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ENTERPRISE TRAINING AND PRODUCTIVITY IN THE MANUFACTURING SECTOR
Malaysia's Experience

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ENTERPRISE TRAINING AND PRODUCTIVITY IN THE MANUFACTURING SECTOR
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1. Introduction

MALAYSIA, a small open economy endowed with rich natural resources, has recorded strong growth in gross domestic product (GDP), low inflation and low unemployment rates in the last few decades. Except in 1985-86 when growth rates fell sharply following global recession, the last two decades under the new economic policy (NEP) witnessed rapid growth. Real GDP recorded a 6.7 per cent annual growth throughout the NEP's 20-year period. Real per capita income increased from RM1,937 in 1970 to RM4,268 in 1990, which was achieved in a relatively stable environment with an inflation rate averaging 4.6 per cent a year. This rapid growth has continued under the New Development Policy (NDP), which replaced the NEP in 1991. During the Sixth Malaysia Plan period (1991-95), the economy recorded an average growth of 8.7 per cent per annum. This rapid growth resulted in an increased per capita income from RM6,099 in 1990 to RM9,786 in 1995 (Malaysia, 1996). Unemployment rate declined from 5.1 per cent in 1990 to a full-employment rate of 2.8 per cent in 1995. In 1995, inflation was only 3.4 per cent. Vision 2020 envisages that for Malaysia to reach developed status by 2020, the economy must double every 10 years between 1990 and 2020. If feasible, then the Malaysian GDP would be eight times larger by the year 2020 than it was in 1990.

Concerted diversification efforts, first in agriculture and later in manufacturing, petroleum and gas, helped change the economic landscape.

Manufacturing overtook agriculture as the main contributor to GDP in 1984 and since 1987. An average growth rate of 10.3 per cent per annum helped raise its share in GDP from 13.9 per cent in 1970 to 33.1 per cent in 1995 (Malaysia, 1996). Exports, powered largely by foreign investment, rose strongly to account for 80 per cent of overall commodity exports in 1995 (Malaysia, 1996).

Annual growth in total manufacturing was 13.3 per cent during 1991-95: 18.3 per cent non-resource-based industries and 9.1 per cent resource-based industries. The main impetus for the export-oriented manufacturing sector was provided by the electric machinery and industrial chemical industries. Domestic-oriented industries recorded strong growth in heavy industries such as iron and steel, fabricated metal and cement industries. Despite rapid growth, however, the manufacturing sector was still narrow-based. In 1995, electrical and electronic products accounted for about 30 per cent of value added, chemical and chemical products about 14 per cent, non-metallic metal products products 7.4 per cent, fabricated metal products 7.2 per cent, textiles and clothings 6.4 per cent, and rubber products 6.3 per cent. The rest only accounted for 5 per cent or less (see Malaysia, 1996).

The government's focus in the manufacturing sector until the 1980s has been on wooing foreign firms to relocate in Malaysia to generate investment and employment. From the 1980s there has been strong emphasis on the development of local firms, beginning with heavy industries and later small and medium scale industries (SM1s). Heavy industries such as automobiles, petrochemicals, iron and steel and cement, are expected to create spin-off effects, particularly on the downstream SM1s. The SMIs are being targeted to contribute in terms of value added and labor absorption in the manufacturing sector from 20 per cent and 30 per cent respectively in 1990 to the level of 40 per cent and 50 per cent by the year 2000 (Malaysia, 1991b). To achieve this, public agencies, *inter alia,* are increasingly providing supporting services such as training, advisory, extension and R & D related services as well as assistance in marketing activities through subcontracting and Government procurement (Malaysia 1991a). Strong growth has also offered the government the leverage to restructure her strategies *vis-a-vis* big firms. Pioneer Status and Investment Tax Incentives were generally granted to export-oriented firms showing a 30 per cent share of local sourcing in overall value added from 1991. This, and the government's Vendor Development Program (VDP) has stimulated the role of anchor companies to develop a few local companies each. The latter includes the training of local firms' employees.

To sustain development in the industrial sector, the government had begun promoting technological deepening with a view to strengthening domestic technological capabilities, increasing productivity and promoting international competitiveness. In this regard, the Government plans to increase its investment in scientific and technological education as well as the development of technical and research manpower. Following the launching of the Action Plan for Industrial Technology Development (APITD), the government is working on transforming science and technology education to foster creativity and innovativeness in the young. Increasing emphasis is in place to develop a high-level core of scientists, researchers, technologists and educationists who can play a major part in advancing technologies (MOSTE, 1990).

To encourage private firms to train their employees to meet the increasing skill requirements of the industrial sector, various instruments have been introduced, such as the double deduction tax incentives (DDTI) and Human Resource Development Fund (HRDF). While the Government provides a supportive role in terms of improving the infrastructural facilities and ensuring a conducive environment for investments and industrial development, the private sector is the ultimate platform to continue the expansion of the manufacturing sector and the upgrading of technological capabilities in the country.

It is obvious that rapid growth has from 1987 catapulted manufacturing to the forefront as the leading sector in the economy. The expansion, especially in the export-oriented sector has, however, led to serious labor shortages (Malaysia, 1994b). It is this widening demand-supply gap, especially in skilled categories which poses problems for vertical expansion in the economy, which leads us to the critical question of training and skills development. How can manpower in the country be generated to meet the requirements of industry? But any policy formulation must take cognizance of existing training structure and mechanisms in the country and the conditions that correlate with higher incidence of training. It is for these reasons we researched for this paper a broad spectrum of firms in the manufacturing sector.

This paper is divided into six sections. After this introduction, section 2 discusses the analytical framework. Section 3 presents data collection methodology. Sections 4 and 5 discuss the survey findings. While Section 4 examines the structure of training in Malaysia, Section 5 focuses on the explanatory variables of training in the country. Finally, Section 6 presents recommendations to enhance industry-driven training in the country.

2. Analytical Framework

ATTEMPTS to formulate policies to enhance training will inevitably require a profound understanding of factors that stimulate training. Some of these factors are institutional and often lie outside the domain of firms, while others emanate from the production floor. For industry-driven mechanisms to evolve, the former will have to be guided by the latter.

Of importance is also the capacity of educational and training institutions to meet industry's needs. Under scrutiny in Malaysia is whether the supply of human capital meets the requirements of a rapidly developing manufacturing sector. More importantly, whether existing supply mechanisms are suitable to solve the mismatch between industry's requirements and manpower turnover and rising wages in Malaysia. If inadequate, what changes are necessary to meet industry's changing needs given the changing factor composition in the country. As is widely acknowledged now, Malaysia is at the top end of the low-wage, low value-added production niche with her status increasingly threatened by low labor cost producers, such as China and Indonesia.

What sort of mechanisms should replace existing ones to make training in the country industry-driven? Should education and training be left entirely to firms? Or alternatively, should markets be given the allocative role and governments made subservient to them? The latter may mean governments, acting on market signals (e.g. firms and their associations requests) direct school and training institutions curriculum, limiting their role to offering the necessary infrastructure to sustain their operations. If information access, underdeveloped capital markets and market failure problems exist, should governments limit their role to reforming them so as to stimulate the establishment of a demand-driven supply capacity of human capital? Should governments intervene more directly to condition the form and content of education and training in the country? Should government intervention be dependent on scale-economies, generic-nature of skills and when risks involved is unlikely to attract private institutions. Or should a blend of market forces and government intervention underpin the development of human capital supply capacity?

Institutional involvement in education and training is obviously unavoidable as even from the transactions cost standpoint (see Chapman, 1993), it cannot be left entirely to firms. Especially under circumstances of market imperfections and failures, governments have a role to play to remove or correct such distortions so that sufficient and the right mix of training is undertaken to meet industry's needs. General education and training need bigger institutions to benefit from scale effects and aggregate capacity dimensions. The question then, is whether firms should govern the operations of these institutions or a blend of governments and firms should govern them. Since firms are generally the ultimate users of manpower, they should have a vital influence on training. Hence, in this paper we examine the extent of firms participation on training mechanisms in the country with a view to elucidating improvements in the extent of coordination between firms and training.

If left entirely to firms to govern education and training, the long-term objectives of continuous technological deepening may not materialize. Smaller firms will be more interested in short-term gains, often working on current prices to maximize gains. Bigger firms, with more market power, may undermine broad-based training as a defensive strategy by acquiring innovative firms. There will also be no competitive pressure to force creative destruction so that old modes of technology may remain too long. Firms, whether big or small, will also have little incentive to innovate if there is no guarantee of windfall gains from it. Under such circumstances, firms may prefer remaining as followers rather than engage in expensive innovative research. Human capital and process skills enjoy no patent control and little transfer barriers. Hence, when there is a lack of external human capital development institutions, pro-active government instruments and cooperation between firms, the emphasis on training might degenerate into deskilling of workers. If left entirely to governments, however, the potential costs of misallocation will also undermine efficiency. Hence, a blend of markets and governments is essential to promote human capital development.

Apart from control issues, training and skills development also involve other structural questions, including firms having heterogenous technological capabilities. There are various sources of technical change that drive productivity improvements. While inventions are rare and occur over long time spans, minor innovations are often the critical channels of technical change. The cumulative nature of technical change enables late corners to start at different levels. As Rosenberg (1982) noted, it is often minor improvements that start of the cumulative accumulation of technology, including learning by doing (see also Setzer, 1974). Where technology evolves quickly, firms may place more emphasis on training. Hence, the structure of innovations and process technologies becomes an important variable in training.

Firms ability to institute effective training is also influenced by the quality of their labor force. It is often the ability of workers to absorb, adapt, assimilate and re-innovate technology which often enhances late comers potential for incremental engineering. Since educated workers are generally better placed to absorb critically new information and work methods, the level of education available in a country is also an important factor in generating skills development and flexibility. Education normally makes workers more amenable to advanced training and skills development.

Past studies have analyzed technology very much as a black box with little disentangling of endogenous factors that explain its evolution. Rosenberg (1982) in an illuminating study, noted the weaknesses of such postulates. The same rationale have also been often used in classifying training. Technological advance has now made it possible to disentangle training and productivity to examine several endogenous factors that explain the relationship between explanatory variables, and training and productivity. This study, *inter alia.* dissects the industry in sufficient detail to identity some of the elements often considered to be embedded in the black box. Such an effort will help us understand better why, what and how firms train and the link between training and productivity.

The next important issue here is circumstances under which firms would seek training once workers are already in employment. Educational, vocational and technical institutions generally feed firms with manpower at entry points, though collaborative links and their judicious administration can stimulate their utilization for off-work training by workers, and where dual training systems exist as in Germanv, their uses continue after emplovment (Marsden and Ryan, 1991). The latter also includes off-work use of public training institutes by workers and the general public. Where it involves direct benefits for firms, decisions on training generally emanate from within firms, though under specific circumstances statutory requirements may force firms to send workers for training.

Since the firm is the central decision maker when it comes to firm-specific skills, we also examine here relevant analytical postulates that explain circumstances under which firms would train their workers, determine the extent of in-house and out-house training and decide between internal and external trainers. These decisions are obviously influenced by other factors; viz. firms innovativeness, employees education levels, degree of competition, government instruments, implicit labor contracts between workers and employers, and supply of external training institutions. The question of internalizing training depends on these endogenous and exogenous factors. If training is dependent on innovations then training intensity will be influenced by firms seeking to move closer to the universe's technology frontier. Under such circumstances, work procedure skills are normally handled in-house. These firms are also likely to hire more educated human capital, place greater emphasis on R&D and machinery and equipment (see Bartel and Lichtenberg, 1987). This is generally the case if firms value long-term efficiency gains. The latter would also require expansionary strategies rather than defensive strategies by firms. Defensive innovations meant to deskill work processes to overcome high labor turnovers will be counterproductive.

Some skills are process-specific, e.g. the use of tool and die making skills for ancillary support in electronics assembly, machine tool manufacture, textile weaving and toy assembly. Work procedure skills here are neither product-specific nor firm-specific. Such process-specific generic skills training which can obviously attract a wide range of trainees is generally more economic to organize out-house at centres located close to industry. Since such centres are likely to utilize expensive machinery, instructors and other facilities, information access and inter-firm collaborative links are vital to amortize investments and thus sustain their efficient operations.

Management and organizational skills are generally fairly universal, i.e. they transcend across industries. Generic aspects of these skills can also be aggregated at training centres rather than locating them in-house. Firm-specific attributes relevant for fine-tuning these skills in firms can obviously be handled in-house. The extent of influence these skills will have in developing economies is quite often influenced by ownership and size characteristics of firms. Bigger firms tend to emphasize and hence train their employees more. Export-oriented foreign firms with generally bigger productive capacity may also be better placed to train their employees more.

Dynamic management is also important in explaining emphasis on training in firms. Long-term orientation often lead to better employment practices, significance offered to training and remuneration. Such firms tend to prefer flexible or neo-Fordist production organizations so that employees can undergo continuous training on a multiplicity of skills. Employees are given the opportunity to reason and responsibility over work stations so that elements of team-working and innovative control circles become central to skills formation and production. Quality control circles (QCCs), total productive maintenance (TPM), statistical process control (SPC), just-in-time (JIT), integrated materials resource planning (MRP II) and some more recent cooperative organizational skills are fed now increasingly to employees (see Rasiah, 1994; 1995). Indeed, the flexibility offered by such state of the art process techniques improve firms ability to respond quickly to volatile chances in markets, thereby making them as effective tools for making industry demand-driven (see Imai, 1987; Lubben, 1988; Best, 1990).

Under conditions of a tight labor market and where skills transfer.and job-hopping are serious problems, firms may only be prepared to expose their workers to expensive training methods if binding contracts exist. As is common, few statutory regulations actually restrict the outflow of workers. Hence, firms often resort to seniority wage systems or bonus claims systems (the latter maturing only after a period of working) to prevent turnovers. Employees leaving will have them forfeited (see Lazear, 1981). Such controls will, however, not restrict the diffusion of skills to employees of other firms through interaction.

Where developed vocational and technical training institutes exist, firms will rely more on them for basic skills in the employees hired and refer to them whenever the derived generic skills are fairly common to industry. Collection of a levy and corporatized payment systems may sustain these institutions. Firms do not directly pay the reproduction costs of schooling, vocational, technical institutes and polytechnics. Tax generated from firms may, however, indirectly go to funding these institutions. The human resource development fund does not meet these costs. It is only an expense to stimulate training in firms. A levy is collected from the payroll of firms employing 50 and more employees which can then be reclaimed by the firms if approved training is carried out, including in training and skills development institutions (Malaysia, 1994c). Given the infancy of the levy system in Malaysia, these institutions and mechanisms are coming under increasing scrutiny.

The nature of industrial relations systems too can have an effect on firms' training methods. Contrary to perceptions of unions being detrimental to training, where firms engage in state-of-the-art production technologies, both the conditions imposed by tripartite relationships and the necessity to remain competitive force both firms and employees to cooperate to intensify training and retraining. The German and Japanese models are the classic cases here, though the former has often generated rigid training orders. Tan *et al* (1992) found similar results from the U.S., Australia and Britain. Where unions and managements are confrontational, this may not arise as mistrust between the two will limit long-term relationships which can otherwise actually benefit both parties. Also, where specific trade-based unionisation is involved, it can fetter multiskilling.

Training is also often influenced by the nature of the industry involved. Certain skills may be specific to particular industries which given scale economies, may be very few in the country, e.g. heavy fertilizer manufacturing, steel making, klinker production and motorcar assembly, so that specialized institutions may be overly-expensive to erect out-house training if relationships between competitors are not cooperative. When collaborative relationships are involved, then even here generic skills can be shared. Nevertheless, given the smallness of numbers involved, these firms tend to concentrate on specialized training in-house and abroad. The lack of collaboration in training to cheapen costs can also arise if protection is excessive. The lack of competition often prevents the positive effects of the gales of creative destruction so that old methods and skills tend to remain too long.

The converse is often the case in competitive industries where firms are often forced to train workers continuously. Excessive competition can obviously bring the reverse effect as firms may prefer to be followers of skills and technologies innovated by leaders. Without entrepreneurial gains, firms would generally become waiters and in that way eventually slowdown innovations, and hence new skills and training methods. Transparency of knowledge and skills, despite their advantages, will also encourage waiting rather than aggressive innovations. Despite these market constraints, however, open economies are more responsive to training and productivity improvements. The discipline of competition opens firms to the "gales of creative destruction", thereby forcing firms to train. Hence, open markets or the degree of export-orientation is another critical variable that should be correlated with training, and in the long term productivity.

Using this rationale, we formulated our research framework, matching the relevant variables that influence training and its overall link with productivity.

3. Data Collection

WE adopted a structured research procedure with the assistance of a generic questionnaire provided by the World Bank. The base level used is the 1988 Manpower Report undertaken by the International Labor Organization (ILO). The original composition used was the 3000 firms from the 1988 sample to net a minimum 1500 firms. No resarnpling was carried out for these firms. Another 500 firms were chosen from an initial sample of 1500 that began operations after 1989. A clustered random sampling procedure was employed here using a sampling frame from the Department of Statistics (DOS). An additional 100 firms each were chosen from Sarawak and Sabah from a sample of 200 each. Firms were chosen using size and industry criteria. An additional criteria of location (state) was added after the sampling. The state criteria became important later as the replacements for non-responses were taken based on size, industry and state.

The composition of the sample changed in the course of the survey due to the usual problems of poor responses. New firms were added to make the numbers. Responses from the states of Selangor and Wilayah Persekutuan (Federal Territory) were quite poor (see Appendices 1, 2 and 3). The final composition, however, is not substantially different from the initial composition, and as such is unlikely to distort seriously the findings. Given that the sampling frame was classified as confidential, we presented our data unweighted.

The characteristics of firms in the sample were fairly mixed. Of the 2200 firms, the eventually achieved breakdown were 42 per cent, 17 per cent, 11 per cent, 11 per cent, 9 per cent and 10 per cent respectively of employment sizes 1-50, 51-100, 101-50, 151-250, 251-500 and above 500 respectively. To facilitate a policy-related discussion, the size breakdown 1-49 and 50-100 have been used quite widely in the paper. The breakdown by industries inevitably varied considerably with more than 50 per cent of firms in pottery, china and earthenware, electric machinery and scientific instalment having an employment size exceeding 250. Of the 14 states in Malaysia, including Wilayah Persekutuan, Johore (421), Selangor (334), Penang (330) and Perak (293) have the highest number of firms.

A fairly comprehensive questionnaire detailing information on the basic aspects of firms' operations, their subsidiaries, prime products, markets, equity sources, employment structure, conduct and performance figures, were used. There were emphasis on employment regulations, remuneration, gender breakdown, hierarchical occupational breakdown, process technology such as machinery and equipment and systems technologies. The core of the questionnaire zoomed in on why and how firms train, their training methods, extent and significance of training, institutions involved, statutory influences and industrial relations practices. In fact, by disentangling firms operations, including the structure of production organization, we have been able to identify in detail factors influencing training, and its relationship with productivity.

4. Training Structure

WITH increasing emphasis on training necessitated by developments in the market place and government legislations, training programs and institutions have mushroomed in the country. It is thus, interesting to examine the extent of emphasis firms place on training, training types, training institutions, workforce structure undergoing training and government legislations relating to the promotion of training. Also of significance is the link between the type of firms and training based on ownership, industry, size and state.

The lack of supply capacity to meet industry's demand is glaring from firms' complaints (Table 1). We questioned firms about the main problems they were facing with their seriousness ranked 1 to 5.[1] The average score derived clearly puts labor supply and workers quality and skills as the most pressing problems. Labor supply appears most acute in mainly labour-intensive industries, such as textile, wearing apparel, footwear, rubber, plastic, pottery, china and earthenware, glass, electric machinery, scientific instruments and other manufactures. The lack of workers' quality and skills appears most serious in leather, footwear, printing and publishing, glass, non-ferrous metals and

[1] We had originally included an "others" category but eventually abandoned it as its results were unreliable.

scientific instruments. Given the problems, it appears obvious that the supply-side instruments have not been delivering sufficiently the needs of industry. In addition, the lack of labor supply suggests serious rigidities that have restricted labor mobility, and excessive industrial promotion through supply-side incentives.

Despite shortages in skilled labor and growing interest in training, the sample results do not reveal strong participation by firms. Few firms in the sample have their own training center. Overall, only 8 per cent of the firms in the sample had their own training center (Table 2), which given scale effects is understandable. Apart from petroleum refineries which had 1 firm (33%) having its own training center, glass (25%), beverage (18%), transport equipment (14%), pottery, china and earthenware (13%) and electric machinery (1 2%) were the next highest owners of training centers. Also, the share of firms having employees with training responsibility was not high. On average, only 29 per cent of such firms in the sample had staff with in-house training duties. The share was, however, fairly high for glass (50%), electric machinery (50%) and fabricated metals (50%). Few of such firms having employees with training responsibility used external institutions to train their staff, only 10 per cent of such firms in sample utilized external institutions for training. The incidence within manufacturing was highest in scientific instruments (29%) and electric machinery (27%). Only 5 per cent of these firms used external trainers whilst another 16 per cent used external training institutions. The incidence of they using external institutions was generally higher amongst larger industries, for example, in scientific instrument (47%), electric machinery (35%), beverage (35%) and industrial chemicals (35%) and petroleum refineries (33%).

The incidence of training is strongly correlated with size. As shown in Table 3, the incidence of firms utilizing all 5 modes of training studied here generally rises as size increases. The least utilized channel is own training centers, and external institutions for firms having staff with training responsibility and those without training responsibility to train employees in-house; varying from 2.0 per cent, and 1.3 per cent and 2.4 per cent respectively from employment category 0-49 to 25.0 per cent, and 36.3 per cent and 47.6 per cent respectively for employment category above 500 in the sample. As expected the incidence of firms having informal in-house training was high across the sample, though, size effects again was important. Among states, Perlis had the highest incidence of own training centers and staff with training responsibility (Table 4), but given that only 7 firms come from there, it is probably not reflective of the status of training there. Selangor, Malacca, Penang and Negeri Sembilan in general showed the next highest incidence of training. Given the large number of firms taken from these states, the results can be expected to be reflective of the status of training in these states.

Overall, the average training expense borne by firms in the sample for in-house training with external trainers and formal out-house training were RM6049 and RM6302 respectively in 1993 (Table 5). The share of firms that sought the two types of training in the sample were 15.5 per cent and 26.3 per cent respectively. The incidence of firms seeking training has been even lower amongst firms with no in-house staff training responsibility. Within manufacturing, the percentage share of firms using in-house training by external trainers was highest in scientific instruments (47%), electric machinery (35%), beverage (35%) and industrial chemicals (35%). The percentage share of firms using training through formal out-house training institutions was also high in almost similar industries, such as in industrial chemicals (53%), glass (50%), electric machinery (48%) and scientific instrument (41%).

It is difficult to compare the utilization of private and public training institutions since they serve different purposes, and operate under different conditions. This is particularly so if the extent of usage is examined, as government institutions are subsidized, operate with quite rigid enrolment rules and generally do not absorb in-service training. One can, however argue that rigidities that are endemic to public institutions should be removed to make them more demand-driven. The most widely utilized training bodies by sample firms appear to be private institutions (Table 6). Overall, 61.0 per cent of employees that sought training/education in external institutions went to private institutes. Although these figures are not indicative of the quality and marketability of the respective institutions as places in government-run and private-run with government supported skills development centers are limited, the figures do offer the background of training sources of employees working in the manufacturing sector. Petroleum refineries (99%), beverage (86%) and food (86%) showed the highest incidence of firms using completely private training institutions. Employees from glass have not sought any training in private institutions. Participation in private training institutions was also low from miscellaneous petroleum and coal (3%), tobacco (16%), and furniture and fixtures (18%). Participation in completely private run institutions for the biggest export-oriented industry of electric machinery was only 38 per cent. Despite their evolution since 1989, participation in skills development centers (SDCs) appears quite impressive. Electric machinery which dominate membership in the SDCS, shows that 50 per cent of their employees have sought training in them. The success of Penang Skills Development Center (PSDC) led to Selangor, Johore, Kedah, Perak, Negri Sembilan, Malacca, Terengganu, Sabah and Sarawak seeking their assistance to start similar SDCs in their states. With the exception of glass which received all employees that sought external training in advanced skills training institutions in 1993, the other industries figured little in such institutions.

Participation in government-run polytechnics, industrial technical institutes (ITIs), Institut Kemahiran Mara (IKM) and Youth Training Centers (YTCS) were generally low. Overall, only 9.2 per cent of employees in sample firms sought external training in polytechnics, ITIs, IKMs and YTCs combined. The figure was, however, high in miscellaneous petroleum and coal, furniture and fixtures, tobacco and leather. Given that these industries use largely small-scale technologies and private training institutions and skills development centers (SDCS) dominate in the more important industries, it suggests that governrnent-run training/educational institutions are not big enough to take more students seeking such training.[2] As noted earlier, a more plausible explanation is the fact that government institutions offer limited places with generally more stringent entry requirements than private institutions.

The survey also shows little participation in joint training programs with other firms. The overall participation of firms through industry associations, government institutions, *ad hoc* arrangements, special training institutions, suppliers and buyers in the sample were 3 per cent, 2 per cent, 4 per cent, 3 per cent, 3 per cent and 2 per cent respectively (Table 7). Glass, however, showed noteworthy participation in *ad hoc* arrangements (25%) and special training institutions (25%).

[2] It will definitely help to undertake a workers' responses study to establish the reasons behind such a pattern.

Table 8 shows the important areas of training undertaken by firms for engineers, supervisors, technicians, and skilled and unskilled workers. The most important area was on-the-job training irrespective of job category. The remaining areas were production control/management, safety and health, and quality control. For technicians, also important was technical skills training, whilst for the remaining categories, motivation is quite significant. There was no clear differences among firms of different size and location.

Tables 9 and 10 show the relationship between training areas and foreign ownership. We used two categories of workers to examine training areas utilized and foreign ownership; viz. skilled and unskilled. Although more firms that utilized training were owned completely by local capital, the incidence was higher for firms having foreign equity ownership. There was, however, no clear relationship between training utilized and degree of foreign ownership. This was the case even when we used only three categories (0%, 1-49% and 50-100%). For skilled workers, on the job training was generally the highest utilized area of training. The highest incidence was found amongst firms having foreign ownership of 51-75 per cent (24.4%) and 1-25 per cent (21.4%) (Table 9). The incidence of firms using health and safety training was highest amongst firms with foreign ownership 51-75 per cent (11.0%). System and procedure training also showed higher incidence of utilization in firms with foreign ownership 51-75 per cent (11.0%). The remaining training areas for skilled workers were fairly insignificant. For unskilled workers too, on the job skilling was the main source of training, the highest incidence found amongst firms with foreign ownership 51-75 per cent (20.7%) and 76-100 per cent (17.8 per cent (see Table 10). The incidence of usage of other training areas for unskilled workers were generally insignificant.

In terms of market orientation and types of training areas emphasized, on-the-job skilling was the most widely utilized for skilled and unskilled workers in the sample (Table 11 and 12). The remaining training areas were generally insignificant. The incidence of usage of the different areas of training was higher amongst firms that export, though there was no clear pattern with the share of exports in output. For example, firms with export/output share of 1-25 per cent (15.9%) showed the highest utilization of on-the-job skilling for skilled workers (Table 11). The highest incidence for on-the-job skilling for unskilled workers was reported for firms exporting 76-100 per cent (15.3%) of output (Table 12). This uneven pattern might explain the insignificance of exports in the five different training modes utilized (see Section 5. 1).

The evidence assembled does show the utilization of various training modes in the manufacturing sector in Malaysia. Government training institutions tend to figure little in employee training; their relatively strong involvement is obvious only in small-scale low technology industries. There is, however, an interesting development as some big industries such as export-oriented electric machinery, located in the more industrialized states, show strong reliance on skills development centers. Private training institutions appear to generate the most training in the manufacturing sector, though, their involvement in specialized fields such as glass has been limited or none at all. Given the lack of flexibility and limited demand in these industries, the risks of non-utilization of training facilities are higher in these industries for private institutions. We will examine the main factors that influence training in the manufacturing sector in Section 5.1 and subsequently its relationship with productivity in Section 5.2.

5. Training and Productivity

IN the previous section we examined the levels and types of training that has taken place in Malaysia's manufacturing sector. Despite its relatively shallow utilization, some training patterns can be observed from the survey. In this section, we attempt to look at the strengthening and inhibiting factors that characterize training incidence in the country. Training is generally influenced by a multiple set of variables. Following our analytical exposition in Section 2, we may assume that ownership, size, industry-type, technology-type (e.g. process techniques, product, machinery, emphasis on R&D), market orientation, educational level of workforce, statutory legislations governing training, structure and permanency of workforce, labor turnover rates, union membership and wage levels influence training.

5.1 Determinants of Training

To examine the incidence of training in the sample with the set of independent variables discussed in section 2, we used the probit model (yes=1 and no=O) (see Appendix 4). The results of all five dependent variables ($T_1...T_5$) on training produced significant results. For T_1 (firms with employees having training responsibility), R&D, labor turnover, size, new product extension, ISO 9000 series certification, firm size and new process technology produced highly significant results. All significant variables showed positive relationship with firms having in-house trainers. Holding other variables constant, 1 percentage point rise in firms with R&D will raise the probability of firms having their own in-house trainers by 0.37 per cent. *Ceteris paribus*, 1 per cent rise in new product extension will raise the incidence of firms having their own in-house trainers by 0.30 per cent. Holding all other variables constant, 1 scale increase in size will raise the incidence of firms having in-house trainers by 0.08 per cent, which being close to zero, is statistically weak. The similar effect of 1 percentage point increase in labor turnover will raise the probability of firms having their own trainers by 0.22 per cent. Holding other variables constant, 1 per cent rise in firms using ISO 9000 series will raise the incidence of firms having their own in-house trainers by 0.36 per cent. *Ceteris paribus*, 1 per cent increase in firms introducing new process technology will raise the probability of firms having in-house trainers by 0.19 per cent. At the 10 per cent level, educational level and machinery age becomes significant but given their closeness to zero they reveal little statistical relationship. Apart from labor turnover, education and machinery age, the significant results support our theoretical postulates that technology and increasing size would tend to raise the incidence of training.

T_2 (use of external institutions in in-house training) assumed slightly different results. In addition to size, R&D, ISO 9000 series and new process technology, educational level, DDTI and use of fully automated machinery were also significant. *Ceteris paribus*, 1 per cent rise in size will raise the incidence of firms using external institutions to train employees in-house by 0.20 per cent. Holding other variables constant, 1 per cent increase in firms claiming DDTI will raise incidence of firms utilizing external training institutions for in-house training by 0.45 per cent. With other variables held constant, 1 per cent rise in education will raise the probability of firms using T_2 by 0.12 per cent. The similar effect of utilizing R&D, ISO 9000 series, fully automated machinery and new process technology will bring an increase in the incidence of T_2 by 0.36 per cent, 0.68 per cent, 0.25 per cent and 0.25 per cent respectively. At the 10 per cent level, *ceteris paribus,* 1 per cent rise in the use of know-how agreements or licensing will raise the incidence of T_2 by 0.23 per cent.

Fewer variables were significant when T assumed own training center. This can be expected as only 8 per cent of firms in sample had such centers. Holding other variables constant, 1 per cent increase in size will raise the incidence of firms having their own training center (T_3) by 0. 8 per cent. The similar effect of a 1 per cent rise in firms utilizing R&D on T_3 was 0.29 per cent. Union membership showed an inverse relationship with T_3; 1 per cent rise in firms having union membership will lower training center ownership incidence by 0.41 per cent. This could be a result of firms with unions being reluctant to install their own training center, or that many firms who have such centers do not have unions. We may undertake industry-level assessment to examine intra-industry effects at a later stage. This is the case with most firms in the electric machinery industry. The inconsequential effects of unions on training obviously raises the role of unions in the country.

T_4 (incidence of firms sending employees outside for training and courses) shows a strong relationship with technology, statutory and size variables. The probability of T_4 rises by 0.45 per cent when the incidence of firms claiming DDTI goes up by 1 per cent. It appears that the DDTI had been an important training stimulant. Holding other variables constant, 1 per cent rise in size will raise the incidence of firms sending employees outside for training/courses by 0.19 per cent. Similar effect of 1 per cent rise in firms utilizing fully automated machinery, HRDF, R&D and ISO 9000 series on T_4 were 0.34 per cent, 0.38 per cent, 0.26 per cent and 0.28 per cent respectively. Holding other variables constant, 1 per cent rise in education will raise T_4 by 0. 10 per cent. Machinery age was inversely correlated with T_4, but its coefficient was statistically insignificant. It can be seen that technology and statutory variables have a strong influence on T_4.

T_5 (informal in-house training) had fewer significant relationships. Albeit the effects of size on training was generally positive, most firms irrespective of size generally carried out informal training. T_5 showed highly significant positive relationship with HRDF, educational level and utilization of R&D. Keeping other variables constant, 1 per cent in HRDF registration will raise the incidence of training by 0.44 per cent. The similar effect of education and R&D on T_5 were 0.10 and 0.75 per cent respectively. Labor turnover had a negative relationship with informal training at the 10 per cent level of significance; 1 per cent increase in labor turnover will reduce training by 0.14 per cent. The incidence of informal training in-house appears to fall as labor turnover rises. The inverse relationship between labor turnover rate and the use of in-house trainers may suggest either that employees trained tend to seek employment elsewhere, or that firms train less due to high labor turnovers. Either explanations could be plausible especially if wages do not rise with increased levels of training. Overall model T_5 was generally less significant due largely to extensive participation of most firms in in-house informal training.

Taken together, the most influential variables on training appear to be technology-related. Investment in R&D and utilization of ISO 9000 series generally shows the strongest statistical relationship with the incidence of training. Yet only a small share of firms invested in technology enhancing factors; only 17.3 per cent carried out R&D and 32.2 per cent and 25.7 per cent had introduced QCC and SPC techniques respectively in the sample. In fact, as our survey shows, the prime limiting factors on training reported by firms is technology related as the two most important reasons relate to inherent technological characteristics. Size, though has significant results, shows a weaker statistical relationship with training than R&D and ISO use. Bigger firms with better educational and managerial capability often tend to train their employees more, but its impact on T_5 is generally small. The results reflect only a slight increase in training as size rises. Interviews, however, reflect that small firms lack the human resources to send employees out for training or to free them from production so that they can be trained in-house. Also of significance is the lack of information on various incentive packages that are available to obtain loans at below market rates from the industrial technical assistance fund (ITAF). The low levels of educational qualifications obtained by the owners of several small enterprises has also inhibited their participation in such programs. Although there is a proliferation of consultants specializing on interfacing between firms and government/training institution to help them coordinate better their activities with assistance schemes and statutory regulations, it will take time for small firms to recognize their importance.[3]

New process technology is the next most important variable. Firms with the need to introduce new technology are obviously forced to train their employees more. Computerization, line automation (both of which also sometimes pick up the use of QCCs and SPC) and installation of new production machinery have a strong impact on firms using own or external trainers in-house, and the use of own training centers. Automation (as reflected by the use of fully automated machinery) had a significant and strong impact on the use of external institutions to train employees in-house and on sending employees outside for training as the statistical relationship is fairly strong.

The level of education, though has been highly significant in 4 of the 5 models we used, is statistically quite weak, suggesting that other variables offer

[3] We interviewed two consultants who worked as intermediaries between firms and government

greater influence on the incidence of training. Also, the results suggest more vertical job mobility in the manufacturing sector. Formal schooling qualifications do not appear to restrict upward mobility. Hence, entry point qualifications is statistically not very strong.

Statutory regulations do have strong influence on certain modes of training. HRDF offers a significant and fairly strong statistical influence on informal in-house training and training/courses pursued from outside. The influence of DDTI on the use of external institutions to train employees in-house and on the incidence of employees sent outside is significant and strong. Otherwise both !egislative instruments reveal generally insignificant results. Given the way DDTI was operated where approved institutions were important for qualifying, it is understandable that DDTI generated higher utilization of formal training channels.

Exports which was positively correlated with training incidence in a two variable probit model, when run with the other variables generally yielded insignificant results. It appears that export-orientation which is often a driver of efficiency enhancement is less significant than technology and statutory variables in explaining training in the manufacturing sector in Malaysia. This could also be a consequence of the use of the HRD Act which makes it mandatory for firms to train their employees to reclaim their contributions to the HRDF (Malaysia, 1994c).

Wages and union membership also generally did not yield significant results. Wages may have been affected by location and industry type variables. Of the 5 models, labor turnover rate's influence on only the incidence of firms

bodies.

having employees with training responsibility was highly significant. The seriousness of labor turnover in inhibiting training reported by firms was even though important, was less significant than technology variables. Besides, union membership was negatively correlated with the incidence of firms having their own training center. The general insignificance of wages, labor turnover and union membership on the incidence of training suggests problems of information access and labor market rigidities in the country.

5.2 Productivity Effects

Having looked at variables influencing the training, we now turn to observing its influence on productivity. For this purpose we used the Cobb-Douglas production function. We used a model with 9 variables, controlling for technology, export and ownership effects. The results of the five alternative models are shown in Appendix 5. Two different proxies were used for the training variable, viz, a dummy of 1 when any of T_1... T_5 =1 and 0 otherwise, and logarithm of formal external training expense incurred by firms. T_5 was dropped as it is an unreliable measure of training. Va_1...Va_3 were run with training, and Va_4 and Va_5 were run with formal training expense. We found all prime production function variables in the 5 models statistically strong wit t ratios significant at the 1 per cent level. The explanatory power of the models were, however, not very strong.

In all 5 models, log(capital) and log(labor) are statistically strong and significant (at the 1 per cent level). Holding other variables constant, a 1 per cent rise in capital will raise value added by 0.239 to 0.323 per cent under models 1 - 3. *Ceteris paribus*, a 1 per cent increase in labor will raise value added by 0.530 to 0.652 per cent. When a training dummy was used, education was significant at the 10 per cent level in models 1-2, and at the 5 per cent level in model 3 (see Appendix 5 for the semi-parametric classification of the training dummy). Training was generally insignificant in models 1-3. Training, however, was significant at the 5 per cent level when formal training expense incurred for sending employees outside for courses/training. Since expense will tend to reflect intensity more than the training dummy, we think models 4 and 5 should be more useful, though training was generally insignificant in model 5. Using model 4, *ceteris paribus* a 1 per cent rise in external training expense will raise value added by 0. 124 per cent. Education is generally insignificant when expense is used as the proxy for training. Foreign ownership (at least some foreign equity) dummy was significant at the 10 per cent level in models 4 and 5. Holding other variables constant, 1 per cent rise in the incidence of foreign ownership will raise log(value added) by 0.336 and 0.438 per cent in models 4 and 5 respectively. Technology transfer, R&D/sales, export/output, and new process technology and product extensions were generally insignificant in all models. These results cannot be interpreted to mean the absence of significant relationships between technology and productivity as the production function approach using the Cobb-Douglas model hardly picks up dynamic non-linear influences (Nelson and Rosenberg, 1993).

The constant, which is big and highly significant in all five models suggest the influence of other variables, possibly technology that has not been picked up effectively by them. If anything there needs to be a more rigorous estimation of all the technology variables, including training, R&D, process and product improvements and technology transfer. More importantly, since all avenues of training and innovation involve long-term scale effects, panel data may be critical to track their influences. This is especially so when detailed interviews with 33 firms showed that R&D participation, in improvement of mature *(d) Flexible Specialization and skilling*

We noted the relatively strong relationship between new process technology (QCCs and statistical process control methods) and training, their utilization has, however, been low. These techniques along with just-in-time, total productive maintenance and total quality management (we did not explicitly report the other techniques in the paper) add flexibility to production so that firms can adapt quickly to volatile fluctuations in both consumer and labor markets and to ensure the continued improvement of production. Hence, we recommend that suitable mechanisms are put in place to expand flexible skilling and specialization across the manufacturing sector. All training institutions should be encouraged to offer training that relate to such techniques. QCCs create a conducive environment for developing and channelling the innovative capacity of every employee towards firms' performance (Imai, 1991). There must also be some rewards for firms and institutions that generate innovations in such process technologies.

Efforts are currently being taken to expand the adoption and utilization of state-of-the-art human resource process technologies in the country. The 9 of the 33 firms we interviewed that reported the use of such techniques appear to have gained substantial efficiency improvements. The PSDC, SSDC, JSDC and the NPC are amongst the institutions promoting such techniques. There must be more concerted efforts to stimulate its usage across the manufacturing sector. The wider use of such techniques will also help expand a demand-driven industry. An institution modelled along SIRIM's framework should be empowered to undertake research and diffusion of process technologies (particularly flexible systems and automation) in the country.

(e) Stimulate more Industry-based Training Institutions in Major Industrial Zones

The share of firms seeking training from skills development centers appear to be impressive despite the fact that they were only established since 1989 and their operating numbers were still very small. The paper (see Section 4) and our own interviews with firms suggest that the SDCs are ideal manifestations of industry's needs and government support to facilitate their achievement. These institutions which have helped reduce duplication costs and attract support from industry to fund lumpy investments in plant and machinery offers state-of-the-art training in the country. An implicit objective of policy is to move towards more employer funding of training.

The effective industry-orientation of such training centers should be a signal for the government to promote its establishment in all major industrial centers in the country. Penang's PSDC has become a model for the setting up of SDCs in Kedah, Perak, Selangor, Negeri Sembilan, Malacca, Johore, Terengganu, Sarawak and Sabah. Interviews show that government involvement is greater in states where industry is not well developed. To ensure that the SDCs become industry-driven, there must be representatives from manufacturing firms to drive industry's needs in such institutions. The PSDC functions this way. It is hoped that the others will utilize such a framework continuously.

To prevent the squeezing out of smaller firms, SDC's control mechanism should have wider participation from SMIs to safeguard their interests. However, once the optimal size of the SDCs' are reached, there must be similar new institutions to overcome the costs of oversize. The ITIs can be revised along the PSDC mechanism. Polytechnics and advanced skills training centers can utilize the industry-influence patterns of the SDCS. The consultation committees do assume such a jurisdiction but its effectiveness will only improve when all the private sector is represented by all industries (5 digit level) and size categories (small, medium and large firms).

Corporatization of government training institutions until diploma level students should be inevitable. The reorientation of government training institutions will inevitably also bring implications for remuneration structures. Given that teachers are part of the moulding mechanism, the new control structures in these organizations should allow remuneration to rise to the level of the private sector. This will help the upgrading of teaching quality and the expansion of teaching staff to meet industry's demand.

(f) *Promoting Greater Training Spinoffs from Successful Companies*

We noted the presence of training derived through buyers and suppliers which was generally low. There can be better support from the government to enhance such technical spinoffs to local firms. The government has launched the anchor and umbrella programs to develop local suppliers. More of such firms should be encouraged to train employees of local firms. To enhance its effectiveness, an institution should coordinate with industry associations to scan skills and parts utilization in firms so as to help match prospective suppliers with buyers similar to that of the vendor exchange programme administered by MITI but on a broader scale. To prevent collusion and misallocation of training, where possible no special incentive should be offered to firms. Nevertheless, where export-oriented firms source a significant amount of inputs from local companies and or train local staff from these companies can continue to be considered for the investment tax allowance.

(g) Complementing Expansion in Technology

The survey results clearly shows a strong correlation between technology related variables and training. Such a relationship is strong, albeit only a small share of firms had invested in R&D, process technologies and received ISO 9000 series certification. Especially R&D, ISO certification and new process technology feature very well with firms showing participation in the five modes of training we examined. Although the ability of firms to involve in such activities will depend on supply of quality personnel, efforts to achieve such technological deepening will inevitably force firms to employ and train such employees. The low level of technology utilized can also be visualized from the fact that a majority of firms reported the utilization of in-house informal training as adequate and mature technologies. Given such a technology trajectory, there must be stronger structural transformation in the economy towards the utilization of more sophisticated technologies if we expect major strides in employee training. Hence, existing mechanisms to expand technological deepening in the country as envisioned in the APITD should be enhanced. There should also be institutional promotion of automation technologies, which with flexible production techniques, can help overcome labor shortage problems gripping the country currently. The survey shows a strong relationship between training incidence, and the utilization of fully automated machines, computerization, on-line automation and use of new production machines. Special efforts (perhaps through the formation of an institution) should be taken to identify continuously aspects of work organization across the manufacturing sector for automation.

(h) Reforming role of Unions

The lack of strong relationship between training incidence, and union membership, wages and labor turnover suggests a lack of supportive skills supply flexibility. Partly, union-employer negotiations have traditionally been revolving around wages and work conditions. Employers normally assumes training responsibility. Partly, the question of how unions should influence training decisions has not been clear. To enhance flexibility, apart from expanding recommendation (a), it may be worth considering encouraging unions across the manufacturing sector to assume an important responsibility for educating and training workers. The importance of cooperation between firms, workers and unions needs to be explored. In doing so it is also pertinent to break strict trade classification of unions so that employees can undergo multiskilling and cross skilling. The extent of workers' mobility should, however, take into account long term training effects so that low labor turnovers can be achieved.

To conclude, training has always been a complex issue. It is nevertheless an important area of policy intervention. An entirely market-oriented approach seems inconceivable. A state training policy is a necessary part of economic management. In particular, it is inconceivable that the state can escape from having a formal and direct effect on training through education policy. It is also difficult to imagine an entirely hands-off approach to training in the labor market where individual externalities are important.

Table 1: Average Rating of Problems Faced by Firms, Sample, 1993

	Raw materials quality	Electricity input/ output	Transport of input/ output	Workers' quality and skills	Labor supply	Machinery quality
Food	2.64	2.42	2.03	2.98	3.57	2.22
Beverage	2.50	3.25	2.55	3.33	3.67	1.91
Tobacco	2.23	1.67	1.64	2.67	3.35	1.27
Textile	2.74	2.55	2.06	3.54	4.13	2.51
Wearing Apparel (exlc footwear)	2.18	2.00	1.90	3.64	4.11	1.95
Leather	3.00	2.78	2.38	3.91	3.83	2.25
Footwear (excl vulcanized, rubber,plastic)	3.40	1.40	2.00	4.00	4.50	1.60
Wood	3.74	2.42	2.14	3.23	3.45	2.16
Furniture & Fixtures (excl metal)	3.13	2.35	2.20	3.58	3.71	2.00
Paper	2.91	1.86	1.76	3.72	3.55	2.58
Print & Publish	2.77	2.25	1.94	3.88	3.67	2.67
Industrial chemicals	2.22	2.52	2.26	3.28	3.31	2.11
Other chemicals	2.00	2.24	2.32	2.73	3.37	1.84
Petroleum refineries	2.00	*1.50*	2.00	2.00	3.00	1.00
Misc Petroleum & Coal	1.43	2.29	1.43	2.75	2.88	1.86
Rubber	2.76	2.45	1.79	3.04	4.04	2.22
Plastic	2.80	2.65	2.17	3.52	4.13	2.27
Pottery, China & Earthenware	3.18	3.00	2.80	3.71	4.46	3.64
Glass	1.71	3.14	2.43	4.00	4.43	1.29
Non-metal Mineral	2.98	2.44	2.36	3.12	3.73	2.42
Iron & Steel	2.60	2.42	2.40	3.75	3.70	2.48
Non-ferrous metals	3.00	2.77	3.00	3.93	3.79	2.92
Fabricated metals	2.25	2.34	2.01	3.12	3.64	2.21
Machinery (excl electric)	2.09	2.10	1.82	3.45	3.74	2.24
Electric machinery	2.26	2.26	2.09	3.21	4.02	2.08
Transport equipment	2.43	2.27	1.93	3.24	3.79	2.28
Scientific instrument	2.57	2.67	1.67	3.92	4.23	2.29
Others	3.27	2.50	2.24	3.60	4.09	2.57
Manufacturing	2.71	2.37	2.07	3.31	3.78	2.23

Source: EPU/World Bank

Table 2: Share of Firms with Selected Sources of Training, Sample, 1993 (%)

		Co.with training responsibility		Co.w/out staff with training responsibility	
	Own training centre	Own trainers	External inst.	External trainers.	External inst.
Food	8	16	3	5	8
Beverage	18	29	29	6	35
Tobacco	10	15	5	0	5
Textile	9	33	6	4	9
Wearina Apparel (exlc footwear)	11	33	5	3	9
Leather	0	25	8	0	8
Footwear (excl vulcanized, rubber,plastic)	0	29	0	14	14
Wood	2	21	3	3	6
Furniture & Fixtures (exlc metal)		29	5	1	7
Paper	6	33	7	9	17
Print & Publish	10	26	11	6	17
Industrial chemicals	6	21	12	24	35
Other chemicals	2	25	9	11	20
Petroleum refineries	33	0	0	')3	33
Mise Petroleum & Coal	11	33	0	0	0
Rubber	11	39	15	4	19
Plastic	5	27	9	3	12
Pottery, China & Earthenware	13	27	7	0	7
Glass	25	50	13	13	25
Non-metal mineral	7	13	3	16	
Iron & Steel					
Non-ferrous metals	9	32	14	5	19
Fabricated metals	0	50	7	14	21
Machinery (excl electric)	7	32	14	2	15
Electric machinery	12	50	27	8	35
Transport equipment	14	36	18	5	23
Scientific instrument	6	47	29	18	47
Others	5	38	11	11	22
Manufacturing	8	29	10	5	16

Source: EPU/World Bank

Table 3: Share of Firms Having Training Facilities and Trainers By Firm Size, 1993,

Size	Availability of Training. Centers	Firms Having Staff With Training. Responsibilities		Firins Without Own Staff With Training, Responsibilities	
		Own Trainers	External Institutions	External Trainers	External Institutions
1 - 49	2.0	16.6	1.3	1.2	2.4
50 - 100	6.8	24.3	6.0	3.3	9.3
101- 150	8.8	33.2	8.8	7.2	16.0
151- 250	9.3	38.1	16.5	6.4	22.9
251- 500	10.5	42.5	18.0	14.5	32.5
> 500	25.0	59.4	36.3	11.3	47.6
Total	8.0	29.4	10.3	5.2	15.5

Source: EPU/World Bank.

Tabe 4: Share of Firms Having Training Facilities and Trainers By State, 1993

State	Availability of Training Centers	Firms Having Staff With Training Responsibilities		Firms Without Own Staff Training Responsibilities	
		Own Trainers	External Institutions	External Trainers	External Institutions
Johor	5.9	34.0	8.3	5	13
Kedah	15.6	30.5	11.7	7	19
Kelantan	5.2	17.2	1.7	2	3
Malacca	6.4	34.6	9.0	5	14
N. Sembilan	7.2	32.5	14.5	4	18
Pahana	1.3	15.6	7.8	6	14
Penang	10.6	34.2	14.5	8	22
Perak	4.8	13.0	5.8	3	9
Perlis	28.6	71.4	14.3	14	29
Selangor	12.3	38.3	17.4	9	26
W. Persekutuan	4.5	29.7	6.3	2	8
Tereng-anu	10.9	17.4	8.7	4	13
Sabah	5.9	29.7	5.0	1	6
Sarawak	4.7	23.4	6.5	1	7
Malaysia	8.0	29.4	10.3	5	16

Source: EPU/World Bank

Table 5: Average Per-firm Training Expense by Industry, Sample, 1993 (RM)

	In house by external trainers % of firms		Formal training outside % of firms	
	with training	RM	with training	RM
Food	8.4	4933	16.3	2678
Bevera.e	35.3	23753	17.7	28513
Tobacco	5.0	2000	20.0	3000
Textile	9.3	6267	14.0	1562
Wearing Apparel (excl footwear)	8.6	647	10.3	24173
Leather	8.3	*5000*	41.7	4417
Footwear (excl vulcanized, rubber,plastic)	14.3	60000	28.6	4014
Wood	6.0	399	18.5	3034
Furniture & Fixtures (excl metal)	6.8	438	17.8	1678
Paper	16.7	4483	25.9	2009
Print & Publish	16.7	5522	22.2	2354
Industrial chemicals	35.3	10590	52.9	13002
Other chemicals	20.5	2023	31.8	247223
Petroleum refineries	333	16667	33.3	100000
Misc Petroleum & Coal	0.0	0	33.3	2967
Rubber	19.1	7232	39.7	60717
Plastic	12.0	2336	24.1	528301
Pottery, China & Earthenware	6.7	1333	46.7	109696
Glass	25.0	13330	50.0	59312
Non-metal mineral	15.8	6296	27.5	14221
Iron & Steel	19.3	11614	29.8	21798
Non-ferrous metals	21.4	3214	28.6	10429
Fabricated metals	*15.5*	9249	29.1	9342
Machinery (excl electric)	17.4	6766	25.6	10207
Electric machinery	35.2	14736	48.4	162663
Transport equipment	23.1	11218	35.9	15506
Scientific instrument	47.1	21031	41.2	1682
Others	21.6	1162	32.4	1534
Manufacturing	15.5	6049	26.3	6302

Source: EPU/World Bank

Table 6: External Training Institutions Used, Sample, 1993*

	Poly/ITI/I KM/YTC	Voc/Tee	Advanced STI	SDC	Private TI	Total
Food	7.2	*0.5*	*0.5*	6.1	85.8	100.0
Beverage	5.2	0.0	8.8	0.0	86.0	100.0
Tobacco	72.0	0.0	12.0	0.0	16.0	100.0
Textile	4.9	4.0	1.6	29.1	60.3	100.0
Wearing Apparel (excl footwear)	1.0	0.0	26.3	7.4	65.3	100.0
Leather	60.3	0.0	0.0	0.0	39.7	100.0
Footwear (excl vulcanized, rubber,plastic)	24.2	0.0	0.0	27.5	48.4	100.0
Wood	2.2	0.0	11.4	15.8	70.6	100.0
Furniture & Fixtures (excl metal)	79.7	0.0	0.0	2.7	17.6	100.0
Paper	16.4	0.0	3.9	3.9	75.8	100.0
Print & Publish	5.2	0.0	0.0	11.6	83.1	100.0
Industrial chemicals	0.5	0.0	2.3	16.0	81.2	100.0
Other chemicals	10.0	0.0	1.1	1.5	87.4	100.0
Petroleum refineries	0.8	0.0	0.0	0.0	99.2	100.0
Misc Petroleum & Coal	91.3	0.0	0.0	6.2	2.5	100.0
Rubber	5.4	0.2	10.8	19.5	64.0	100.0
Plastic	7.0	2.7	4.9	31.4	53.9	100.0
Pottery, China & Earthenware	4.1	2.7	1.4	13.5	78.4	100.0
Glass	0.0	0.0	100.0	0.0	0.0	100.0
Non-metal mineral	15.2	0.8	3.5	4.5	75.9	100.0
Iron & Steel	10.9	14.3	3.7	17.0	54.0	100.0
Non-ferrous metals	0.7	9.1	4.2	14.0	72.0	100.0
Fabricated metals	5.6	6.4	36.3	7.6	44.1	100.0
Machinery (excl electric)	10.0	0.3	2.3	30.3	57.1	100.0
Electric machinery	5.5	1.8	5.2	49.8	37.7	100.0
Transport equipment	13.0	0.7	16.8	6.6	62.8	100.0
Scientific instrument	32.5	8.1	5.7	13.0	40.6	100.0
Others	11.2	0.0	8.3	1.5	79.0	100.0
Manufacturing	9.2	2.4	7.1	29.6	61.0	100.0

Note: * - computed as % of staff who receiving training from outside.
Source: EPU/World Bank

Table 7: Structure of Joint Training programs with Other Firms, Sample, 1993

	Industry association	Govern-ment institution	Ad-hoc arrange-ment	Special training	Suppliers	Buyers
Food	2	3	3	2	3	1
Beverage	0	0	0	0	0	6
Tobacco	0	10	5	0	5	0
Textile	1	4	6	4	3	2
Wearing Apparel (excl footwear)	2	2	2	0	1	1
Leather	0	0	0	0	0	0
Footwear (excl vulcanized, rubber,plastic)	14	14	0	0	0	0
Wood	1	1	2	1	2	1
Furniture & Fixtures (exlc metal)	1	0	3	1	1	3
Paper	4	2	2	6	2	0
Print & Publish	6	3	4	8	6	0
Industrial chemicals	3	3	6	3	3	0
Other chemicals	0	2	0	0	0	0
Petroleum refineries	0	0	0	0	0	0
Misc Petroleum & Coal	0	11	0	0	0	0
Rubber	4	3	7	4	5	2
Plastic	2	2	6	2	3	3
Pottery, China & Earthenware	7	0	7	0	0	0
Glass	13	13	25	13	25	0
Non-metal mineral	2	3	3	4	3	1
Iron & Steel	5	4	5	7	5	4
Non-ferrous metals	0	0	0	0	0	0
Fabricated metals	2	1	3	3	2	1
Machinery (excl electric)	0	2	1	1	2	2
Electric machinery	8	2	8	7	8	6
Transport quipment	3	1	9	8	4	1
Scientific instrument	6	6	6	6	6	6
Others	5	0	3	0	0	0
Manufacturing	3	2	4	3	3	2

Source: EPU/World Bank

Table 8: Distribution of Firms by Important Areas of Training, Sample, 1993

	Technicians		Supervisors		Skilled		Unskilled	
	No.	%	No.	%	No.	%	No.	%
On-the-job skills	166	28.0	276	43.9	248	38.2	236	47.8
Production control	123	20.8	68	10.8	59	9.1	62	12.6
Safety and health	104	17.6	53	8.4	80	12.3	47	9.5
technical skills	48	8.1	32	*5.1*	34	5.2	17	3.4
Systems and procedures	45	7.6	27	4.3	79	12.2	1.1	2.2
Quality control	45	7.6	56	8.9	56	8.6	54	10.9
Basic management	41	6.9	6	1.0	12	1.8	9	1.8
Motivation	8	1.4	66	*10.5*	61	9.4	48	9.7
ISO orientation	6	1.0	6	1.0	6	0.9	3	0.6
Attitude skills	2	0.3	22	3.5	1	0.2	2	0.4
Panning and simple tayloring	2	0.3	1	0.2	1	0.2	1	0.2
Communication	1	0.2	1.7	2.7	8	1.2	3	0.6
Daily duty/house keeping	1	0.2	1	0.2	*5*	0.8	1	0.2
Total	592	100.0	631	100	0 650	100.0	494	100.0

Source: EPU/World Bank

Table 9: Training Areas and Foreign-ownership, skilled Workers, Sample, 1993

Areas	Foreign ownership (%.)				
	0	1-25	26-50	51-75	76-100
on the job skilling	7.8	21.4	17.1	24.4	16.2
Health and safety	2.5	1.8	5.1	11.0	6.3
System and procedure	2.6	4.5	5.1	11.0	5.0
Motivation	2.0	2.7	3.8	4.9	3.3
Production control	2.1	1.8	3.8	4.9	4.7
Quality control	2.0	0.9	3.2	2.4	4.2
Technical	1.4	3.6	0.0	1.2	4.7
Basic management	0.5	0.0	1.3	0.0	2.3
Communication	0.2	0.0	0.6	1.2	0.8
ISO orientation	0.3	0.9	0.0	0.0	0.8
Daily duty and housekeeping	0.3	0.0	0.0	0.0	0.3
Attitude	0.0	0.9	0.0	0.0	0.3
Paucing and simple tailoring	0.1	0.0	0.0	0.0	0.0
Responding firms	1465	112	158	82	383

Source: EPU/World Bank

Table 10: Training Areas and Foreign Ownership, Unskilled Workers, Sample, 1993

Areas	Foreign ownership (%.)				
	0	1-25	26-50	51-75	76-100
on the job skilling	7.4	16.1	15.8	20.7	17.8
Production control and management	2.3	0.4	3.8	1.2	4.2
Quality control and management	1.7	0.5	3.2	4.9	3.7
Motivation	1.8	0.3	2.5	3.7	3.1
Safety and health	1.4	0.4	3.8	4.9	9.3
Te@ical.	0.8	0.9	1.3	0.0	0.8
System and procedures	0.4	1.8	0.0	1.2	0.3
Basic management	0.4	0.9	0.6	0.0	0.0
Communication	0.1	0.0	0.0	0.0	0.3
ISO orientation	0.0	0.0	0.0	1.2	0.5
Attitude	0.0	0.9	0.0	0.0	0.0
Paucing and simple tailoring	0.1	0.0	0.0	0.0	0.0
Daily duty and housekeeping	0.1	0.0	0.0	0.0	0.0
Responding firms	1465	112	158	82	383

Source: EPU/World Bank

Table I l: Training Areas and Export Orientation, skilled Workers, Sample, 1993

Areas	Export/Output (%)				
	0	1-25	26-50	51-75	76-100
On the job skilling	6.2	15.9	13.8	12.3	15.7
Health and safety	1.5	5.3	4.6	0.9	6.4
System and procedure	1.5	4.5	5.7	2.8	6.0
Motivation	2.4	2.6	4.0	1.9	3.3
Production control	1.2	2.9	5.0	3.1	4.0
Quality control	1.1	3.7	2.3	9.3	4.5
Technical	0.7	1.3	1.1	0.8	3.1
Basic management	0.4	0.5	0.0	0.3	0.9
Communication	0.1	0.8	0.0	0.0	0.7
ISO orientation	0.2	0.0	1.1	0.3	0.3
Daily duty and housekeeping	0.1	0.5	0.0	0.5	0.1
Attitude	0.0	0.3	0.0	0.0	0.2
Paucing and simple tailoring	0.0	0.3	0.0	0.0	0.0
Responding firms	961	378	174	106	581

Source: EPU/World Bank

Table 12: Training Areas and Export-Orientation, Unskilled Workers, Sample, 1993

Areas	Export/Output (%)				
	0	1-25	26-50	51-75	76-100
on the job skilling	6.7	11.1	14.9	14.2	15.3
Production control and management	2.2	3.7	2.9	0.0	3.8
Quality control and management	0.8	3.4	4.6	0.9	4.1
Motivation	1.2	3.7	1.7	2.8	2.8
Safety and health	1.2	2.1	5.2	0.0	3.1
Technical	0.8	1.6	0.0	0.0	0.5
System and procedures	0.3	0.5	0.6	0.0	0.9
Basic management	0.3	0.8	1.1	0.0	0.2
Communication	0.0	0.3	0.0	0.0	0.3
ISO orientation	0.0	0.0	0.0	1.9	0.2
Attitude	0.2	0.0	0.0	0.0	0.0
Paucing and simple tailoring	0.0	0.3	0.0	0.0	0.0
Daily duty and housekeeping	0.1	0.0	0.0	0.0	0.0
Responding firms	961	378	174	106	581

Source: EPU/Warld Bank

Appendix 1: Distribution of Firms by Industry, Sample, 1993

Industry	Firms	
	Numbers	%
Food	380	17.3
Beverage	17	0.8
Tobacco	20	0.9
Textile	107	4.9
Wearing Apparel (excl footwear)	116	5.3
Leather	12	0.5
Footwear (excl vulcanized, rubber,plastic)	7	0.3
Wood	233	10.6
Furniture & Fixtures (excl metal)	73	3.3
Paper	54	2.5
Print & Publish	72	3.3
Industrial chemicals	34	1.5
other chemicals	44	2.0
Petroleum refineries	3	0.1
Misc Petroleum & Coal	9	0.4
Rubber	131	6.0
Plastic	133	6.0
Pottery, China & Earthenware	15	0.7
Glass	8	0.4
Non-metal Mineral	120	5.5
Iron & Steel	57	2.6
Non-ferrous metals	14	0.6
Fabricated metals	110	5.0
Machinery (excl electric)	86	3.9
Electric machinery	213	9.7
Transport equipment	78	3.5
Scientific instrument	17	0.8
Others	37	1.7
Manufacturing	2200	100.0

Source: EPU/World Bank

Appendix 2: Distribution of Firms by Size, Sample

Size (Full-time employment)	Firms	
	Numbers	%
1-50	784	42
51-100	366	17
100-150	250	11
151-250	236	11
251-500	200	9
>500	212	10

Source: EPU/World Bank

Appendix 3: Distribution of Firms by State, Sample

State	Firms	
	Number	%
Perlis	7	0.3
Kedah	157	7.0
Penang	330	15.0
Perak	293	13.3
Selangor	334	15.2
W.P.	111	5.0
N. Sembilan	83	3,8
Malacca	78	3.5
Johore	421	19.1
Kelantan	58	2.6
Terengganu	46	2.1
Pahang	77	3.5
Sarawak	107	4.9
Sabah	101	4.6
Total	2200	100.0

Source: EPU/World Bank

Appendix 4: Training Incidence and Firms Characteristics, Sample, 1993

We used the following probit model to estimate the probability of firms raising training institutions/practice. Five different training variables were originally used (T,....T,). T, refers to firms having employees with training responsibility (yes=l, no=o). T, refers to inhouse training undertaken by external training institutions. T3 refers to firms having their own training center (yes=l, no=O) - T4 refers to firms sending employees outside. for training and courses (yes=l, no=O) T, refers to firms having informal in-house training (See Gujerati, 1988; Maddala, 1987).

The independent variables used were Lt (labor turnover rate), union membership (yes=l, no=l), Wa (average wages), DD - double deduction training incentive; HR - Human resource development fund; Au fully automated machinery (0=0, >0 1); Lt - labor turnover rate; Un union membership (yes=l, no=o) ; Wal average wages of skilled workers; Wa2 average wages of unskilled workers; Tpc - new process technology (yes=l, no=o); Tpd - new product technology (yes=l, no=O); Fn - foreign ownership (>=50=foreign); Ex - export (1=0, 2>0<50; 3=>=50=<100) mc - percentage of machinery 1-4 yrs old; Fa - fully automated machinery (1=0, 2>=0<50; 3=>=50=<100) ; ISO (yes-1, no=O) ; LK - technology knowhow or license (yes=l, no=o) ; cons - constant. We eventually dropped some of the variables as their results were generally insignificant.

Independent variables	Dependent Variable (Yes=1, No=0)				
	T_1	T_2	T_3	T_4	T_5
DD	-0.006	0.446	0.165	0.453	0.104
	(-0.046)	(3.164)*	(1.062)	(3.250)-	(0.494)
HR	0.154	0.148	0.205	0.264	0.440
	(1.484)	(1.050)	(1.276)	(2.392)**	(3.275)*
Au	0.066	0.249	0.015	0.335	-0.079
	(0.804)	(2.467)--	(0.132)	(3.925)*	(-0.718)
Wal	0.152	0.220	0.062	0.081	-0.106
	(1.047)	(1.151)	(0.297)	(0.517)	(-0.615)
Wa2	-0.050	-0.237	-0.013	-0.145	-0.054
	(-0.293)	(-1.018)	(-0.053)	(-0.768)	(-0.274)
Edu	0.050	0.116	0.057	0.102	0.095
	(1.916)--	(1.543)	(3.613)*	(3.126)*	*(3.414)*
Sz	0.080	0.201	0.184	0.188	0.025
	(2.639)*	(5.363)*	(4.346)*	(5.909)*	(0.604)
Tpd	0.297	0.114	-0.102	0.120	0.019
	(3.370)*	(1.001)	(-1.817)***	(1.273)	(0.165)
Tpc	0.190	0.246	0.223	0.175	-0.122
	(2.170)**	(2.201)**	(1.756)***	(1.879)***	(-1.068)
RD	0.365	0.363	0.292	0.381	0.745
	(4.072)*	(3.487)*	(2.473)**	(4.062)*	(4.552)*
LK	0.146	0.226	0.031	0.101	0.124
	(1.237)	(1.726)***	(0.210)	(0.822)	(0.617)
Ex	-0.042	-0.053	-0.125	-0.113	-0.050
	(-0.765)	(-0.747)	(-1.571)	(-1.906)***	(-0.694)
MC	0.002	0.000	-0.003	0.003	0.002
	(1.671)***	(-0.227)	(1.530)	(-2.025)	(1.148)
Un	-0.118	-0.253	-0.411	-0.149	0.031
	(-0.779)	(-1.465)	(-2.213)**	(-0.958)	(0.143)
Lt	0.223	0.078	- 0.135	-0.074	-0.142
	(3.426)*	(0.937)	(-1.489)	(-1.078)	(-1.714)**
Is	0.364	0.680	0.102	0.284	-0.182
	(2.828)*	(5.041)*	(0.663)	(2.142)**	(0.938)
Fn	0.133	0.047	-0.030	0.090	0.050
	(1.453)	(0.425)	(-0.242)	(0.936)	(0.389)
cons	-2.603	-3.313	-2.464	-1.894	1.217
	(-3.135)*	(-3.039)*	(-2.123)**	(-2.130)**	(1.250)
X2(17)	199.50	333.62	114.40	349.62	82.57
Prob>X2	0.000*	0.000*	0.000*	0.000*	0.000*
obs	1270	1270	1270	1270	1270

Note: * - significant at 1% level; ** - significant at 5-. level; *** - significant at 10% level.

Source: EPU/World Bank

Appendix 5: Productivity Effects, Sample, 1993

We used the following production function model to estimate the effect of explanatory variables on the growth in production. Nine different variables were used. The normal production function and control variables were used. we also ran regressions by dropping some variables. Apart from dummies and percentage share variables, others are represented by the logarithmic values and hence the coefficients refer to elasticities.

Independent variables	Dependent variables				
	Value added				
	Val++	Va2++	Va3++	Va4++	Va5++
capital++	0.280*	0.279*	0.323*	0.239*	0.297*
	(4.678)	(4.629)	(8.313)	(3.752)	(3.677)
Labor++	0.652*	0.625*	0.571*	0.536*	0.643*
	(7.121)	(6.912)	(10.502)	(5.887)	(4.556)
Education+	0.117***	0.114***	0.088**	0.076	0.130
	(1.913)	(1.852)	(2.031)	(1.063)	(1.526)
Technology transfer@	0.083	0.087	-0.001	-0.222	-0.319
	(0.489)	(0.514)	(-1.063)	(-1.082)	(-1.245)
Training#	0.078	*0.069*	0.084	0.124**	0.063
	(0.389)	(0.339)	(0.761)	(2.082)	(0.703)
New product, process	-0.352		-0.116	-0.228	-0.321
	(-1.562)		(-0.943)	(-0.941)	(-0.889)
Export/output	-0.002	-0.002	-0.001	-0.004	-0.003
	(-1.177)	(-1.015)	(-1.063)	(-1.402)	(-0.929)
R&D/Sales	0.005	0.005			-0.002
	(0.588)	(0.629)			(-0.059)
Foreign	0.249	0.247	0.088	0.336***	0.438***
	(1.500)	(1.481)	(0.793)	(1.756)	(1.739)
Cons	6.852*	6.739*	6.837*	7.497*	5.971*
	(7.890)	(7.745)	(11.548)	(6.815)	(4.493)
Obs	141	141	397	149	69
F	25.11*	27.64*	60.83*	16.94*	13.63*
R square	0.633	0.626	0.556	0.492	0.695
R-bar square	0.608	0.604	0.547	0.463	0.626

Note: ++ ~ logarithmic values; + - weighted with level of education; @ - dummy variable equal to 1 when firm reported licensing or knowhow agreement from foreign sources; # dummy variable equal to one when any formal sources of training were reported (T1..T4), and log training expense incurred when workers were sent outside for training/courses; exports and R&D/sales represent percentage shares; *- significant at 1% level; ** - significant at 5% level; .*** - significant at 10% level.

Source: Computed from EPU/World Bank

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