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Industrial Efficiency And Economic Growth: A Case Study of Karachi

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INDUSTRIAL EFFICIENCY AND ECONOMIC GROWTH: A CASE STUDY OF KARACHI.

The problem of growth in the less-developed areas has become increasingly identified in recent years with the problem of industrialization. It is true that some of the early proponents of such an identity fell into the trap of mistaking association for causation and became easy targets for the "remember Denmark" or "development through agricultural expansion" school of thought. But an objective analysis of the growth potential of the contemporary labour-surplus areas will almost invariably lead us to the same prescription. The other possibility, commercialization of agriculture for export, requires a favorable natural resource base at home and favorable demand conditions abroad. This is indeed a rare combination and we may more or less neglect this as a practical possibility for a country like Pakistan. Industrialization, it should be added, does, of course, not preclude—and in fact depends for investment funds on—a simultaneous overhauling of agricultural productivity geared largely to the domestic market; but success in the agricultural sector will in itself increase the necessity for a simultaneous sustained growth in industry to absorb the newly redundant agricultural manpower.

The next question, of course, is what kind of industry and what kind of technology. We will readily admit at the outset that the relationship between the theory of production and the problem of growth is still in a rather unrefined state.[1] The related concern with selecting relevant investment criteria for resource allocation has been the subject of one of the most heated yet inconclusive

[1] Hollis Chenery calls it "the most controversial aspect of the problem of economic development," ("The Role of Industrialization in Development Programmes," *American Economic Review*, May 1955).

controversies in the recent literature.[2] Available theory can provide only some general guidelines for planning an optimum path of industrial expansion, either in terms of output mix or technology.

This monograph is concerned with the choice of technology, given a stipulated output mix. We assume that decisions as to the future expansion of certain industries, based on a variety of considerations (including the anticipated pattern of demand, domestic raw material availabilities, etc.) have already somehow been made.[3] The technological choice must then be governed by two major considerations: efficiency in the static sense of using the resource endowment most effectively and efficiency in the dynamic sense of permitting a maximum potential for reinvestment over time.

Guided by the total unavailability of reliable data in this general context the Institute of Development Economics embarked on a sample survey of 530 establishments in the textile, light engineering, plastics and leather goods industries in Karachi. A statement on sampling frame and methodology is included in Appendix A. This monograph presents some of the preliminary results of that survey.

A principal aim of our study is to examine the comparative efficiency in the use of the capital stock at different scales of operation resulting from differences in the technological choices open to entrepreneurs. A second aim is to investigate the extent to which market imperfections obstruct a socially optimum utilization of the factor endowment. Finally, some implications for policy are discussed.

Industrial efficiency is not an unambiguous concept. It raises a variety of conceptual and empirical problems of imputation and of the choice between the private and the social points of view.

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2 See especially Galenson and Leibenstein, "Investment Criteria, Productivity and Economic Development," *Quarterly Journal of Economics*, August, 1955 and references quoted therein.

3 As they, in fact, have been by the Pakistan Planning Commission. We consulted with the Commission's experts concerning the industries likely to expand during the Second Five-Year Plan and thereafter. We also assume the absence of any "feedback" effects from technology to demand and output mix via distributional changes.

Nevertheless, in the context of labour surplus areas like Pakistan, the average productivity of capital may be advanced as a central indicator of so-called static efficiency from the social vantage point. At the aggregative level the average productivity of capital, turned upside down and modernized as the capital-output ratio, has been in considerable vogue in recent years in the context of the investment requirements for stable growth in the mature economy. In the under-developed country the same concept is useful as an indicator of the economy's ability to "spread" its capital stock effectively in terms of squeezing out a maximum output. One may feel that the enthusiasm with which U.N. agencies and Planning Commissions have accepted and applied it to the solution of inter-sectoral or inter-industry allocation problems has been excessive[4] and nevertheless recognize the average productivity of capital as a useful, if imprecise, measure of industrial efficiency. According to Bator, "if labour is so plentiful as to be redundant even after the most labour intensive known production functions have been utilized the maximization of output implies a maximization of the average productivity of capital.[5] Even in the case of the Soviet Union a minimization of the capital-output ratio appears to have been a consistently followed policy.[6] Emphasis on economizing in the use of one input is reasonable when, from the social point of view, the opportunity cost of other inputs can be virtually ignored.

Our four-industry sample has been stratified according to the number of workers employed as an index of the scale of operation. As Tables 1 and 2 indicate, there seems to be a reasonably close relationship between capital intensity and scale as measured by

[4] For some of the difficulties involved see, for example, Charles F. Kindleberger, *Economic Development*, McGraw Hill, 1958, p. 44, and "Use of the Capital-Output Ratio in Programming and Analyzing Economic Development," Intelligence Report No. 7013, Department of State, February 7, 1956.

[5] F. Bator, "Productivity, Input Allocation and Growth," *Quarterly Journal of Economics*, February, 1957. Kindleberger (*op. cit.* p. 46) also agrees that "where labour is redundant, the capital-output ratio is appropriate to use." The problem of the appropriate time period to be employed, which is relevant to considerations of internal and external economies of scale, must, of course still be faced in some logically consistent fashion.

[6] David Granick, "Economic Development and Productivity Analysis; The Case of Soviet Metal-Working," *Quarterly Journal of Economics*, May, 1957.

the number of workers employed. The average productivity of capital has been computed for each scale and for each industry and the results are presented in Table 3. (For the convenience of those who prefer it, the capital-output ratios are also shown). Under "capital" we include the depreciated fixed capital stock including equipment, land and buildings as well as working capital in the form of average inventory holdings.[7] Value added has been used as the least arbitrary index of productive activity in our four industries.[8]

It should be noted that the minimum scale, *i.e.* 0-9 workers, has the most favorable (highest) average productivity of capital (or lowest capital-output ratio) for all four industries concerned. The highest capital-output ratio is located in the largest scale (100 workers and above) for the engineering industry, in medium-large (50—99) for the case of plastics and in medium (20—49) for the textile and leather goods industries. The trend is quite clearly, and not unexpectedly, in favour of a "better" use of capital in the small-scale sector. Nevertheless, the data do not permit sweeping conclusions about the incontrovertible superiority of smaller scales at each level and in every industry. A summary picture by scale is presented in Table 4. Since the four industries concerned comprise nearly 80 per cent of the Karachi industrial capacity the aggregate capital-output ratio of 3.42 may give some indication of magnitude for the industrial sector as a whole.

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7 Working capital in the form of transactions cash has been excluded since it is not meaningful from the social point of view.

8 This is based on the assumption that raw materials or the intermediary factors of production are a constant proportion of total output and that there are no changes in the relative prices of intermediary inputs and output. That is, if O=total output, L=labor, K=capital stock, R=raw materials, P=price, and V = value added, assuming R = kO and $\frac{P_o}{P_r} \div k'$, the production function $O = AL^{a1} \cdot K^{a2}$, for example, can be rewritten as follows:

$$V = P_o O - P_r R$$
$$V = P_o O - P_r RO$$
$$V = (P_o - P_r k) AL^{a1} K^{a2}$$
$$V = (k' P_r - P_r k) AL^{a1} K^{a2}$$
$$V = P_r (k'-k) AL^{a1} K^{a2}$$

The Pandora's box marked "other inputs" has been advisedly left unopened thus far. Labour has been used as an essentially "free" good. Its average productivity at different scales in the several industries is presented in Tables 5 and 6. Obviously, however, to treat capital as the only "scarce" resource with positive marginal product is an over-simplification. Foreign exchange (capital from abroad) and specialised human resources (embodied capital) cannot easily be lumped with the physical stock of capital. Yet they are strictly in excess demand and their husbanding must constitute yet another aim of development policy in countries like Pakistan. If the optimum scale with respect to each of the high-priced scarce inputs is identical we have no difficulty in making a choice. If they diverge, a hazardous weighting problem may arise.

In tables 7 and 8 we present the average productivity of imported raw materials for each industry and for each scale, all industries combined, as a measure of the relative efficiency in the utilization of foreign exchange. Again, we may note that import requirements on current account per unit of output are almost uniformly minimized (or the average productivity maximized), at the smallest scale.[9] While the pattern is by no means conclusive, there is a considerable measure of agreement as to the optimum scale locus for each industry with respect to these two scarce inputs.

There are, moreover, a small but increasing number of economists who view high talent human resources as "the" key bottleneck in the less-developed areas. We have, therefore, in Tables 9 and 10 presented output/managerial or supervisory manpower ratios in the hope they may give some indication as to the efficiency with which the scarcest human talents are being utilized.[10] Our results indicate that the largest or medium to large scale of operation

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[9] One caveat is in order here; some of the small-scale firms tend to understate the import component of their raw material requirements since they cannot obtain import licences and are forced to purchase on the local "black" market. We have tried to correct for obviously imported items wherever possible.

[10] Admittedly there are difficulties attached to the definition of "managerial or supervisory manpower" when applied to different scales. To reduce the effects of quality differentials on our ratios, unskilled owner-operators in the smallest scale (0—9 workers) have been excluded from consideration.

TABLE I

CAPITAL INTENSITY

(By Industry and Scale)

Industry by Scale	Fixed Capital (K_F) (In Rs. 1000)	Total Capital (K) (In Rs. 1000)	Man-hours (L) (1000s)	Fixed Capital Per Man-hour (K_F/L)	Total Capital Per Man-hour (K/L)
Textiles					
0—9 Workers	204	249	783	0.26	0.32
10—19 „	1,160	1,487	379	3.06	3.92
20—49 „	3,546	5,218	1,381	2.57	3.78
50—99 „	5,206	6,422	1,553	3.35	4.14
100 and over Workers	1,89,330	2,56,324	66,525	2.85	3.85
Total	1,99,446	2,69,701	70,621	2.82	3.82
Light Engineering					
0—9 Workers	987	1,086	1,117	0.88	0.97
10—19 „	749	1,186	463	1.62	2.56
20—49 „	4,054	5,822	1,661	2.44	3.51
50—99 „	5,309	8.325	2,654	2.00	3.14
100 and over Workers	22,333	39,561	5,899	3.79	6.72
Total	33,433	55,980	11,784	2.84	4.76
Plastics					
0—9 Workers	136	220	64	2.12	3.41
10—19 „	554	576	297	1.87	1.94
20—49 „	1,106	2,021	453	2.44	4.46
50—99 „	553	914	110	5.01	8.28
100 and over Workers	320	448	214	1.50	2.09
Total	2,669	4.179	1,139	2.34	3.67
Leather and Leather Goods					
0—9 Workers	40	67	219	0.18	0.30
10—19 „	49	97	145	0.34	.67
20—49 „	1,160	1,872	1,132	1.03	1.65
50—99 „	485	663	564	0.86	1.18
100 and over Workers	—	—	—	—	—
Total	1,734	2,699	2,059	0.84	1.31
Grand Total	2,37,282	3,32,558	85,603	2.77	3.88

Figures may not necessarily add up to totals due to rounding.

TABLE 2

CAPITAL INTENSITY

(Summary Table by Scale)

Scale	Fixed Capital (F_F) (In Rs. 1000)	Capital (K) (In Rs. 1000)	Man-hour (L) (1000s)	Fixed Capital Per Man-hour (K/L)	Capital Per Man-hour (K/L)
0—9 Workers	1,367	1,622	2,183	0.63	0.74
10—19 ,, ...	2,511	3,346	1,283	1.96	2.61
20—49 ,, ...	9,867	14,934	4,627	2.13	3.23
50—99 ,, ...	11,553	16,324	4,881	2.37	3.34
100 and over Workers	2,11,983	2,96,333	72,629	2.92	4.08
Total	2,37,282	3,32,558	85,603	2.77	3.88

Figures may not necessarily add up to totals due to rounding.

TABLE 3

AVERAGE PRODUCTIVITY OF CAPITAL AND CAPITAL-OUTPUT RATIOS

(By Industry and Scale)

Industry by Scale		Value Added (V) (In Rs. 1000)	Capital (K) (In Rs. 1000)	Average Productivity of Capital (V/K)	Capital-output ratio (K/V)
Textiles					
0—9 Workers	...	395	249	1.58	0.63
10—19 ..	...	503	1,487	0.34	2.96
20—49 ,,	...	1,423	5,218	0.27	3.67
50—99 ,,	...	2,309	6,422	0.36	2.78
100 and over Workers	...	73,867	256,324	0.29	3.47
Total	...	78,496	269,701	0.29	3.44
Light Engineering					
0—9 Workers	...	1,118	1,086	1.03	0.97
10—19 ,,	...	324	1,186	0.27	3.65
20—49 ,,	...	2,248	5,822	0.39	2.59
50—99 ,,	...	3,489	8,325	0.42	2.39
100 and over Workers	...	7,873	39,561	0.20	5.02
Total	...	15,053	55,980	0.27	3.72
Plastics					
0—9 Workers	...	162	220	0.74	1.35
10—19 ,,	...	135	576	0.24	4.26
20—49 ,,	...	534	2,021	0.26	3.78
50—99 ,,	...	182	914	0.20	5.01
100 and over Workers	...	198	448	0.44	2.26
Total	...	1,213	4,179	0.29	3.45
Leather and Leather Goods					
0—9 Workers	...	199	67	2.98	0.34
10—19 ,,	...	130	97	1.35	0.74
20—49 ,,	...	1,249	1,872	0.67	1.50
50—99 ,,	...	830	663	1.25	0.80
100 and over Workers	...	—	—	—	—
Total	...	2,408	2,699	0.89	1.12
Grand Total	...	97,170	332,558	0.29	3.42

Figures may not necessarily add up to totals due to rounding.

Table 4

AVERAGE PRODUCTIVITY OF CAPITAL AND CAPITAL-OUTPUT RATIOS

(*Summary Table by Scale*)

Scale (All Industries)		Value added (V) (In Rs. 1000)	Capital (K) (In Rs. 1000)	Average Productivity of Capital (V/K)	Capital-output ratio (K/V)
0—9 Workers	...	1,874	1,622	1,16	0.87
10—19 ,,	...	1,093	3,346	0.38	3.06
20—49 ,,	...	5,454	14,933	0.37	2.74
50—99 ,,	...	6,811	16,324	0.42	2.40
100 and over Workers	...	81.938	296,333	0.28	3.62
Total	...	97,170	332,558	0.29	3.42

Figures may not necessarily add up to totals due to rounding.

TABLE 5

AVERAGE PRODUCTIVITY OF LABOUR

(By Industry and Scale)

Industry by Scale			Value Added (V) (In Rs. (1000)	Man-hours (L) (In 1000s)	Output per Man-hour (V/L)
Textiles					
0—9 Workers	...	...	395	783	0.50
10—19 ,,	...	...	503	379	1.33
20—49 ,,	...	...	1,423	1,381	1.03
50—99 ,,	...	...	2,309	1,553	1·49
100 and over Workers	...	...	73,867	66,525	1.11
Total	...	...	78,496	70,621	1.11
Light Engineering					
0—9 Workers	...	...	1,118	1,117	1.00
10—19 ,,	...	..	324	463	0.70
20—49 ,,	..	..	2,248	1,661	1.35
50—99 ,,	...	...	3,489	2,654	1.31
100 and over Workers	...	...	7,873	5,890	1.34
Total	...	...	15,053	11,784	1.28
Plastics					
0—9 Workers	...	...	162	64	2.52
10—19 ,,	...	...	135	297	0.46
20—49 ,,	...	...	534	453	1.18
50—99 ,,	...	...	182	110	1.65
100 and over Workers	...	...	198	214	0.93
Total	...	...	1,213	1,139	1.07
Leather and Leather Goods ...					
0—9 Workers	...	...	199	219	0·91
10—19 ,,	...	...	130	145	0.90
20—49 ,,	...	...	1,249	1,132	1.10
50—99 ,,	...	...	830	564	1.47
100 and over Workers	...	...	—	—	—
Total	...	...	2,408	2,059	1.17
Grand Total	...	...	97,170	85,603	1.14

Figures may not necessarily add up to totals due to rounding.

TABLE 6

AVERAGE PRODUCTIVITY OF LABOUR

(Summary Table by Scale)

Scale (All Industries)	Value Added (V) (In Rs. 1000)	Man-hours (L) (In 1000s)	Output per Man-hour (V/L)
0—9 Workers	1,874	2,183	0.86
10—19 „	1,093	1,283	0.85
20—49 „	5,454	4,627	1.18
50—99 „	6,811	4,881	1.40
100 and over Workers	81,938	72,629	1.13
Total	97,170	85,603	1.14

Figures may not necessarily add up to totals due to rounding.

TABLE 7

OUTPUT/IMPORTED RAW MATERIALS RATIOS

(By Industry and Scale)

Industry by Scale			Value Added (V) (In Rs. 1000)	Imported Raw Materials (RM) (In Rs. 1000)	Output/ Imported Raw Material Ratio (V/RM)
Textiles					
0—9 Workers	...	...	395	89	4.44
10—19 ,, ...	...	...	503	240	2.09
20—49 ,, ...	...	...	1,423	1,062	1.34
50—99 ,, ...	...	...	2,309	1,537	1.50
100 and over Workers	...	...	73,867	24,728	2.99
Total ...	...	...	78,496	27,657	2.84
Light Engineering					
0—9 Workers	...	...	1,118	642	1.74
10—19 ,, ...	...	...	324	198	1.64
20—49 ,, ...	...	...	2,248	3,100	0.73
50—99 ,, ...	...	...	3,489	3,757	0.93
100 and over Workers	...	...	7,873	16,493	0.48
Total ...	...	...	15,053	24,190	0.62
Plastics					
0—9 Workers	...	...	162	140	1.16
10—19 ,, ...	...	...	135	185	0.73
20—49 ,,	...	...	534	358	1.49
50—99 ,, ...	...	...	182	161	1.13
100 and over Workers	...	...	198	166	1.20
Total ...	...	...	1,213	1,010	1.20
Leather and Leather Goods ...					
0—9 Workers	...	...	199	52	3.80
10—19 ,, ...	...	...	130	46	2.81
20—49 ,, ...	...	...	1,249	519	2.40
50—99 ,, ...	...	...	830	263	3.16
100 and over Workers	...	...	—	—	—
Total ...	...	...	2,408	881	2.73
Grand Total	...	...	97,170	53,738	1.81

Figures may not necessarily add up to totals due to rounding.

TABLE 8

OUTPUT/IMPORTED RAW MATERIALS RATIOS

(Summary Table by Scale)

Scale (All Industries)	Value Added (V) (In Rs. 1000)	Imported Raw Materials (R_M) (In Rs. 1000)	Output/ Imported Raw Materials Ratio (V/R_M)
0—9 Workers	1,874	924	2.03
10—19 ,, ...	1,093	669	1.63
20—49 ,, ...	5,454	5,040	1.08
50—99 ,, ...	6,811	5,718	1.19
100 and over Workers	81,938	41,387	1.98
Total	97,170	53,738	1.81

Figures may not necessarily add up to totals due to rounding.

TABLE 9

AVERAGE PRODUCTIVITY PER HEAD OF SUPERVISORY PERSONNEL

(By Industry and Scale)

Industry by Scale	Value Added (V) (In Rs. 1000)	No. of Supervisory Personnel (S)	Average Productivity per Head of Supervisory Personnel (V/S)
Textile			
0—9 Workers	395	6	65.8
10—19 ,, ...	503	6	83.8
20—49 ,, ...	1,423	29	49.1
50—99 ,, ...	2,309	27	85.5
100 and over Workers	73,867	589	125.4
Total	78,496	657	119.5
Light Engineering			
0—9 Workers	1,118	17	65.3
10—19 ,, ...	324	10	32·4
20—49 ,, ...	2,248	29	77.5
50—99 ,, ...	3,489	35	199.7
100 and over Workers	7,873	74	106.4
Total	15,053	165	91.2
Plastics			
0—9 Workers	162	1	162.2
10—19 ,, ...	135	5	27.1
20—49 ,, ...	534	10	53.4
50—99 ,, ...	182	1	182.4
100 and over Workers	198	2	99.2
Total	1,213	19	63.8
Leather and Leather Goods			
0—9 Workers	199	6	33.2
10—19 ,, ...	130	2	65.1
20—49 ,, ...	1,249	15	83.2
50—99 ,, ...	830	7	118.6
100 and over Workers	—	—	—
Total	2,408	30	80.3
Grand Total	97,170	871	111.6

Figures may not necessarily add up to totals due to rounding.

TABLE 10

AVERAGE PRODUCTIVITY PER HEAD OF SUPERVISORY PERSONNEL

(*Summary Table by Scale*)

Scale (All Industries)	Value Added (V) (In Rs. 1000)	No. of Supervisory Personnel (S)	Average Productivity per Head of Supervisory Personnel (V/S)
0—9 Workers	1,874	30	62.5
10—19 ,, ...	1,093	23	47.5
20—49 ,, ...	5,454	83	65.7
50—99 ,, ...	6,811	70	97.3
100 and over Workers	81,938	665	123.2
Total	97,170	871	111.6

Figures may not necessarily add up to totals due to rounding.

tends to optimize the use of supervisory inputs. In this dimension, in other words, the large-scale firms tend to be more "efficient". Other efficiency criteria in this static sense may, of course, be advanced.[11] But we may now, in conclusion, turn briefly to the question of "dynamic" efficiency as an additional and important criterion governing the choice of scale.

This is essentially a problem of examining the relative reinvestment potential in different scales over time. The case against adopting the most labour-intensive known production functions on distributional grounds is made most vehemently by Galenson and Leibenstein.[12] It is their assertion that even in the presence of redundant labour, a higher K/L ratio or larger scale is desirable since the rate of savings (and reinvestment) varies inversely with the size of the wage bill as proportion of output. We have no doubts about e higher mtharginal propensity to save out of profits on which their argument is based but it is necessary to remember that the volume of savings depends on both the rate of savings, given output. and on the size of the output at any point in time. If it is true that "labour-intensity" leads to larger output statically and "capital intensity" to larger savings rates the Galenson and Leibenstein assertion is true only if the second factor swamps the first. This hypothesis may be examined with the help of our data.

In Tables 11 and 12 profit rates on fixed and total capital stock have been presented for each industry by scale and for all industries combined by scale. These will be made further use of below. In Tables 13 and 14, however, they are harnessed for the computation of savings and/or reinvestment ratios for each industry and scale.[13] The savings and re-investment figures of Tables 13 and 14 include undistributed corporate profits and the savings of unincorporated enterprises. We find that the percentage of total profits which the

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[11] The maximization of employment (*i.e.* of a labour-capital ratio) may be one such. If this is seen as a target of planners, regardless of the effects on output, however, it becomes a political consideration which, no matter how valid, is difficult to integrate with economic analysis.

[12] op. cit.

[13] The smallest scale, however, had to be excluded for this purpose since information on savings and reinvestment was unobtainable.

TABLE 11

RATES OF RETURN ON FIXED AND TOTAL CAPITAL

(By Industry and Scale)

Industry by Scale	Profit (P) (In Rs. 1000)	Fixed Capital (K_F) (In Rs. 1000)	Working Capital (K_W) (In Rs. 1000)	Total Capital (K) (In Rs. 1000)	Rate of Return on Fixed Capital (P/K_F) (In %)	Rate of Return on Total Capital (P/K) (In %)
Textiles						
0—9 Workers	256	204	45	249	125.50	102.80
10—19 "	224	1,160	327	1,487	19.30	15.05
20—49 "	664	3,546	1,672	5,218	18.72	12.72
50—99 "	1,137	5,206	1,217	6,422	21.84	17.70
100 and over Workers	32,562	1,89,330	66,994	2,56,324	17.20	12.70
Total	34,843	1,99,446	70,225	2,69,701	17.47	12.92
Light Engineering						
0—9 Workers	605	987	99	1,086	61.29	55.70
10—19 "	130	749	437	1,186	17.41	10.99
20—49 "	1,159	4,054	1,768	5,822	28.59	19.91
50—99 "	1,911	5,309	3,015	8,325	35.99	22.95
100 and over Workers	2,546	22,333	17,227	39,561	11.40	6.44
Total	6,352	33,433	22,547	55,980	19.00	11.35
Plastics						
0—9 Workers	131	136	83	220	96.10	59.65
10—19 "	70	554	23	576	12.67	12.17
20—49 "	318	1,106	915	2,021	28.78	15.75
50—99 "	43	553	361	914	7.84	4.75
100 and over Workers	89	320	128	448	27.79	19.86
Total	652	2,669	1,510	4,179	24.42	15.60
Leather and Leather Goods						
0—9 Workers	100	40	27	67	252.69	150.22
10—19 "	60	49	47	97	121.14	61.74
20—49 "	613	1,160	712	1,872	52.83	32.74
50—99 "	443	485	178	663	91.27	66.80
100 and over Workers	—	—	—	—	—	—
Total	1,216	1,734	964	2,699	70.10	45.05
Grand Total	43,062	2,37,282	95,276	3,32,558	18.15	12.95

Figures may not necessarily add up to totals due to rounding.

TABLE 12

RATES OF RETURN OF FIXED AND TOTAL CAPITAL

(Summary Table by Scale)

Scale (All Industries)	Profit (P) (In Rs. 1000)	Fixed Capital (K_F) (In Rs. 1000)	Working Capital (K_W) (In Rs. 1000)	Total Capital (K) (In Rs. 1000)	Rate of Return on Fixed Capital (P/K_F) (In %)	Rate of Return on Total Capital (P/K) (In %)
0—9 Workers	1,093	1,367	255	1,622	79.91	67.37
10—19 ,, ...	484	2,511	835	3,346	19.27	14.46
20—49 ,, ...	2,754	9,867	5,067	14,934	27.92	18.44
50—99 ,, ...	3,534	11,553	4,771	16,324	30.59	21.65
100 and over Workers	35,197	2,11,983	84,349	2,96,333	16.60	11.88
Total	43,062	2,37,282	95,276	3,32,558	18.15	12.95

Figures may not necessarily add up to totals due to rounding.

small scales are capable or willing to save is not significantly smaller than that in other scales. The performance among the larger scales of operation, as well, is mixed with no clear trend discernible for all industries. In the last columns of 13 and 14 we have computed what we shall call reinvestment/capital ratios which measure the relationship between the plough-back of profits and the in-place capital stock, through the rate of return and the reinvestment ratio. Interestingly enough, the performance of the medium scale firms seems to be optimum when we take account, in this fashion, of the size of profits (per unit of capital invested) as well as the rate of reinvestment out of given profits. The Galenson-Leibenstein hypothesis is thus subjected to considerable doubt by our findings.[14]

In examining these various indices we have discovered, not unexpectedly, that the determination of a socially optimum scale for each industry is not an easy matter. As soon as we introduce dimensions additional to the conservation of a specific scarce input like capital, the simple optimization problem vanishes. Nevertheless, depending on the relative importance ascribed to the husbanding of various scarce inputs (statically) and to the effects on reinvestment (dynamically), an optimum scale can, theoretically at least, be arrived at. Of course, if market forces operated so that input prices reflected relative scarcities (discounted through time) such prices would themselves constitute a non-arbitrary weighting system. But, as is well-known, markets in less-developed areas are notoriously beset by all sorts of institutional imperfections.[15] Policy formulation based on our results would, therefore, require some attempt at quantifying the relative weights society attaches to the various criteria we have advanced, *i.e.*, the determination of shadow prices.

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[14] It should also be noted that, if redistribution should be desirable, it might better be achieved by means of fiscal and monetary policy than through an inefficient allocation of resources.

[15] More on this in Section II below.

TABLE 13

RATES OF RETURN AND SAVINGS AND REINVESTMENT RATIOS

(By Industry and Scale)

Industry by Scale	Profit (P) (In Rs. 1000)	Savings and/or Re-investment (R) (In Rs. 1000)	Capital (K) (In Rs. 1000)	Rates of Return (P/K) (in %)	Re-investment Profit Ratio (R/P) (in %)	Re-investment Capital Ratio (R/K) (in %)
Textiles						
10—19 Workers	224	118	1,487	15.05	52.73	7.94
20—49 „	664	357	5,218	12.72	53.70	6.83
50—99 „	1,137	838	6,422	17.70	73.71	13.05
100 and over Workers	32,562	21,875	2,56,324	12.70	67.18	8.53
Total	34,587	23,188	2,69,452	12.84	67.04	8.61
Light Engineering						
10—19 Workers	130	56	1.186	10.99	42.69	4.69
20—49 „	1,159	865	5,822	19.91	74.62	14.86
50—99 „	1,911	1,532	8,325	22.95	80.19	18.41
100 and over Workers	2,546	1,433	39,561	6.44	56.26	3.62
Total	5,747	3,886	54,894	10.47	67.61	7.08
Plastics						
10—19 Workers	70	35	576	12.17	49.61	6.04
20—49 „	318	241	2,021	15.75	75.70	11.92
50—99 „	43	43	914	4.75	100.00	4.75
100 and over Workers	89	39	448	19.86	43.31	8.60
Total	521	358	3,959	13.15	68.68	9.03
Leather and Leather Goods						
10—19 Workers	60	31	97	61.74	51.37	31.72
20—49 „	613	472	1,872	32.74	77.06	25.23
50—99 „	443	338	663	66.80	76.20	50.90
100 and over Workers	—	—	—	—	—	—
Total	1,115	840	2,632	42.38	75.35	31.93
Grand Total	41,970	28,272	3,30,936	12.68	67.36	8,54

The Smallest Scale has been eliminated from this table due to lack of information on savings and re-investment.

Figures may not necessarily add up to totals due to rounding.

TABLE 14

RATES OF RETURN AND SAVINGS AND REINVESTMENT RATIOS

(Summary Table by Scale)

Scale (All Industries)	Profit (P) (In Rs. 1000)	Savings and/or Re-investment (R) (In Rs. 1000)	Capital (K) (In Rs. 1000)	Rates of Return (P/K) (in %)	Re-investment Profit Ratio (R/P) (in %)	Re-investment Capital Ratio (R/K) (in %)
10—19 Workers	484	239	3,346	14.46	49.40	7.15
20—49 „	2,754	1,935	14,934	18.44	70.25	12.96
50—99 „	3,534	2,751	16,324	21.65	77.85	16.85
100 and over Workers	35,197	23,347	2,96,333	11.88	66.33	7.88
Total	41,970	28,272	3,30,936	12.68	67.36	8.54

The smallest scale has been eliminated from this table due to lack of information on savings and reinvestment.

Figures may not necessarily add up to totals due to rounding.

TABLE 15

WEIGHTED SOCIAL OPTIMALITY

(By Industry and Scale)

Industry by Scale		Optimality Factor	Weight	Number of Workers: 0—9		10—19		20—49		50—99		100 and over		Total	
				Index (Max. = 100)	Weighted Index	Index (Max. = 100)	Weighted Index	Index (Max. = 100)	Weighted Index	Index (Max. = 100)	Weighted Index	Index (Max. = 100)	Weighted Index	Index (Max. = 100)	Weighted Index
Textiles															
„	...	O/K	5	100.0	500.0	21.3	106.5	17.2	85.9	2.27	113.4	18.2	91.0	18.4	91.9
„	...	O/Rm	4	100.0	400.0	47.1	188.5	30.2	120.6	33.8	135.3	67.3	269.1	63.9	255.7
„	...	R/K	3	—	—	60.8	182.4	52.4	157.1	100.0	300.0	65.4	196.2	65.9	197.8
„	...	O/S	3	52.5	**157.4**	66.8	**200.5**	39.2	**117.5**	68.2	**204.5**	100.0	**300.0**	95.3	**285.9**
Weighted Average					88.1		45.2		32.1		50.2		57.1		55.4
Light Engineering															
„	...	O/K	5	100.0	500.0	26.5	132.7	37.5	187.6	40.7	203.6	19.3	96.7	26.0	**130.2**
„	...	O/Rm	4	100.0	400.0	94.2	376.8	41.7	166.7	53.3	213.3	27.4	109.6	35.8	143.0
„	...	R/K	3	—	—	25.5	76.5	80.7	242.1	100.0	300.0	19.7	59.0	38.5	115.6
„	...	O/S	3	33.0	**98.9**	16.2	**48.7**	38.8	**116.4**	100.0	**300.0**	53.3	**159.8**	45.7	**137.0**
Weighted Average					83.2		42.3		47.5		67.8		28.4		25.1

TABLE 15—*contd.*

WEIGHTED SOCIAL OPTIMALITY

(*By Industry and Scale*)

Industry by Scale	Optimality Factor	Weight	0—9 Index (Max. = 100)	0—9 Weighted Index	10—19 Index (Max. = 100)	10—19 Weighted Index	20—49 Index (Max. = 100)	20—49 Weighted Index	50—99 Index (Max. = 100)	50—99 Weighted Index	100 and over Index (Max. = 100)	100 and over Weighted Index	Total Index (Max. = 100)	Total Weighted Index
Plastics														
,, ...	O/K	5	100.0	500.0	31.8	159.2	35.8	178.9	40.5	202.6	60.0	300.0	39.3	196.5
,, ...	O/Rm	4	77.5	310.1	49.3	197.0	100.0	400.0	75.9	303.6	80.2	320.8	80.5	322.2
,, ...	R/K	3	—	—	50.6	151.9	100.0	300.0	39.8	199.5	72.2	216.5	75.8	227.3
,, ...	O/S	3	88.9	266.8	14.9	44.6	29.3	87.8	100.0	300.0	54.4	163.2	35.0	104.9
Weighted Average				89.7		36.9		64.5		61.7		66.7		56.7
Leather and Leather Goods														
,, ...	O/K	5	100.0	500.0	45.1	225.7	223.3	111.6	41.9	209.6	—	—	29.9	149.5
,, ...	O/Rm	4	100.0	400.0	73.9	295.7	63.2	252.7	83.1	332.4	—	—	71.9	287.5
,, ...	R/K	3	—	—	62.3	186.9	49.6	148.7	100.0	300.0	—	—	62.7	188.2
,, ...	O/S	3	28.0	84.0	54.9	164.7	70.2	210.5	100.0	300.0	—	—	67.7	203.1
Weighted Average				82.0		58.2		48.2		76.1		—		55.2

Figures may not necessarily add up to totals due to rounding.

TABLE 16

WEIGHTED SOCIAL OPTIMALITY

(*Summary Table by Scale*)

Optimality Factor	Weight	0—9 Index (max. 100)	0—9 Weighted Index	10—19 Index (max. 100)	10—19 Weighted Index	20—49 Index (max. 100)	20—49 Weighted Index	50—99 Index (max. 100)	50—99 Weighted Index	100 and over Index (max. 100)	100 and over Weighted Index
O/K	5	100.0	500.0	28.2	141.1	31.6	158.0	36.1	180.5	23.9	119.5
O/Rm	4	100.0	400.0	80.5	322.1	53.4	213.4	58.7	234.9	97.6	390.3
R/K	3	—	—	42.4	127.2	76.9	230.6	100.0	300.0	46.7	140.2
O/S	3	51.0	152.9	38.6	115.7	53.3	160.0	79.0	235.9	100.0	300.0
Weighted Average			87.7		47.1		50.8		63.5		63.3

Figures may not necessarily add up to totals due to rounding.

Such an endeavour is at best a very difficult task.[16] In tables 15 and 16, for purely illustrative purposes, certain more or less arbitrary weights have been attached to four of our optimality factors as an example of how policy-makers might arrive at a combined index conveying an indication of "the" socially optimum scale for each of our industries. The purely arbitrary, illustrative nature of these partial equilibrium calculations needs to be emphasized.

II

In Section I, we have presented certain observed relationships with respect to "social optimality," however imperfectly defined, for the four industries with which we are concerned. If socially optimum scales can be determined (either by means of some weighting process or by maximizing "successively" according to some ordinal ranking of importance) the two following questions arise quite naturally: to what extent does the actual performance of the individual firms operating in the socio-economic environment of Pakistan conform to the rule of social optimality; and in case such conformity is lacking (*i.e.*, there is a divergence of social and private interests) how is it to be explained. The first question is basically concerned with a statistical inquiry, the second leads us to the need for a theoretical formulation and analysis. We shall attempt to examine them in this order.

From the individual private entrepreneur's point of view the optimum scale is, of course, identified with optimum profits. Rates of return on fixed and total capital stock have been presented in Tables 11 and 12 above. What strikes our attention immediately is the existence of a considerable spread in private profit rates (after tax) both within industries (at different scales) and between industries; the markedly higher rates of return in the leather and leather goods industry are a case in point. Secondly, we may note the appreciably higher rates of return in the smallest scales throughout,

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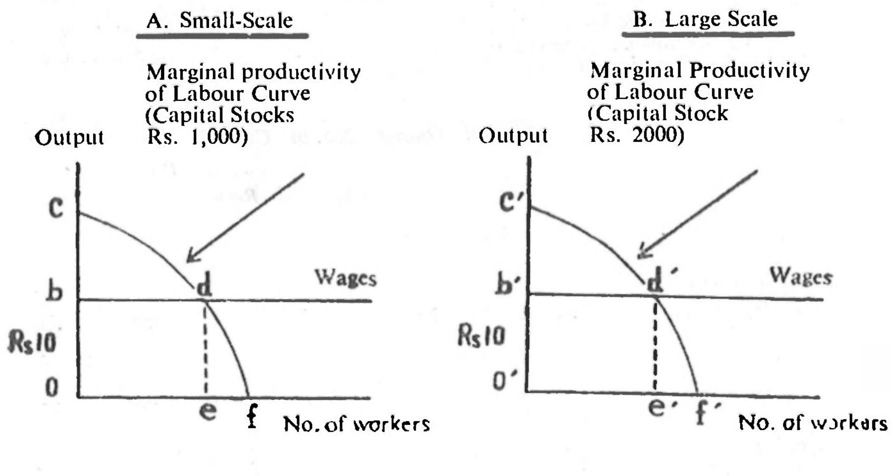
[16] Where the assumptions are relevant and reasonable quantification is possible, the dual of the linear programming solution to the income-maximization problem will yield such prices.

even if these may be somewhat overstated by the common practice of merging self and family wages with entrepreneurial profits in the owner-operated enterprises.

Observation of the first of these two phenomena leads us to the conclusion that we are, in fact, dealing with a situation of divergence from social optimality; for, if there is such a thing as a "socially optimal" scale then surely the existence of a considerable spectrum of profit rates or "privately optimal" scales is proof that at least all but one (if not all) scales of actual operations differ from the social ideal.[17] This provides an answer to our first

17 An example of such divergence may be provided with the help of a simple numerical example. Let us assume that in a given Pakistani Industry, say textiles, we have a choice of using Rs. 2,000 available units of capital, either by setting up one large-scale unit or two small-scale units each using Rs. 1,000 of capital. This situation is pictured in diagram I (A & B).

DIAGRAM I



Footnote contd. on next page.

question above and gives us ample reason for further pursuit of the second (conditional) inquiry, an explanation of why all firms in given industry are not somehow induced to operate at a "socially optimum" level. Our evidence indicates that the answer must be sought in terms of the state of imperfection of markets in the less developed area.

The basic analytical explanatory scheme we intend to propose is composed of three major ingredients. First of all, we must assume that each firm is trying to maximize its individual profits; otherwise the economist's explanatory apparatus threatens to break down and we must evacuate the field to Veblen and the sociologists. Each firm then may be assumed to be attempting to move in the direction of equilibrium at equality in the rates of return (coupled with the disappearance of unprofitable scales).

Footnote contd. from previous page.

Let the wage per worker per day equal Rs. 10 and let the marginal physical productivity of labour curves be shown as cdf for the small scale (diagram 1A) and c'd'f' for the large-scale firm (diagram 1B). In the course of profit maximization firm A will hire Oe= 50 workers and firm B will hire O'e'=80 workers producing an output of Oedc = 800 and O'e'd'c' = 1500 respectively. A pays out a wage bill of Oedb = Rs. 500 leaving a profit of bcd = Rs. 300 B pays out a wage bill of O'e'd'b' = Rs. 800 leaving a profit of b'c'd'=Rs. 700. Let us now examine the aforementioned two choices with respect to the optimum allocation of the Rs. 2000 capital stock.

	Capital	*Output*	No. of *workers employed*	*Capital-output Ratio*	*Total Profits*	*Profit Rate*
	Rs.	Rs.			Rs.	
Choice I (two small-scale units)	2,000	1,600	100	1.25	600	.30
Choice 2 (one large-scale unit)	2,000	1,500	80	1.33	700	.35

Choice 1 has the lower capital-output ratio and is preferred from the social point of view. Choice 2 has the larger rate of return on capital and is preferred from the private point of view. Choice of the two small-scale firms permits us to employ 20 additional workers who would otherwise be forced to join the army of the unemployed. Since labour is a socially "free " good this permits us to increase total output and thus optimize the use of the given scarce} capital stock.

Secondly, while the individual firm adheres to a maximizing calculus, the disappearance of these profit differentials is obstructed by the characteristic immobilities and rigidities in both the factor and product markets of the less-developed economy. The various factors operating to render classical competitive equilibrium expectations irrelevant are too well-known to merit lengthy treatment. There is the initial inequality in the distribution of capital and economic influence provided by the heavy hand of (usually commercial) history. There is the notorious inequality of access to new capital, limiting freedom of entry and the growth potential of smaller firms.[18] There is the preferential treatment accorded larger and older firms with respect to the maze of direct control sanctions required for almost all economic activity. In the language of economics we might say that the quality of the "hidden" input, entrepreneurship, varies considerably as between firms, where entrepreneurship is defined more as the ability to manoeuvre through a sea of regulations, obtain approvals and "get things done", rather than the ability to innovate in the more conventional sense. On the other hand, there is the possibility that small firms may wish to remain small since they stand to do better outside the reach of factory legislation and under the umbrella of an oligopolistic price structure.[19] More precisely put, this means that different individual firms in each industry face widely differing market situations to which they must adapt their maximizing machinery. The

18. One index of this may be the observed differentials in the rate of growth of different-sized surviving firms over time. Between 1953—56 and 1958 the percentage growth rates (as measured by number of workers employed) for different scales are presented below:—

Scale *No. of workers*	0—20	20—49	50—99	100 and over
Rate of growth (1953-56 to 1958)	5.82%	16.75%	13.90%	28.13.%

19. See also "The Co-existence of Large and Small Firms : As Study of Italian Mechanical Industries," Stanislaw A. Wellisz, *Quarterly Journal of Economics*, February, 1951.

industry may thus be viewed as segmented into a number of non-competitive sub-groups, especially as far as the input markets are concerned. While such manifestations of departure from text book equilibrium are by no means restricted to the less-developed economy it is undoubtedly true that they are more pronounced where capitalistic markets are not yet fully developed, traditional institutional forces are relatively strong and direct controls play a dominant allocative role.

The third major ingredient of our analytical framework is a recognition of the *general* state of imperfection of the factor markets facing *all* industries at *all* scales. This is the well-known problem of market rates of remuneration generally out of line with equilibrium factor prices. Wage rates in less-developed countries like Pakistan are usually maintained at levels above marginal productivity as determined by a blend of caloric subsistence considerations generously mixed with some sort of social consensus on "minimum acceptable" levels of remuneration. Where unions are weak, as they usually are in the less developed world, the government may assume the role of spokesman on behalf of labour's demands for minimum wage and other "welfare" legislation. Similarly the narrowness of capital markets as well as equity (and sometimes religious) considerations are likely to keep the interest rate at a depressed level below the equilibrium price of capital. As a result, production functions will be relatively insulated from the equilibrium or shadow prices determined by the economy's actual factor endowment. What results will be a distortion of the optimum use of factors both among those with and without access to directly allocated scarce resources and an "over-utilization" of the relatively scarce and an "under-utilization" of the relatively abundant factor from the overall point of view. We propose to show that recognition of the above three environmental ingredients permits us to derive a satisfactory theoretical explanation of the contemporary situation in the industrial sector of Pakistan. Certain policy conclusions may then be drawn.

III

In Section I, it will be recalled, we presented a set of tables reflecting actual operating ratios at different scales in the industries under consideration. As the scale of operation increases we note that capital intensity rises (Tables 1 and 2), average productivity of capital declines (Table 2) and the average productivity of labour rises (Tables 5 and 6) while profit rates have a tendency to decline (Tables 11 and 12). Our explanatory framework must be capable of explaining or "accommodating" these characteristics.

Let us first make use of the hypothesis that market imperfections convert different sized firms within the same industry into non-competitive sub-groups, at least as far as input markets are concerned. The prime manifestation of this imperfection may be found in the observable differentiated wage structure facing firms at different scales of operation. This result is presented in Table 17.

TABLE 17

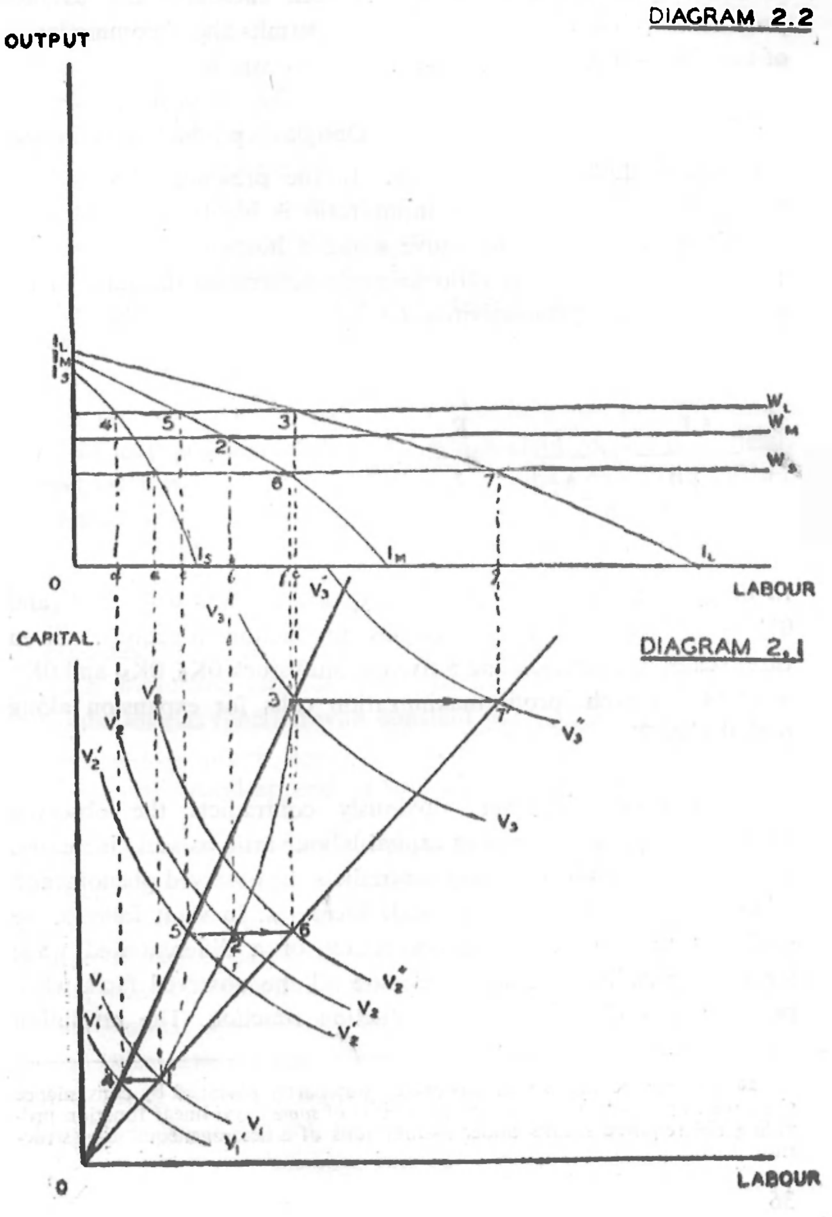
Scale (No. of workers)	Average Hourly Wage (Rs.)	Index (100 and above = 100)
0—9	.53	58
10—19	.69	76
20—49	.81	89
50—99	.87	96
100 and over	.91	100
All Scales	.73	80

While the quality of labour may in some cases be somewhat higher in the large-scale enterprises, such deviations from our assumption of labour force homogeneity are not likely to account for the substantial wage differentials encountered. There differentials must, rather, be explained by the fact that the labour market, insulated as a whole from the interplay of competitive forces is, moreover, threaded through with institutional disparities of one kind or another. It should be noted that the major "jump" in the wage rate is recorded between the smaller-scales which lie outside the purview of the Factories Act and the larger-scales in which protective legislation and union bargaining pressures make themselves felt. In other words, not only is "the" overall wage level out of line with overall manpower availabilities but a differential wage structure based on institutional considerations and on an inequality of relative bargaining power has become established.

To further explore the meaning of this hypothesis let us examine the production function of a given industry with the help of Diagram 2. In Diagram 2.1 let labour be measured on the horizontal, capital on the vertical axis and the usual production contour map be shown. Let us assume that there exist three types of firms in this industry, *i.e.*, small, medium and large-scale, disposing over capital to the amounts of K_s, K_m and K_l, respectively. The size and distribution of the capital stock *ab initio* may be taken as a given institutional result of factors lying outside the scope of this paper. Each entrepreneur will then attempt to add the appropriate amount of labour to the capital stock at his disposal in conformity with the profit maximization principle previously postulated.

For the actually observed data, *i.e.*, rising capital-labour and capital-output ratios, falling profit rates and labour-output ratios, to be consistent with the production function one of two possible alternatives with respect to the nature of that production function may be accepted. Firstly, the production function may describe a curvi-linear expansion path bending upward towards the vertical (capital) axis, or one which connotes capital-saving innovations when scale is small and capital using innovations as the scale increases. This provides a possible explanation of the data even in the presence of a homogeneous wage facing all scales. Secondly, the production function may be of the Cobb-Douglas type implying a straight line expansion path through the origin. This, as we shall

DIAGRAM 2



show, provides a possible explanation of our data in the presence of a heterogeneous wage facing the different scales. In view of the actual evidence on the existence of a differential wage structure the Cobb-Douglas functional form has been chosen.[20] Let us now proceed to prove our assertion that it permits the accommodation of the observed relationships.

The properties of the Cobb-Douglas production function, $0 = AK^{a_1} L^{a_2}$ are well-known. In the presence of a uniform real wage the capital-labour input ratio is identical for all firms regardless of scale. As we move along a homogenous expansion path this constant input ratio uniquely determines the ratio of the marginal physical productivities, *i.e.*

$$\frac{\frac{\delta 0}{\delta L}}{\frac{\delta 0}{\delta K}} = \frac{a_1}{a_2} \quad \frac{K}{L}$$

In diagram 2.1 both straight line expansion paths 0 4′ 5′ 3′ and 01′ 6′ 7′ represent Cobb-Douglas production functions. Given three scales of operation and a fixed capital stock $0K_S$, $0K_M$ and $0K^L$ available to each, profit maximization calls for expansion along path 0 1′ 6′ 7′.

This result, however, obviously contradicts the observed phenomenon of an increasing capital-labour ratio as scale increases. But, it should be noted, it also contradicts the observed phenomenon of an increasing real wage as scale increases. In what follows, we shall try to show that the acceptance of a differentiated wage structure permits us to accommodate all the observed facts when postulating a Cobb-Douglas production function. The resolution

[20] It should be noted that this choice was partly governed by convenience since we cannot *ex ante* reject the possibility of *some* curvi-linear function providing the required results under assumptions of a heterogeneous wage structure.

of this apparent logical dilemma thus leads us to some very interesting theoretical results and policy conclusions.

In Diagram 2.2 let labour be measured on the horizontal and output on the vertical axis. Let the marginal physical productivity of labour curves I_S I_S, I^M I_M, I_L I_L be shown corresponding to a capital stock of size $0K_S$, $0K_M$ and $0K_L$ (in Diagram 2.1) for the small, medium and large-scale firms, respectively. Postulating a differential real wage structure, let W_S, W_M and W_L represent the different prevailing market wages facing each of the three scales. With each firm trying to maximize profits we may then expect equilibrium to obtain at points 1, 2 and 3 for the small, medium and large-scale firms, respectively. Employment of 0a, 0b and 0c, workers producing an output of $0a1I_S$, $0b2I_M$ and $0c3I_L$ respectively, results.

Interpreting these results with the help of the production contour map in Diagram 2.1 (with which Diagram 2.2 is vertically "lined up") the same equilibrium points can be located at 1′, 2′ and 3′ respectively (with $V_1 = 0a1I_S$, $V_2 = 0b2I_M$; and $V_3 = 0c3I_L$).

We must now be in a position to show that the expansion path 0/1′ 2′ 3′, which is in accord with our observed operating ratios, is explained by the combination of a differential wage structure and a given production function. This can be shown to be the case for a Cobb-Douglas function with constant ($a_1 + a_2 = 1$) and diminishing returns ($a_1 + a_2 < 1$). Proof of this assertion is presented in the mathematical appendix (Appendix B).

Let us now see whether our data do, in fact, give us a good fit for a Cobb-Douglas production function of either of these two types. The existing differential wage structure permits us to identify a large number of disparate observations in each of our four industries concerning technologically feasible combinations of the two inputs (capital and labour) and output (or value added) as the factor price ratio changes. Since this gives us a series of feasible points along the same isoquants, rather than simply observations along the same straight radial line, the so-called identification problem has been avoided and the engineering production function for each industry can be estimated on hand of our 1958 cross-section data.

A standard regression technique is used to estimate the unknown parameters in

$$0 = AK^{a_1} L^{a_2} u$$

by the method of least squares, where A is a constant term, a_1 and a_2 the elasticities of output with respect to capital and labour, respectively, and u the stochastic term.

The statistical significance of the computed elasticities has been subjected to a t test and the standard errors estimated. Further, the goodness of fit has been verified by means of multiple correlation coefficients. Our results are summarized in Table 10.

TABLE 18

Output Elasticices

Inudstry	Sample Size	A (Constant term)	a_1 (Capital)	a_2 (Labour)	$a_1 + a_2$	Multiple Correlation Co-efficient
Textiles	189	.7915	.3682 (.0122)	.6382 (.0190)	1.0064	.9843
Light Engineering ...	229	.6839	.1812 (.0329)	.8429 (.0619)	1.0241	.8488
Plastics	23	7.9855	.3674 (.1172)	.4160 (.2420)	0.7834	.7058
Leather and Leather Goods	58	4.7424	.3166 (.0619)	.5518 (.1267)	0.8684	.8846

Figures in parentheses represent standard errors.

These results clearly indicate the existence of constant returns to scale in our two major industries, textiles[21] and engineering with and somewhat less confidence,[22] the existence of diminishing returns to scale in the plastics and leather goods industries.[23] The values of the correlation coefficients all of which are significant at the 1% level, give indication of a good fit. We have thus shown that the theoretical explanatory framework we have constructed is in accord with the operating ratios of the real world and, more importantly, that the type of production function required for this purpose, does, in fact, obtain.

IV

Our hypothesis concerning the two types of social inefficiency facing the individual Pakistani firm is thus fully borne out. On the one hand there exists the inefficiency "in the small" caused by the persistence of a differential wage structure in each industry. Since the marginal physical productivity of labour differs as we move from scale to scale along expansion path 0 1′ 2′ 3′ the absence of homogeneous wage prevents a reallocation of workers until the marginal physical product everywhere is at equality with "the" wage. And, on the other hand, there is the inefficiency "in the large" caused by the overvaluation of labour relative to its shadow price for the industrial sector as a whole. Since the existence of institutional barriers prevents the (usually sizeable) pool of unemployed workers from having its full impact on factor price and hence

[21] An interesting comparison may be made with estimates of the co-efficients for the Indian cotton textile industry. The most recent (1952) results of Murti and Sastry on the basis of a sample of 81 firms yield coefficients of .34 for capital (standard error .06), and of .66 for labour (standard error .04) and a correlation of .97, all magnitudes very close to our own estimates. (See V. N. Murti and V. K. Sastry, "Production Functions for Indian Industry" Econometrica, April, 1957).

[22] The labour coefficient for the plastics industry, for example, is not significant at the 5 per cent level.

[23] While diminishing marginal productivity is indicated by the fact that no a_1 or a_2 is greater than 1, diminishing returns to scale means that total output will increase by less than 10 per cent if both inputs are increased by 10 per cent. Constant returns to scale, (*i.e.* $a_1 + a_2 = 1$) of course means that output goes up by the same percentage as the two inputs.

input ratios, potentially productive manpower is kept redundant and potential output is foregone.

From the policy point of view the adoption of a uniform wage level may thus be viewed as a positive achievement. The next, and perhaps more relevant, question concerns the level of that uniform wage, *i.e.*, to return to Diagram 2, what will be the relative effects of uniformity of the wage at the level previously facing the samll, the medium or the large-scale firm. We may now briefly examine this matter by reference to the two extreme cases.

Firstly, let us assume that the new and uniform wage is pegged at the level of W_L, the *highest* previously existing wage. The new equilibria in Diagram 2.1 are then established at points 4, 5, and 3, for the small, medium and large-scale firms, respectively. Employment of workers falls to 0d (from Oa) for the small-scale, to 0e (from Ob) for the medium scale, remaining constant at Oc for the large-scale. Similarly, output for the small and medium scales falls to $0d4I_s$, and $0e5I_M$, respectively. Translated into Diagram 2.2, this means that a new expansion path 0 4′ 5′ 3′ to the left of 0 1′ 2′ 3′ is motivated. Output falls to $V'_1 V'_1 = 0d4I_s$ and $V'_2 V'_2 = 0e5I_M$ as less labour cooperates with the same capital stock. There is, of course, no change in the equilibrium position of the large-scale firm.

Let us now, on the other hand, assume that the uniform wage is established at W_s, *i.e.* at the lowest previously obtaining level. The new profit-maximizing equilibria in Diagram 2.1 are now obtained at points 1, 6 and 7 for the small, medium and large-scale firms, respectively. Now output and the employment of labour in the small-scale case remains unchanged, with employment rising to 0f and 0g and output to $0f6I_M$ and $0g7I_L$ for the medium and large-scale cases, respectively. In Diagram 2.2 a new expansion path 0′ 1′ 6′ 7′. i now motivated to the right of the original. Output for the medium-scale firm increases to $V_3''' V_3'' = 0g7I_L$ as more labour cooperates with the given capital stock.

These results clearly show that by moving in the direction of a uniform and lower wage level a socially preferable production pattern will be achieved, *i.e.* a larger output can be attained on hand of a fixed capital stock.[24] The policy implications are, moreover, quite clear. The precise determination of an optimum wage rate, *i.e.* that equilibrium rate which would obtain in the factor markets in the absence of all inefficiencies "in the large" and "in the small", may be difficult to achieve by means of armchair theorizing. The direction of equilibrium towards which policy must be operative is nonetheless unmistakable.[25] The implementation of such a lower average wage level in the contemporary less developed area is, however, another matter. While a discussion of this subject lies somewhat outside the scope of our paper a brief concluding comment may be in order.

24 It should be evident that this result does not depend on adopting "the" lowest previously existing wage rate; it is sufficient that the average level of wages decline.

25 For the sake of illustrative convenience let us assume that there exist no institutionally determined intra-industry wage differentials, rendering the problem one of merely adjusting over-all factor prices in the direction of equilibrium. The following table then indicates the changes in factor proportions as inputs which would result under alternative assumptions concerning factor price changes.

Fixed Capital-Labour Ratios Under Varying Assumptions Concerning Factor Price Changes

Industry	1958 Actuals	*Case* 1 PL Down 10% PK Constant	*Case* 2 PL Constant PK Up 10%	*Case* 3 PL Down 10% PK Up 10%	*Case* 4 PL Down 30% PK Constant	*Case* 5 PL Constant PK Up 30%	*Case* 6 PL Down 30% PK Up 30%
Textiles ...	2.824	2.5414	2.5671	2.3104	1.9767	2.1721	1.5206
Light Engineering	2.837	2.5524	2.5682	2.3204	1.9852	2.1815	1.5269
Plastics ...	2.344	2.1093	2.1307	1.9176	1.6406	1.8028	1.2618
Leather and Leather Goods ...	0.842	0.7577	0.7556	0.6888	0.5893	0.6476	0.4533
All Industries Combined ...	2.771	2.4939	2.5216	2.2722	1.9397	2.1337	1.4963

It is clearly difficult, if not impossible, to simply reduce market wage rates anywhere in the world in the middle of the twentieth century. If wages are considered "low" to start with, welfare state demonstration effects strong, and the adherence to equity arguments vocal, no attempt to implement such a policy is feasible, or even desirable. The same objective may, however, be accomplished indirectly, through the utilization of government fiscal and/or monetary policies. Subsidies may, for example, be granted to firms using labour-intensive production functions.[26] Such subsidies would be paid for by taxing the, now higher, entrepreneurial incomes or by taxing the, now larger, number of employed workers. Since it can be reasonably assumed that the previously employed (at a higher wage) workers in one way or another provided the main support of the previously unemployed redundant workers squatting outside the factory gates, their real income will not decline in spite of the now lower level of real wages. In this fashion social security via the family or clan system is displaced by distribution through the market; and since total output in the economy has increased in association with a constant capital stock, the community as a whole is better off and no member of it need be worse off than before.

In the course of this monograph we have thus attempted to make use of our primary sample survey data to estimate certain social optimality indices in different scales of our four industries. Secondly, we showed the existence of a divergence between social and private optimality and attempted a theoretical explanation based on market imperfections in the less-developed area. Thirdly, we showed that all our observed empirical data, including the differential wage structure and production functions estimated for our four industries serve to corroborate our theory. And lastly, we arrived at theoretical and policy conclusions regarding the meaning and practicality of eliminating some of the harmful effects of market imperfections in a less-developed economy like Pakistan.

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26 Similarly, although we have not treated this aspect of the shadow-market price divergence as fully, with respect to the price of capital. If it should be impossible to raise interest rates for psychological, equity, or religious reasons, a tax on outstanding debt may be considered.

APPENDIX A

Sampling Frame and Methodology

The population for this sample survey was derived in two ways: for the larger establishments covered by the Factories Act the results of the Census of Manufacturing Industries for 1957 were utilized. For establishments not covered by the Factories Act and of less than 20 workers, for which no complete enumeration existed anywhere, a method of geographic area sampling was adopted. The entire "spliced" random sample was stratified by the variable "number of workers employed".

In Table 1 we have listed the total population of large-scale firms in our four industries covered by the 1957 Census of Manufacturing.

TABLE 1

Distribution of Firms from Census of Manufacturing Industries

Industry	Strata by No. of Workers			Total
	20—49	50—99	100 +	
1. Textiles	123	26	35	184
2. Light Engineering ...	116	29	17	162
3. Plastic	28	4	1	33
4 Leather and Leather Goods	58	6	2	66
Total ...	325	65	55	445

In order to determine the proper size of the sample, the distribution of workers in the population was examined. The average number of workers per firm and their dispersion as measured by the standard deviation was calculated for each stratum of each industry. If "L", the number of workers, is considered as a random variable, then by the definition of the population mean,

$$\bar{L} = \frac{1}{N} \sum_{i=1}^{N} L_i$$

where N is the total number of units in the population.

The population variance, $$S^2 = \frac{1}{N-1} \sum_{i=1}^{N} \left(L_i - \bar{L}\right)^2,$$

where S is the standard deviation.

Comparing the values of the means and the standard deviations, it was decided to draw independent random samples from each stratum. However, those strata which were highly variable and also those containing a relatively small number of firms, were taken for complete enumeration.

To determine the appropriate sample size for all other strata the following procedure was used: let n be the number of firms selected randomly from a finite population of size N, and let

$$\bar{l} = \frac{1}{n} \sum_{i=1}^{n} L_i$$ be the average number of workers

per firm in the sample.

We use the criterion.

$P_r \{ \mid \bar{l} - \bar{L} \mid \geqslant K_1 \} = K_2$ *i.e.* the probability that sample mean $\bar{l}$ deviates from the population mean $\bar{L}$ by an amount K_1, is K_2. Further, if we assume that $\bar{l}$ is normally distributed with mean $\bar{L}$ and variance $\left(\frac{N-n}{N.n}\right)S^2$ then

$$K_1 = \sqrt{\frac{N-n}{Nn}}\,tS$$

where t is the normal variate corresponding to probability K_2.

$$\text{or } n = \frac{\left(\frac{ts}{K_1}\right)^2}{1+\frac{1}{N}\left(\frac{ts}{K_1}\right)^2}$$

The sample size was then determined by the criterion that there should be no more than a 5% probability that the sample mean deviate from the true mean by more than 10% apart from chance, *i.e.* $K_1 = 10\%$, $K_2 = 5\%$, assuming the sample mean to be normally distributed. The results of our sample size determination are presented in Table 2.

TABLE 2

Sample Size of Firms from Census of Manufacturing Industries

Stratum	(20—49)			(50—99)			(100+)			GRAND TOTAL		
Industry	Total Pop.	Sample Size	Per-centage	Total Pop.	Sample Size	Per-centage	Total Pop.	Sample Size	Per-centage	Total Pop.	Sample Size	Per-centage
1. Textiles ...	123	44	35.8	26	11	42.3	35	35	100.0	184	90	48.9
2. Light Engineering ...	116	44	37.9	29	19	65.5	17	17	100.0	162	80	49.4
3. Plastics ...	28	18	64.2	4	4	100.0	1	1	100.0	33	23	69.7
4. Leather and Leather Goods ...	58	22	37.9	6	6	100.0	2	2	100.0	66	30	45.5
Total ...	325	128	39.4	65	40	61.5	55	55	100.0	445	223	50.1

With respect to the small-scale establishments not covered by the Factories Act an aerial map dividing all of Karachi into chunks, blocks and segments was used. Random segments constituting a sample fraction of 4% (1 in 25) were completely enumerated; the population of establishments in our four industries contained in this sample fraction became our sample for purposes of enumeration.

The complete enumeration of the 4% sample employing less than 20 workers yielded a total of 461 industrial establishments. This permits us to estimate the total population of small-scale industries in Karachi at 11,525 establishments. The standard error of this population is estimated at 1,478, *i.e.* at a 95% confidence limit, the total population of small industry establishment in Karachi = 11,525 + 2,897.

In the four industries we are concerned with the number of units in our 4% sample totals 330. The population estimate is 8,250 and the standard error 1,093. The results are summarized in Table 3.

TABLE 3

Sample size and Population Estimates for Small-scale Establishments in the Relevant Industries

	Sample Size	Population Estimate
Textiles	135	3,375
Light Engineering...	157	3,925
Plastics	35	875
Leather and Leather Goods	3	75
Total ...	330	8,250

The standard error of this population is 1,093, *i.e.* at a 95% confidence limit the total stands at 8,250 ± 2,142. Estimates of the average and total number of workers in our four industries may also be of interest and are presented in Table 4.

TABLE 4

Estimates of Employment in the Relevant Small-Scale Industries

Industry	Total No. of units in Sample	Total No. of workers in Sample	Total No. of workers in Population	Average No. of workers per establishment	Standard error of total workers	Standard error of average workers	95% Confidence Limits for	
							Total workers	Average workers
Textiles	135	382	9,550	2.8	818	.77	9.550 (± 1,603)	2.8 (± 1.5)
Light Engineering ...	157	493	12,325	3.1	779	.62	12,325 (± 1,527)	3.1 (± 1.2)
Plastic	3	31	775	10.3	—	—	—	—
Leather and Leather Goods	35	84	2,100	2.4	179	.23	2,100 (± 386)	2.4 (± .45)

Work on the compilation of extensive employers' and workers' questionnaires was begun in the spring of 1959. These questionnaires were successively improved by means of pilot tests. The temptation to cover too much ground was resisted at every stage. Nevertheless, it was realised that the marginal cost of obtaining additional relevant information, once a statistically reliable and carefully planned and executed sample survey had been instituted, was relatively small. It was, therefore, decided to make a rather exhaustive investigation of the relevant magnitudes and relationships.

All schedules were filled by means of personal interview and entries recorded by the enumerator. Especially for the case of large-scale firms, reference was made to company records when available. Under no circumstances were schedules left with respondents but a series of revisits were undertaken when necessary. All information was thoroughly checked; questionnaire entries specifically designed to indicate inconsistencies permitted special attention to be focussed on deficiently responding establishments. Information was sought exclusively from managers in the case of corporations and from owners or partners in the case of unincorporated enterprises. Workers' schedules were administered in privacy. Spot checks and resurveys covering approximately 20% of all filled-in questionnaires provided a further safeguard against enumerator errors or negligence.

Out of a total sample size of 553 establishments, 530 schedules were successfully administered. There were 20 outright refusals—all large-scale establishments—and 3 cases of firms which had become defunct or could not otherwise be located.

The spliced sample of industries actually enumerated, by stratum of number of workers employed, is given below:

TABLE 5

Total Firm Enumerated Stratified by number of Workers actually employed

	Textiles	Engineering	Plastic	Leather	Total
0—9 Workers ...	130	161	5	36	332
10—19 „ ...	24	15	7	4	50
20—49 „ ...	22	27	9	17	74
50—99 „ ...	11	16	1	4	33
100 and over Workers	26	14	1	—	41
Total ...	213	233	33	61	530

The information received was coded and placed on IBM cards to facilitate present tabulation requirements as well as to serve as a storehouse for future research interests. The information covering the employer's schedule for each establishment is contained on 11 cards; the information covering each worker's schedule is contained on 4 additional cards.

APPENDIX B.

It is the purpose of this appendix to show that under the conditions of constant returns to scale and of decreasing returns to scale (Cobb-Douglas function) and under the condition that a firm with a larger capital stock must pay a higher market wage the following is true:

As the size of the firm, measured by capital stock, increases:

(1) $\frac{K}{L}$, the capital-labor ratio, increases.

(2) $\frac{O}{L}$, the average productivity of labor, increases.

(3) $\frac{O}{K}$, the average productivity of capital, falls

(4) $\frac{P}{K}$, the rate of profits, falls

where K is the capital stock, L is labor (in man-hours) O is output, and P is profits.

Let us assume there are two firms, for which the same Cobb-Douglas production function applies:

$$(1)\ O = A L^{a_1} K^{a_2} \text{ where } 0 < a_1 \ ; \ 0 < a_2 \quad 1 - a_1 - a_2 \geqslant 0$$

where a_i meets the conditions of both constant and decreasing returns to scale. Denoting the relevant magnitudes of the smaller firm by the subscript "1" and those of the larger firm by the subscript "2", we assume:

$$(2)\ W_2 > W_1 \quad \text{and } K_2 > K_1$$

where W_i is the market wage rate faced by firm i. It is then our purpose, in the first instance, to show that

$$(3)\ \frac{K_2}{L_2} \Big/ \frac{K_1}{L_1} = \frac{K_2}{K_1} \quad \frac{L_1}{L_2} > 1$$

From (1) the marginal phytical productivity of labor function $MPP_L = A a_1 L_i^{a_1-1} K_i^{a_2}$ is obtained ($i = 1, 2$) which, under the condition of profit maximization, must be equated with the market wage rate, W_i, *i.e.*

$$W_i = A a_1 L_i^{a_1-1} K^{a_2} \qquad (i = 1,2)$$

from which we can immediately derive the equilibrium level of employment, L_1, for the two firms.

$$(4) \qquad L_i = \left(\frac{W_i}{A a_1 K_i^{a_2}} \right)^{\frac{1}{a_1-1}} \qquad (i = 1,2)$$

From this we derive

$$(5) \quad \frac{L_2}{L_1} = \left(\frac{W_2}{W_1} \right)^{\frac{1}{a_1-1}} \qquad \left(\frac{K_2}{K_1} \right)^{\frac{a_1-1}{a_2}}$$

Substituting (5) in the left-hand side of (1) we have, for the left-hand side of (1),

$$(6) \quad \frac{K_2}{L_2} \Big/ \frac{K_1}{L_1} = \frac{K_2}{\left(\frac{W_2}{Aa_1 K_2^{a_2}} \right)^{\frac{1}{a_1-1}}} \Bigg/ \frac{K_1}{\left(\frac{W_1}{Aa_1 K_1^{a_2}} \right)^{\frac{1}{a_1-1}}}$$

$$= \left[\left(\frac{W_2}{W_1} \right) \left(\frac{K_2}{K_1} \right)^{1-a_1-a_2} \right]^{\frac{1}{1-a_1}}$$

By (1) and (2) $\left(\frac{K_2}{K_1} \right)^{1-a_1-a_2} \geq 1$. Expression (5) is therefore seen to be $>$ 1 and the case for a higher capital-labor ratio for the larger firm, *i.e.* (3), is proved.

With respect to the average productivity of labor, we need to show that

$$(7) \quad \frac{A L_2^{a_1-1} K_2^{a_2}}{A L_1^{a_1-1} K_1^{a_2}} > 1.$$

Substituting (5) in the left-hand side of (7) we have, for the left-hand side of (7),

$$(8) \quad \left(\frac{W_2}{W_1}\right) \left(\frac{K_2}{K_1}\right)^{(a_1-1)^2}$$

By (1) and (2) this expression is seen to be $>$ 1 and hence the higher average productivity of labor for the larger firm, *i.e.* (7), is proved.

With respect to the average productivity of capital, we must prove that

$$(9) \quad \frac{A L_2^{a_1} K_2^{a_2-1}}{A L_1^{a_1} K_1^{a_2-1}} < 1$$

We know, from (1), that $a_1 t = 1-a_2$, where $t \geqslant 1$ (*i.e.* $t = 1$ for constant returns to scale and $t > 1$ for decreasing returns to scale). The left-hand side of (9) can be written as

$$\left(\frac{L_2}{L_1}\right)^{a_1} \left(\frac{K_2}{K_1}\right)^{a_2-1} = \left(\frac{L_2}{L_1}\right)^{a_1} \left[\left(\frac{K_1}{K_2}\right)^{t}\right]^{a_1}$$

$$= \left[\left(\frac{L_2}{L_1}\right) \left(\frac{K_1}{K_2}\right)^{t}\right]^{a}$$

Since $\left(\frac{L_2}{L_1}\right)\left(\frac{K_1}{K_2}\right) < 1$ by (3) and, since $t \geqslant 1$

the above expression is seen to be < 1. Hence (9) is proved, *i.e.* the case for a lower average productivity of capital for the larger firm has been established.

Finally, with respect to the rate of profits, we need to show that

$$(10)\ \frac{AL_1^{a_1} K_1^{a_2} - W_1 L_1}{K_1} > \frac{AL_2^{a_1} K_2^{a_2} - W_2 L_2}{K_2}$$

which is true provided that

$$(11a)\quad AL_1^{a_1} K_1^{a_2-1} > AL_2^{a_1} K_2^{a_2-1}$$

and

$$(11b)\ \frac{W_1 \ L_1}{K_1} < \frac{W_2 \ L_2}{K_2}$$

The validity of (11a) is established in (9). Expression 11(b) is true if and only if

$$\frac{W_1}{W_2} < \left(\frac{L_2}{K_2}\right)\left(\frac{K_1}{L_1}\right)$$

or $$\frac{W_1}{W_2} < \left[\left(\frac{W_2}{W_1}\right)\left(\frac{K_2}{K_1}\right)^{1-a_1-a_2}\right]^{\frac{1}{a_1-1}} \quad \text{by (6)}$$

or $$\left(\frac{W_1}{W_2}\right)^{a_1} < \left(\frac{K_2}{K_1}\right)^{1-a_1-a_2}$$

This inequality is seen to hold by (1) and (2). Hence, we have proved (10), *i.e.* the lower rate of profits for the larger firm.

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