

Performance of Foreign and Local Firms in Pakistan: A Comparison

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I. INTRODUCTION

There is a little doubt in the argument that foreign-owned (henceforth foreign) firms are more productive than local firms in less-developed countries because the former use more capital-intensive techniques, employ more qualified workers, and are able to reap the economies of scale [see Blomstrom (1988); Chudnovsky (1979) and Willmore (1986)]. Such arguments, however, do not ascertain whether efficiency of foreign firms is due to any ownership-specific advantage or to other factors such as industrial distribution (product mix), size of the firm, capital intensity, skill intensity, market concentration, and export orientation. To arrive at some conclusive empirical verification concerning the labour productivity differences between foreign and local firms, it is essential to take into account the difference between capital intensity and skill intensity, etc., and control the size and products of firms. Most of the previous studies are aggregative and failed to control for differences in size or type of products. Moreover, the previous studies considered only a few aspects of performance.

The present paper examines the labour productivity differences between foreign and local firms based on the data for 32 matched pairs of the large-scale manufacturing firms in Pakistan. In particular, we examine the question whether capital intensity, skill intensity, and economies of scale explain all of the labour productivity differences between foreign and local firms, or whether foreign firms enjoy some ownership-specific advantages, such as proprietary technology and management expertise, etc.

This kind of analysis helps in understanding the phenomena that how foreign firms are able to compete (or out-compete) the local firms in their own markets. Moreover, such analysis provides information regarding learning-by-competing capabilities of local *vis-a-vis* foreign firms in terms of technology and business management.

The schematic details of the paper are as follows. Section II describes with the model used in this paper. In Section III, we present data issues. Empirical findings are reported in Section IV. Finally, Section V concludes the paper.

II. THE MODEL

In order to explain the labour productivity differences between local and foreign firms we relate labour productivity to capital intensity, skill intensity, and economies of scale.¹ This kind of approach can be found in Blomstrom (1988); Cohen (1973) and Radhu (1973).² The model for local firms (*L*) can be written as

$$LP_{iL} = a_1 + a_2 KINT_{iL} + a_3 SCALE_{iL} + a_4 LQ_{iL} + \varepsilon_i \quad (i = 1, \dots, 32) \dots \quad (1)$$

The model for foreign firms (*F*) can be written as

$$LP_{iF} = \beta_1 + \beta_2 KINT_{iF} + \beta_3 SCALE_{iF} + \beta_4 LQ_{iF} + \varepsilon_i \quad (i = 33, \dots, 64) \dots \quad (2)$$

The model for combined firms (*C*) can be written as

$$LP_{iC} = \delta_1 + \delta_2 KINT_{iC} + \delta_3 SCALE_{iC} + \delta_4 LQ_{iC} + \varepsilon_i \quad (i = 1, \dots, 64) \dots \quad (3)$$

where

LP = Labour productivity—value added divided by the total number of workers;

KINT = Capital intensity—the ratio of total fixed assets to total number of workers;³

SCALE = Measure of economies of scale – the ratio of average gross production in local and foreign plants, respectively, in an industry to the average gross production of the largest 2 to 3 plants (as a proxy for minimum productive scale); and

¹In addition to these variables one can also incorporate market concentration ratio and export orientation to capture the effects of competition in local and international markets. Due to the data limitations we do not include these variables in the present analysis. For details see Section III.

²For Pakistan, Radhu (1973) examined the labour productivity differences between foreign and local firms. His analysis is for the year 1967-68 which did not control the size of firms. As the study used average values of the variables for all the foreign firms in an industry and average values of the variables for all the local firms in an industry.

³Ideally, we should have used hours worked to compute labour productivity and capital-intensity. It requires data on the number of shifts and hours worked. Such data are available only for few firms considered in this study. In the absence of data for other firms we assume that rate of shift worked is same across firms.

LQ = Skill intensity (labour quality) – the ratio of nonproduction workers to production workers.

To check whether foreign and local firms have labour productivity differences we test a null hypothesis that the two sets of firms can be regarded as belonging to the same regression model, after controlling for the size and product-mix, and taking into account the differences in determining variables. In other words, the estimated coefficients in two sub-models are statistically equivalent. To test this, we apply the Chow test (1960). The Chow test is based on the following ratio

$$\frac{(SSE_C - SSE_L - SSE_F)/K}{(SSE_L + SSE_F)/(n + m - 2K)} \quad NF(K, n + m - 2K) \quad \dots \quad (4)$$

where

SSE 's = Sum of the square of errors from the estimates of combined, foreign, and local firms regression models;

K = Number of parameters in a regression;

n = Number of observations of local firms ($n = 1, \dots, 32$); and

m = Number of observations of foreign firms ($m = 33, \dots, 64$).

III. DATA ISSUES

Analysis of this paper is based on the data for 32 matched pairs of foreign⁴ and local firms drawn from 25 large-scale manufacturing industries. The data are drawn from a PIDE Survey Conducted in 1981. This survey generated firm-level data for 750 firms, belonging to 90 large-scale manufacturing industries of Pakistan. The firms included in the sample survey account for 25 percent of the value-added by the large-scale manufacturing industries in 1980-81. To ensure country-wide representation, at least one firm of each size – viz. small, medium, and large – was selected from an industry in all four provinces, except where a particular firm or industry did not exist in a province.⁵

Out of the 90 manufacturing industries covered in the PIDE survey, we select only 25 industries because for the remaining 65 industries either foreign firms are non-existent or lack matched local firms. Six foreign firms are dropped

⁴For the purpose of this study a firm is deemed to be foreign-owned if foreigners own 25 percent or more of the equity capital.

⁵Details of the survey are reported in Naqvi *et al.* (1983).

because of the non-reporting of some of the variables used in this analysis.

We have selected matched pairs of foreign and local firms by controlling their size. For this purpose we have compared the value of fixed capital.⁶ Moreover, we have selected firms by controlling the product(s) they are producing. We could not control the products at very fine-level. Six firms in our analysis were multiproducts, producing 'few' products different than their control firm.

For this paper we use data on employment of production and nonproduction workers, value of fixed capital, gross value of production, and value-added.

Production workers consist of skilled and unskilled workers. Nonproduction workers are consist of professional, technical, managerial, clerical, sales, and service workers. For fixed capital we use current value of the capital assets, including factory buildings, residential buildings, land, capital equipments, transport equipment, furniture and fixtures. In the case, where current value of capital assets is not available we use the book-value of assets plus the accumulated depreciation.

In addition to the determining variables used in this study, we also tried the market concentration ratio and export orientation to see the impact of competition in local and international markets. These variables have to be dropped from our analysis because (i) to compute the market concentration ratio the required data on all the industrial establishments are not available for the period under study,⁷ (ii) as most of the manufacturing firms do not directly export, we get many blanks in the series on export receipts.⁸ Because of these limitations, we estimate regressions without these two variables.

IV. EMPIRICAL FINDINGS

We start our analysis by using a test-statistic in order to verify whether some statistically significant differences in labour productivity do exist between local and foreign firms. The test used for this exercise is a mean-difference *t*-statistic,

$$t = \frac{\bar{D}}{S_D}$$

⁶One can also select firms by comparing value-added of local and foreign firms, however, its use will introduce selectivity bias. While selecting a pair, one should also take into account the vintage of firms. We are unable to match the year of establishment of firms because for many firms such information is not reported in the survey.

⁷We used market concentration ratios reported in Kemal (1974) for the year 1967-68. Estimated regressions based on this data gave us spurious results, therefore, we dropped this variable from the analysis.

⁸We could not improve the explanatory power of estimated regressions using this series.

where

\bar{D} = Mean of the difference of a variable;

S_D = Standard deviation of the differences.

Based on this test-statistic, we find that labour productivity differences between foreign and local firms are statistically significant at 1-percent level. Similarly, for both kinds of firms significant differences are found in determining variables.⁹ These test-statistics point out that the causes of labour productivity differences in foreign and local firms may be due to capital intensity and skill intensity. However, we cannot infer from this analysis the effects of other variables which may be ownership-specific.

In order to ascertain whether the labour productivity differences are due to capital intensity, skill intensity, and economies of scale or to other ownership-specific advantages, we next estimate the regression models (1) to (3). Estimates of these regressions are reported in Tables 1 to 3. We first estimate all three regressions by using a linear specification. All three determining variables turned out to be statistically significant. For the combined regression model, all the determining variables turned out statistically significant at 1-percent level. On the other hand, for foreign- and local-firms regression models, capital intensity and skill intensity are statistically significant at the 1-percent level while economies of scale variable is statistically significant at the 5-percent level. When we apply a log-linear specification then capital-intensity becomes significant at the 5-percent level while remaining determining variables in all regressions become significant at 1 percent level. \bar{R}^2 's are quite high, which indicate that determining variables in the regression models have captured sufficient variations in the labour productivity. Interestingly, both kinds of firms behaved in the same way which proves that local firms imitate foreign firms in terms of use of technologies and factors use.

Since our objective in this study is to test the labour productivity differences between foreign and local firms, we apply a Chow test to examine this. Our estimates based on Chow ratio, for linear and log-linear specifications, are

$$\text{Chow ratio (linear)} = 3.85$$

$$\text{Chow ratio (log-linear)} = 3.81$$

⁹The estimated *t*-statistic for labour productivity, capital intensity and skill intensity, respectively, are 3.50, 1.72, and 2.39.

Table 1

Estimates of Combined Firms (T-Ratios in Parentheses)

Dependent Variable	Constant	KINT	SCALE	LQ	Dummy	\bar{R}^2	F-Statistic	SSE
Labour Productivity (Linear)	-49.20 (-2.10)	0.77 (3.12)	141.63 (3.57)	57.18 (1.77)		0.47	19.47	516297
Labour Productivity (Log-linear)	4.20 (7.25)	0.19 (1.43)	0.41 (2.53)	0.74 (4.21)		0.44	17.42	60.90
Labour Productivity (Linear)	-61.22 (-2.60)	0.79 (3.27)	102.30 (2.38)	68.28 (2.14)	52.59 (2.08)	0.53	16.50	
Labour Productivity (Log-linear)	4.06 (6.60)	0.19 (1.45)	0.37 (2.06)	0.76 (4.25)	0.19 (0.69)	0.47	13.07	

Table 2

Estimates of Foreign Firms (T-Ratio in Parentheses)

Dependent Variable	Constant	KINT	SCALE	LQ	\bar{R}^2	F-Statistic	SSE
Labour Productivity (Linear)	-72.99 (-1.48)	0.86 (2.44)	101.15 (1.45)	186.50 (2.44)	0.45	9.43	384934
Labour Productivity (Log-linear)	4.49 (4.82)	0.26 (1.14)	0.75 (1.88)	1.06 (3.33)	0.47	10.20	40.60

Table 3

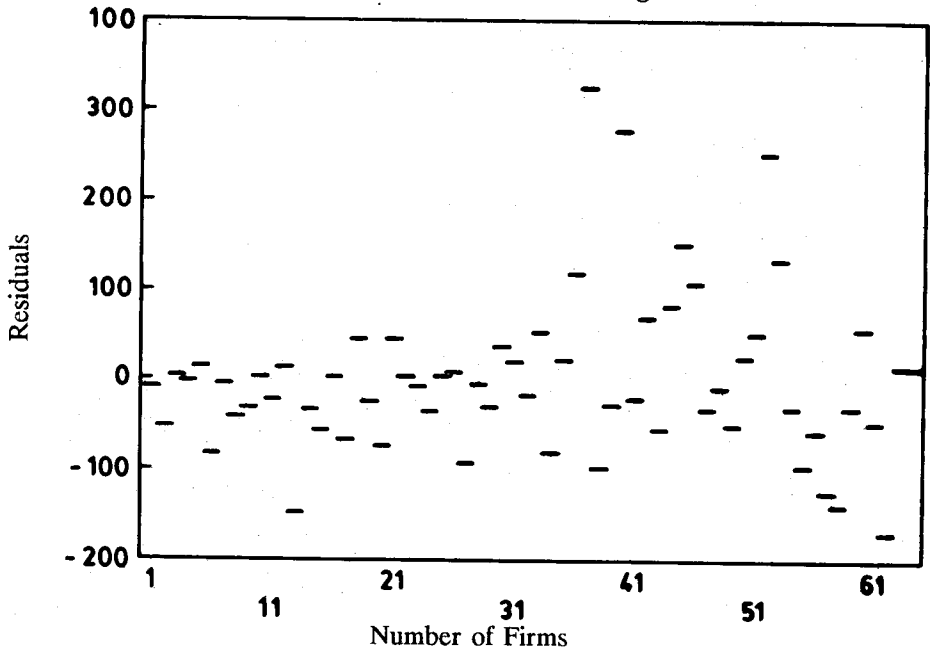
Estimates of Local Firms (T-Ratio in Parentheses)

Dependent Variable	Constant	KINT	SCALE	LQ	\bar{R}^2	F-Statistic	SSE
Labour Productivity (Linear)	-15.07 (-1.62)	0.74 (4.20)	31.37 (1.36)	34.83 (2.69)	0.71	25.85	19880
Labour Productivity (Log-linear)	2.93 (6.07)	0.33 (3.17)	0.17 (1.51)	0.31 (2.31)	0.60	16.25	7.28

The critical value of $F(56, 4)$ at 1-percent level is 3.65. Since the estimated Chow-ratios are greater than the critical value, therefore, we can reject the null hypothesis that two sets of firms belong to the same regression model. We thus unambiguously conclude that labour productivity in foreign firms is statistically different than their local counterparts.

Analysis based on the Chow test, which takes into account the differences in determining variables, does not provide additional information we require to examine whether foreign firms are more (less) productive than local firms. To examine the labour productivity differences for both kinds of firms we plot the estimated residuals in Graph 1. It may be noted from the cluster of observations that foreign firms ($i = 33, \dots, 64$) have a tendency on the positive side while this is not so for the local firms ($i = 1, \dots, 32$). The Graph although indicates that foreign firms are more productive compared to their local counterparts but it does not provide any statistical proof. To test whether foreign firms are statistically (and significantly) more productive than their local counterparts, we apply two tests. First, we compare constant terms of estimated regressions using a log-linear specification. It may be noted from Tables (2) and (3) that the value of the intercept of foreign firms is higher than the value of intercept of local firms and both are statistically significant. Second, we introduce an intercept dummy to check whether foreign firms are statistically more productive than local firms. We find a positive and significant coefficient of the dummy variable for foreign firms. Both of these tests confirm the observation made through the graph that foreign firms are more productive compared to local firms.

Graph 1. Residuals of Local & Foreign Firms



Even after taking into account the differences in capital intensity, skill intensity and economies of scale we find that foreign firms are more productive than their local counterparts, this suggest that foreign firms enjoy some ownership-specific advantages.

CONCLUSIONS

This paper has analyzed the labour productivity differences between foreign and local firms working in the large-scale manufacturing industries of Pakistan. For this purpose we used a more systematic approach by controlling the size and products of foreign and local firms, and by taking into account the differences in capital-intensity, skill-intensity, and economies of scale. Our findings are that foreign firms use more capital- and skill-intensive techniques in production which explain some of the productivity differences that exist between foreign and local firms in Pakistan. Our analysis further points out that even after taking into account the differences in capital intensity, skill intensity, and economies of scale, foreign firms are still significantly more productive than their local counterparts who enjoy more familiarity with their home markets. This suggests that foreign firms enjoy some ownership-specific advantages which helps them to perform in a more productive way than their local counterparts. Ownership advantages to foreign firms usually involve, better and modern technology which they draw from their parent companies; manufacturing experience of the parent companies; modern managerial expertise; easy and relatively cheap foreign exchange availability; easy credit availability even in the local capital market. These ownership-specific advantages over local firms explain why foreign firms apply more capital-intensive and skill-intensive techniques of production to offset the disadvantages inherent in operating in the host country.¹⁰ Consequently, in an effort to bring local firms at par with foreign firms, it is suggested that local firms should strive for modern technology and improve their managerial skills; while the government should ensure easy credit and raw materials availability to local firms. Our results further confirm the "spillover" of technology from foreign to local firms in Pakistan which does not conform to the factor endowment of the country. Adoption of the 'inappropriate' technology has reduced the labour absorptive capacity of the manufacturing industries in Pakistan.

¹⁰Our analysis does not go that far to incorporate ownership-specific advantages. Future research based on detailed surveys may shed some light on these issues.

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Comments on
“Performance of Foreign and Local Firms in Pakistan:
A Comparison”

I have a minor reservation regarding the title of the paper and a few points of clarification regarding the general thrust. If the authors want to call this paper the performance of foreign and local firms in Pakistan I think that they need to be talking more about issues of X-efficiency and allocative efficiency and not just labour productivity differences which is what the paper, in its present form, attempts to do. The stated objective of the paper is to examine the question of whether capital intensity, skill intensity and economies of scale explain the labour productivity differences between foreign owned and local firms.

The authors need to spell out for me, and for others, the conceptual link between economies of scale and labour productivity. Moreover, I am not completely comfortable with the scale and the skill variables constructed by the authors. The scale variable used in the analysis is, at best, a proxy for size. And if size is what the authors hope to capture then why not use total gross output. I did not understand the average measure used; average over what? – time, space or some other dimension. If scale efficiency is what the authors hope to capture would not it be simpler to estimate cost functions.

The skill variable used in the analysis loses most of the interesting richness, such as administrative and marketing skills, that could be important in explaining productivity differentials. Estimating the model using the authors skill variable relegates the explanation of a large proportion of the variation in productivity to the residual.

The most important contribution of this paper is the fact that it brings to light the rich 1981 PIDE data set on large-scale manufacturing industries in Pakistan. It is unfortunate that this data set was never fully mined and has been lost in the darkness of the archives of the Institute for so many years. Because it has been lost for so many years, the authors need to state in much greater detail, the overall sample selection procedure and the method whereby they got the 32 matched pairs of foreign and local large-scale manufacturing firms. Moreover, the authors should tap in much greater depth the tremendous detail that is available in this survey. For example, they point out themselves that non-production workers consist of professional, technical, managerial, clerical, sales and

service workers, yet when they use these data they aggregate out the richness, as I had stated earlier in my comments on the skill variable.

One minor quibble. The authors need to footnote why, when they find that their linear specification produces significant estimates, they move on to a log-linear specification. They need to spell out the theoretical justification for doing so. At the start of their empirical analysis, the authors report that they find, based on a difference of means test, that labour productivity, capital intensity and skill intensity are significantly different between local and foreign-owned firms. After that what follows is simply a refinement of the result thus obtained with attempts to ascribe causality. The authors conclude that they find that foreign firms are more productive than their local counterparts and this suggests that foreign firms enjoy some ownership-specific advantage. It would be extremely relevant to know about factors which explain this ownership-specific advantage. And this is something that the authors should think about in their future work.

It would be extremely useful if the authors spelt out in the discussion, answers to the following questions. What additional or policy relevant insight is obtained if we discover that average labour productivity is higher in foreign firms, for example, because they are more capital intensive? What are the policy prescription? The paper would be greatly strengthened if this was done.

It should be borne in mind, that the severe space limitations on PSDE papers brutally constrains authors in the presentation of their work. The present authors have used a hitherto untapped data resource and addressed an interesting topic. With some more work this paper can be developed into an important study.

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