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Deficiencies in Education and Poor Prospects for Economic Growth in the Gulf Countries: The Case of the UAE

JOAN MUYSKEN & SAMIA NOUR

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ABSTRACT *Our paper shows that the deficient educational system and the large share of unskilled foreign workers in the Gulf countries are serious impediments to a successful implementation of the strategies of these countries to reduce their dependence on foreign technologies and to restructure their economies in order to make them less dependent on oil exports. A novel element in our analysis is that we emphasise the role of the deficient educational system as an important problem, next to the well-documented quandary of a high incidence of unskilled foreign workers in the workforce. We use new survey data, both at an establishment level and economy-wide, to provide evidence on how the poor educational facilities lead to a poor provision of training, low skill levels, serious skills mismatch and deficient transfer of knowledge. These inadequate facilities and the lack of incentives to improve them also lead to low R&D efforts to promote local technologies and hamper a restructuring of the economy.*

I. Introduction

In the last decade the Gulf countries¹ have formulated three strategies which focus on the future of the Gulf: diversification, technological development and restructuring the labour market. The notion underlying these strategies is that the Gulf countries need to build local capacity and improve their competitiveness in the international market (UAE University, 1997; El Sabaa, 1997; Alfakhry, 1999). In our view, the idea behind the technological development strategy is that in the long run the Gulf countries need to reduce their dependence on foreign technologies. To that end, the costly process of building domestic technologies can be funded from oil revenue. Currently, the share of oil and oil industries constitute around one third of the GDP, and part of the revenue from oil is used to fund the import of technologies and enhance economic development in the Gulf countries. However, the heavy dependence on oil leads to a new challenge since oil is an exhaustible resource and also, because of instability of oil prices, the revenue from oil is uncertain and volatile.

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Hence, economic growth and a sustainable development strategy in the Gulf depend on both a shift from a resources (oil) based economy to a technology and skill based economy and on economic diversification, in addition to economic incentives to improve them.

In our opinion the three strategies are seriously hampered by the deficient educational system and the large share of unskilled foreign workers in the Gulf countries. While the problem posed by the high incidence of unskilled foreign workers in the workforce is well documented, the impact of deficiencies in the educational system is hardly recognised – although the economic growth literature emphasises the importance of education as an important element in economic growth, through its impact on human capital formation. The impact of poor education, in combination with the high incidence of unskilled foreign workers, is the focus of our analysis.

We use the results from the surveys of Nour (2002a, b) to analyse the relationship between the educational system of the Gulf countries, the large share of unskilled foreign workers and the dependence in these countries on foreign technologies. We find that the educational system in the Gulf countries failed to provide sufficient education and is not suited to do so. This interacts with the excessive share of unskilled foreign workers and has serious implications such as a poor provision of training, on average a low skill level of the workforce, severe skills mismatch and a lack of transfer of knowledge. The education deficit in combination with the high incidence of unskilled foreign workers also leads to too low R&D efforts to enhance the development of local technologies and hence consolidates dependence on foreign technologies. Finally it hampers the restructuring of the economy.

For the UAE, diversification depends on both the manufacturing and the services sectors, which both require high skills. In recent years the services sector has become increasingly important, but we focus on manufacturing – because it is the most important source of economic growth and productivity.

The strategic shift in the Gulf from a resources-based economy to a technology and skill-based economy and to economic diversification is in our view contingent upon the adequate availability of appropriate skills and technologies and incentives to improve them. From that perspective our analysis presents various new elements. First our findings differ from the Gulf literature (El Sabaa, 1997; Haan, 1999) because we recognise upskilling as a necessary condition for the fulfilment of the three current strategies in the Gulf. Second, our research provides a more elaborate and in-depth analysis of the skill problem, since we use a very comprehensive set of indicators based on the new growth literature to assess the technological performance in the Gulf. We use these indicators to analyse the causes and consequences of low skills and technology levels and the link between them, at both macro and micro levels. Finally we fill the gap in the Gulf literature (El Sabaa, 1997; Haan, 1999) by highlighting the importance of external effects of schooling and the transfer of knowledge and we examine which factors hinder this process.

In addition, our analysis contributes to the recent small amount of literature that addresses the interaction between skills and technology and calls for upskilling in the Gulf. Our findings provide further evidence for the poor level of education in these countries, in particular the UAE. We analyse the implications for low skill levels, the inadequate provision of training, the skills mismatch and their relation to knowledge transfer and the duality between public and private sectors (Gray, 1999; Khorshid,

2000; Abdelkarim and Haan, 2002). Our results also demonstrate the low technological level and dependence on foreign technologies (El Sabaa, 1997; Haan, 1999).

Before elaborating our analysis, we first present some stylised facts on the Gulf countries in Section II and introduce the surveys for the United Arab Emirates – taken from Nour (2002a, b) – which we use in our analysis. In Section III we emphasise the importance of education, training and technology for economic growth and welfare and we show that the findings of the establishment survey in Nour (2002b) for the chemical and metal industries are in line with those of the new growth theory. In Section IV we use the results of the Nour (2002a) survey amongst policy-makers and experts to discuss the causes and consequences of a deficient educational system and its interaction with the excessive share of unskilled foreign workers that lead to, on average, a low skill level, serious skills mismatch and insufficient transfer of knowledge. Next we examine some further implications that lead to poor prospects for growth in Section V, in particular with respect to the transfer of knowledge and local technological capacity. The final section concludes our argument.

II. Some stylised facts and the data used

It might be useful to begin with some stylised facts on the Gulf countries, with a special focus on the UAE, and the surveys data. Next to the prevalence of unskilled foreign workers, these data indicate the incidence of low skills and technology use at both macro and micro levels, skills mismatch at micro level and the dependence on foreign technology at macro level.

The Gulf Countries

Table 1 summarises some characteristics of the Gulf countries. We observe that most of these countries (except Saudi Arabia) are characterised by a tiny population size, a high share of foreign workers in the total labour force and a high income per capita. The World Bank classification of economies puts four of the Gulf countries amongst the high-income economies and the other two amongst the upper-medium income economies. During the last three decades, the economies of the Gulf countries remained heavily dependent on oil revenues, which on average constitute around one third of GDP in these countries.

On the other hand, the heavy dependence on oil created several serious challenges for development in the Gulf countries. One serious challenge is that the Gulf countries suffer from structural problems related to the ‘Dutch disease’ phenomenon. A general increase in expenditures and appreciation of the real exchange rate brought about by the oil windfall resulted in a boom in non-tradables, adversely affecting the production of tradable goods. The Dutch disease or de-industrialisation appears from the stagnant or declining share of manufacturing and industry in total exports, GDP and employment (Corden, 1984; Richards and Waterbury, 1998; World Bank, 2004a).

For the UAE, Figure 1 below illustrates a substantial decline in the share of manufactured exports in total exports from 46 per cent in 1990 to only 4 per cent in

Table 1. Main characteristics of the Gulf countries

Country	Population size (million) (2001) ^a	Share of foreign workers in total labour force (1995)(%) ^b	GDP/capita (PPP US\$) (2001) ^a	Share of oil revenues in GDP (1995) ^c	Share of crude oil and fuel in total exports (1998) ^d	Share in total industrial employment (capital investment) (1998) ^d		Dependence on foreign technology* (1998) ^e
						Chemicals	Metal	
<i>Bahrain</i>	0.7	60	16,060	18	52.8	20 (22)	18 (74)	53.3
<i>Kuwait</i>	2.4	83.4	18,700	48	88.6	28 (30)	28 (56)	81
<i>Oman</i>	2.7	64.2	12,040	37	88.6	10 (14)	14 (61)	79
<i>Qatar</i>	0.6	82.1	19,844	36	81.0	19 (16)	8 (78)	86.6
<i>Saudi Arabia</i>	22.8	63.5	13,330	38	86.0	24 (39)	26 (33)	75.7
<i>United Arab Emirates</i>	2.9	88.4	20,530	32	87.4	16 (13)	27 (68)	86.4
<i>Total Gulf</i>	32.1	73.6	16,751	35	85.0	20 (22)	20 (62)	79.8

Sources: ^aUNDP (2003); ^bGirgis (2000); ^cAskari, Nowshirvani and Jaber (1997); ^dGOIC (2000).

Notes: *We measure the dependence on foreign technology by the share of chemical, machinery, equipment and manufactured products in total imports (Lall, 1999; Patel, 1995).

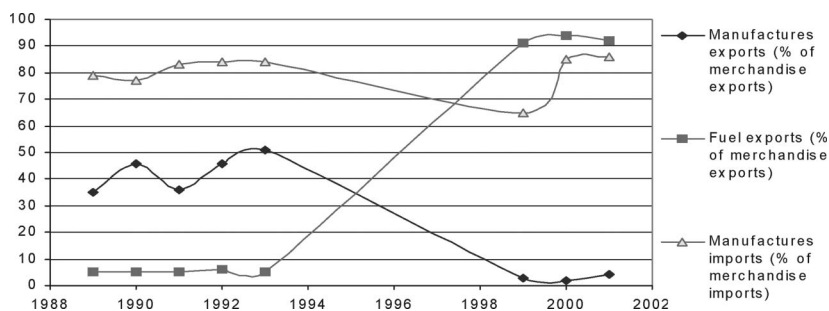


Figure 1. Structure of exports and role of manufacturing in the UAE (1989–2002) (%).
Source: WDI Database

2002, and a considerable rise in manufacturing imports and rise in primary (fuel) exports over the period 1989–2002.

Another serious implication of the Dutch disease is a distortion of incentives on labour markets in the Gulf countries. The high revenues from oil lead to a high wages premium and subsidies for public sector jobs offered to domestic workers, without requiring high skill levels. This leads to the dualistic feature of a concentration of domestic workers in the public sector and foreign workers in the private sector and the great disparity in wages premium between domestic and foreign workers (Gray, 1999; Khorshid, 2000; Abdelkarim and Haan, 2002). Therefore a change in the structure of the Gulf economies can only be fulfilled with proper incentives and policies to improve skills, which will most likely encourage both industrialization and more employability of skilled domestic workers in the private sector.

More recently, the revenues from oil contribute to the development of the industrial sector, especially petroleum, chemical and petrochemical industries, which together with the metal industries have a significant share in total employment and capital investment in the industrial sectors of the Gulf countries.

One should realise, however, that while the share of industry is higher than the services sector in terms of GDP, it is lower in terms of employment (GOIC, 2000).² Moreover, as Goyal (2003: 43) states:

Average annual growth of real non-oil GDP was about 7 per cent in 1990s through 2002, up from 3.6 per cent in the previous decade. It was particularly strong in finance and insurance, wholesale and retail trade, and manufacturing, including petrochemicals. Tourism growth was also robust, especially in Dubai. As a result, the economy moved from primarily oil-based to non-oil services based, with the non-oil share of GDP rising from close to 35 per cent in 1980 to more than 70 per cent in 2002.

On the other hand, economic utilisation of the regional cheap energy resources such as oil is more relevant and promising in the industrial sectors, which underlines their strategic importance to foster economic growth.

For the UAE, diversification depends on both manufacturing and services sector, which both require at least some high skills. In 2000–01, the share of manufacturing sector in the GDP and total employment was 13.8 per cent and

10.96 per cent, respectively, while the comparable figures for the services – including government – were 29.4 per cent and 76.4 per cent, respectively (UAE Ministry of Planning, 2004). Although there is an increasing importance of the services sector, we focus on manufacturing, because it is most important source of economic growth and productivity.

Industrial development is the main determinant of industrial development and comprehensive economic development, because of forward and backward linkages both among different industries and between the industrial sector and the other sectors of the economy Considering the natural and economic resources in the UAE reveals that industrialization, and industrial development could hardly be viewed as one of the options available for development. Rather it is a sort of imperative choice . . . it has been obvious that dependence on oil is a risk, as such depleting resource can hardly play the leader of the country's economic development Meantime, none of the other sectors were hardly capable to play the leader of local economy. Scarcity of water and limited cultivated land hinder agricultural development. Similarly, developing the service sector was a hard task in the absence of enough productive sectors, and limited number of inhabitants that present the services consumers. (El Saaba, 1997: 18–19)

Despite the high income and positive impact of oil on the economy and industry, the Gulf countries remained heavily dependent on foreign technologies. For instance, the share of chemical, machinery, equipment and manufactured products in total imports remains high in most of the Gulf countries. The high share of crude oil and mineral fuel in total exports together with the strong dependence on foreign technologies indicates a failure to manufacture oil domestically within the Gulf countries. Economic diversification fails in this respect.

Table 2 presents some indicators of both technology and skills in the Gulf countries. We find that despite considerable growth in the use of ICT for business, government, and education and household sectors,³ both expenditure on R&D and applications to patents are very low in the Gulf region.⁴ Moreover, the skills indicator as defined by both gross enrolment in tertiary education (particularly in science, mathematics and engineering) and school life expectancy remains low in all Gulf countries. The share of tertiary students enrolled in sciences, math and engineering in the Gulf is low compared to Korea (34%), Algeria (50%) and China (53%) (cf. UNDP, 2003). The low skill levels and technical skills constraint in the UAE/Gulf compared to World countries also appear in the share of labour force with tertiary and secondary education in total employment. For instance, for the Gulf countries, on average the share of labour force with tertiary and secondary education (17.66% and 17.66%, respectively) is near to other developing countries: Brazil (7% and 19%) and Mexico (15% and 16%) but fall below advanced Asian countries: Singapore (38% and 28%) and Korea (24% and 44%) (WDI database). In addition a problematic feature of higher education in the Gulf is that the majority (96%) of tertiary students obtain less than a university degree, while only few (4%) obtain the first university degree or higher, falling far behind China (48%) and Korea (41%) (cf. UNDP, AHDR, 2003; UNESCO, UIS, 2003). Finally, Lall (1999)

Table 2. Technology and skills indicators in the Gulf countries compared to some advanced countries (1990–2002)

Country	% of population accessing the Internet		Spending on R&D (% GDP) (1996–2000) ^{b,e}	Patents (1991–99) ^c	Gross enrolment ratio (%) in tertiary education (1998) ^d	% Share of tertiary students in science, math and engineering (1994–97) ^e	School life expectancy	
	(2001) ^a	(2002) ^a					(1992) ^f	(2000) ^d
<i>Saudi Arabia</i>	4.69	6.39	0.14 ⁺	103 ⁺⁺⁺	20.71	18	8.5	10.7
<i>UAE</i>	32.5	37.5	0.02 ⁺	15 ⁺⁺⁺	12.10	27	10.6	10.8
<i>Average Gulf countries</i>	12.8	16.2	0.095 ⁺	25 ⁺⁺⁺	21.35	25	10.3	16
<i>Sweden</i>	52	57.3	3.8 ⁺⁺⁺	285 ^{e+++++}	62.3	31	13.7	16
<i>UK</i>	33.5	42.2	1.9 ⁺⁺⁺	76 ^{e+++++}	58.39	29	15.7	16
<i>Republic of Korea</i>	52	55.3	2.7 ⁺⁺⁺	931 ^{e+++++}	71.69 ⁺⁺⁺⁺⁺	34	13.5	15

Sources: ^aCalculated from World Bank (2004b); ^bQasem (1998) and GOIC (2000); ^cUS Patent and Trade mark office web site: www.uspto.gov; ^dUNESCO-UIS (2003); www.unesco.org; ^eUNDP (2003); ^fUNESCO-UIS (1999).

Notes: ⁺Data for 1996; ⁺⁺Data for 1996–2000; ⁺⁺⁺Data for 1991–99; ⁺⁺⁺⁺Data for 1999.

uses several indicators (technical enrolment index, engineering enrolment index and the percentage of enrolments in natural sciences, maths and computing, engineering and total technical subjects) to assess skill levels and technical skills for various countries. His results show that the averages of all these ratios for the UAE/Gulf countries fall behind the advanced countries, Korea and even other developing countries such as Brazil and Mexico. For instance, on average the Gulf enrolment in technical subjects and enrolments in engineering respectively are nine and seven lower times than the Republic of Korea.

The Case of the UAE: Low Skill Levels and a Non-Native Workforce

The United Arab Emirates, on which we focus in our survey, has a particularly high share of unskilled foreign workers (Table 1) and a low gross enrolment ratio in tertiary education (Table 2). Together with Oman it also has the lowest level of public spending on education of all Gulf countries, whereas Saudi Arabia and Kuwait have the highest (UNESCO, UIS, 2003). However, these differences should not hide the fact that in general the quality of education is poor in all Gulf countries. For instance, Al-Sulayti (2002) observed that:

... the poor quality of educational system in the Gulf countries is attributed to high repetition rates. . . . Moreover, the educational system in the Gulf countries suffers from serious weak performance/low quality of teachers due to lack of teaching skills and knowledge of the recent teaching and learning techniques/tools. (See also Nour, 2005)

For the UAE, the poor quality of the educational system is reflected in the observation from the population census (1995) data that a majority of both the native and the foreign population have lower educational and skill levels.⁵ Of the native population, 60 per cent has an educational attainment below secondary schooling and 67 per cent of the foreign population. Moreover, 33 per cent of males and 40 per cent of females have no formal education (UAE University, 1997: 37). These figures are reflected in Figure 2 too, which also illustrates the huge incidence of unskilled foreign workers and its persistence over time.

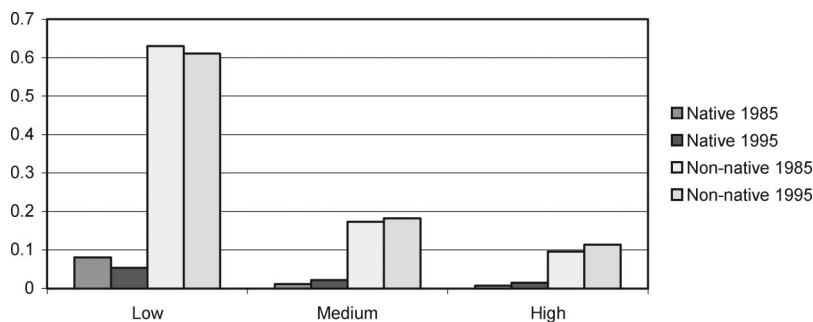


Figure 2. Composition of UAE economically active population, according to nationality and education, 1995. Sources: Adapted from Population Census data (1985: 193–4, Table 24) and Population Census data (1995: 206–7, Table 24)

While the population census shows that the activity rate of the UAE total active population was 55 per cent in 1995, only 20 per cent of the native population is working. In contrast, the share of the non-native workforce is high and increasing from 90 per cent in 1985 to 90.9 per cent in 1995.⁶ The incredibly high share of foreign workers in total employment can be attributed to both the small size of the population, and cheap and relatively easy to exploit foreign workers. In addition to serious disincentives to hire native workers in the private sector due to a lack of educational qualifications and provision of high salary and subsidy in the public sector. However, the high incidence of foreign workers, the majority of whom are unskilled or low educated workers, causes serious imbalances in labour market and socio-economic problems as discussed in the Gulf literature (Gray, 1999; Khorshid, 2000; Abdelkarim and Haan, 2002).

In addition, the structure of higher education has two problematic implications and disincentives. First it leads to a lack of local technical skills, because the educational system is biased against technical fields and most of the students in higher education are found in humanity and social studies. For instance, the UNDP (2003) indicates that the share of tertiary students in technical fields represents only 27 per cent of total tertiary students – cf. Table 2 above, and also El Sabaa (1997) and Haan (1999). Furthermore, according to the UAE Ministry of Labour (1999), while over half of the native active population in 1995 was in the groups ‘professional, technical and related’ and ‘legislative, administrative and managerial and clerical and related’, the majority were not in technical and technical-related professions. Second, biases in the educational system lead to mismatch as most of the qualified people with technical skills still end up working in the government and white-collar work in general, reflecting the bias against technical and manual work (Haan, 1999). Furthermore, the deficient educational system leads to a serious skills mismatch, since it hinders the employability of the native population in the private sector and hence is biased towards public sector occupations (cf. Figure 3). This is in line with earlier studies, which attributed these biases to several factors including the limited supply of the native population with adequate qualifications and relevant experience and demand for high salary (UAE University, 1997; Haan, 1999; Gray, 1999).⁷

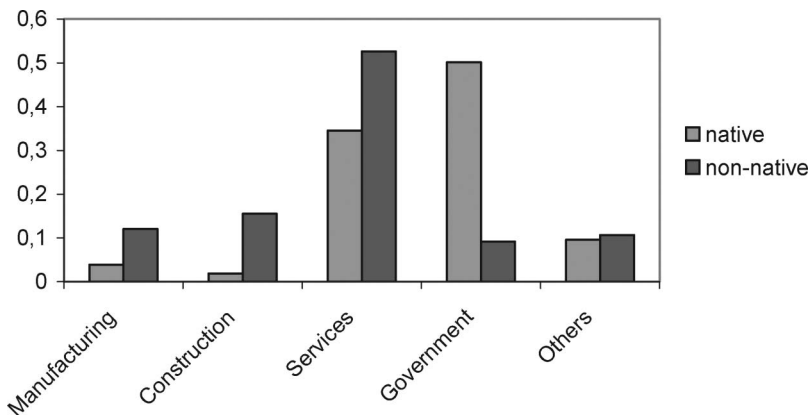


Figure 3. The sectoral composition of (non)native employment in the UAE, 1995. *Source:* Economic Research Forum (2002)

Consequently, both the mismatch and the increasing supply of unskilled foreign workers without an equivalent increase in the demand create a surplus supply of unskilled labour, which in turn increases unemployment rates in the Gulf countries (ERF, 2000; Abdelkarim and Haan, 2002).

Moreover, as we elaborate below, the deficient educational system leads to poor training provisions to upgrade the skill levels of low skilled native and foreign workers. The high share of unskilled native and foreign workers also reflects the lack of upskilling plans and an inadequate provision of efficient, systematic and comprehensive training facilities. The latter is consistent with the limited incentives, involvement and contributions by institutions for higher education, public and private sectors (UAE University, 1994; Gray, 1999). Finally, poor local technological capabilities and hence dependence on foreign technologies in the UAE can also be attributed to both the poor educational system and the poor qualifications of most of the foreign workers (El Sabaa, 1997; Haan, 1999).

The Survey Data

The survey of Nour (2002a) was addressed to 40 policy-makers and experts in 14 public and university institutions in the United Arab Emirates. It aims to assess the upskilling efforts at macro level in the UAE and to gather the experts' view on the causes of deficient education and the consequences for the provision of training, skill level, skills mismatch, transfer of knowledge and technology development.

The selection of both policy-makers and experts was based on their experience and potential contribution to enhancing the upskilling process. The coverage and representativeness of both groups is summarised in Table 3. The response rate is 75 per cent. Moreover, the survey was followed up by five face-to-face interviews, which focussed on the use of local technologies.

The survey by Nour (2002b) has been held in the United Arab Emirates for two industries: chemical and metal products. The chemical industry also encompasses petroleum and petrochemicals (see Table 1).⁸ The focus of the survey is on large and medium-size firms,⁹ based on their share in sectoral employment (for example, 59 per cent and 41 per cent) and capital investment (for example, 20 per cent and 80 per cent), respectively, for chemical and metal firms. Moreover, these firms are most advanced in adopting new technologies. The representativeness of the survey is quite reasonable, as can be seen from Table 4.

Table 3. Characteristics of the survey of Nour (2002a) in the UAE

Institutions	Policy-makers and experts				Institutions	
	Number in sample	Share in sample (%)	Total response	Response rate (%)	Number in sample	Total response
<i>Universities</i>	12	30	6	50	5	2
<i>Ministries</i>	15	37.5	11	73	5	5
<i>Other</i>	13	32.5	13	100	4	4
<i>Total</i>	40	100	30	75	14	11

Table 4. Characteristics of the survey of Nour (2002b) in the UAE

Industry	Employment size	Share of employment in survey (%)	Share of capital in survey (%)	Number of firms in survey	Response rate (%)
<i>Chemical products</i>	Medium	57	87	28	44
	Large	59	17	35	37
	Total	59	20	63	40
<i>Metal products</i>	Medium	42	14	20	47
	Large	40	83	23	41
	Total	41	80	43	44

The distribution of firms in the survey enables us to compare chemical (labour intensive) and metal (capital intensive) industries. The selection was based on the following notions: first, the important contribution of both sectors in the manufacturing sector to the economy of the region as appears from Table 1. Second, the strategic importance of both sectors in creating forward and backward linkages and spin-off effects to other industries and sectors. Third, both upskilling and technological upgrading are relevant in these sectors and can be useful mechanisms to reduce the dependence on unskilled foreign workers. Fourth, both sectors have the potential to produce or promote energy intensive products, benefiting from the comparative advantage of cheap energy sources available in the region, particularly petroleum and natural gasses.

III. The Importance of Education, Training and Technology

The questionnaire in the survey of Nour (2002a) asked whether or not the UAE is facing problems with respect to the provision of education and training. It investigates the relative importance of these problems and views on possible solutions – short and long run plans and mechanisms – to promote education and training at the aggregate level. The questionnaire in the survey of Nour (2002b) asked whether or not firms are experiencing any shortage of skilled workers and are confronted with problems with respect to training. It investigates the relative importance of skill shortage, and factors hindering the effort of training. It also examines the coverage, resources and support offered to firm training, and indications of possible solutions – short and long run plans and mechanisms – to promote training and enhance skill across firms.

We use the results of Nour (2002b), presented above, first to assess skill and technology levels and then to investigate the relationship between education, training, technology and tacit knowledge at micro level.

Table 5 presents the major skills and technology indicators that can be derived from the sample. Our findings show the low skill level amongst the respondent firms as indicated by the low share of high skilled labour (both attained and required education) in total employment. This is consistent with the Gulf literature on the excess supply of unskilled foreign workers in the Gulf as discussed in the previous section, and also with the low participation in tertiary education in the Gulf countries compared to international standards (cf. Table 2).

Table 5. Skill and technology indicators for 2001 in the survey (% share in total)

	Industry		Firm size	
	Chemicals	Metal	Large	Medium
<i>Skill and mismatch indicators (share in %)</i>				
High education	35	23	33	27
High required skill	28	21	21	28
High skilled wages/low skilled wages	6.9	8.1	6.3	8.4
High	29	30	36	20
Mismatch Medium	69	75	83	56
Low	60	71	73	50
<i>Technology indicators</i>				
Firms conducting R&D* (%)	48	26	48	26
R&D expenditure/total output (sales value) (%)	0.012	0.005	0.017	0.014
Firms applying for a patent (%)	13	0	12	0
Share of spending on ICT**	0.88	0.12	0.95	0.05
Share of spending on ICT training	0.86	0.14	0.94	0.06
Use of sophisticated technologies (%)	55	26	46	37
Dependence on foreign technology (%)	96	84	91	90

Source: Nour (2002b).

Notes: *R&D is a combination of activities/efforts or practical researches carried out with the aim to (1) develop and enhance the productive capacity; (2) introduce new technologies, or improve the old technologies and (3) allow optimal adaptations of imported technologies to industrial/local needs. This item includes the outsourcing of research activities. **This refers to the share of group of firms spending on ICT to total sectoral spending on ICT, and the same holds for the share of spending on ICT training.

When comparing attained and required education, we find mismatch amongst all employment categories, especially within both medium and low skilled foreign workers. For instance, Table 5 shows that the educational attainment amongst medium skilled labour does not match the required skill/educational level for medium skilled jobs across approximately 70 per cent of total respondent firms.

Skills mismatch might be affected by the structure of the labour market in the Gulf countries. Figure 3 shows that the overwhelming majority of the unskilled workers are non-native.¹⁰ This implies that the poor educational attainment of foreign labour and a lack of incentives to train them are important factors in the skills mismatch problem.

Our results also show a low level of technology – indicated by the low share of firms conducting R&D efforts,¹¹ low R&D expenditures as a percentage of total output (sales value), and low patenting activities – and a heavy dependence on foreign technology amongst both chemical and metal firms. As we indicated in Section II above, and shall argue below, these findings on low skills and technology indicators, dependence on foreign technology and skills mismatch at micro level are quite consistent with those at macro level.

Our findings in Table 5 illustrate that both technology and skills indicators across firms vary with firm size and industry. For instance, the share of high skilled labour in total employment, the share of R&D expenditure in total output, expenditure on R&D, ICT, training and patents are higher within large-size and chemical firms

compared to medium-size and metal firms. This implies that both skills and technology indicators are increasing in firm size and are higher for the chemical sector. Our findings with respect to R&D and firm size are consistent with the Schumpeterian hypothesis that a large-size or market concentration is conducive to R&D investment (Braga and Willmore, 1991; Kumar and Saqib, 1994¹²). Our results with respect to R&D and the chemical sector are consistent with the evidence for OECD countries (OECD, 1997).¹³

The new growth literature emphasises the importance of education, training and technology to enhance economic growth and welfare (Lucas, 1988; Romer, 1990). The results of Nour (2002b) can be used to support several stylised facts found in that literature. These results then can also be used to underline the importance of education and training and their relation to technology and the transfer of knowledge at firm level.

Table 6 presents simple OLS regression results to show that there is a significant positive relationship between the share of high education and the share of ICT expenditures, which can be interpreted as complementarity between skills and technology (Goldin and Katz, 1998; Acemoglu, 1998).¹⁴ The same holds for the positive correlation between high education and training expenditures, which can be interpreted as complementarity between skills and upskilling. From the perspective of the new growth theory these positive correlations show that a higher educational level of the labour force will induce higher levels of output and productivity.

To explore the data further, we interpret the share of higher education as an indicator of tacit knowledge (Nelson and Winter, 1982; Freeman and Soete, 1997). The results of this research then are consistent with the recent findings of the knowledge literature. The positive correlation between tacit knowledge and the other variables reported in Table 6 supports the view that this source of knowledge enhances output, profit and productivity at micro level (Abramovitz and David, 1996, 2000).¹⁵ This works not only through its direct effects, but also through the further effects on ICT spending (David and Foray, 2001; Smith, 2002) and through upskilling (Nour, 2002b). These findings also illustrate the importance of a good education and a skilled workforce for economic growth in the UAE.

Table 6. The impact of tacit knowledge at firm level

	Tacit knowledge (share of high skilled workers)	R ²	N***
ICT expenditures	21037195** (5.956)	0.703	17
Training expenditures	1679404.3** (4.089)	0.563	15
Total profit	28131288** (5.608)	0.712	16
Total output (total sales value)	141000000** (2.038)	0.206	18
Productivity (total sales value per worker)	637482.59** (2.985)	0.358	18

Notes: Correlation is significant *at the 0.05 level (one-tailed) **at the 0.01 level (one-tailed). ***Since some of the respondent firms were particularly reluctant to provide adequate quantitative data on the spending indicators, we have relatively few firms left for these regressions.

Finally, Table 7 shows that there is a positive wage premium on education and experience, as one might expect – again emphasising the importance of education and skills. This effect is in particular significant for large firms, which is not surprising since these firms have sufficient scope for a coherent wage policy. Somewhat surprising, required education (required qualifications translated into required years of schooling) has no significant impact on wages. In light of the results of the overeducation literature (Hartog, 2000; Muysken et al., 2003) we would have expected a different outcome.

In summary, the data from Nour (2002b) show that tacit knowledge enhances the levels of output and productivity in the investigated UAE firms. Also, education is significantly correlated with training and technology. As we elaborate below any deficiency in the educational system will have further serious implications on all these elements.

IV. The Deficient Educational System in the UAE: Causes and Implications

The data from the survey of Nour (2002a) presented above relate to the whole economy of the UAE and can be used to analyse the causes of the deficient educational system and their implications.

We find that the deficiencies of the educational system in the UAE appear in both the basic (primary and secondary) and the tertiary educational systems. Table 8 shows that major causes are the low quality and inefficiency of the educational system at basic and tertiary levels, together with an inadequate assessment and monitoring of educational needs and inadequate planning. Other important factors are the lack of flexibility of educational institutions, the lack of modernisation and dynamism and the weak incentives for enrolment in technical education. In addition, the lack of incentives, low involvement and spending by the private sector, low spending in technical education and weak linkages between universities, colleges, technical and training institutes are also mentioned, but of somewhat less importance. That also holds for the lack of infrastructure (insufficient investment in education) and the lack of teachers and mentors.

Moreover, as Al-Sulayti (2002) argues, despite the considerable proportion of government spending allocated to education, the Gulf countries are facing increasing difficulties to continue allocating the same proportion of expenditures to satisfy the increasing need for both expanding education and improving the quality of

Table 7. Correlations between wages (log), education and experience in 2001

	Coef (t-value)			R ²	N
	Actual education	Experience	Required education		
All firms	0.231** (2.259)			0.195	23
Large firms	0.284** (4.545)			0.674	12
All firms			0.159 (1.275)	0.119	14
All firms	0.170* (1.471)	0.048 (1.107)		0.242	23
Large firms	0.193** (2.175)	0.053* (1.374)		0.730	12
All firms	0.192* (1.199)	0.011 (0.172)	0.063 (0.412)	0.254	14

Note: Correlation is significant *at the 0.05 level (one-tailed), **at the 0.01 level (one-tailed).

Table 8. The causes of the deficient educational system in the UAE (indicated by respondents)

Causes of deficiency	Basic (%)	Tertiary (%)
Inadequate assessment and monitoring of educational needs	83%	86%
Low quality/efficiency of educational system	79%	86%
Inadequate planning for educational needs	79%	86%
Lack of flexibility of educational institutions	76%	79%
Weak incentives for enrolment in technical education	76%	75%
Lack of modernisation and dynamism	76%	71%
Low involvement and spending by private sector	72%	68%
Low spending in technical education	69%	68%
Weak linkages [network] between universities, colleges, technical and training institutes	—	79%
Lack of infrastructures due to Inadequate investment (public spending on education)	55%	61%
Lack of teachers and mentors	55%	54%

Source: Nour (2002a).

education. These difficulties are related to uncertain public revenues, in particular oil revenues. In addition, there are increasing competing claims on public revenues to cover defence spending and infrastructure.

These difficulties with respect to public spending may be countered by an increased contribution of the private sector in education and increased enrolment of the citizens from the Gulf countries in overseas higher educational institutions. One common characteristic of the educational policies in the Gulf countries is that public education is very important. More recently, following the declining trends of public spending, private spending on education shows an increasing trend to fill the gap in most of the Gulf countries, but still the educational investment is almost entirely publicly provided. For the UAE, the share of public spending declined from 95 per cent in 1990 to 92 per cent in 1996, while private spending increased from 5 per cent to 8 per cent, enrolment in private primary and secondary schooling increased over the period 1990–96 (cf. UNESCO, UIS, 2000, 2003). Until 2001, tertiary education is almost publicly provided since there are only one or two universities in Bahrain, Kuwait, Oman and Qatar, in both Saudi Arabia and the UAE there are 8 universities, some with internationally accredited private institutions. The UNESCO UIS (2005) database indicates that the number of the citizens from the Gulf countries who study abroad, particularly in the US and UK increased by 10 per cent throughout the period 1998–2001 – probably due to high GDP per capital. In contrast, the UNDP information indicates that over the period 1999–2002/2003 the number of students from Saudi Arabia, Qatar, Oman and the Gulf, who study in the US declined by 31 per cent, 26 per cent, 25 per cent and 27 per cent respectively – due to the September 11 2001 events (cf. UNDP, AHDR, 2003: 23, Table 1). This underlines the need for improving domestic higher educational institutions to fill the gap and absorb the domestic students.

The data on unskilled labour and mismatch from Nour (2002b) are not only related to deficiencies in the educational system, but also to the well-documented observation of a high share of unskilled workers in the UAE workforce. Due to the high incidence of the latter in manufacturing – see also the discussion on

Table 5 – we use the results of Nour (2002b) to indicate the impact of unskilled foreign workers next to deficiencies in the educational system.

Using the results from both surveys, Table 9 shows that it is generally felt that both the deficient educational system and the high supply of unskilled foreign workers lead to low skill levels, low training provision, skills mismatch, low transfer of knowledge, weak efforts for local technological development and dependence on foreign technologies.

One of the implications of the poor educational system is that the skills mismatch phenomenon, which is widely observed (Haan, 1999), should be mainly attributed to the supply side of the labour market. In particular, about 96 per cent of the respondents to the survey of Nour (2002a) reported that the mismatch is mainly attributed to the deficiency of both tertiary and basic education. Moreover, the follow-up interviews with policymakers and experts show that the mismatch is attributed to the deficient educational system, the lack of coordination and planning to meet the critical skills needs, and cultural and social reasons which results in a preference for white-collar jobs and biased against technical education and technical jobs.¹⁶ And finally, there is a lack of information about skills needs in the productive sector.

The skills mismatch which results from the deficiencies in the educational system and the high incidence of unskilled non-native workers has serious consequences. Figure 4 shows that 32 per cent of the respondent firms report a relative shortage of skilled workers, which leads to a serious delay in project implementation in 58 per cent of all respondents firms. Moreover, we find that skills mismatch is particularly higher within both large-size firms and metal firms, compared to medium-size firms and chemical firms.

Finally, the results of Nour (2002a) indicate that the contribution of both the educated and trained population to promote the local skills is constrained by several factors. Major factors are the lack of interaction with market needs (mismatch), the lack of information on educational and training needs in the productive sectors and their demand for graduate students.¹⁷ Other important reasons are the preference for

Table 9. The implications of a deficient educational system and unskilled foreign workers

The effect of deficient education	Officials	The effect of unskilled foreign workers	Firms
Low skill level	83%	Weak effort for adaptation of imported technologies*	86%
Hindering the transfer of knowledge/external effect of schooling	95%	Weak effort for local technological development	37%
Low training**	79%	Dependence on foreign technologies	90%

Source: Nour (2002a, b).

Notes: *The results of Nour (2002b) indicate that the contribution of research units to adapt the imported technologies is constrained by a shortage of skilled and qualified workers amongst (for example, 86%, 82%, 100%, 80% and 89%) of all firms, chemical, metal, medium and large firms respectively; **According to Nour (2002b) only 35 per cent of the respondent firms find information about training opportunities from public education and training institutions (universities and specialized colleges) – and hence may use these opportunities.

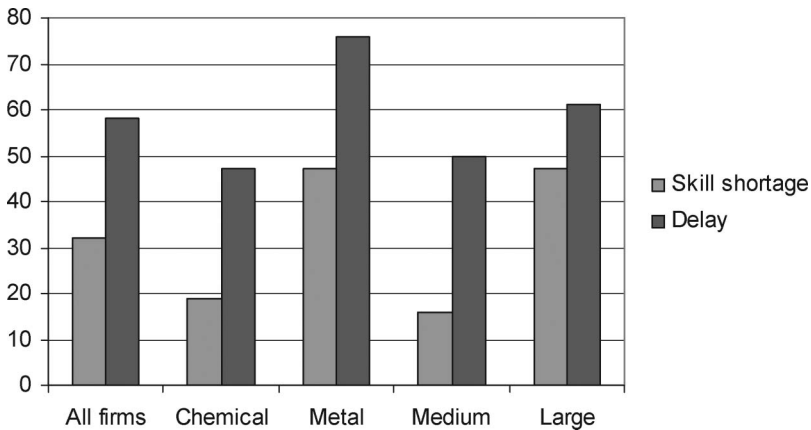


Figure 4. The effects of skill shortage on project implementation across firms. *Source:* Nour (2002b)

more certain short term returns to available jobs than long-term skill investments, the uncertainties about future skills needs, the lack of a system of certification of skills acquired and inadequate incentives for trainers.¹⁸ These factors probably also impede the transfer of knowledge within society at large.

In summary, the interaction between the high share of unskilled foreign workers and the deficient educational system lead to a lower skill level, a poor provision of training, skills mismatch and hindered transfer of knowledge.

V. Low Skill Level, Transfer of Knowledge and Local Technological Capacity

More recently, few studies discuss the status of knowledge in the Arab countries. The UNDP, AHDR (2003) examines the weak status of demand, production and dissemination of knowledge in the Arab states. Moreover, Aubert and Reiffers (2003) assess the challenges and underline a strategy for the development of knowledge-based economies in the Middle East and North Africa countries (MENA). Both reports provide significant contribution, but somewhat general analysis at the aggregate/macro level that refers to all Arab and MENA countries respectively. Since the Gulf countries show considerable disparity from the other Arab and MENA countries, at least in some indicators, such as structure and size of the economy, level of income and structure of labour market, it might be useful to look at them separately. Thus one advantage of our analysis is that we provide a more specific analysis that focus only in the Gulf countries. Moreover, differently from earlier studies, we provide a new empirical investigation of both the importance (impacts) of tacit knowledge at the micro level – see our discussion in Section III above – and the discrepancy in the transfer of knowledge/external schooling effects at the macro–micro levels, as we explain below.

A peculiar aspect of the results of the surveys of Nour (2002a, b) is that these yield contradicting views concerning the incidence and transfer of knowledge at both macro-micro levels and public–private sectors. Nour (2002b) finds that 95 per cent of the respondent firms reported that the transfer of knowledge is successful inside the

firm, while, on the other hand, only 42 per cent of the respondent policy-makers and experts reported that the transfer of knowledge is successful within society at large (Nour, 2002a). From the latter survey we also find that the transfer of knowledge is hindered by a low quality of education, weak linkages and lack of a network between universities, colleges, technical and training institutes and the productive sectors (see also the results reported in Table 10).

In our view, the reason for this apparent contradiction is related to the presence of effective interaction between knowledge holders (high skilled) and knowledge recipients (low skilled) at firm level and a lack of this interaction at aggregate level. For instance, Table 8 indicates that the weak linkages and lack of a network between universities, colleges, technical and training institutes is mentioned by 79 per cent of the respondents to the survey of Nour (2002a) as factor that constrains the efficiency of the educational system – it probably also constrains the transfer of knowledge to the productive sectors. The lack of effective interaction between knowledge holders (high skilled) and knowledge recipients (low skilled) within society at large might be attributed to the presence of cultural and social differences due to an imbalanced structure of the population, resulting from the large share of foreign workers (cf. Table 1 above). Whereas the effective interaction between knowledge holders (high skilled) and knowledge recipients (low skilled) at the firm level might be attributed to successful incentives and motivation mechanisms, which are probably lacking at the aggregate level. Furthermore, we observe that besides using training as a channel of knowledge transfer, firms have somewhat wider options in acquiring and transferring knowledge. For instance, the survey of Nour (2002b) indicates that firms tend to use various channels to acquire and transfer technological knowledge, such as hiring foreign skills/technologically advanced workers/consultants (for example, 32 per cent of the respondent firms), FDI (for example, 21 per cent) and licensing (for example, 16 per cent).

Another implication of the generally low level of skills is the poor local technological capacity.¹⁹ For the UAE case Haan (1999) finds a lack of technology policy, technical skills, R&D and technology culture, resulting in a strong dependence on foreign technology. Moreover, El-Sabaa (1997) indicates the positive contribution of technology transfer in accelerating industrial and economic growth in the UAE, but also shows the limited effects of technology transfer in inducing spill-over effects to constitute an autonomously developing local technological base, as opposed to the success stories in the Far East industrial countries. In her view

Table 10. Factors constraining knowledge transfer and external effects of schooling in the UAE (indicated by respondents)

	Officials
Low quality/return from education	95%
Low quality/return form of training compared to international standard	95%
Failure of knowledge holders (skilled workers) to deliver knowledge to benefit knowledge recipients (unskilled workers)	90%
Failure of knowledge recipients (unskilled workers) to acquire and absorb knowledge from knowledge holders (skilled workers)	90%

Source: Nour (2002a).

these limitations are caused by the inadequate awareness of the end target of technology transfer, the lack of a constitutional framework or a comprehensive plan for transferring technology, the insufficient local base of technological data and the lack of qualified local manpower necessary for transferring technology. From the data in Nour (2002b) we find similar results. The dependence on foreign technology appears in the high dependence on imported equipment, machinery and techniques (for example, 90 per cent of the respondent firms), the high percentage (for example, 70 per cent) of capital equipment built by foreign companies relative to total capital equipment, and the lack of short-run plans to promote local technology.²⁰ The main reasons for this dependence on foreign technology are, respectively, the lack of local technology from local suppliers (for example, 84 per cent of respondent firms), a better price (for example, 37 per cent) and a better quality of foreign technology (for example, 34 per cent).²¹ The survey also indicates that the lack of local efforts for technology development is basically related to low R&D efforts, which according to the follow-up interviews can be attributed to a lack of fruitful cooperation between universities and firms, that is transfer of knowledge from universities to firms. Other disincentives factors are a lack of R&D employees, a lack of information systems, a lack of resources and a lack of social awareness and concern (Nour 2002a, b).²²

Our results found at firm level are also consistent with those found in the literature at aggregate level. In general, the heavy dependence on foreign technologies varies across the Gulf countries (cf. Table 1). However, throughout the period 1989–98, the average for all Gulf countries has not shown considerable change and remained above 70 per cent (GOIC, 2000). It is attributed to a lack of R&D efforts, skills and scientific cooperation and to a poor technology infrastructure (Zahlan, 1999; Rasiah, 2002). Finally, the status of the Gulf countries according to the UNDP (2001) classification of world countries according to the technology achievement index (TAI) shows that none of the Gulf countries are classified amongst leaders, potential leaders or dynamic adopters of technologies in the world.

Therefore, both the excessive share of unskilled foreign workers and the deficient educational system have serious implications including a lack of skills, transfer of knowledge and effective networks that hamper the local efforts for developing local technologies, consolidate dependence on foreign technologies and a decline in productivity at both micro and macro levels.

VI. Conclusions

In this paper we argue that upskilling of the workforce, both local and foreign, is a necessary condition for a successful implementation of the three strategies of the Gulf countries: technological development, economic diversification and structural labour market change. Focussing in particular on the UAE we show that the deficient educational system in the Gulf countries and the high share of unskilled foreign workers constrain economic growth, in particular technological development, and foster dependence in these countries on foreign technologies.

From the survey data on firms in the metal and chemical industries we find that the positive correlation between education, training and technology on the one hand, and tacit knowledge on the other, is consistent with the stylised facts emphasised in

the new growth literature. The same holds for the positive relationship between education and wages.

We also use the survey data for policymakers and experts to argue that the deficiencies of the educational system result from a poor quality of the educational system at basic and tertiary levels, inadequate planning, assessment and monitoring of educational needs and private investment. Low quality of teachers and mentors, lack of infrastructure, and low enrolment and access to schooling, particularly in tertiary and technical education.

Taking all these results together, our findings imply that the interaction between the deficient educational system and the high supply of unskilled foreign workers has many serious consequences. Particularly, a low skill level, a low provision of training, severe skills mismatch, low transfer of knowledge, weak efforts for local technological development, dependence on foreign technologies and productivity decline. We also note that the poor quality of education and training and the lack of incentives to motivate effective interaction between knowledge holders and knowledge recipients and skills mismatch are important factors hindering the transfer of knowledge.

Therefore, the major policy implication from this study is that the Gulf countries need to reform their educational system, which is essential for improving the provision of training and enhancing tacit knowledge. This also should improve the skill level, the transfer of knowledge, the development of local technologies and productivity growth, and at the same time reduce the dependence on foreign technologies and foreign unskilled workers. The reform of the educational system requires improvement in the quality (internal efficiency) of that system at basic and tertiary levels. From the survey data for policy-makers and experts we recommend that priority should be given to enhance the quality of teachers and mentors, using both internal training (Al-Sulayti, 2002) and external training to acquire knowledge and skills from abroad. In addition one should improve the infrastructure through increasing both public and private spending on education, enrolment and access to schooling – particularly, tertiary and technical education. Also one should enhance the quality of educational institutions mainly through modernisation and dynamism, improving planning and monitoring of educational needs on a regular basis, the linkages (network) between universities, technical and training institutes and their flexibility.²³ And finally, the quality of educational courses should be improved and the management of the educational institutions should be decentralised (Al-Sulayti, 2002). This also may imply more scope for private education.

In our view the Gulf countries can benefit from the experiences of other advanced countries to improve the coordination and planning to avoid the mismatch between supply and demand and to meet critical skills needs. For instance, the Gulf countries can benefit from the experiences of the European countries, where the government limits itself to pay teacher's salaries and leaves the coordination problem to employer's federation. The Gulf countries should continue to upgrade schooling and increase enrolment in all levels, especially in higher education, and should also induce firms to organise in a federation that has the task of organising branch specific education—with taxes as a stick, and payment of teacher salaries as a carrot.

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Notes

1. The Gulf countries include Bahrain, Kuwait, Oman, Qatar, the Kingdom of Saudi Arabia and the United Arab Emirates.
2. According to UNDP and the International Labour Organization (ILO) definitions, using ISIC Revision 3, industry includes mining and quarrying (including oil production), manufacturing, construction, electricity, gas and water. Services include wholesale and retail trade; restaurants and hotels; transport, storage and communication; financing, insurance, real estate and business services; and community, social, and personal services (UNDP, 2003).
3. ICT spending in all Gulf countries increased from 2.2 per cent of GDP in 1992 to 3.6 per cent of GDP in 2001 (WITSA, 2002).
4. Furthermore, the low levels of net capital inflows and foreign direct investment in the Gulf countries fall below those of the developing countries (cf. UNDP, 2003) and may indicate the weak incentives to attract foreign investment to develop the local technologies.
5. More recent census data are not yet available.
6. Similarly, the ESCWA (1999) information provides further evidence on the low participation rate of the native population and the high participation rate of the foreign population in Kuwait, Oman and Bahrain. Al-Tony (2002) finds that for the case of Kuwait, the participation rate of the native population increases with the increase of educational level from 7.5 per cent, 40 per cent to 92 per cent for illiterate, secondary and university graduates respectively.
7. For instance, as a reflection on the national educational system, about a quarter of the respondents to the survey of Gray (1999) report that the skills and qualifications provided by the local educational system did not prepare native workers for private sector employment. Other important factors include salary differentials, social, economic, attitudinal and motivational conditions and behavioural characteristics related to work status, working conditions (working hours).
8. The chemical sector includes manufacturers of basic industrial chemicals, fertilizers and pesticides, synthetics resin and related materials, paints, varnishes and lacquers, petrochemical, pharmaceuticals, drugs and medicine, soap and cleaning preparations, chemical products, petroleum refinery, miscellaneous petroleum and coal products, tyre and tube industries, rubber products and plastics product. The metal sector covers only fabricated metal industries, represented by aluminium and iron-steel, while in Table 1 it is much broader. However, the remaining part of this sector is not very relevant in terms of employment, capital and number of industrial establishments.
9. For the purpose of this study, firm size is defined by employment size, where small size firms are firms with less than 50 workers, medium size firms are firms with 50–100 workers and large size firms are firms with more than 100 workers.
10. Al-Tony (2002) finds that for the case of Kuwait 68 per cent and 72 per cent of the foreign workers are either unskilled or low-skilled in 1989 and 1999, respectively.
11. In most of the industrialised countries, more than half of R&D expenditures are financed by industry (Second European Report on S&T, 1997).
12. Kumar and Saqib (1994) suggest that the probability of undertaking R&D increases only up to a certain level with firm size, while R&D intensity increases linearly with it.
13. According to the OECD classification, eight sectors account for almost 80 per cent of R&D expenditures in member countries: pharmaceutical, electronics, computer and office equipment, aerospace, chemicals, motor vehicles, electrical machinery and instruments (cf. OECD, 1997).

14. There is also a positive correlation between training expenditures and ICT expenditures not reported in Table 5, which can be interpreted as complementarity between upskilling and technology (Colecchia and Papaconstantinou, 1996; Bresnahan et al., 1999).
15. Using the share of ICT, R&D, training and capital investment as an indicator of codified knowledge, analogous to David and Foray (2001) and Freeman and Soete (1997), did not lead to satisfactory estimation results.
16. In recent years, the participation of women in education, including higher education shows an increasing trend; however, the share of women in the labour market is still lagging behind, and in some cases the employment of women in certain jobs contributes to the mismatch problem (cf. Al-Tony, 2002).
17. As reported by 82 per cent and 79 per cent of the respondent policy-makers and experts, respectively.
18. As indicated by 75 per cent of both the respondent policy-makers and the experts. Less important factors include the uncertainties about the future value of investment in education and training and the high costs of financing education and training.
19. The weak technological capacity is similar to other developing countries. In the recent years there is a growing body of literature focusing on technological capability building in the developing countries (for early references, cf. Enos, 1991). Early studies on Trinidad and Tobago, Costa Rica and Iran have brief remarks indicating that technological capability building is related to current resources-based industries and governments' works only on static capability building. Another earlier study on the Andean countries in 1979 briefly mentions that multinationals discourage capability building.
20. Nour (2002b) finds that the short-run plan (next three years) for 46 per cent of the respondent firms is depending on imported technology.
21. Our results with respect to metal sector are consistent with the findings of Haan (1999).
22. A majority (for example, 87.5 per cent) of the respondent firms with R&D activities in the survey of Nour (2002b) only have a small number (1–5) of fulltime research employers.
23. Other suggested means for skill upgrading include both the use of ICT and long-distance learning as indicated by 75 per cent and 64 per cent of the respondent policymakers and experts respectively.

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