SHIFT	MKET		WK PROB	EDU URB
Q/L					+			+		+			.06
Q/KK	+	+		-			-						.12
VA/Q	-												.03
W					+			+			+		.23
EX/Q				+	+	-	+	+		+			.36
RR	-	+			+	+			+				.13
SHIFT	+		-			-	+			-			.44
I/Q				+			+				+		.02

^aOther variables tested, whose coefficients were not significantly different from zero:

1. Ratio of credit to total capital
2. Dummy for product sold regionally, nationally or exported
3. No. of designs, new products, new processes, etc., during the past 8 years.
4. Dummy for male workers
5. Ratio of respondents who stated that lack of working capital is a serious problems to total respondents
6. Ratio of respondents who stated that the "uncertainty of policy continuity" is a serious problem
7. Number of new industrial units started in the last 12 months in the mouza
8. No. of NGOs in mouza
9. Dummy for the availability of electricity in mouza

All variables are defined in Appendix A.

APPENDIX A

Regressions of Growth Ratios on
Locational Factors

(to Note No. 90.1)

Equation Number 1 Dependent Variable.. QL OUTPUT/LABOR

Multiple R	.36011	Analysis of Variance	
R Square	.12968	DF	Sum of Squares
Adjusted R Square	.06332	Regression	26 120668278997889.
Standard Error	1541074.8103	Residual	341 809844845731961.

F = 1.95421 Signif F = .0041

Mean Square
4641087653764.97
2374911571061.47

Equation Number 1 Dependent Variable.. QL OUTPUT/LABOR

----- Variables in the Equation -----

Variable	B	SE B	Beta	T	Sig T
SIZE7DUM	-82495.13037	973972.0082	-8.433E-03	-.085	.9325
MKET2	354004.50705	1619759.595	.01159	.219	.8270
F2	1713.76275	8922.68738	9.9157E-03	.192	.8478
DIST	.05333	.19345	.01461	.277	.7922
SIZE6DUM	624438.82040	1128789.270	.06385	.553	.5805
N15	280909.56672	340019.2253	.04362	.826	.4093
SIZE3DUM	487084.71021	1092399.590	.08122	.446	.6560
R1	130810.53015	601227.0185	.01122	.217	.8282
X	-141320.1415	184692.3635	-.04217	-.765	.4447
X1	3975.38465	7047.62557	.03075	.564	.5731
DESIGN	-39527.84612	227225.3080	-.01374	-.262	.7935
MIG	1363947.1344	466964.3801	.22531	3.992	.0001
F14	119731.31299	180146.3383	.03545	.665	.5067
SIZE2DUM	960866.24004	1122545.683	.22762	.856	.3926
L	-109.42695	560.71702	-.02250	-.195	.8454
AI1	74020.05449	1650720.513	2.4232E-03	.045	.9643
T14	-239032.9392	174956.7717	-.07452	-1.366	.1728
MKET1	296779.48067	180913.6445	.09215	1.640	.1018
U1	132032.05936	184254.9945	.04147	.717	.4741
SIZE1DUM	1252829.0160	1192567.343	.16067	1.051	.2942
AA	2416.58060	12256.37205	.01121	.197	.8438
SIZE4DUM	665569.62619	1080421.952	.18124	.616	.5383
D1	1019897.9490	243625.3949	.25173	4.152	.0000
T1	-5072.27717	29930.36573	-.01038	-.169	.8655
SHIFT	900.27986	2036.89990	.03086	.442	.6588
SIZE3DUM	1070906.7800	1096978.033	.32556	.976	.3296
(Constant)	-1531093.273	1415229.345		-1.082	.2801

Table Appendix A--Contd.

Equation Number 2 Dependent Variable.. QKK OUTPUT/CAPITAL

Multiple R	.42920	Analysis of Variance	
R Square	.18421	DF	Sum of Squares
Adjusted R Square	.12201	Regression	26
Standard Error	5.21400	Residual	341
			9270.36058

Mean Square F = 2.96155 Signif F = .0000

60.51202

27.18581

----- Variables in the Equation -----

Variable	B	SE B	Beta	T	Sig T
SIZE7DUM	1.59735	3.29529	.04674	.485	.6292
STATE	-3.15351	5.47534	-.02959	-.577	.5645
BI	-.02579	.03019	-.04353	-.854	.3938
BI37	2.887575E-06	6.54522E-07	.22552	4.412	.0000
SIZE6DUM	3.41389	3.61909	.09989	.994	.3720
M13	2.80701	1.15041	.12472	2.440	.0152
SIZE5DUM	3.31497	3.69597	.15817	.897	.3704
BI	-.28598	2.03416	-7.030E-03	-.141	.8893
BI	-.33556	.62488	-.02865	-.537	.5916
BI	-.06323	.02384	-.14009	-2.654	.0083
DESIGN	-.65910	.76878	-.04418	-.370	.3847
M13	.35929	1.57991	.01248	.227	.8202
BI4	-.38550	.60950	-.03256	-.632	.5275
SIZE2DUM	4.15395	3.79797	.28158	1.094	.2748
L	-4.18345E-04	1.99710E-03	-.02461	-.221	.8256
ALL	5.75113	5.58497	.05389	1.030	.3039
TLV	.45115	.59194	.04025	.762	.4455
MNET1	.77675	.61209	.06902	1.269	.2053
UI	-.22605	.62340	-.02031	-.363	.7171
SIZE1DUM	4.55957	4.03488	.16733	1.130	.2593
AB	.01218	.04147	.01617	.294	.7691
SIZE4DUM	3.61263	3.65545	.28151	.988	.3237
BI	-1.14311	.83104	-.08074	-1.376	.1699
TL	-.27425	.10127	-.16062	-2.708	.0071
SHIFT	.02396	6.89155E-03	.23504	3.477	.0006
SIZE3DUM	2.56472	3.71146	.22311	.691	.4900
(Constant)	3.82858	4.78822		.800	.4245

Table Appendix A—Contd.

Equation Number 3	Dependent Variable..	VAQ	VAL ADDED/Q
Multiple R	.31171	Analysis of Variance	
R Square	.09729	DF	Sum of Squares
Adjusted R Square	.02846	Regression	26
Standard Error	.32334	Residual	341
			35.65219

Mean Square	F =	1.41380	Signif. F =	.0000
.14775				
.10455				

Equation Number 1	Dependent Variable..	VAQ	VAL ADDED/Q
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Variables in the Equation

Variable	B	SE B	beta	t	sig.
SIZE7DUM	-.24072	.20475	-.11427	-.1178	.9238
MPR11	-.17751	.33864	-.05157	-.0511	.9898
R2	1.878076E-03	1.37214E-07	.02775	.2009	.8427
SIZE1	-.081928E-07	4.06899E-12	-.12428	-.1228	.928
SIZE3DUM	-.38082	.23881	-.18871	-.1871	.8701
R3	.04301	.07137	.07571	.0517	.9583
SIZE5DUM	-.38925	.22900	-.17175	-.1772	.8612
R4	-.17291	.12813	-.05127	-.0571	.9753
R5	-.07150	.08875	-.04151	-.0413	.9687
R6	4.87978E-04	1.47871E-05	.01235	.0123	.9211
SIZE6DUM	-.04434	.04788	-.04888	-.0471	.9631
R7	.17725	.09778	.07000	.0700	.9713
R8	.04328	.03780	.05331	.0533	.9254
SIZE2DUM	-.40128	.23853	-.19581	-.1971	.8680
R9	-2.85731E-04	1.17848E-04	-.28571	-.2857	.9787
R10	.40411	.34835	.08121	.0812	.9281
R11	-4.35898E-03	.03871	-.03868	-.0386	.9888
MPR12	-.04111	.03798	-.03128	-.0387	.9794
R12	-.05295	.03868	-.03887	-.0388	.9844
SIZE4DUM	-.38888	.25021	-.22781	-.2278	.1414
R13	-1.20551E-04	2.87180E-07	-4.0558E-05	-.0371	.9441
SIZE4DUM	-.40942	.22887	-.54118	-.2319	.0718
R14	.01254	.05154	.01302	.0243	.9879
R15	-2.82836E-04	6.27991E-05	-2.811E-05	-.042	.9586
SHIFT	-7.42950E-04	4.27377E-04	-.12780	-.1738	.0830
SIZE3DUM	-.48800	.25017	-.67188	-.2981	.0484
(Constant)	.98887	.29894		3.323	.0010

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Table Appendix-A.—Contd.

Equation Number	Dependent Variable..	W	WAGE RATE
* * * * MULTIPLE REGRESSION * * * *			
Multiple R	.52534	Analysis of Variance	
R Square	.27559	DF	Sum of Square
Adjusted R Square	.25220	Regression	26 9056757630.4891
Standard Error	8101.06026	Residual	341 22544903657.2264
Mean Square	F = 3.25872	Signif F =	.0000
	348336831.94189		
	66114189.72794		

----- Variables in the Equation -----

Variable	B	SE B	Beta	T	Sig T
SIZE7DUM	751.46880	5138.89914	.01319	.146	.8938
MPETL	1219.92587	8540.94695	.08531E-03	.143	.8865
PC	-17.75921	47.07814	-.01723	-.377	.7062
SIZE1	-1.34883E-03	1.92171E-03	-.06316	-1.321	.1873
SIZE5DUM	3361.23447	5255.75043	.05880	.563	.5740
W15	-2071.30210	1794.01922	-.05524	-1.156	.2486
SIZE5DUM	2700.27077	5753.75015	.19179	1.163	.2486
W1	-2739.79867	3172.21130	-.04039	-.864	.3824
W2	-485.65810	974.47927	-.02452	-.499	.6178
W3	26.89174	37.18488	.03570	.723	.4701
W4	1415.87341	1198.89271	.05645	1.189	.2351
W5	1545.20822	2461.81090	.03390	0.310	.7500
W6	2111.00000	4510.44310	-.01875	-.593	.5524
W7	3575.00000	3112.80783	.22744	.945	.3455
W8	-1.40017	2.95847	-.01419	-.136	.8919
W9	4405.05355	8709.57907	.02475	.506	.6100
W10	1816.17747	921.11195	.09780	1.920	.0485
W11	-472.56307	954.84178	-.02540	-.499	.6178
W12	691.11749	1921.17150	.03723	.711	.4770
SIZE1DUM	4375.75103	5292.25813	.09830	.695	.4871
W13	21.52712	64.86742	.01717	.333	.7394
SIZE4DUM	5448.45792	5700.55339	.27795	1.043	.2973
W14	6133.43254	1295.97578	.25553	4.656	.0000
W15	141.99814	157.91946	.04987	.899	.3692
W16	39.14588	10.74715	.23029	3.643	.0003
SIZE3DUM	7321.81946	5787.90706	.35238	1.300	.1946
(Constant)	75.71059	7467.07380		.013	.9897

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Table Appendix A—Contd.

Equation Number 5		Dependent Variable..	EXQ	
Multiple R	.63584	Analysis of Variance		
R Square	.40430	Regression	DF	Sum of Squares
Adjusted R Square	.35888		26	8.93153
Standard Error	.19645	Residual	341	13.15995
Mean Square	F = 8.90128	Signif F = 0.0		
34352				
03859				

----- Variables in the Equation -----

Variable	B	SE B	Beta	T	Sig T
SIZE7DUM	.36997	.12416	.24551	2.950	.0031
MKET2	.03478	.20635	7.3897E-03	.169	.8683
P2	8.273654E-05	1.13742E-03	3.1072E-03	.073	.9421
DIST	1.224589E-08	2.46606E-08	.02169	.497	.6198
SIZE6DUM	.50278	.14389	.33385	3.494	.0005
N15	.01229	.04334	.01842	.422	.6735
SIZE5DUM	.07795	.13925	.08436	.560	.5780
R1	.05619	.07664	.03133	.733	.4640
X	-.02276	.02354	-.04407	-.967	.3344
X1	1.641907E-03	8.98398E-04	.08244	1.828	.0625
DESIGN	-.02079	.02897	-.03114	-.718	.4733
MIG	.19077	.05953	.15033	3.205	.0015
F14	3.124142E-03	.02296	6.0026E-03	.136	.8919
SIZE2DUM	.16032	.14310	.24647	1.120	.2634
L	3.655779E-04	7.14776E-05	.46783	5.115	.0000
AI1	-.47584	.21043	-.10110	-2.261	.0244
T14	-.01616	.02230	-.03270	-.725	.4691
MKET1	.03702	.02306	.07481	1.605	.1094
U1	-.02310	.02349	-.04702	-.983	.3261
SIZE1DUM	.21080	.15202	.17545	1.387	.1665
AA	1.922215E-03	1.56239E-03	.05766	1.230	.2194
SIZE4DUM	.15383	.13773	.27186	1.117	.2648
D1	.07914	.03131	.12678	2.528	.0119
T1	.01015	3.81538E-03	.13480	2.660	.0082
SHIFT	-1.72217E-04	2.59655E-04	-.03832	-.663	.5076
SIZE3DUM	.16534	.13984	.32622	1.182	.2379
(Constant)	-.40391	.18041		-2.239	.0258

Table Appendix A.—Contd.

Equation Number	6	Dependent Variable..	Q	OUTPUT
Multiple R	.66504	Analysis of Variance		
R Square	.44228		DF	Sum of Squares
Adjusted R Square	.39976	Regression	26	294051947952365200
Standard Error	32975714.729	Residual	341	370802636793534500
Mean Square	F = 10.40069	Signif F = 0.0		
1.1309690306E+16				
1087397761857873				

----- Variables in the Equation -----

Variable	B	SE B	Beta	T	Sig T
SIZE1DUM	1721729.0350	20840924.06	6.5860E-03	.083	.9342
MEET2	7049253.1880	34638003.46	8.6343E-03	.204	.8328
P2	34707.78103	190926.4830	7.5135E-03	.162	.8559
DIST	.93727	4.10949	9.5701E-03	.226	.8210
SIZE2DUM	-29383101.70	24153683.33	-.11240	-1.217	.2246
MIS	3945046.5072	7275686.359	.02292	.542	.5880
SIZE3DUM	-56619093.65	23375021.77	-.35318	-2.422	.0159
R1	2650154.6150	12864976.13	.02730	.672	.5018
X	-4528495.072	3952023.166	-.05055	-1.146	.2527
DE	-29066.32267	150804.1588	-8.413E-03	-.193	.8473
DESIGN	4051250.4815	4862137.051	.03497	.833	.4053
MIS	31506729.109	9992041.971	.14311	3.153	.0018
F14	-1775294.314	3854747.493	-.01966	-.461	.6454
SIZE1DUM	-53429609.21	24020083.88	-.47349	-2.224	.0268
L	29667.28041	11998.14862	.22820	2.473	.0139
R11	60563102.382	35321898.96	.07417	1.715	.0873
T14	-4562652.878	3743701.633	-.05321	-1.219	.2238
MEET1	4444615.8067	3871166.210	.05163	1.148	.2517
U1	6061741.8297	3942663.973	.07122	1.537	.1251
SIZE1DUM	-50134486.27	25518398.09	-.24054	-1.965	.0503
HA	72042.20745	262260.2261	.01250	.275	.7837
SIZE4DUM	-55597902.14	23118725.86	-.56640	-2.405	.0167
D1	16135843.082	5255859.676	.14899	3.070	.0023
T1	-97434.13813	640446.0026	-7.460E-03	-.152	.8792
SHIFT	40354.31672	43585.31427	.05176	.926	.3552
SIZE3DUM	-51528878.15	23472990.69	-.58604	-2.195	.0288
(Constant)	38794375.174	30282890.13		1.281	.2010

Table Appendix A—Contd.

*** MULTIPLE REGRESSION ***

Equation Number 7	Dependent Variable..	VA	VALUE ADDED
Multiple R	.57247	Analysis of Variance	
R Square	.32772	DF	Sum of Squares
Adjusted R Square	.27647	Regression	25 30634243069943030
Standard Error	13575178.838	Residual	341 62641348644122710
Mean Square	F =	5.39756	Signif F = .0000
1178240112070886			
164235480481295			

Variables in the Equation

Variable	B	SE B	Beta	T	Sig T
SIZE2DUM	-12333604.75	3579615.146	-.34622	-1.476	.1406
MI2T2	2652919.4810	14259496.68	6.3350E-03	.186	.8923
R2	21919.08662	78999.02645	.02235	.279	.7805
D13T	.40850	1.70411	.02112	.240	.8197
SIZE3DUM	-122292191.47	9943396.419	-.12223	-2.645	.0083
M13	1891761.6539	2995196.444	.02450	.528	.5978
SIZE5DUM	-31120279.29	9822842.250	-.31277	-3.134	.0013
R1	1517387.8139	5296159.211	.01731	.287	.7747
X	-1255114.097	1626927.329	-.07737	-.771	.4419
X1	-24302.70112	32091.95150	-.01376	-.392	.6952
DES15H	1087589.4134	2001605.744	.02594	.543	.5872
M13	17198815.942	4117444.025	.41593	3.198	.0015
R14	-675150.2193	1598891.657	-.01994	-.425	.6703
SIZE2DUM	-30719324.43	9988396.266	-.30730	-3.107	.0021
L	-1573.30342	4939.30198	-.03330	-.723	.4669
R11	22066673.029	14541037.22	.00072	6.331	.0000
T14	-1857767.235	1541177.267	-.08156	-1.076	.2823
MNET1	1139551.1122	1597350.793	.00530	.715	.4751
U1	2019529.2655	1623094.411	.06328	1.244	.2143
SIZE1DUM	-29319221.32	10505210.29	-.07514	-2.791	.0055
AA	-4299.39660	107965.1950	-1.983E-03	-.040	.9683
SIZE4DUM	-30799111.50	9517332.394	-.32379	-3.236	.0013
D1	6344956.9567	2153690.329	.29325	2.932	.0036
T1	-94800.89436	263653.6946	-.01936	-.360	.7194
SHIFT	1320.47939	17942.95403	4.5166E-03	.074	.9414
SIZE3DUM	-22427745.16	9663173.311	-.09259	-3.045	.0025
(Constant)	29247931.987	12466618.32		2.346	.0195

Table Appendix A--Contd.

*** MULTIPLE REGRESSION ***

Equation Number 1 Dependent Variable.. RR RATE OF RETURN

Multiple R	.43619	Analysis of Variance	
R Square	.19026		DF
Adjusted R Square	.12852	Regression	26
Standard Error	1.54615	Residual	341

Sum of Squares	Mean Square
191.54201	7.36700
815.18349	2.39057

F = 3.08170 Signif F = .0000

----- Variables in the Equation -----

Variable	B	SE B	Beta	T	Sig T
SIZE7DUM	.31473	.97718	.03094	.322	.7476
MKET2	-.61350	1.62409	-.01931	-.378	.7058
P2: CR/K	-3.13932E-03	8.95205E-03	-.01746	-.351	.7260
DIST	-1.46678E-06	1.94090E-07	-.38488	-7.557	.0000
SIZE6DUM	.41590	1.13250	.04088	.367	.7137
NLS:CENTIV	.82782	.34114	.12358	2.427	.0152
SIZE5DUM	.30699	1.09599	.04921	.290	.7796
R1: GENDER1	-.45604	.60321	-.03756	-.756	.4502
X: FLOGD	-.17847	.19530	-.05120	-.963	.3362
X1: AGE	-1.44577E-04	7.07082E-03	-1.075E-03	-.020	.9837
DESIGN	-.24595	.22797	-.05456	-1.079	.2814
MIG	.20122	.46850	.02349	.429	.6678
P14: WK PR2	.04174	.18074	.01188	.231	.8175
SIZE2DUM	.44052	1.12624	.10033	.591	.6959
L: Labor	-5.68615E-04	5.62562E-04	-.11240	-1.011	.3128
A11: PUB1	4.01262	1.65615	.12629	2.423	.0159
T14: UNCERT	.07522	.17553	.02254	.429	.6685
MKET1	.18137	.18151	.05414	.999	.3184
U1: EDU HRS64	-.12202	.18486	-.03634	-.660	.5097
SIZE1DUM	.67816	1.19649	.08362	.567	.5712
AA	-.01759	.01230	-.07842	-1.430	.1536
SIZE4DUM	.27504	1.08398	.07200	.254	.7999
D1: ESTAT	-.14646	.24643	-.03475	-.594	.5527
T1: Ed!!	1.231203E-03	.03003	2.4228E-03	.041	.9673
SHIFT	3.417337E-03	2.04360E-03	.11263	1.672	.0954
SIZE3DUM	.19674	1.10059	.05750	.179	.8582
(Constant)	.41120	1.41989		.290	.7723

Table Appendix A.—Contd.

*** MULTIPLE REGRESSION ***

Equation Number 1 Dependent Variable.. SHIFT

Multiple R	.59035	Analysis of Variance	
R Square	.47658		DF
Adjusted R Square	.43832	Regression	25
Standard Error	40.91108	Residual	342

Sum of Squares	Mean Square
521183.04650	20847.32196
572411.13217	1673.71676

F = 12.45570 Signif F = 0.0

----- Variables in the Equation -----

Variable	B	SE B	Beta	T	Sig T
SIZE7DUM	-93.87452	25.35296	-.27999	-3.703	.0002
MKET2	7.28796	42.97152	6.9596E-03	.170	.8654
P2	-.02176	.23687	-3.673E-03	-.092	.9269
DIST	9.807391E-06	5.10818E-06	.07802	1.920	.0557
SIZE6DUM	-176.61768	28.40346	-.52677	-6.218	.0000
N15	5.09121	9.02233	.02306	.564	.5729
SIZE5DUM	-171.80292	27.47177	-.83560	-6.254	.0000
R1	-.37897	15.96083	-9.496E-04	-.024	.9811
X	-9.90374	4.87371	-.08621	-2.032	.0429
X1	.13327	.13695	.03021	.716	.4745
DESIGN	5.06134	6.02596	.03407	.840	.4015
MIG	-8.85041	12.38729	-.03138	-.715	.4749
P14	2.61176	4.78028	.02255	.546	.5852
SIZE2DUM	-191.63521	27.94066	-1.32417	-6.859	.0000
L	2.124651E-03	.01488	.01274	.143	.8866
AI1	-99.54007	43.49004	-.09506	-2.289	.0227
T14	1.42304	4.64396	.01294	.306	.7595
MNET1	-8.06086	4.78282	-.07319	-1.690	.0920
U1	-2.18008	4.89002	-.01997	-.446	.6560
SIZE1DUM	-197.81490	29.79746	-.74001	-6.639	.0000
AA	.16920	.32524	.02289	.520	.6032
SIZE4DUM	-170.06128	27.16796	-1.35083	-6.260	.0000
D1	3.88426	6.51726	.02796	.596	.5516
T1	1.48261	.79051	.08851	1.876	.0616
SIZE3DUM	-178.59854	27.47362	-1.58377	-6.501	.0000
(Constant)	269.29213	34.63354		7.775	.0000

Table Appendix A—Contd.

Equation Number 1 Dependent Variable.. IQ INVEST/OUTPUT

*** MULTIPLE REGRESSION ***

Multiple R	.30359	Analysis of Variance	
R Square	.09217		DF
Adjusted R Square	.02129	Regression	26
Standard Error	1.86781	Residual	333

Sum of Squares	Mean Square
117.94451	4.53633
1151.73725	3.48870

F = 1.30029 Signif F = .1524

Equation Number 1 Dependent Variable.. IQ INVEST/OUTPUT

----- Variables in the Equation -----

Variable	B	SE B	Beta	T	Sig T
SIZE7DUM	-.31675	1.18142	-.02751	-.268	.7888
MNET2	.18981	1.98597	5.2986E-03	.097	.9231
P2	-8.70568E-03	.01082	-.03308	-.820	.5360
DIST	-8.19259E-08	2.34758E-07	-.01906	-.349	.7273
SIZE5DUM	-.09919	1.36909	-8.645E-03	-.072	.9423
MIS	-.10548	.42158	-.01368	-.250	.8025
SIZE5DUM	2.273769E-03	1.32487	3.2299E-04	.002	.9985
R1	.49330	.72907	.03613	.677	.4991
X	-.05873	.22640	-.01477	-.259	.7955
X1	.02251	8.58272E-03	.14748	2.622	.0091
MIG	.14963	.57020	.01533	.262	.7932
DESIGN	.23677	.27615	.04649	.857	.3918
SIZE2DUM	-.07944	1.36348	-.01560	-.052	.9536
P14	-.10131	.22086	-.02528	-.459	.6467
U1	.49916	.22472	.13224	2.221	.0270
L	-9.62825E-05	6.79807E-04	-.01687	-.142	.8875
A11	-.45913	2.00112	-.01282	-.229	.8187
SIZE1DUM	-.15563	1.45152	-.01650	-.107	.9147
T14	-.14702	.21440	-.03872	-.686	.4934
MNET1	-.16768	.22261	-.04385	-.753	.4518
AA	-.01957	.01490	-.07698	-1.314	.1899
SIZE4DUM	.61851	1.31057	.14205	.472	.6373
D1	.10550	.29821	.02215	.354	.7237
T1	.06461	.03662	.11128	1.764	.0786
SHIFT	-2.91865E-03	2.48210E-03	-.08503	-1.176	.2405
SIZE3DUM	.23109	1.33097	.05942	.174	.8623
(Constant)	-1.28867	1.71819		-.750	.4538

Table Appendix A--Contd.

^aThe variables are defined below:

Dependent variables

1. Q/L = Output/labor ratio in Takas thousands
2. Q/KK = Output/capital ratio; K =fixed capital, KK =fixed + working capital
3. VA/Q = Value added/output ratio
4. w = Wage rate
5. EX/Q = Export/output ratio
6. I = Investment in Takas thousands
7. E = Employment Growth rate (g) of the given variable
8. g of $Q = Gq$) Geometric annual percent rate of growth
9. g of $I = Gi$) for 1980-81 through 1988-89, or starting
10. g of $Emp = Ge$) with the first year having nonzero value.
11. RR = Rate of return: $(VA-W)/K$
12. $SHIFT$ = No. of shifts worked/year
13. I/Q = Investment/Output ratio
14. EFF = Firm efficiency parameter from the TL production function

Table Appendix A--Contd.

Independent Variables

1. ESTAT = D1=1 if in industrial estate, zero otherwise
2. PUB=AI1=1 if in public sector
3. SHIFT = Shift/year used as an adjustment to inputs in
production functions
4. EDU=T1=No. of school years of entrepreneur
5. EURB=U1=1 if education of urban areas
6. CRED=P2=Ratio of credit to KK
7. AGE = Age of entrepreneur
8. L = Labor
9. L1 = Managerial/tech. personnel
10. L2 = Production workers: skilled
11. L3 = Production workers: Semiskilled
12. L4 = Production workers: Unskilled
13. L56 = All other labor (clerical+family)
14. RM = Raw materials: All Raw Materials + chemicals + fuels +
other supplies + packaging
15. MC = Material cost: RM + all other costs, including
marketing costs
16. MKET1 = 1 if sold to wholesaler, zero otherwise
17. MKET2 = 1 if sold regionally, nationally, or exported,
zero otherwise
18. DESIGN = No. of designs, new products, new processes, etc.
during the past 8 years

Table Appendix A--Contd.

19. CENTIV = 1 if entrepreneur stated that the incentive in the form of tariff on product is important
20. DISTC = Distance in tens of miles from nearest city (Dhaka, Chittagong, Khunla)
21. DISTD = Distance in miles from district headquarter
22. ELECT = Electricity available 1, zero otherwise
23. DISTB = Distance in miles from bank, unity if local bank exists
24. DISTC = Distance in miles from college, unity if local college exists
25. DISTH = Distance in miles from hospital, unity if local hospital exists
26. DISTT = Distance in miles from thana, unity if local than exists
27. DIST = DISTC*DISTD*DISTB*DISTC*DISTH*DISTT
28. FLOOD = X = Area flooded almost every year = 1, zero otherwise
29. MIG = Migrants abroad as % of total households
30. IND = Total number of industrial units started last year in mouza
31. SIZE1DUM = Dummy for Size-Class 1
32. SIZE2DUM = Dummy for Size-Class 2
33. Base dummy for Size-Class 4
34. SIZE5DUM = Dummy for Size-Class 5
35. SIZE5DUM = Dummy for Size-Class 6
36. RL = Gender dummy: 1 if entrepreneur male

Footnotes

¹For empirical measures of agriculture and industry linkages, see Mahbub Hossain, "Agricultural Growth Linkages--the Bangladesh Case," World Bank/Washington, D.C. Feb., 1986.