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Comparative Evidence from Developing Economies

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Introduction

1.1 The role of small scale industries in providing productive employment and earning opportunities has emerged as an important concern among policy makers, donor agencies and researchers. Until the 1970s most developing country governments paid little attention to small scale enterprises, instead promoting industrialization through policies that favored large firms. Since the 1970s there has been growing recognition that the earlier emphasis on large scale industrialization has had only moderate success in generating employment growth and alleviating poverty and that enhancing the development of small scale enterprises may be an effective way of fostering growth and equity.

1.2 Such policy interest notwithstanding, large gaps remain in our knowledge about micro, small and medium size enterprises (SMEs). The evidence is mixed about how efficient SMEs are relative to larger firms (see Little, Mazumdar and Page, 1987; Cortes, Berry and Ishaq, 1987; Liedholm and Mead, 1987). This issue is critical since inefficient SMEs are unlikely to compete and survive, grow and generate employment. Several factors are thought to constrain SME growth, but there is little empirical evidence on whether the constraints are binding or which market failures are most important. Shortages of working capital among SMEs are often cited as the principal constraint. Other candidates include poor access to information, low levels of skills, weak management, and limited technological capabilities, but their relative importance is not well known. As a result, policymakers have often been forced to devise policies with little or incomplete information about SMEs.

1.3 This paper addresses some of these issues using rich firm-level data from five developing economies. It derives firm-level estimates of technical efficiency, compares the distributions of efficiency across firms of different sizes, and identifies its most important correlates. This allows us to address the following questions: Are small firms less efficient than their larger counterparts? If so, why? Are there inherent constraints in being small, and not being able to take advantage of economies of scale in productive activities? Or are SMEs less efficient because they use lower quality inputs, invest less in productivity-augmenting activities such as technology and training, and have weak management capabilities?

1.4 Our analyses show that mean efficiency levels rise with firm size in all five economies. However, there is substantial overlap in the distribution of efficiency across firm sizes, with some small firms operating at higher levels of efficiency than large firms. Thus, small firms are not inherently inefficient. A common set of factors appear to distinguish more-efficient

firms from less-efficient firms in all five economies: education and training of workers, low labor turnover, certain investments in technology, exporting, automation, and quality control. As reasons for not providing training, many SMEs cite the low-skill requirements of mature technology and the adequacy of existing skills supply; many others see it as a concern and they rank poor information, limited financial resources, and high turnover of trained workers as significant constraints on training. We conclude that there are pockets of low-efficiency firms where selective policy interventions to improve firm efficiency may have high payoffs.

1.5 Chapter 2 outlines the analytic framework for studying the technical efficiency of firms. This is followed in chapter 3 by a description of the data and a discussion of the empirical results. We examine the distributions and correlates of firm efficiency in chapter 4, and discuss their policy implications in chapter 5.

2

The Analytical Framework

2.1 The technical efficiency of small firms is central to the debate about the role of small scale industries in generating growth and employment in developing countries. Knowing their levels of efficiency, its distribution, and its correlates is critical if policymakers are to determine whether policies targeting SMEs are needed, and if so, what kinds of policies and delivery mechanisms are appropriate.

2.2 The methodology we adopt to analyze firm efficiency is the stochastic frontier production function. The production frontier is the theoretical maximum output that can be achieved using every possible combination of inputs. As such, the frontier can be thought to represent "best practice" technology. In practice, many firms operate inside that frontier because of inefficiency. For given input levels, this inefficiency (the existing output) can be measured relative to the theoretical maximum output, so that a value of 1 represents best practice technology and values between 0 and 1 measure how far firms' efficiency levels are from best practice.

2.3 The empirical literature on SMEs has used a similar methodology to estimate firm level efficiency and investigate its correlates. Some examples include Pitt and Lee (1981) on weaving firms in Indonesia; Little, Mazumdar and Page (1987) on five industrial sectors in India; and Cortes, Berry and Ishaq (1987) on metal working and food processing firms in Colombia. They adopt a two-stage approach: in the first stage, a frontier production function is estimated (or calculated by linear programming) to generate a firm-level measure of efficiency; in the second stage, this efficiency measure is regressed on various employer attributes to gain insights into the factors underlying SME efficiency. Typically, only limited information about firm attributes is available, such as firm size, literacy or education of the owner, experience of employees, labor turnover, and age of the firm.

2.4 Our analytic approach extends this empirical SME literature in several ways. First, we jointly estimate the stochastic frontier production function and the model relating efficiency to the explanatory variables. This econometric method yields consistent parameter estimates and improves upon two-stage estimation techniques used in earlier studies. Second, we use a rich set of explanatory variables not available to earlier researchers. These variables--firm investments in research and development (R&D), know-how licenses, quality control, worker education, and training--provide direct measures of the technological and skill capabilities of SMEs and other firms. Finally, our analyses are based on large samples of firms from five

economies, each covering a broad range of industries. This gives us the ability to compare distributions of firm-level efficiency both across and within size groups, as well as across economies at different levels of development.

Measurement of Firm Efficiency and Its Correlates

2.5 Following Aigner, Lovell and Schmidt (1977), the stochastic frontier production function is expressed as:

$$Y_i = exp(x_i\beta + v_i - u_i) \tag{1}$$

where subscript i indexes the firm, y_i is the maximum output obtainable from x_i, a vector of inputs, and β is an unknown parameter vector to be estimated. The v_is are random errors assumed to be independently distributed of the one-sided error term u_i where $u_i<0$. The non-positive one-sided error term u_i reflects the fact that each firm's output must lie on or below its stochastic frontier, $f(x_i;\beta + v_i)$.

2.6 To investigate the presence of systematic influences on inefficiency, we incorporate firm characteristics into the model by expressing u_i as:

$$u_i = z_i\delta + w_i \tag{2}$$

where firm-level inefficiency is assumed to be a linear function of a systematic component z_i, and a random component w_i.[1] The systematic component includes a vector of firm attributes, z_i, which are related to efficiency by the parameters, δ. The random variable w_i follows the same truncated normal distribution as the one-sided error term, u_i, where the truncation point is $-z_i'\delta$ such that $w_i \geq -z_i'\delta$.

2.7 Equations (1) and (2) <u>are estimated jointly</u> using maximum likelihood techniques to obtain consistent estimates of the parameters of the production frontier (equation 1) and the inefficiency effects (equation 2) [2]. From these results, an index of firm-specific technical efficiency can be calculated as $TE_i = exp(-u_i) = exp(-z_i\delta - w_i)$. This measure of technical efficiency, and its distribution across and within firm size categories, will be used to address the issue of whether SMEs are as efficient as their larger counterparts.

2.8 The joint specification of these two equations also highlights a potential estimation problem in earlier empirical studies of SME efficiency. By regressing efficiency

[1] Note that our analysis does not permit us to conclude anything about the direction of causality between investments in technology and efficiency. For instance, causality between technology and efficiency could run in either direction. Our purpose is to use cross-sectional evidence to establish relationships in the data linking formal technology investments and technical efficiency.

[2] This methodology is similar to that of Battese & Coelli (forthcoming), Huang and Liu (1994) and Aw and Batra (1995a).

estimates on z_i using least-squares techniques, the two-stage procedure used in the earlier literature yields inconsistent parameter estimates of the inefficiency equation (2). This problem arises because least-squares treats w_i as being normally distributed in the second-stage regression when it should follow the same distribution as u_i.

Model Specification and Hypotheses

2.9 Equation (1) is specified as a two-factor Cobb-Douglas production function.[3] The dependent variable y_i is the logarithm of value added, calculated as the difference between the firm's value of output and the sum of its expenses on raw materials, energy and electricity. The two factors of production--capital and labor--are expressed in logarithms, with labor measured by total employment and capital by the value of net assets. Other variables in the vector x_i include industry indicator dummy variables to control for industry effects and the firm's rate of capacity utilization, a measure of how fully the two inputs are used.[4]

2.10 In equation (2), z_i represents a vector of attributes that are thought to reflect the firm's technological and workforce capabilities. These variables and their hypothesized effects on firm-level efficiency are discussed in turn below.

Technological Capabilities

2.11 Employers can acquire technological capabilities and attain higher efficiency levels in several ways: (i) investments in in-house R&D or technology or know-how licensing agreements; (ii) contacts with foreign firms, either through exporting relationships with buyers or by setting up joint-ventures with foreign partners; and (iii) production experience.

2.12 *R&D Investments.* In developing countries where R&D capabilities in basic research are often limited, indigenous R&D efforts are usually oriented towards reverse engineering and modification of existing product and process technologies. The cumulative modifications from this R&D can have large productivity and efficiency payoffs to the firm (see Griliches, 1984; Mairesse and Sassenou, 1991).

2.13 *Know-how licenses.* Many firms may not have the capabilities to do their own R&D. For these firms, technology and know-how agreements with both foreign and innovative domestic firms can be a substitute for own R&D investments. Pack (1992) documents the importance of such know-how purchases in the development of indigenous technological capabilities in export-oriented NICs such as Taiwan, China.

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[3] The Cobb-Douglas functional form provides maximum flexibility in dealing with data imperfections (Tybout, 1992).

[4] The absence of capacity utilization rate in most databases is believed to be the main cause of measurement error in the capital input variables included in the production function (Mairesse, 1990).

2.14 *Exporting.* International contacts offer exporting firms substantial opportunities for acquiring new technology and improving their technical capabilities. Foreign buyers play a critical role in this technology transmission by providing firms with crucial information relating to product specifications and, in many cases, offering free technical assistance (Westphal et al, 1979; Keesing and Lall, 1992).

2.15 *Foreign capital participation.* Foreign joint-venture partners bring new technology not available domestically. This technology transfer, and accompanying management expertise and training to use the technology effectively, can lead to significant improvements in firm efficiency (see Tan and Batra, 1995).

2.16 *Age of the firm.* Start-up firms often go through an initial period of developing expertise in production, management, and marketing. If these learning-by-doing effects are important, older firms with longer production experience are likely to be more efficient than their younger counterparts (Pitt and Lee, 1981). An alternative interpretation is that the age-efficiency link is the outcome of a dynamic process in which the underlying efficiency of firms is revealed, and less efficient firms exit while more efficient firms survive and age.

Workforce Capabilities

2.17 A firm's efficiency is also dependent upon the production know-how and experience embodied in the human capital of its employees. This human capital is reflected in the mean education of employees, formal training provided to skilled and unskilled workers, and the use of female workers.

2.18 *Education of employees.* There is a large body of evidence that educated workers are not only more productive in performing given tasks, but they are more adept at critically evaluating new information and learning from it. Firms with a literate and well-educated workforce are thus likely to be more efficient because of their greater capability to absorb and effectively utilize new technology (Hewitt and Wield, 1992; Lucas, 1993).

2.19 *Worker training.* Like education, training provides workers with the skills to perform a wide variety of tasks, and to upgrade job skills as new technologies are introduced (see Tan and Batra, 1995). Worker training plays a key role in adapting, modifying, and improving new technology, without which its superior productivity over older technologies are seldom realized (Westphal, 1990; Dahlman, 1993).

2.20 *Use of female workers.* Use of large numbers of female workers may reflect forms of work organization built around simple assembly, manual dexterity, seasonal work, and low pay. Efficiency levels are likely to be low in such organizations where low skills and high job turnover inhibits learning and the retention of production know-how within the firm.

3

Data and Empirical Results

3.1 The data used are for manufacturing firms in five developing economies. Cross-sectional surveys are used for four economies--Colombia, 500 firms in 1992; Indonesia, 300 firms in 1992; Malaysia, 2,200 firms in 1994; and Mexico, 5,072 firms in 1992. The fifth source is the 1986 Census of Manufactures for Taiwan, China, covering 56,047 firms. [5]

Overview of the Data

3.2 The five data sets contain broadly comparable, firm-level data on the key variables of interest. These include (1) establishment characteristics, including year established, single-plant or multi-plant status, two-digit industry classification, and foreign capital participation; (2) total employment, workforce structure, and compensation; (3) information on training, expenditures on R&D and foreign technology licenses, and exports; and (4) data on production and inputs, including capital assets, employment, intermediate inputs, and energy used. The data sets also contain information on equipment, automation, quality control methods, reliance on temporary workers, unionization, and labor turnover, but the coverage and definitions of these variables are not always comparable across economies.

3.3 The key characteristics of the samples in each economy are summarized by firm size in Table 1. With the exception of three variables, most firm characteristics are self-explanatory. Firms are divided into four size categories--micro with 15 or fewer workers, small with 16-100 workers, medium with 101-250 workers, and large with over 250 workers. Training is defined to include only formal structured training, either provided in-house or in external training institutions.[6] The training variable in the Taiwan data set is not comparable to the other

[5] The data on Taiwan, are from nine industries: textiles, clothing, paper/publishing, chemicals, plastics, iron & steel, machinery, electric/electronics and transport equipment are used in the analysis. In 1986, these nine industries accounted for 63 percent of total manufacturing output, 66 percent of total employment in manufacturing, 71 percent of total exports and 71 percent of total expenditures on R&D and know-how purchases.

[6] A more inclusive training variable would have little discriminatory power because most employers provide some informal OJT, especially to new hires. The decision to exclude informal OJT was informed by the findings of existing training studies (see Lillard and Tan, 1992) and our own findings that informal and formal training are highly correlated (see Tan and Batra, 1995).

Table 1: Mean Characteristics by Firm Size

	Colombia				*Indonesia*[a]				*Malaysia*			
Characteristics	*Micro*	*Small*	*Medium*	*Large*	*Micro*	*Small*	*Medium*	*Large*	*Micro*	*Small*	*Medium*	*Large*
Number of firms	661	1060	1546	1789	n.a.	62	58	185	153	638	932	453
Size (employment)	5.9	56.1	168.7	730.5	n.a.	51.2	164.7	1138.0	7.1	29.6	124.6	804
Age of firm (years)	13.3	17.9	23.2	26.9	n.a.	12.4	12.5	17.7	22.2	19.8	16.6	16.1
% Firms training	14.8	49.5	64.9	72.3	n.a.	24.2	25.9	32.4	9.1	18.2	44.6	70.4
% Firms with R&D	14.1	29.8	31.6	35.3	n.a.	12.9	13.8	15.7	5.2	10.0	22.7	32.0
% Firms with know-how	19.8	34.5	43.5	49.2	n.a.	4.8	10.3	14.6	2.6	3.8	10.8	23.2
% Firms exporting	3.8	21.8	35.1	51.6	n.a.	22.6	24.1	55.7	13.7	32.6	65.7	85.0
% Firms with foreign capital	1.5	10.1	18.8	34.8	n.a.	1.6	6.9	16.8	7.2	13.5	36.4	65.3
Proportion skilled labor	0.36	0.30	0.29	0.28	n.a.	0.17	0.15	0.11	0.11	0.14	0.14	0.13
Education (years)	7.7	8.6	8.7	8.9	n.a.	8.0	9.5	9.4	7.6	8.1	8.8	9.5

	Mexico				*Taiwan, China*			
Characteristics	*Micro*	*Small*	*Medium*	*Large*	*Micro*	*Small*	*Medium*	*Large*
Number of firms	46	143	139	62	34,505	13,053	1,834	984
Size (employment)	11	52	163	621	5.8	36.9	154.6	4,189.6
Age of firm (years)	10.6	14.7	23.6	24.4	6.5	9.8	11.3	15.6
% Firms training	32.6	62.2	74.8	69.8	6.3	9.0	22.3	38.5
% Firms with R&D	52.2	70.6	79.9	83.1	5.9	9.2	29.6	55.1
% Firms with know-how	0.0	14.0	35.2	26.7	5.5	3.4	5.4	14.9
% Firms exporting	4.3	28.0	47.5	53.5	7.4	34.6	73.1	87.8
% Firms with foreign capital	n.a.	n.a.	n.a.	n.a.	5.5	3.9	7.7	22.5
Proportion skilled labor	0.32	0.25	0.21	0.20	0.25	0.24	0.23	0.23
Education (years)	8.1	8.7	8.7	8.4	n.a.	n.a.	n.a.	n.a.

Notes:

Micro firms are those with 15 or fewer workers
Small firms are those with 16-100 workers
Medium firms are those with 101-250 workers
Large firms are those with more than 250 workers
[a]: There are no microenterprises in the Indonesia sample.

countries since it is based on training expenditures rather than the number of workers trained by type and source of training. Skilled workers are defined to include managers, engineers and professionals, technicians, line supervisors and skilled production workers. In Malaysia and Taiwan, data limitations made it necessary for us to treat all non-production employees as being skilled workers.

3.4 It is clear from Table 1 that large firms are over-sampled relative to their true weight in the population of enterprises. The exception is Taiwan, where census data are used. The population of smaller firms, micro enterprises in particular, is not known with any precision in the other four economies. Crude population weights exist and are used to weight the data whenever economy-wide numbers are reported. In all other cases, we report unweighted figures by firm size to reduce the possibility of aggregation bias.

3.5 Table 1 suggests that, relative to large firms, micro and small enterprises have few of the technology and workforce attributes that are thought to be associated with highly efficient firms. On average, micro and small firms are less likely to invest in R&D and technology licenses, or have foreign partners, or export abroad as compared with larger firms. They also rely on a less-educated and less-skilled workforce, and are less likely to provide them with structured job training.

Constraints on Training

3.6 What accounts for these striking differences by firm size? Do they simply reflect the relatively weak technological and worker capabilities of smaller firms, or are they the result of market failure?

3.7 Insights into these questions are provided by firm respondents in the Colombia, Indonesia, and Malaysia surveys. They were asked to rank the relevance of each one of seven statements to their decision to provide little or no training:

- Training is not affordable because of limited resources
- Training is costly because of high labor turnover
- We lack knowledge about training techniques and its organization
- The firm uses a mature technology so that learning-by-doing is sufficient
- Skilled workers are readily hired from other firms
- Skills provided by schools are adequate
- We are skeptical about the benefits of training

3.8 To facilitate comparison of the relative importance of different factors, we coded firm responses to each statement as being "important" if it was assigned a high score, and not very important otherwise.[7]

3.9 The use of mature technology was the most commonly cited reason for why employers provide little or no job training in Colombia and Malaysia. In Indonesia, which has the lowest income level in our sample, use of mature technology ranked a close second to limited resources in importance. In well-functioning markets, this was the response that we expected to find from theory. The productive attributes of mature technologies are well-established and there is typically little scope for improving upon existing production techniques. As such, no additional training is required and workers quickly become proficient at their jobs through learning-by-doing.

3.10 Firms in all three economies ranked high labor turnover, poor knowledge about training, and limited resources among the three most important reasons for little or no training. High labor turnover can inhibit training by preventing employers from recouping their investments in workers' specific skills. Lack of information on training methods can also be a constraint for employers, especially if there are no external training providers capable of meeting their particular skill needs. Resources to finance training may also not be forthcoming because of imperfect capital markets.

3.11 The relative importance of each constraint varied from economy to economy. Reflecting their relative income levels, limited resources was ranked number one by firms in Indonesia, it tied with lack of information for third place in Colombia, and was not included among the top three reasons in Malaysia, a higher-middle income economy. High labor turnover was ranked number two in importance after mature technology in Malaysia and Colombia, and it was ranked number three in Indonesia.

3.12 Finally, relative to large firms, a higher proportion of micro and small firms ranked these same factors as being important reasons for little or no training. This result by firm size holds in all three economies. Smaller firms were also more likely to emphasize the importance of limited resources than larger firms--they ranked it first in Indonesia and second in Colombia. In contrast, large firms did not include limited resources among their top three reasons, except in Indonesia where it ranked number two. This finding is consistent with the view that capital market constraints are most binding for SMEs.

3.13 Thus, while markets are generally well-functioning, market failures from poor information, high labor turnover and imperfect capital markets appear to pose binding constraints for some firms, micro and small firms in particular. The resulting low levels of training (and investments in technology) have implications for technical efficiency, an issue pursued below.

[7] The ranking scale varied from country to country. For example, in Malaysia where the scale ranged from 1 (not relevant) to 5 (very relevant), we coded all responses of 4 and 5 as being important.

Empirical Results

3.14 Maximum likelihood methods are used to jointly estimate the stochastic frontier production function and the equation relating inefficiency to employer attributes. We assume that there is a common production frontier for all firms in a given economy, and control for sectoral differences in technology using industry dummy variables. We also assume that the correlates of inefficiency are invariant with firm size (we address this issue in the next chapter).

3.15 Table 2 reports the coefficient estimates of the production frontier of each economy. The coefficient estimates for labor and capital are all statistically significant and, with the exception of Indonesia, are generally consistent with factor shares in developing countries. The coefficient on the capacity utilization rate is positive and significant in Mexico and Taiwan indicating the importance of controlling for utilization rates to reduce measurement error.

3.16 The estimated parameters of the inefficiency regressions are reported in Table 3. The signs of these parameters have been reversed so that the firm attributes relate to efficiency rather than inefficiency.

3.17 The correlation between efficiency and R&D is positive and significant in only two of the five economies--Mexico and Taiwan, China. In the other economies, this correlation is negative but statistically insignificant (except in the case of Indonesia). We interpret the mixed efficiency-R&D results as reflecting differences in the R&D capabilities of economies at different levels of development--higher in Mexico and Taiwan, and lower in Indonesia, Malaysia and Colombia. This interpretation is consistent with the literature on technology accumulation in developing economies, which suggests that, while investment in R&D is important in developing technological capability, firms with limited initial capabilities can improve efficiency through other sources.

Table 2: Stochastic Production Frontier Estimates
Dependent Variable: log (value added)

Independent Variable	*Colombia*	*Indonesia*	*Malaysia*	*Mexico*	*Taiwan, China*
Constant	6.330 [a]	1.413 [b]	6.854 [a]	2.275 [a]	3.387 [a]
	(0.390)	(0.719)	(0.339)	(0.118)	(0.026)
Log (labor)	0.787 [a]	0.332 [a]	0.681 [a]	0.879 [a]	0.653 [a]
	(0.074)	(0.099)	(0.032)	(0.015)	(0.003)
Log (capital)	0.238 [a]	0.738 [a]	0.319 [a]	0.254 [a]	0.375 [a]
	(0.036)	(0.071)	(0.021)	(0.009)	(0.003)
Capacity utilization rate	0.059	n.a.	n.a.	0.005 [a]	0.002 [a]
	(0.149)			(0.007)	(0.0001)

Notes:

[a]: Significant at 1% level
[b]: Significant at 5% level
Industry dummy variables included.
Numbers in parentheses are standard errors

Table 3: Parameter Estimates of the Efficiency Equation

Independent Variable	*Colombia*	*Indonesia*	*Malaysia*	*Mexico*	*Taiwan, China*
Constant	-	-4.026	-1.296 [a]	-3.492 [a]	8.241 [a]
		(4.050)	(0.211)	(0.224)	(0.177)
R&D	-0.076	-7.501 [b]	-0.206	0.883 [a]	1.878 [a]
	(0.134)	(3.446)	(0.118)	(0.157)	(0.088)
Technology transfer	-0.074	-1.586	0.089	1.231 [a]	-3.559 [a]
	(0.143)	(2.019)	(0.136)	(0.159)	(0.101)
Foreign ownership	n.a.	1.361	0.002	1.064 [a]	-0.685 [b]
		(2.178)	(0.002)	(0.179)	(0.280)
Exports	0.279 [b]	3.490 [b]	0.187 [b]	0.160	3.722 [a]
	(0.133)	(1.705)	(0.087)	(0.129)	(0.038)
Age	0.005	0.216	0.011 [a]	0.083 [a]	-0.001
	(0.004)	(0.098)	(0.002)	(0.009)	(0.001)
Education	-0.018	1.065 [a]	0.091 [a]	1.043 [a]	n.a.
	(0.016)	(0.329)	(0.020)	(0.110)	
Skilled worker training	0.382 [c]	12.567 [a]	0.414 [b]	2.863 [a]	0.001 [a]
	(0.218)	(4.624)	(0.211)	(0.363)	(0.0002)
Unskilled worker training	-0.245	-4.633	-0.105	1.446 [a]	-0.0001
	(0.279)	(3.661)	(0.226)	(0.300)	(0.0006)
Proportion of female labor	-0.278	3.738	-0.515 [a]	-2.487 [a]	0.585 [a]
	(0.243)	(2.110)	(0.154)	(0.247)	(0.116)
σ^2_s	1.435 [a]	22.465 [a]	0.969 [a]	6.833 [a]	3.299 [a]
	(0.263)	(7.684)	(0.019)	(0.773)	(0.078)
γ	0.574 [a]	0.936 [a]	0.014	0.908 [a]	0.936 [a]
	(0.154)	(0.025)	(0.055)	(0.011)	(0.002)
Mean efficiency	0.55	0.39	0.74	0.59	0.76
x^2	-	34.57	37.79	646.54	1902.772
Log likelihood	-438.161	-421.471	-2124.096	-7230.206	36689.817

Notes:

[a]: Significant at 1% level
[b]: Significant at 5% level
[c]: Significant at 10%
Industry dummy variables included.
Numbers in parentheses are standard errors

3.18 Among these other sources, the export activity is the most important correlate of firm efficiency. It has a positive and significant correlation with efficiency in four of the five economies, the exception being Mexico. In comparison, efficiency is only weakly correlated with technology licensing, foreign capital participation, and age of the firm. It appears that there are strong efficiency-enhancing benefits from operating in export markets, possibly because of exposure to information about new products and technologies, and interactions with foreign buyers.

3.19 The efficiency effects of exporting may also be more important for firms with low technological capabilities. From related research on Taiwan, (Aw and Batra, 1995b) and on-going research on Colombia, we found evidence that exports are significantly correlated with productivity but only for firms that do not engage in R&D.

3.20 The educational attainment of a firm's workers is positively related to its level of efficiency. The education coefficient is statistically significant in Indonesia, Mexico and Malaysia (although not for Colombia), a finding consistent with the view that educated workers are better adept at learning and responding to new information. These results are similar to Little et al (1987), who found a positive relationship between the entrepreneur's education and firm efficiency in India, Korea and Taiwan. Our results are more broad-based in that they refer to the mean education of the firm's work force.

3.21 Skilled worker training is positively and significantly correlated with efficiency in all five economies. Indeed, except in Taiwan,[8] it is the largest contributor to efficiency of all the parameters estimated. In contrast, unskilled worker training is not correlated with firm efficiency except in Mexico where it has a positive and significant correlation. These asymmetric efficiency results by skill group are consistent with the findings reported in Tan and Batra (1995).

3.22 Given the nature of the types of industries employing female labor in most developing countries, higher proportions of female labor are expected to be associated with lower firm efficiency. Support for this hypothesis is found for Malaysia and Mexico, but not in Taiwan where efficiency is positively correlated with the proportion of female workers.

3.23 Overall, our results have two important implications. First, research and development can have an important impact on raising efficiency in countries with better developed R&D capabilities. When these capabilities are limited, exports and links with foreign buyers may be a more important source of technology for developing countries. Second, irrespective of where the technology is acquired, efforts to assimilate new technology require an educated and well-trained workforce. These firm investments in its employees' human capital are key to realizing the efficiency gains from technological change.

[8] The training results for Taiwan are not directly comparable to the other countries. In Taiwan, the training variables are defined on the basis of expenditures; in the other countries, they are based on the proportion of each skill group receiving training.

4

Firm Efficiency and Its Correlates

4.1 The production frontier methodology yields estimates of a firm-specific efficiency index that ranges from 0 to 1, where a firm with an index of 1 is at the production frontier. In this chapter, we use this unit-free index to compare relative efficiencies not only across firms of different sizes, but also across economies. We categorize firms in each size group as being efficient or inefficient relative to the overall sample mean in order to identify the principal factors correlated with higher or lower firm efficiency.

Relative Efficiency by Size and Across Economies

4.2 The first row of Table 4 reports the overall mean efficiency of firms in the five economies. They range from a low of 0.39 for Indonesia (1992) to a high of 0.76 for Taiwan, (1986). The other three countries fall in between, with mean efficiency of 0.55 for Colombia (1992), 0.59 for Mexico (1992), and 0.74 for Malaysia (1994). We caution that these means are unweighted for Colombia and Indonesia. To the extent that larger and relatively more efficient firms are over-represented in these two economies, the estimates overstate their efficiency levels relative to the others. Still, the cross-national ranking of mean efficiency is broadly consistent with one based on per capita income levels.

4.3 The remaining rows of Table 4 give the average firm efficiency in four size categories: micro firms (less than 16 workers), small firms (16-100 workers), medium firms (101-250 workers) and large firms (over 250 workers). Note that there are no micro firms in the Indonesia sample.

4.4 Mean efficiency increases with firm size in all five economies. For example, in Mexico the mean efficiency in micro firms is 0.46, rising to 0.61 in medium and large firms. In Taiwan, China the corresponding means are 0.74 and 0.82. Equality of means tests indicate that the mean efficiency of micro and small enterprises is significantly different from the efficiency level of large firms in all cases. For Colombia and Mexico, medium size firms have a slightly higher mean efficiency than large firms, but the difference between them is not statistically significant.

4.5 We interpret this as compelling evidence of a positive size-efficiency relationship, given the robustness of this finding across all five economies. This contrasts with earlier studies

that find mixed results, albeit based on relatively small sample sizes. This result is also consistent with studies that find higher rates of firm failure among smaller firms than larger ones; we attribute it to the lower mean levels of efficiency among SMEs. But sample means can be deceptive. For policy makers, the more important issue is whether SMEs are all uniformly inefficient, or whether highly efficient micro and small firms exist that have the potential for growing into large ones and generating employment.

Table 4: Distribution of Efficiency by Firm Size

Firm Size	*Colombia (1992)*	*Indonesia (1992)*	*Malaysia (1994)*	*Mexico (1992)*	*Taiwan, China (1986)*
Mean Efficiency	0.55	0.39	0.74	0.59	0.76
Micro (<=15 workers)	0.53	-	0.73	0.46	0.74
Small (16-100 workers)	0.54	0.36	0.74	0.58	0.77
Medium (101-250 workers)	0.55	0.35	0.79	0.62	0.81
Large (>250 workers)	0.54	0.43	0.84	0.61	0.82

Relative Efficiency within Size Groups

4.6 To address these questions, firms in each size group are classified as "efficient" and "inefficient" relative to the overall mean efficiency estimated for the economy. Figure 1 graphs the proportion of efficient firms in each size group for each economy. Note that the proportion of efficient firms summed across all size categories can be more or less than 50 percent because efficiency is being compared to the mean, rather than the median. Means and medians can differ greatly depending upon the shape of the efficiency distribution, a fact that we exploit in comparing efficiencies both across size categories and across economies. Three striking results emerge from a close examination of Figure 1.

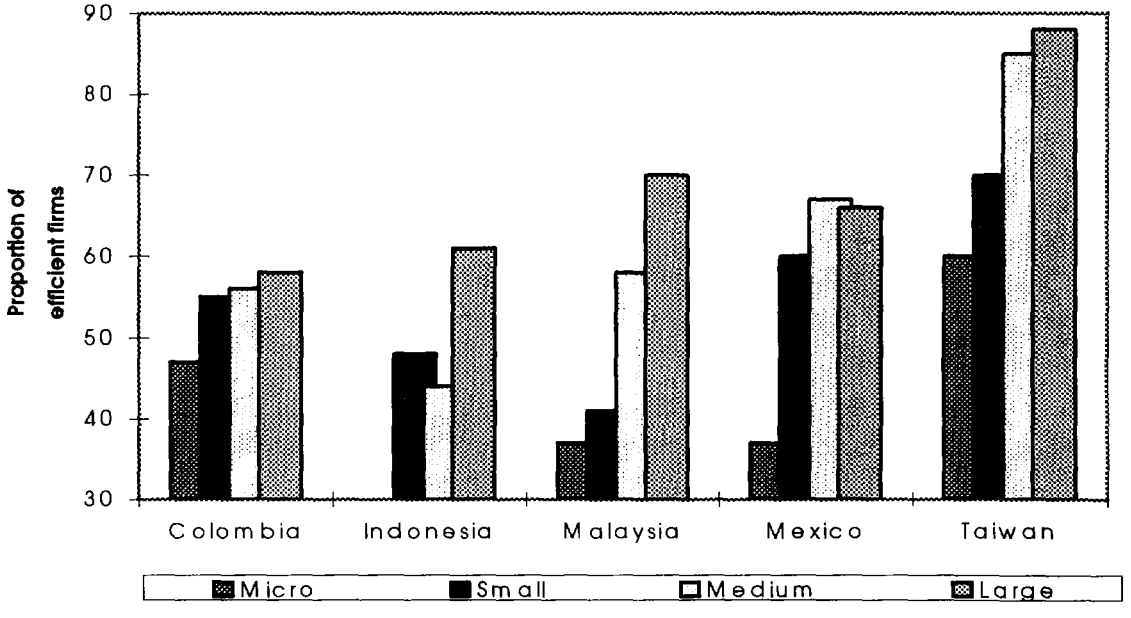
4.7 First, in all five economies, there is considerable variance in firm efficiency in every size category. Micro and small enterprises are not inherently inefficient. On average, across economies, at least 35 percent of firms in these size categories are classified as efficient. Their lower average efficiency relative to large firms is attributable to the fact that there are fewer efficient firms in these smaller size groups, not to their uniformly lower efficiency levels in all firms. If many SMEs are inefficient because they invest little in worker skills or technology (Tables 1 and 3), these results suggest great potential for upgrading productivity and efficiency through training and technical assistance directed at SMEs.

4.8 Second, comparing economies, there is considerable variation in the proportion of efficient firms in each size category. In Malaysia and Mexico, about a third of micro and small firms are classified as efficient. In contrast, almost half are in Colombia and Indonesia, and three-fifths in Taiwan, China. At the other end of the size scale, the proportion of efficient large firms is approximately 60 percent in Colombia and Indonesia, 70 percent in Malaysia and Mexico, and 88 percent in Taiwan.

4.9 These efficiency distributions by size, and their variation across economies, suggest somewhat different areas of focus for policymakers in each place. In Malaysia and Mexico, the big size differentials in the share of efficient firms suggest their governments should focus on improving productivity at the smaller end of the enterprise scale. In Colombia and Indonesia, the proportion of efficient firms is relatively low in all size groups, suggesting problems endemic to all firms. As such, broad-based policies to improve overall industrial productivity should be the focus in these two economies.

4.10 Third, the high overall levels of efficiency were attained very differently in Taiwan, (sample mean of 0.76 in 1986) and Malaysia (sample mean of 0.74 in 1994).. This reflects differences in development strategies. In Taiwan, China, there is a high proportion (60 percent and above) of efficient firms in all size groups. In addition to a higher levels of education and strong external links to buyers and suppliers, small and medium enterprises in Taiwan benefited from publicly supported R&D and technology extension services directed to SMEs. In contrast, Malaysia's overall efficiency level is driven by the relatively high proportion of highly efficient firms in the large-size category, with most micro and small enterprises being of below average efficiency. Thus, while Malaysian development policies (including special tax incentives) to attract large multinationals appear to have generated growth, they have done relatively little to improve the efficiency of domestic SMEs.

Figure 1: Size Distribution of Efficiency



Characteristics of Efficient and Inefficient SMEs

4.11 Can we identify the efficient and inefficient firms in each size group, SMEs in particular? The inefficiency estimates from the production frontier model provide some insights into this question. They show the individual contributions of different firm attributes to efficiency, but are silent on which correlates of efficiency are more important for firms of different sizes. Small and large firms have different efficiency-augmenting attributes that may be related to each other in ways that differ by size. Forms of work organization, in particular, are likely to vary by size. Some organizational variables--such as quality control, extent of automation, unions, use of temporary workers, non-wage benefits, and labor turnover--were elicited in several surveys and these are exploited here.

4.12 In Tables 5 through 9, we use this expanded set of attributes--broadly divided into technology, workforce, and organizational factors--to compare the characteristics of efficient and inefficient firms in each size group, focusing on SMEs. Due to smaller sample sizes, micro firms in Colombia and Indonesia are grouped with small firms so that this category now includes all firms with 100 or fewer employees.

Technology Factors

4.13 Among the formal sources of technology, R&D is less important than technology licenses in discriminating between efficient and inefficient firms. With the exception of Mexico and Taiwan, R&D is just as likely to be done in efficient firms as in inefficient firms of all sizes. For most size groups in Indonesia and Malaysia, more inefficient firms report doing R&D than efficient firms. In contrast, access to foreign technology through licensing agreements is an important distinguishing factor across all size categories in Colombia, Malaysia, Mexico and among small, medium and large firms in Taiwan, China.

4.14 Contacts with foreign firms is a particularly important characteristic of efficient firms, SMEs in particular. Foreign capital participation is associated with higher levels of efficiency in all four cases for which ownership data are available (Indonesia, Malaysia, Mexico and, with the exception of large firms, in Taiwan). It is especially good at discriminating between efficient and inefficient SMEs. Similarly, with two exceptions (medium firms in Colombia and large firms in Mexico), highly efficient firms are more likely to be exporters in all size groups and in all five economies.[9]

4.15 These correlations reinforce the earlier finding that, for SMEs and other firms with limited R&D capabilities, alternative sources--exporting, licensing agreements, and foreign capital participation--can be important means of acquiring new technology and know-how, and improving firm efficiency.

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[9] In Mexico, the negative relationship between efficiency and exports may be attributable in part to the presence of large maquiladora plants, many relying on low-wage, low-productivity assembly operations for re-export to the U.S.

Table 5: Colombia: Characteristics by Efficiency and Firm Size

	Small		*Medium*		*Large*	
Characteristic	*inefficient*	*efficient*	*inefficient*	*efficient*	*inefficient*	*efficient*
Technology						
% firms investing in R&D	65.1	66.7	85.4	81.0	86.2	86.0
% firms with licensing agreements	3.0	11.1	31.2	41.7	27.6	40.0
% firms exporting	16.7	29.6	60.4	41.7	55.2	65.7
Age of firm	13.8	14.4	27.0	23.7	25.8	34.4
Worker						
Education	7.6	8.7	8.4	8.6	8.2	8.8
Proportion of skilled labor	0.26	0.26	0.21	0.22	0.21	0.19
% firms with only informal training	36.4	27.2	16.7	15.0	24.1	20.0
% firms with formal training	53.0	56.8	81.2	77.0	75.9	74.3
Organizational						
% value of automatic machinery	16.9	18.6	24.0	15.1	25.0	29.0
% of firms with quality control	12.1	14.8	16.7	15.0	41.4	22.9
Proportion of temporary workers	0.64	0.42	0.08	0.07	0.16	0.06
Proportion of female labor	0.37	0.40	0.54	0.47	0.45	0.45
Proportion labor turnover	0.18	0.23	0.11	0.13	0.29	0.14
% firms with unionized labor	1.5	8.6	23.1	25.0	21.0	37.0
% firms reporting turnover of skilled workers as a problem	39.4	35.8	35.4	35.0	31.0	3.7

Table 6: Indonesia: Characteristics by Efficiency and Firm Size

	Small		*Medium*		*Large*	
Characteristic	*inefficient*	*efficient*	*inefficient*	*efficient*	*inefficient*	*efficient*
Technology						
% firms investing in R&D	19.1	5.0	11.5	15.1	15.7	7.5
% firms with technology licenses	0.0	0.0	15.4	10.0	13.7	10.0
% firms exporting	19.0	20.0	12.0	40.0	54.1	61.1
% firms with foreign ownership	0.0	0.0	3.8	15.0	15.6	17.5
Age of firm	12.0	10.2	13.3	14.6	14.5	20.6
Worker						
Education	7.9	7.9	8.8	10.2	9.1	10.0
Proportion of skilled labor	0.13	0.12	0.15	0.14	0.12	0.11
% firms with only informal training	23.2	5.0	38.2	5.0	16.1	15.2
% firms with formal training	28.6	30.0	19.2	35.0	25.5	32.5
Organizational						
% value of automatic machinery	13.8	27.0	37.8	45.3	35.8	38.2
% firms with quality control	28.6	50.0	23.1	30.0	45.1	47.5
Proportion of female labor	0.44	0.46	0.44	0.26	0.40	0.45
Proportion labor turnover	0.04	0.03	0.03	0.03	0.04	0.03
% firms with severance pay	0.0	9.5	10.1	30.7	8.8	18.2
% firms reporting turnover of skilled workers as a problem	10.0	4.0	15.0	0.0	24.0	16.0

Table 7: Malaysia: Characteristics by Efficiency and Firm Size

	Micro		*Small*		*Medium*		*Large*	
Characteristic	*inefficient*	*efficient*	*inefficient*	*efficient*	*inefficient*	*efficient*	*inefficient*	*efficient*
Technology								
% firms investing in R&D	2.7	7.1	11.8	10.5	31.2	18.6	53.6	31.8
% firms with technology licenses	1.4	2.4	2.6	7.3	3.7	17.0	17.9	28.6
% firms exporting	8.2	28.6	18.8	57.6	47.1	79.0	88.1	88.5
% firms with foreign ownership	2.7	16.7	8.1	23.6	16.5	45.1	58.3	68.7
Age of firm	19.0	33.3	16.7	23.8	13.7	19.1	11.7	19.7
Worker								
Education	7.0	8.3	7.5	9.1	7.9	9.5	8.9	9.9
Proportion of skilled labor	0.07	0.17	0.12	0.17	0.12	0.15	0.11	0.15
% firms with only informal training	62.1	59.2	69.2	57.3	60.1	40.1	37.4	23.2
% firms with formal training	4.1	9.5	11.4	28.8	30.5	53.6	58.3	75.0
Organizational								
% value of automatic machinery	1.0	3.8	9.1	16.8	16.3	27.0	28.6	35.3
% firms with quality control	4.1	11.9	17.3	28.8	36.4	49.1	64.3	64.6
Proportion of temporary workers	0.27	0.22	0.25	0.18	0.20	0.13	0.15	0.06
Proportion of female labor	0.01	0.0	0.05	0.03	0.17	0.09	0.49	0.21
Proportion labor turnover	0.24	0.27	0.27	0.19	0.27	0.22	0.36	0.29
% firms with unionized labor	4.1	4.8	3.3	8.4	12.1	24.9	23.8	51.0
% firms with severance pay	21.3	17.7	33.5	34.3	44.3	31.4	41.8	37.2
% firms reporting turnover of skilled workers as a problem	16.1	34.8	41.7	42.7	42.7	52.0	68.8	59.9

Table 8: Mexico: Characteristics by Efficiency and Firm Size

	Micro		*Small*		*Medium*		*Large*	
Characteristic	*inefficient*	*efficient*	*inefficient*	*efficient*	*inefficient*	*efficient*	*inefficient*	*efficient*
Technology								
% firms investing in R&D	12.1	18.8	21.0	35.8	23.9	35.5	26.8	39.8
% firms with technology licenses	17.1	25.2	28.0	38.9	36.0	47.1	37.7	55.4
% firms exporting	2.5	3.0	14.0	16.4	22.5	24.0	39.7	32.9
% firms with foreign ownership	1.0	2.6	6.1	12.9	15.4	20.6	34.3	35.4
Age of firm	12.0	14.6	16.2	19.1	19.3	25.2	21.9	29.6
Worker								
Education	6.8	9.5	7.8	9.2	7.9	9.1	8.0	9.3
Proportion of skilled labor	0.30	0.27	0.15	0.2	0.14	0.17	0.13	0.18
% firms with only informal training	8.1	15.1	18.3	15.7	14.2	13.8	12.2	8.0
% firms with formal training	9.8	24.8	41.0	55.3	58.3	68.2	67.3	75.5
Organizational								
% Value of automatic machinery	48.0	56.0	71.6	70.9	71.2	72.9	73.0	74.4
% firms with quality control	80.3	84.2	94.2	94.7	95.6	96.8	98.7	98.7
Proportion of temporary workers	0.07	0.03	0.12	0.09	0.15	0.11	0.16	0.13
Proportion of female labor	0.25	0.19	0.34	0.24	0.35	0.24	0.36	0.22
Proportion labor turnover	0.07	0.19	0.29	0.27	0.23	0.19	0.20	0.15
% firms with unionized labor	13.1	31.2	67.6	71.4	81.0	85.1	79.6	91.7
% firms with severance pay	17.4	37.6	47.3	52.6	48.4	49.2	37.1	41.4

Table 9: Taiwan, China: Characteristics by Efficiency and Firm Size

	Micro		*Small*		*Medium*		*Large*	
Characteristic	*inefficient*	*efficient*	*inefficient*	*efficient*	*inefficient*	*efficient*	*inefficient*	*efficient*
Technology								
% firms investing in R&D	9.7	9.3	3.7	12.4	13.4	35.5	26.1	67.1
% firms with technology licenses	10.4	3.3	2.0	4.6	3.9	6.5	16.3	17.9
% firms exporting	4.1	9.5	14.7	43.0	46.1	80.2	68.5	92.9
% firms with foreign ownership	1.0	3.3	2.1	5.1	7.3	8.7	26.1	24.6
Age of firm	6.2	6.7	7.6	11.0	9.3	11.5	12.3	16.1
Worker								
Proportion of skilled labor	0.31	0.31	0.21	0.24	0.18	0.24	0.17	0.23
% firms training	4.4	10.8	4.9	11.6	11.6	26.7	25.0	46.6
Organizational								
% value of automatic machinery	8.3	5.9	7.8	10.4	11.6	13.4	10.9	19.6
Proportion of temporary workers	0.07	0.07	0.17	0.07	0.15	0.08	0.05	0.04
Proportion of female labor	0.30	0.35	0.41	0.42	0.47	0.48	0.52	0.53

Workforce Factors

4.16 The education and formal training of employees are powerful discriminants of efficient and inefficient firms in all size categories. In all four cases for which education data are available (Colombia, Indonesia, Malaysia and Mexico), higher efficiency is associated with higher educational levels across all firm size categories. The difference in education between the less efficient and more efficient firms is generally highest among SMEs.

4.17 Similarly, relative to inefficient firms, highly efficient firms are more likely to report formal training for their employees, either in-house or at external training institutions. Except for medium and large firms in Colombia, this result holds in all cases across all firm sizes[10]. The previous analyses indicated that efficiency was improved by skilled worker training but not by formal training for unskilled workers. That result, coupled with the absence of a correlation between efficiency and the proportion of skilled workers employed, suggests that it is formal training that counts for efficiency.

4.18 The distinction between formal training programs and informal on-the-job instruction is also critical. In contrast to formal training, highly efficient firms are less likely to rely exclusively on informal on-the-job training from co-workers and supervisors. With the exception of micro firms in Mexico, this strong negative correlation between informal training and firm efficiency is found for all firm sizes and in all economies for which data on informal training are available. These results are consistent with findings reported in Tan and Batra (1995) of positive and significant impacts of formal training on firm level productivity but

[10] The difference between the inefficient and efficient firms in the proportion of firms providing formal training is not statistically significant in the medium and large size categories in Colombia.

negative productivity impacts of informal training. This is an important result for SMEs given their heavy reliance on informal on-the-job training.

Organizational Factors

4.19 Decisions about technology and skills development are made in the context of the firm's production and work organization. Organizational modes can vary markedly by firm size, and have very different efficiency implications for small and large firms.

4.20 The extent of automation and quality control are two indicators of how firms organize their production. The evidence suggests that, across all economies, efficient firms and SMEs in Indonesia, Malaysia and Mexico are more highly automated, possibly reflecting greater technology and capital intensity, and higher inputs of educated and trained workers to operate this equipment. Emphasis on quality control also appears to be a hallmark of efficient firms, particularly for SMEs in Colombia, Indonesia, and Malaysia. Since quality control to ensure high-quality is widely practiced among large employers, it is not a good discriminating factor for efficiency except among small firms in Mexico.

4.21 Human resource management (HRM) practices that motivate workers and discourage high job mobility can improve firm efficiency by giving workers incentives to learn and acquire new skills. Reliance on female employees and temporary workers are two measures of HRM practices thought to be associated with a transient, low-skill workforce. However, with two exceptions (Mexico and Malaysia), there is no evidence of any systematic link between firm efficiency and the proportion of female employees. The reliance on temporary workers is a more important source of inefficiency, in all four countries for which data are available--Colombia, Malaysia, Mexico, and Taiwan, China.

4.22 Two other HRM practices--deferred compensation and unionization--may have beneficial effects on firm efficiency. Deferred compensation schemes, such as severance pay and pension plans that reward long seniority in the firm, can enhance job attachment and thus encourage skill acquisition (Schiller and Weiss, 1979). Unions play the same role. By giving workers a collective voice and establishing grievance and arbitration procedures, unions can also reduce job turnover and promote workforce stability and training (World Bank, 1995).

4.23 The evidence indicates that highly efficient firms are more likely to have severance pay systems in Indonesia and Mexico and be unionized in Colombia, Malaysia and Mexico (where we know the union status of the firm). In both sets of countries, differences between efficient and inefficient firms in severance pay and unionization are especially pronounced for SMEs[11].

4.24 Finally, we compare the labor turnover experiences of efficient and inefficient firms. The first indicator, a crude measure of labor turnover, is correlated with firm efficiency but only among medium and large firms; in small firms, this efficiency-turnover relationship is

[11] The difference between efficient and inefficient firms in the proportion of firms with severance pay, is not statistically significant in the micro, medium and large categories in Malaysia.

mixed. A second variable, which was discussed in the previous chapter, is whether firms view job turnover of skilled workers as a serious problem or constraint. This variable, available only in Colombia, Indonesia and Malaysia, provides strong evidence that highly efficient firms in all size groups are less likely to see it as a problem.

4.25 To summarize, highly efficient firms, both large and small, have distinct characteristics that distinguish them from inefficient firms. These include investments in certain kinds of technology, reliance on an educated and well-trained workforce, adoption of organizational practices that emphasize greater automation and quality control, and HRM practices that encourage job attachment and skill acquisition. These strategies can have large efficiency payoffs for firms of all sizes.

5

Conclusions and Policy Implications

5.1 The technical efficiency of SMEs is central to the debate about the role of small scale industries in economic development. SMEs are unlikely to be an important source of growth and employment generation if they turn out to be relatively inefficient, with limited ability to compete, survive and grow into larger firms. Some studies find SMEs to be more efficient than large firms in some industrial sectors but not in others, while other studies find them to be less efficient overall. This mixed evidence sends conflicting signals to policy makers about the emphasis to be placed on policies targeting SMEs.

5.2 Our results, based on large samples of firms from five developing economies, suggest a possible explanation for the mixed findings in these earlier studies. Because SMEs are so heterogenous, simple comparisons of the mean efficiencies of different size firms can be very misleading. Thus, while we find that SMEs are less efficient on average than their larger counterparts in all five economies, we also find a significant number of highly-efficient SMEs that are more productive than many large firms. For policy makers, the latter is the more important finding since it indicates that SMEs are not inherently inefficient as compared to large firms.

5.3 Highly-efficient firms, both large and small, have several technological, work force, and organizational characteristics that can, in principle, be emulated by other less-efficient SMEs. Efficient firms have better access to new technology through knowhow licensing agreements, joint-ventures with foreign partners, and export contacts with foreign buyers and suppliers. They have a more educated work force, and are more likely to provide formal structured training to their workers. Their work organization is characterised by greater automation and quality control in production, and by human resource management and compensation practices that emphasize job stability and skill acquisition. The wide dissemination and adoption of these best practices will have productivity-enhancing benefits to less efficient firms, SMEs in particular.

5.4 Policy makers have a role to play in promoting these best practices among SMEs. While markets in these developing economies are generally well-functioning, there is evidence that market failures from poor information, high labor turnover, and imperfect capital markets pose important constraints on training for many employers, especially SMEs. Many of the same constraints are pertinent to other employer decisions tied intimately to training, such as investments in new technology, use of quality control methods, and adoption of high-

performance work practices. The resulting low levels of efficiency limit the contribution that SMEs can make to overall economic growth and to employment generation, and justify government intervention to address these market failures.

5.5 What kinds of SME policies are appropriate, and how these services should be delivered, are design issues beyond the scope of this paper? However, our findings suggest that SME policies should have two features. First, proactive delivery of SME services is critical given the severity of informational constraints among SMEs. As the Malaysian example demonstrates, many SMEs are not familiar with policies specifically designed for them and are often not aware of the potential productivity benefits of using these services. Second, given the strong inter-dependencies that exist between training, investments in technology, and organizational practices, policies should be designed to provide SMEs with a package of integrated services. Mexico's CIMO program, initially designed to give subsidized training to SMEs, has now evolved into one that provides a wide range of training, technical and marketing services. The mid-term evaluation of CIMO indicates that it has been successful in raising the initially lower productivity levels of program participants to that of the control group.

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