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Critical Skills for Industrial Development

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INTRODUCTION

Malaysia has experienced extremely rapid industrialization since the recession period 1985-86. Besides experiencing very high growth in industrial output, the rapid pace of industrialization is also accompanied by significant restructuring of industries and major shifts towards mre technology-intensive activities within existing industries. This has resulted in a concomitant rapid increase in the demand for various types of industrial skills and technical know-how.

In light of this recent trend and in view of the ambitious industrial growth targets set by the Industrial Master Plan (IMP) up to 1995, there is a growing concern among national economic planners as well as industrial employers that the country may be running into various skill shortages and bottleneck problems, especially in certain "high-tech" industries that may require new technical skills or professional expertise which previously did not exist in the country. Indeed, complaints by private sector employers are increasingly being heard regarding their difficulties in recruiting certain types of skills, high employee turnover, increasing poaching of staff by other firms, and escalating salaries for certain jobs. The alleged fear is that, unless these problems are effectively overcome, Malaysia's future industrial growth will be choked. The implicit assumption behind such expressed fear is that there is a failure of the market mechanism left to itself to solve this problem, and hence, some form of government policy intervention is needed.

Despite the increasing concern expressed, there is actually very little empirical data available in Malaysia on the extent of critical skill shortages, their incidence by sectors, and their likely causes (see Hollister and Wong 1989). Moreover, the existing discussions on critical skills generally do not clearly define what exactly is meant by a critical skill. The lack of conceptual clarity and empirical database, not withstanding a number of typical responses, appear to have emerged recently regarding how critical skill problems can be overcome.

One typical response is to call for the government to forecast with greater precision and timeliness the demand for various specific skills, so that "proper" planning can be carried out to achieve the required increase in the supply of such skills. Thus, it has been suggested that the manpower demand projections provided in the IMP is too aggregative to provide the necessary guidances and such projections are in any case already outdated. More detailed disaggregation and timely update of such forecasts are therefore necessary. It is alleged, to allow the government training institutions to plan ahead for the development of the new training programs required.

Closely related to the above is the call for greater centralized government direction in determining what skills are required, and in expanding the role of public training institutions to meet such targeted skills needs. This approach can thus be described as a return to the classical *centralized manpower planning* approach.

Another typical response, particularly favored among private sector employers, is to call for greater government fiscal incentives to subsidize industrial manpower training. The proposed incentives range from improvements to the existing double-deduction incentive scheme for training, "bonus" points to be added to existing investment incentives for industrial projects that incorporate significant skill development and directly subsidized government-provided training.

The main argument of this paper is that, while the above responses have their respective roles to play in dealing with the problems of "critical" skills, a more important and effective approach to these problems lies in improving the *flexibility* and *responsiveness* of the *market mechanism* for supply. Rather than supplanting the market mechanism with greater government intervention and centralized planning, the approach should instead strengthen the free market process, including the removal of existing factors that result in market distortions and rigidities.

Central to this argument for a more market-oriented approach is the economic analysis of the factors that determine and influence the emergence of "critical" skill problems. Since existing discussions of the problems of critical skills generally do not clearly define what exactly is meant by a critical skill, this paper therefore hopes to contribute towards this debate by attempting to clarify, at the outset, the concept of critical skills in quantifiable economic terms. It will be clear from such a conceptualization that various critical skill situations either do not involve any market failure at all as alleged. If they do, the means to improve the situations lie not so much in centralized planning and new fiscal incentives for training *perse*, but changes to existing policies that cause labor market inflexibilities or rigidities, as well as changes to policies that affect the structure of industries and capital markets which indirectly influences the labor market.

The organization of this paper is as follows. Firstly, a brief definition of the concept of critical skills in economic terms will be made. A number of simplified models are presented to highlight the key factors determining the flexibility of the labor market for a specific skill. Based on this framework, a further discussion will be made in the third part on how critical skills can be identified for industrial development by providing a number of examples of "critical skill" situations encountered in recent years in Malaysia, and then showing how these situations can be analyzed using the concepts derived from the framework. An examination of empirical methodology problem in studying critical skills in Malaysia will also be made. This paper ends by drawing some implications for government policy in dealing with current and future critical skill problems that the country may face in its industrialization efforts.

CONCEPT OF CRITICAL SKILLS

The most common definition of critical skill might be a skill in a particular sector whose absence or limited availability would cause a bottleneck in the expansion of that sector.

A skill might be critical for a sector not just with respect to expansion but also in the creation of that sector in the first place. For example, if one sought to create a software industry in Malaysia specializing in expert system development, it might well require a minimum number of such software specialists with the necessary knowledge for such an industry to be created.

Critical skills need not be specific to a particular sector in that they may be required across a wide number of industrial and services sectors. Such "generic" or "infrastructural" skills might be skills related to telecommunications, finance, corporate management, or information technology.

Not all skills in shortages should be regarded as "critical" since not all skill shortage situations give rise to serious economic ill effects. One should therefore confine the use of the term to only those situations where the economic "loss" to society as a result of the critical skill problem can, to some extent be said to be significant and moreover persist for a sustained period, or have long-term serious indirect consequences. In particular, significant skill shortages occurring in specific priority industries regarded as strategic to the country's industrialization drive should be accepted as constituting critical skill bottlenecks. Similarly, skills that are found to be required across many important economic sectors should also qualify as critical skills if their supply is limited relative to demand.

Not all skill shortage problems actually manifest themselves in the form of actual and persistent shortages. The short run shortage situation may cause a rapid increase in wage levels which induce supply to increase in the long-run, thereby removing the shortages over the long-term. In practice, a significant increase in reported shortages is usually accompanied by a sharp or persistent rise in wages, and therefore can be taken as symptoms for the occurrence of critical skill problems.

The above are very broad generalizations about what might constitute critical skills. Clearly if one is going to operationalize the concept it is necessary to be rather more precise. It should be evident that a critical skill situation arises from interactions between demand and supply conditions. In an idealized, well operating market economy, the demand for and supply of particular skills would interact and adjust over time so that critical skill shortages would not emerge, or, if they do, would not persist for a long period of time. The occurrence of critical skill situation therefore implies the existence of various constraints or limiting factors preventing such adjustment.

To characterize such constraints more precisely, a discussion will be made on the next subsection of a simple microeconomic model that analyzes the interaction of supply and demand conditions. The model serves as a framework to operationalize the concept of critical skills in a more precise manner.

MODEL OF CRITICAL SKILL SITUATION

Let $D(t)$ and $S(t)$ denote the demand and supply of a particular skill at time t, with time, t ,as a dynamic variable. Initially, it is assumed that the demand function, $D(t)$, depends only on the wage level, $w(t)$, and the Gross Domestic Product (GDP) level, $Y(t)$, of the sector which demands the skill. The supply function, S(t), depends only on the wage level and the aggregate labor force, L(t), of the economy.

$$D(t) = D[w(t), Y(t)] \tag{a}$$
$$S(t) = S[w(t), L(t)] \tag{b}$$

Assuming that Y(t) and L(t) are given exogenously, with respective growth rates denoted as follow:

$$r_Y = \frac{1}{Y} \bullet \frac{dY}{dt} \tag{c}$$

$$r_L = \frac{1}{L} \bullet \frac{dL}{dt} \tag{d}$$

It is assumed that there is a perfect and instantaneous wage adjustment, and market equilibrium is achieved for all time.

$$D\ [w^*(t),\ Y(t)] = S\ [w^*(t),\ L(t)] \text{ for all t} \tag{1}$$

This implies $\dfrac{dD}{dt} = \dfrac{dS}{dt}$ for all t

$$\Rightarrow \frac{\partial D}{\partial w^*} \bullet \frac{dw^*}{dt} + \frac{dD}{\partial Y} \bullet \frac{dY}{dt} = \frac{\partial S}{\partial w^*} \bullet \frac{dw^*}{dt} + \frac{\partial S}{\partial L}\frac{dL}{dt} \tag{2}$$

$$\Rightarrow D\ (-\alpha r_{w^*} + \eta r_Y) = S\ (\beta r_{w^*} + \text{ø} r_L) \tag{3}$$

where: α = wage elasticity of demand
β = wage elasticity of supply
η = employment elasticity relative to sectoral value added
ø = supply elasticity relative to total labor force

$$\text{Hence, } r^*_{w^*} = \frac{\eta r_Y - \text{ø} r_L}{(\alpha + \beta)} \tag{4}$$

For constant α, β, η and ø, equation (4) implies that the equilibrium wage w*(t) will increase at a steady rate if $\eta r_Y > \text{ø} r_L$ and decreases at a steady rate if $\eta r_Y < \text{ø} r_L$. Moreover the speed of this increase or decrease depends inversely on the sum of the wage elasticity of supply and demand; the less elastic the supply and demand curces are, the faster is the change in wage levels required to maintain market equilibrium.

The simple expression (4) is derived assuming instantaneous adjustment of wages for all time t. More realistically, the actual adjustment of market wages would not be instantaneous, but involves some time-lag. To model this effect, let

$Z(t) = D(t)/S(t) =$ ratio of demand level to supply level at any time t.

Note that $Z(t) > 1$ implies excess demand and *vice versa*, and $Z(t) = 1$ only if the market is in equilibrium at time t.

The actual speed of wage changes is, in general, influenced by the magnitude of Z, i.e. how far away the market is from the equilibrium position Z=1. For simplicity, assume the following functional form:

$$r_w = r^*_{w*} + k(1 - 1/Z) \tag{5}$$

where $k > 0$ is a parameter characterizing the speed of wage adjustment, that is the larger k is, the faster would the wage level w_t converge to the equilibrium wage w^*_t level. Note that for $Z > 1$ (excess demand), $r_w > r^*_{w*}$, that is, the actual rate of wage increase is bigger than the rate of equilibrium wage increase when there is excess demand, and *vice versa*.

Differentiating Z(t) with respect to time, one can obtain,

$$\begin{aligned} \frac{\partial Z}{\partial t} &= Z\left(\frac{1}{D} \cdot \frac{dD}{dt} - \frac{1}{S} \cdot \frac{dS}{dt}\right) \\ &= Z\left[-(\alpha + \beta)\, r_w + (\eta r_Y - \o r_L)\right] \\ &= -(\alpha + \beta)\, Z\, (r_w - r^*_{w*}) \end{aligned} \tag{6}$$

Using (5), one can reexpress (6) as:

$$\frac{\partial\,(Z(t) - 1)}{\partial t} = -(\alpha + \beta)\, k\, (Z(t) - 1) \tag{7}$$

$$\Rightarrow Z(t) = 1 + (Z_0 - 1) \exp(-\alpha + \beta)\, kt \tag{8}$$

where Z_0 = initial value of Z at time t = 0.

Note that, as t —> α, Z_t —> 1 (market equilibrium), and the bigger the k is, the faster the convergence.

Using (5) and (8), one can now solve for w_t as:

$$\Rightarrow w(t) = w^*(t) \left(\frac{W_o}{W_o^*}\right) \exp\left(k \int_0^t \frac{(Z_0 - 1)\, e^{-(\alpha+\beta)k\tau}}{1 + (Z_0 - 1)\, e^{-(\alpha+\beta)k\tau}}\, d\tau\right) \quad (9)$$

where w_o and w_{o*} are the initial values of w_t and w_{t*} at time t = 0. Again, as t —> ∞, w_t —> w_t^*.

The above simple model, although still rather crude, serves the purpose of capturing the key parameters that determine whether a critical skill shortage situation may arise. In summary, the factors that might contribute towards a critical skill situation can be identified as resulting, directly or indirectly, in one or more of the following:

1. $\eta r_Y > \o r_L$
2. α and/or β small
3. k small
4. cross-elasticity of substitution by other skills is small;

The result of the above conditions is either a large value of Z > 1 persistently, or a persistently high value of r_w. As discussed earlier, to qualify as a critical skill situation, the skill shortage problem identified above must either affect an industry regarded as a priority or strategic industry in Malaysia, or is a "generic" or "infrastructure" skill common to many important industries in Malaysia.

What are the major factors that may lead to one or more of the conditions above? In what follows, the demand side factors will be reviewed, followed by factors which don't fit neatly into either supply or demand side.

DEMAND SIDE FACTORS

Rapid Sectoral Expansion The most obvious cause for skill shortage is a very rapid expansion of sectoral output (Y) which in turn induces a big increase in all inputs that the sector utilizes, including the particular skills concerned.

Characteristics of Skill-utilizing Technology If the production technology is such that there is little substitutability for a particular skill (fixed-proportion technology in the extreme case), then any growth in the sector would be translated into a corresponding increase in demand for that skill.

Pace of Technological Change and Product Life-cycle Technological change has a profound effect on the type and composition of skills required for the production of a given output level in an industry. It may be that, as an industry expands, there is a systematic shift towards the use of certain technologies which uses a particular skill with a higher intensity than traditional technologies. In such a case, the employment elasticity of that skill relative to industry output (n) may be significantly larger than 1. Hence, as an industry moves through different stages of its production phases, the skill demand for a particular skill may increase at a much higher rate than the industry growth itself.

Industrial Structure of Skill-utilizing Sector The structure of firms operating in an industry may strongly influence the composition and intensity of usage of certain types of skills. For example, an industry dominated by large firms may have higher intensity of employment of engineers than if the industry is comprised of many small firms. Similarly, large multinational corporations (MNCs) operations may adopt a greater level of automation and hence have greater demand for information technologists than if the same industry consists mostly of small local firms.

International Demands for Skills Particular skill groups can be subject to strong demands in the international market place. This has long been referred to as the "brain-drain" phenomenon, whereby highly skilled professionals from developing countries emigrate to the more developed countries due to the higher salaries or career prospects in the latter. More recently, with increasing liberalization of immigration policies in several developed countries, international demands for "experienced" semi-skilled workers have also increased, resulting in "experience-drain" as well.

"Crowding-out" Effect of Public Sector In many developing countries including Malaysia, the public sector has been the largest employer of certain highly skilled and educated manpower. Public policies with regard to recruitment, bondage of scholarship holders, promotion and job-security may dominate the market for certain skills, and may effectively "crowd-out" or otherwise distort the market for such skills required in the private sector.

SUPPLY SIDE FACTORS

Technology of Supply Certain skills are based upon a deep and hierarchical knowledge that requires long formal training, while certain skills may require long practical experience (on the job training) in order for the necessary proficiency to be acquired. Where there are such long gestation periods for the production of such skills, the wage-elasticity of supply (β) is likely to be very low in the short-run.

Low supply elasticity can also be due to economies of scale in the training process itself. If training involves large and expensive equipment, then no such training will be provided for so long as the demand is still insufficient to make such training economical, and once implemented, it is difficult to reduce training output even when demand declines, that is the technology of supply may become highly inflexible due to scale economy. Finally, long curriculum planning and implementation cycle on the part of training institutions may add to the long gestation period.

Barriers to Entry in the Training Market To the extent that training institutions are regulated by the government, it may be difficult for new institutions to come on-line in response to increase in market demand and it may be more difficult for outdated training institutions to shut-down or converted to provide more updated training programs.

Other Barriers to Recruitment Certain government regulations may constitute barriers to recruitment. For example, a licensing requirement may limit the number of persons who can be recruited for certain jobs, even though the actual supply of individuals with the necessary skills may in fact be much larger. In addition to government control, many professional skills are subject to control by their respective professional bodies through the legal requirement for certification. Such control powers are often used to restrict entry and hence limit supply.

Market Failure in Capital Markets Availability of financing for training in particular skills may be an important restriction on the responsiveness of supply. If capital is necessary for the creation of certain training institutions, then the failure of the capital markets to fund such developments will limit the supply of such training.

Similarly, the ability of individuals to finance the costs of training may be limited by their inability to borrow in order to meet. their training and sustenance cost while undergoing training.

Barriers to External Sources of Supply The supply of many skills can be supplemented by allowing foreigners to work in the country. However, many countries have strict restrictions against such external sources of supply, even on a temporary basis.

OTHER FACTORS

Imperfect Information and High Search Cost The elasticities of supply and demand are often reduced due to imperfect information and high search cost. Prospective employers and job-seekers may not be aware of each other's existence, or the prospective employers may not know what the market clearing wage level is and spends too long a time searching the market with wage offers that are too low.

Wage Rigidities Despite rapidly increasing demand relative to supply, the wage level may not rise sufficiently to equilibrate the new supply and demand due to various wage rigidities in the system. Consequently, no new supply is induced, and excess demand may persist for a very long time. Thus, the supply of good researchers may be too low because government research institutions are not allowed to offer flexible remuneration packages that are sufficiently attractive to them.

Time-lags in Expectation Formation Despite rapidly changing market conditions, the expectation of the labor market participants may be conditioned by previous situations, and there may be a considerable time-lag before such expectations are revised. Thus, it may be that certain occupations are historically regarded as "blue-collar sweatshop" jobs (for example mold and die tooling). Even though the industry has subsequently become more modernized and wage and work conditions have become more favorable than before, the old perception may still persist. Similarly, an employer may persist in expecting to recruit certain skills at a previously given wage, even though such wages are no longer tenable under new circumstances.

Externality Considerations Surrounding Human Capital Formation Many skills can be properly acquired only through on the job training (or training that requires simultaneous on the job experience to provide the necessary practical). However, the formation of such skills accrue to the worker in the form of human capital, and hence cannot be appropriated by the employer when the worker leaves. Hence, employer has too little incentives to invest in the training of their workers especially when turnover rates is high. A worker who acquires the necessary training through working in a firm may subsequently leave and start a rival firm, in a sense deriving externality benefits from the first firm.

Skill Mismatch Skill mismatch arises when the market demands one type of skill but the available supply is in another related but not quite substitutable skill. Thus, the market demand may be for "experienced" systems analysts, whereas the available supply is abundant in fresh graduates in computer science with no experience. Even though the total supply of a particular skill group is high in aggregate, the actual supply to specific skill subgroup within this aggregate group may be severely short while there is excess supply in other subgroups.

INTERACTION OF SUPPLY AND DEMAND FACTORS: SOME ILLUSTRATIVE EXAMPLES FOR MALAYSIA

Usually, more than one of the above factors are present in any critical skill situation. It must be stressed, however, that both supply-side as well as demand-side factors must be present in order for critical skill situations to arise. Factors on other side alone is not sufficient. For example, suppose that demand is expanding very rapidly for a particular skill, that is t_Y is large. If supply can be adjusted flexibly, that is $øt_L$ and k are large, then r_w would remain small, and Z quickly converge to 1. So critical skill bottleneck would not occur. This appears to be the situation with general industrial foremen and supervisors. Even though demand has expanded rapidly in recent years due to double-digit industrial growth, supply can be easily expanded through external recruitment or internal promotion as there is little specialized training required. Similarly, the supply of a particular skill was drastically reduced due to a high rate of emigration. If cross-elasticity of substitution is high on the demand side, then the skill supply shortage can be readily replaced by factor substitution. This appears to be the situation for plantation managers, whereby despite of high rate of attrition of expatriate estate managers, their positions can be easily substituted by Malaysian managers. Moreover, much of the plantation management skills are generic and not specific to particular crops.

Therefore substitutability of managers between plantations of different crops exist.

As an illustrative example of a critical skill problem currently existing in Malaysia, consider the case of demand for experienced systems analysts/programmers (SAP). Due to rapid diffusion of information technology in the Malaysian economy in recent years there has been a dramatic increase in the demand for SAPs, (Wong 1988a) especially those with industry experience of 3-5 years. While no comprehensive statistical data are available, the following crude but plausible estimates of the demand and supply characteristics can be made based on the author's field surveys and analysis of available data:

$$
\begin{aligned}
\upsilon_Y &= 8\ \%\ \text{p.a.} \\
\upsilon_L &= 3\ \%\ \text{p.a.} \\
\eta &= 2 \\
\emptyset &= 1.2 \\
\alpha &= -0.5 \\
\beta &= 0.3
\end{aligned}
$$

These estimates imply a r_{w*} value of about 18 percent annum. w The low value of $\emptyset$ is due to the relatively low rate of production of such skills as a result of long gestation period in experience acquisition. Considerable emigration of such skills to other countries in recent years also contributed towards lowering the value of $\emptyset$. The relatively higher value of η is caused by the increasing shift towards information technology usage in the Malaysian economy. The low demand elasticity α is caused partly by the low substitutability of inexperienced SAPs for experienced SAPs and partly by the lack of substitution of human SAP skills by greater automation and capital equipment (system analysis programming work is still highly labor-intensive, although recent developments in computer-aided system engineering (CASE) tools may allow greater automation of software production in the future). The low supply elasticity is related to the long gestation period in training as well as industrial experience acquisition. Barriers to entry by foreigners may also contribute towards the shortage of supply at least in the short run.

Additional factors specific to the nature of SAP demand also contribute towards the critical skill situation. Firstly, despite recent trend towards the use of common operating system environments, most computer system in commercial use today remain fragmented into many different proprietary operating system (OS) and machine-specific environments. Consequently, much of the experience and knowledge acquired by SAPs may be system-specific and hence not easily transferable to other systems. The result is a segmentation of skills and a decrease in substitutability and speed of substitution across segments. Secondly, many industry demands for SAPs require a good knowledge of the business operations specific to the particular industries concerned (for example knowledge of banking operations, material requirement planning in discrete manufacturing and process control operation in process manufacturing). Such knowledge can normally be acquired only through on-the-job experience (rather than formal education) in the specific industries. This vertical market specialization requirement further segments the skill demand, reduces inter-market substitutability, and increases the overall time-lag in adjusting supply to changing demand.

The above example illustrates the need to have a comprehensive understanding of the various factors that affect the supply and demand conditions leading to the occurrence of critical skill situations. Such understanding can usually be developed only through in-depth knowledge of the industry or skill at hand, rather than through aggregate statistical analysis of general-purpose labor force survey data.

IDENTIFICATION OF CRITICAL SKILLS FOR MALAYSIAN INDUSRIAL DEVELOPMENT: EMPIRICAL METHODOLOGY ISSUES

The above example raises the issue of empirical methodology for identifying and quantifying the incidence and degree of critical skill problems for a given skill in a given sector. Clearly, a systematic identification of actual or future potential critical skills that may be encountered in the industrial development of Malaysia requires the availability of comprehensive data on a sufficiently disaggregated level (for example 3 or 4 digit level of the Malaysian occupational classification). Such data are currently not available (see Hollister & Wong (1989) for a review of existing data availability). Essentially, existing general purpose labor and industry surveys such as the Department of Statistics Labor Force surveys and industrial surveys and Malaysian Industrial Development Authority's (MIDA)s industrial survey of companies in production are not suited to provide relevant information on critical skill problems since such surveys cover skill category at a very aggregate level, and the production of survey results generally involves very long time-lag.

In the absence of relevant data from established sources, a second best approach is to rely on timely industry feedback and prompt follow-up with interviews of key industry informants and market monitoring survey targeted at the specific skills at hand. The more responsive is this system of feedback the earlier the problem can be identified so that a more detailed study can be mounted. It is strongly suggested that the industrial trend surveys conducted by MIDA be expanded to cover questions on any serious skill problem that may be expected to arise or may have already arisen. Similarly, the Ministry of Labor might consider expanding its surveys of employment situations of selected industries to cover more industries but with a more focused analysis of specific skill groups in specific industry subgroups. Moreover, the survey should try to monitor some of the key indicators of supply and demand factors. A survey of the electronics industry should not lump all electronics firms together, but should segment between semiconductors and components, consumer electronics, telecommunication and industrial equipment. Moreover, the skill categories to be covered should be more detailed than just "technicians", "engineers" and "managers", etc., and there should be monitoring of the direction of technological change (for example automation) and how they may affect skill composition and intensity.

Another second-best approach is to monitor the skill market trends in countries which are more advanced than Malaysia. The closer these countries are to Malaysia in terms of industrial structure, resource endowments and technological development priorities, the more relevant would such information be. Thus, the growth trends of specific skills in certain sectors (for example electronics) in the Asian Newly Industrialized Countries (NICs) are probably more relevant to us than trends in the European countries. Nonetheless, much caution needs to be exercised in using such historical cross-country comparative data, given the high uncertainty in technological changes even over a short period of time, and differences in factor endowments and hence differences in optimal skill intensities. Thus, the manpower projections given by the IMP has been justly criticized for the simplistic assumptions it makes using cross-country reference data (for example the targeting of Korean engineer-to-worker ratio to be achieved by Malaysia).

SOME POLICY IMPLICATIONS

Given the multiplicity of possible factors that gave rise to critical skill situations, it is evident form the above discussion that no single approach to the problem will suffice. Instead, a multiplicity of policy responses may be needed depending on the specific combination of factors relevant to each situation. Indeed, in many situations, there may be no need for government policy intervention at all, if the market adjustment mechanism itself is found to be working reasonably well, so that the critical skill situation that arises is only for the shortterm and will not persist for long. It is only when there is evident failure of the market mechanisms that active government policy intervention may be necessary. Even then, the main policy concern should be to improve the flexibility of the market response mechanisms by removing the relevant constraint factors (including constraints caused by past government policies), rather than imposing more market-distorting policies.

As is evident from the factors identified in the previous discussion a major source of skill supply rigidities is actually the government itself. For example, most government training institutions are not as responsive to market changes as they ought to be. Curriculum planning takes too long, course contents are often not relevant to industry needs, good trainers are often in shortage due to rigid, unattractive remuneration system compared to the private sector, and quota restrictions may apply. A major policy focus of the government should therefore be how to make the existing system of skill supply more flexible and market responsive.

Much interest has been expressed in developing more disaggregated forecast of various skill requirements to serve as targets for manpower planning, especially planning for critical skills. While any improvement to the existing poor database on skills is welcome and would certainly contribute towards improved policy analysis, one tends to caution against putting too much reliance on such forecast as infallible targets. Numerous studies in various countries have shown that the demand for many skills are subject to a great deal of uncertainty and hence inherently difficult to predict with any precision (Spenner 1988 and Psacharopoulos 1983). This is particularly true for various new skills in emerging "high-tech" sectors. Rather than focus on government attention on setting and meeting specific quantitative targets for various categories of skills, it is probably better for the government to identify strategic directions for industrial and technological developments, and to leave the more detailed skill supply and demand responses to the private sector as much as possible.

In light of the above, the provision of government fiscal incentives to encourage greater training of specific skills should only be resorted to, in instances when there is evident market failure resulting in underinvestment in training. Even then, other policies besides training subsidy can be explored, for example allowing the withdrawal of Employees Provident Fund (EPF) for approved training purposes (which in effect removes an existing bias in the cost for financing training), and promoting pooling of training among member firms of an industry to achieve economy of scale. Various studies in other countries have indicated that very often, training subsidies tend to be appropriated mostly by the larger firms rather than the intended smaller firms, and the same appears to have occurred in Malaysia under the existing double-deduction training incentive scheme.

Finally, for certain critical skill situations which are affected by the industrial structure of the skill-utilizing sector, the government may need to consider policies to restructure the industry itself in addition to providing training incentives. An example of this is the mold and die industry which is currently characterized by the existence of many small and under-capitalized firms operating in a highly competitive environment with low job-security and unattractive work environments. Firms within such an environment have little incentives to train their workers and prefer to pinch staff from other firms, while workers have incentives to leave and form their own firms once they acquired the necessary skills and contacts. Under such circumstances, a major restructuring of the industry, with the promotion of the growth of a number of better managed, better financed, and technologically more competent enterprises to spearhead the upgrading of the industry as a whole, is probably necessary before the present under-investment in skill training can be overcome.

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