

Skill Mapping in Indian Labour Market: Supply Side Potential and Emerging Demand Scenario

S.K. Sasikumar*
Anup K. Karan**

This paper attempts to map the availability of skills (or supply of skills) in India. After a comprehensive assessment of the magnitude and types of supply of skills presently available, the paper aims to forecast the emerging supply and demand situation during a medium-term period of five years. The assessments are intended to feed to policy in order to achieve the target of creating 500 million skilled persons in India by 2022.

I. INTRODUCTION

Skills and knowledge are the driving forces of economic growth and social development of any country. Countries with higher and better levels of skills adjust more effectively to the challenges and opportunities of world of work. Presently, the skill base of the Indian economy is quite low as compared to other developed economies of the world. In fact, low skill base of Indian workforce is often referred to as one of the major factors which could act as deterrents for sustaining high economic growth that India has achieved during the last one decade or so (Planning Commission, 2008). The issue has gained further attention in the post-financial crisis period as unskilled and less educated workers were among the worst sufferers of the economic slowdown (Sasikumar and Anup Karan, 2009). This calls for evolving and implementing a suitable and workable framework to enhance the employability of workers. Against the various challenges, National Skill Development Policy has been formulated in India in 2009 which, *inter alia*, targets creating 500 million skilled people by 2022. Further, continuous skill upgradation is also considered important, *inter alia*, for raising productivity, gender equality and social cohesion (Ministry of Labour & Employment, 2009).

* Senior Fellow, V.V. Giri National Labour Institute (e-mail: sasikumarsk2@gmail.com)

** Labour Economist (e-mail: karan.anup@gmail.com)

2 *Labour & Development*

The Indian economic growth during the current phase of globalisation has attracted significant global attention. Among the various factors, the demographic transition that India is currently passing through is considered to have contributed significantly to the present growth pattern¹. The demographic dividend, mainly in terms of the largest ever share of youth and working age population, has not only ushered new hopes and aspirations but also significantly added to the supply side potential of economic growth in the country (Bloom and Canning, 2006). The vision of skilling Indian workforce is particularly important in the light of considerable changes in the structure of Indian economy over the years, more so during the last two decades. This is reflected by a substantial shift of workers away from primary sectors such as agriculture, animal husbandry, mining and quarrying to manufacturing and service sectors over the years. Even within the manufacturing sector, shift from traditional industries such as food processing and other primary processing industries, to modern manufacturing such as wearing apparel, chemical and engineering products etc. has been distinctly witnessed. This has led to significant increase in the demand for skilled workforce across different sectors of employment.

The increasing demand for skilled workforce in the country is driven not only by the internal structural changes in the economy but also structural shift and restructuring of economies world wide. For instance, analysing the existing and emerging employment scenario in European Union (EU) countries, the CEDEFOP (2008) notes that "Europe has experienced continuing shifts away from primary sector (especially agriculture) and traditional manufacturing industries towards services and knowledge intensive economy in general, and these trends are likely to continue to be a key feature over the coming decade²". The CEDEFOP Report (2008) further observes that as compared to number of workers in 2006, Europe will need an additional approximately 10 million managers, professional and skilled technicians and professional associates with high skill content by 2015. The highest growth (approximately 1.5% per annum) of workers in Europe for the period 2006-15 is projected to be with respect to corporate managers and physical and engineering science professionals, doctors and para-medical workers and other technical assistants. India is considered as a country with potential to meet the emerging skill made in Europe.

The emerging scenario in India and abroad clearly indicates that the skilled workforce does not imply only the workers with mechanical and technical education. Instead there has been a large number of 'higher education' based specialised knowledge that has been on high demand particularly in the expanding information technology (IT) and service sectors (particularly health care and education sectors) of the economy. Even with regard to medium (or lower) level skills, there has been a shift from a more narrowly defined vocational training (VT) that is dominated by technical skills to a broadly viewed technical and vocational education and training (TVET) where generic or transferable skills thrive alongside the technical knowledge (Leney, 2008).

How is India ready to take up these new challenges in coming years? Given the supply side benefits emerging from the demographic dividend and the demand side dynamisms of the changing economic structure internally and globally, India certainly needs to plan strategically. This calls for a comprehensive assessment of the present situation, particularly in terms of the availability of skill in the country. Moreover, there is need to assess the emerging demand situation not only of the total volume but also the types of skills. Against this background the present paper makes an attempt to map the availability of skill (or supply of skill) in the country. After a comprehensive assessment of the magnitude and types of supply of skills at present, the paper aims to forecast the emerging demand situation during a medium-term period of five years. The assessments are intended to feed to policy in order to achieve the target of skilling 500 million persons by the year 2022.

II. DATA SOURCE AND METHODOLOGY

2.1. Data Source

The paper is largely based on the National Sample Survey Organisation (NSSO) data for the year 2004-05 (61st round), Employment and Unemployment Situation (EUS) in India. However, the preceding two rounds *viz.* 1999-2000 (55th round) and 1993-94 (50th round) have also been used for the purpose of estimating trends in employment and unemployment growth. In addition to the NSSO data, gross domestic product data has been used for the purpose of calculating sectoral and total employment elasticity. The GDP data has been collated from the web-site of Central Statistical

Organization (CSO), Ministry of Statistics and Programme Implementation, Government of India. Data and information on domestic product at 2-digit classification of the National Industrial Classifications (NIC) has also been used for the analysis at broad dis-aggregation levels, particularly within manufacturing and service sectors.

Further, since NSSO bases its data on sample surveys, all the estimates are calculated by applying inbuilt weighting system of the NSSO. However, despite applying the inbuilt weights, total population estimated by the NSSO is usually underestimated for a particular year. All the estimates in this study have been calculated by adjusting with the interpolated Census population data for respective years. For this, the Census projection for different years (*Population Projections for India and States – 2001-2026*) has been used.

2.2. Methodology

1. Skill mapping – base line

Skill mapping for the year 2004-05 has been done at three levels: *viz.* persons currently reporting as: a) employed; b) unemployed and c) out of labour force.

a) Employed – skill assessment of all the employed persons has been done by classifying all the employed persons (approximately 457 million in 2004-05) by industries (National Classification of Industries 1998, NIC 1998) and occupation (National Classification of Occupations 1968, NCO 1968). Further, the levels of educational achievements, both general and technical education of the employed persons has been used for classifying the skills into 'high', 'medium' and 'low' skills. As for example, workers with technical education of degree and above are classified as 'high' skilled. Education levels of diploma and certificate courses are classified as 'medium' and 'low' skill. All workers who acquired skill through any informal process are classified as 'low' skill.

b) Unemployed – for 'unemployed' levels of skill can be assessed on the basis of reporting of receiving/received formal and informal training. In addition, educational levels both general and technical has also be considered for classifying skills into 'high', 'medium' and 'low' skills.

c) **Out of labour force**³ – for all persons reporting out of labour force skill base has been assessed by the same method as reported in a) and b).

Total stock of skill in the base year (2004-05) will be estimated as to be the total number of skilled persons under a), b) and c).

Levels of skills *i.e.* 'high', 'medium' and 'low' has been classified on the basis of educational achievements of the labour force. In this regard most developed countries treat educational levels of workforce above upper secondary level as specific skill (Nam, 2009). The present study follows largely the same classification with further classifications of skills into 'low', 'medium' and 'high' by cross-classifications of general education and technical education. Following matrix presents the levels of such classifications to identify the levels of skills among workers as well as general population.

Matrix of General and Technical Educational Achievements of Indian Labour Force

General education level	Levels of technical education			
	No technical education	Vocational training	Diploma/certificate	Degree
Primary or below*				
Middle				
Secondary				
Higher secondary				
Graduate				
post graduate & above				

Note: *including illiterate not applicable no skill low skill medium skill high skill

An alternative method to classify the skills of the employed into low, medium and high may be the classification of occupation levels. For this, occupation data will be analysed at NCO 3-digit levels. As for example, engineers, doctors, scientists and professionals may be classified into high skill category, while technicians, machine operators and artisans may be classified into medium skill category. Similarly, helpers, trainees, and some categories of service workers may be classified into low skilled. Table 1 presents snapshot of classification of skill on the basis of occupation of workers:

Table 1
Classification of Occupation by Levels of Skill

Occupations	Levels of skill
Physical scientists, architects, technologists, surveyors, and town planners, engineers, life scientists, physician, surgeon, university teachers and researchers, Professional (Managers, executives etc.), Accountants, Auditors and Related Workers	High
Technicians, Artisans, nurses, mid-wives, Vaccinators, Inoculators, Medical Assistants, X-Ray Technicians, Ophthemetrists & Opticians, Physio-therapists and Occupational Therapists, school teachers, technical construction workers	Medium
Machine operators, helpers, trainees, cutter and processors	Low
Agriculture workers, Manual workers, others	Not skilled

2. *Projection of employment and skill*

Considering 2004-05 as the base line, projections of employment and skill has been done for the years 2009-10 and 2014-15. These two years have been chosen for the projection purposively. As the last comprehensive EUS is available for the year 2004-05, projections for the year 2009-10 will provide the current prevailing situations and the projection for the year 2014-15 will provide a medium term future scenario (of say 5 years from now) Following steps has been followed for the projections:

- a. Total size of labour force for the period 2009-10 and 2014-15 has been projected by considering demographic projections for respective years and average labour force participation rates (LFPR).
- b. Projection of total as well as sectoral (at one-digit NIC) employment for the period 2009-10 has been done on the basis of the employment elasticity with respect to domestic product.
- c. Projection of total as well as sectoral (at one-digit NIC) employment for the period 2010-14 has been done under three different scenario:
 - i. High economic growth of say 10% per annum;

- ii. Medium economic growth of 9% per annum; and
 - iii. Low economic growth of 8% per annum.
- d. Projection of skilled workers for the year 2009-10 and 2014-15 will base on:
- i. Sectoral employment growth between 2004-05 to 2009-10 estimated on the basis of sectoral employment elasticity during 2009-10 to 2014-15 estimated on the basis of changing sectoral share of employment;
 - ii. Growth rates of different occupation types (NCO 3-digit level) estimated on the basis of sectoral employment growth between the two referred periods; and
 - iii. Likely economic growth separately under the low, medium and high growth scenarios.

III. BASELINE MACRO SCENARIO ON STOCK OF SKILL

3.1 General and Technical Education

In terms of general and technical educational achievements of Indian population, total stock of skilled persons can be estimated on the basis of persons with higher levels general education (such as higher secondary, graduates and post graduates) and technical education (such as degree level technical education, diploma and certificate courses, vocational education etc.). As far as general educational achievement of Indian population is concerned, it is bottom heavy. In the year 2004-05, approximately 40% of the total population was illiterate with an additional approximately 32% having education only up to primary level. Only 9% of total population was higher secondary or above and only 4% graduate and above. Proportion of graduate in the 20 years and above age population was approximately 7% with additional approximately same proportion above higher secondary but below graduate. Proportion of educational achievements among women is further low as 48% of all women were illiterate in the year 2004-05. Further, only 8% and less than 3% women of age 20 years above were higher secondary and graduate respectively in the same year.

Despite the fact that the overall educational standard of population in India reflects a dismal picture in general, total stock of educated persons (higher secondary level and above) in the

country can not be undermined. The NSSO data indicates that in 2004-05 more than 97 million persons were higher secondary and above (Table 2). Out of this, approximately 50 million was youth (age 15 to 29 years) including approximately 22 million women youth. There is also no dearth of persons with graduate or above levels of education in the country. Based on the Census 2001 data and the university enrolment and outturn rates, Agarwal (2008) estimated approximately 51 million graduate persons in India in the year 2004-05. This included approximately 10.6 million post graduate persons as well. According to the NSSO, approximately 45 million people in 2004-05 had education level of graduate and above. To this, women constituted approximately 33% (*i.e.* approximately 15 million). Similarly, total number of graduate in the younger age group of 20 to 29 years is estimated to be approximately 17 million including approximately 7 million women youth.

Table 2

Distribution of Total Number of Persons (in million) with Educational Achievements by Age Groups, 2004-05

Age groups (in years)	Illiterate	Primary or below	Middle	Secondary	Higher secondary*	Graduate	Post graduate	Total
0-4	108.91	4.16	0.00	0.00	0.00	0.00	0.00	113.07
5-9	36.78	80.22	0.06	0.00	0.00	0.00	0.00	117.05
10-14	12.03	88.41	19.02	0.79	0.00	0.00	0.00	120.17
15-19	17.79	28.92	35.35	23.68	10.67	0.39	0.00	116.82
20-24	23.82	22.82	20.29	11.69	14.19	7.18	1.09	101.11
25-29	25.90	19.98	16.08	9.85	7.66	6.57	2.24	88.27
30-34	29.18	18.00	12.39	7.76	6.13	5.26	1.59	80.32
35-39	29.92	17.51	10.03	6.32	4.47	3.82	1.23	73.30
40-44	28.76	15.03	8.27	5.33	3.72	3.21	1.14	65.46
45-49	25.62	12.70	6.47	4.13	2.65	2.72	0.73	55.02
50-54	22.12	9.53	4.59	3.19	2.09	2.11	0.69	44.32
55-59	18.85	7.35	2.77	2.12	1.38	1.40	0.48	34.37
>59	52.81	16.18	4.71	4.00	1.88	1.71	0.71	82.01
All	432.00	348.19	137.37	76.42	53.50	34.13	9.87	1091.28

Note: * includes Diploma/certificate courses

Source: Calculated from unit level records of the EUS of the NSSO 61st Round.

Moreover, over the years a significant increase in the number as well as percentage of persons with higher education is noticeable. Number of persons with higher secondary or above level of education almost doubled during the period of 1993-2004 from approximately 49 million in 1993-94 to more than 97 million in 2004-05. Number of persons with graduate degree increased from less

than 24 million in 1993-94 to 44 million 2004-05 *i.e.* registering an annual growth of 5 to 6% per annum during the period (Table 3).

Table 3

Number and Percentage of Persons with Different Levels of Education

Educational standard	Number of persons(in millions)			Percentage distribution		
	1993-94	1999-2000	2004-05	1993-94	1999-2000	2004-05
Illiterate	443.89	447.96	432.00	49.69	44.62	39.59
Below primary	159.83	184.42	197.16	17.89	18.37	18.07
Primary	103.62	119.87	150.83	11.60	11.94	13.82
Middle	85.98	113.70	137.37	9.62	11.32	12.59
Secondary	50.73	67.77	76.42	5.68	6.75	7.00
Higher secondary	25.75	34.97	53.50	2.88	3.48	4.90
Graduate and above	23.59	34.10	44.00	2.64	3.40	4.03
Total Population	893.39	1003.98	1091.28	100	100	100

Source: Calculated from unit level records of the EUS of the NSSO of the respective Rounds.

The formal education sector of the country also has a large network of institutions providing technical education of various levels. This comprises of institutions under the university sector imparting degree level technical education such as engineering, medicine, architecture etc. In addition, outside the higher education sector, there are institutions imparting diploma level and certificate courses training, Industrial Training Institutes (ITI's) and Industrial Training Centres (ITC's) for craftsmen training, vocational and apprenticeship training between elementary and secondary level education and degree level technical knowledge in variety of professional courses. However, despite a wide network of technical institutions in the country at all levels percentage of population with technical education is at abysmally low level. Only 1.5% of total population and 2.5% of population of age 15 years and above report to have any kind of formal technical education in the year 2004-05. The proportion is less than 1.5% among women (Table 4).

Table 4
Distribution (Number and Percentage) of Population of Age 15 years and above by Levels of Technical Education in 2004-05

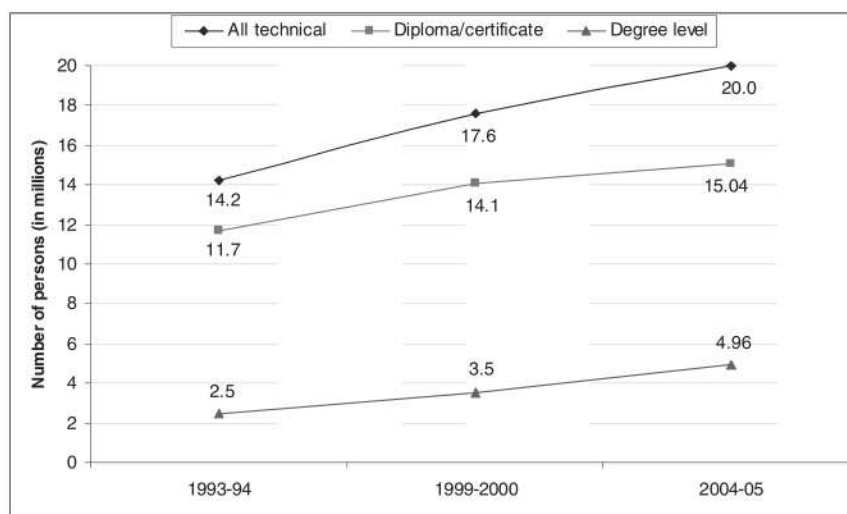
Levels of technical education	Numbers (in millions)			% distribution		
	Male	Female	Total	Male	Female	Total
No technical education	366.18	356.71	722.92	96.56	98.60	97.56
Diploma/certificate level	7.81	3.11	10.89	2.06	0.86	1.47
Degree level	3.38	1.56	4.96	0.89	0.43	0.67
Other technical degree	1.90	0.43	2.30	0.50	0.12	0.31
Total technical education	13.09	5.1	18.15	3.45	1.41	2.45
Total population, age 15 years and above	379.23	361.77	741.00	100	100	100

Source: Same as Table 1

Nonetheless, approximately 17.8 million persons (including approximately 5 million women) of age 15 years and above reported to have some or other formal technical education with little less than 5 million persons with degree level technical education. In addition, there are approximately 1.2 million persons with diploma/certificate courses classified under general education but not classified under technical education in the data base of 2004-05. Taking these together (17.8 million classified under technical education and an additional 1.2 million classified under general education) leads to a total estimate of 20 million persons educated in some or other formal technical professional stream in the year 2004-05.

Again, over the years the number of technically educated persons, on the whole as well as by specific levels of degree is on the increase. Total number of persons with degree level of technical education doubled between 1993-94 and 2004-05 from just 2.5 million in 1993-94 to 5 million in 2004-05. Similarly, total number of technically educated persons increased from approximately 14 million in 1993-94 to 20 million in 2004-05. The growth pattern of degree level and technical education and all kinds of technical education during the period of 1993-94 to 2004-05 is depicted in Figure 1.

Figure 1
Number of Persons with Technical Education (Diploma/Certificate, Degree Level and All Technical), 1993-94, 1999-2000 and 2004-05



Note: 'All technical' and 'Diploma/Certificate' include 1.2 million persons with Diploma/certificate courses classified under general education but not classified under technical education in the data base of 2004-05.

Source: Same as table 2

The growth pattern of technical education in the country indicates that between the period 1993-94 and 2004-05, number of persons with any kind of technical education increased at a rate of 3.16% per annum with degree level education increasing at a rate of more than 6% per annum during the same period. In fact, degree level technical education increased at a rate of more than 7% per annum during the period of 1999-2000 to 2004-05. Clearly, the growth rate of diploma/certificate level education has been rather sluggish. In fact the growth rate of diploma/certificate level technical education declined to 1.30% per annum during 1999-2000 to 2004-05 from more than 3% per annum during 1993-94 to 1999-2000.

3.2 Skills among Youth, 2004-05

Identification of skills among youth (age 15 to 29 years) has attracted significant attention in recent years worldwide as well as in India. The concerns are related to increasing unemployment rates among educated youth during the last couple of decades or so. This concern led to several researches worldwide on enhancing employability of youth by providing marketable skills⁴. NCEUS (2009) estimated that in 2004-05 approximately 11.5% youth in India have received (or receiving) any vocational training, whether formal or informal. This amounts to approximately 33.4 million youth (21 million male and 12.4 million women) receiving or received any kind of vocational training. However, this estimate does not include a large number of youth in the same age group with higher level of general and technical educational achievements but not received vocational training. A cross-classification of data on status of 'vocational training' and 'technical education' among youth indicates approximately 88% concordance as that proportion of the total number of youth (approximately 290 million in 2004-05) have neither achieved any technical education nor received (or receiving) any vocational training (Table 5).

Table 5

Distribution of Total number of Youth (in millions) by Status of Vocational Training and Technical Education, 2004-05

Sources of vocational Training	Levels of technical education				Total
	No technical education	Diploma/certificate	Degree	Other Courses*	
None	253.89	1.23	0.91	0.53	256.56
Formal	6.04	3.56	1.20	0.33	11.12
Informal	22.09	0.13	0.04	0.01	22.26
Total	282.01	4.91	2.14	0.88	289.94

Note: * is classified as 'any technical degree' in the data base.

Source: same as Table 1

However, what is important to note is that approximately 2 million youth who do not report having received (or receiving) any vocational training have achieved some professional/technical

education such as diploma/certificate, degree and others. Hence estimating skill among youth only by status of vocational training leads to a lower bias by approximately 1.3% of the total number of youth. Similarly, only going by technical educational achievement leads to a downward bias of approximately 50%, as more than 28 million youth who received (or receiving) some or other vocational training do not report having achieved formal technical education. Vocational training through informal process is the main component which does not get captured in the technical educational achievements of the population.

If the status of vocational training is cross classified with general educational achievements, approximately 7.4 million youth with formal or informal vocational training report themselves with educational achievement either as illiterate or below primary level. Majority of them acquired education through non-formal education system. Additional approximately 11 million youth report education between primary and middle levels. This essentially indicates that out of approximately 33 million youth who received (or receiving) any vocational training, more than 18 million possess low levels of skills as their general education achievements are below middle levels. However, what is important to note that more than 75 million youth with secondary or higher levels of general education (including more than 13 million graduate youth) do not report receiving or received any vocational training. In addition, more than 4.9 million youth with secondary and higher levels of education report to have received (or receiving) vocational training through informal sources. These figures essentially indicate about the limited coverage of vocational training system in India which is also reflected by the fact that nearly double the number of youth with formal vocational training have received (or receiving) such training through informal sources (Table 6).

Table 6
Distribution of Total Number of Youth (in millions) by Status of Vocational Training and General Education, 2004-05

Levels of general education	Sources of vocational training			
	formal	Informal	none	Total
Below primary*	0.22	7.27	82.47	89.97
Primary & middle	1.13	10.09	98.53	109.75
Secondary and higher secondary	6.82	4.28	62.24	73.34
Graduate & above	2.95	0.63	13.31	16.89
Total	11.12	22.26	256.56	289.94

Note: * including illiterate.

Source: same as Table 1

3.3 Educational Status of Workers

In general, educational achievements of Indian workforce are not significantly different from the adult population who are out of labour force. As high as 39% of all workers are illiterate with additional approximately 25% of them having educational attainments only up to primary level. In fact, as compared to workers, a higher proportion of non-working adult population have educational achievements of secondary level or above. As against 21% workers having educational achievements of secondary level or above more than 26% of non-working adults are secondary and above (Table 7).

Table 7
Percentage Distribution of Workers, Unemployed and Out of Labour Force Persons by Educational Achievements, 2004-05

Levels of education	Workers	Unemployed	Out of labour force	Total population age>=15 years
Illiterate	38.77	7.59	36.38	37.32
Below Primary	10.93	5.06	8.26	9.84
Primary	13.74	9.11	11.50	12.83
Middle	15.47	18.87	17.20	16.16
Secondary	8.75	17.55	12.86	10.42
Higher secondary*	6.17	19.77	8.75	7.36
Graduate	4.69	17.05	4.08	4.70
Post graduate & above	1.49	4.99	0.97	1.36
Total	100.00	100.00	100.00	100.00

Note: * including Diploma/Certificate.

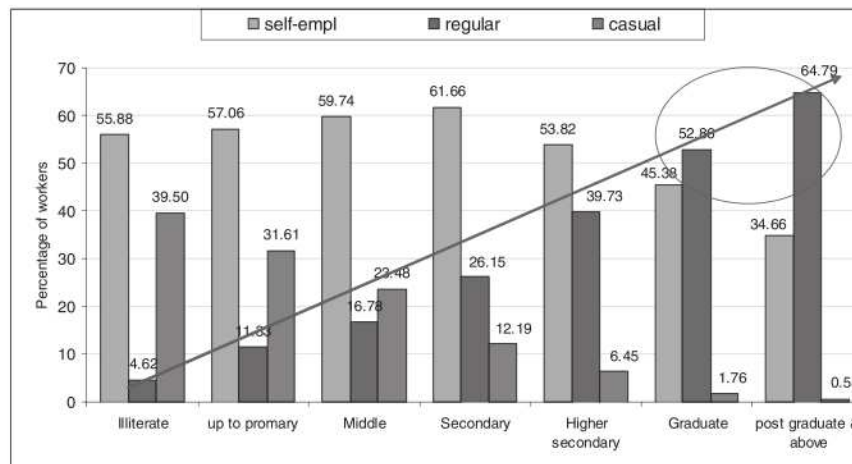
Source: same as Table 1

However, what is evident in Table 7 is significantly higher level of education among unemployed. Approximately 60% of the unemployed have education levels of at least secondary level including approximately 5% with at least graduation level. In absolute terms this amounts to 8 million unemployed persons with secondary and above including 3 million persons with graduation and above. High unemployment rate among educated persons has been one of the prime policy concerns in most developed and developing countries. Among various reasons of high unemployment among educated, particularly youth, lack of marketable skills has been identified as one of the main reasons. In recent years large quantum of literature has emerged on the subject with some sort of unanimity that revamping the present education system and providing modern skill to youth are the real solutions of the rising unemployment among educated youth (O'Higgins, 2001; Planning Commission, 2006; NCEUS, 2009).

One more disquieting feature that emerges here is that the group of 'out of labour force' is predominantly comprised of women population. Given the very low labour force participation rates of women in India, more than 77% of the adult population categorised as 'out of labour force' are women. Further, more than 45 million women with secondary or higher level (and approximately 10 million women with graduation or higher level) of education report themselves as out of labour force. Although a small proportion of these are in older age groups more than half of the total number of women reporting as 'out of labour force' are in the prime working age group of 15 to 35 years.

Although the facts presented in Table 7 may indicate that the general education system is not helpful in enhancing employability of the Indian labour force as overwhelming proportion of the workforce are either illiterate or has an education level of below middle level, it is evident that higher educational achievements immensely contributes to access to quality employment. This is reflected by the fact that workers with higher levels of education have better access to regular jobs while those with lower education levels or illiterate are mainly self-employed or casual labourers. More than 52% of workers with graduate level of education and as high as 65% of the workers with post graduate levels are engaged in the labour markets as regular workers (Figure 2).

Figure 2
Percentage Distribution of Workers at Each Level of Educational Achievements by their Status of Employment, Self-employed, Regular and Casual, 2004-05



Note: upto primary includes below primary as well, all other stages of education are completed levels.

Source: same as Table 1

As far as the formal technical education of workers is concerned, only 3% of the total workers report having any formal technical education. This implies that approximately 13.5 million workers have attained some or other kind of formal technical education. Further, as in case of general higher education, a significant number (approximately 4.5 million) of adult persons with formal technical education report themselves as non-workers (*i.e.* either 'unemployed' or 'out of labour force'). Even with degree level technical education more than 1.5 million adult persons report to be either unemployed or out of labour force. As indicated earlier, a large proportion (approximately 70%) of them are women in prime working age group of 30 to 45 years.

3.4 Occupational Profile of Workers

Yet another set of information on the skill base of the Indian workforce can be obtained through the detailed occupational profile

of the workers. The analysis of the 2004-05 EUS indicates a high degree of correspondence between the general and technical educational pattern on the one end and the occupational distribution of workers on the other. The broad occupational distribution of workers reflects a large concentration the Indian workforce among elementary and low end occupations such as office clerks, farming and cultivation, small and tiny small enterprise owners, and manual labourers. Although all these workers may not be exclusively unskilled workforce, given the nature of occupations, most of these workers possess either low levels of skill or do not match the increasing demand for the kinds of skill needed to deliver the diverse range of knowledge and services demanded in a modern economy. However, a significant number of workers with varied levels of skills may be identified as those associated with occupations like executive and administrative officials, managers, professionals, technical associates, health and education workers, building trades (construction sector) and production workers etc. Further, within these categories of occupation (particularly within production workers) varied levels of technical skills are required ranging from low technology based handicrafts production to highly mechanised metal processors and plant and machine operators. The ensuing paragraphs present a broad and a detailed occupational categorisation of Indian workforce first in the base year of 2004-05 followed by a trend analysis over the last two decades or so.

A broad skill-based broad classification of the occupational pattern⁵ of the Indian workforce in 2004-05 presented in Table 7 clearly indicates that out of a total of 457 million workers approximately 285 million (more than 62%) workers are engaged in either farm sector or work as manual labourers. Proportion of farm sector workers and labourers is as high as 68% among women workers as compared to less than 60% among male workers. Next concentration of women workers is observed in the fishery sector, followed by sales and service (including personal services), handicraft and food beverages and tobacco processors. Sales and service sector is also one of the major employers of male workers and altogether more than 47 million (approximately 11%) workers are engaged as sales and service workers. In addition to this, 11.6 million workers are office clerks including computing machine operators, time recorders, book-keepers, and junior clerks. All kinds

of production workers taken together constitute up to 53.4 million, which is approximately 12% of the total workforce in the country (Table 8).

Table 8
Distribution of Male, Female and All Workers by Broad occupational Divisions, 2004-05

Name of Occupations	Number of workers (in millions)		
	Male	Female	Persons
Legislators, senior officials and managers	12.42	1.83	14.25
Professionals (engineers, physicians, architects etc.)	8.22	3.07	11.28
Technicians and associate professionals	4.15	2.07	6.22
Clerks (office clerks, computing machine operators etc.)	9.99	1.56	11.55
Service workers and shop and market sales workers	39.70	7.34	47.04
Skilled agricultural* and fishery workers	8.01	19.20	27.21
Production workers I: Metal processors, machine operators etc.	15.70	0.16	15.86
Production workers II: Artisans and other precision workers	8.26	2.30	10.56
Production workers III: Handicraft	8.22	5.78	13.99
Production workers IV: Extraction and building trades	1.65	0.06	1.71
Production workers V: Brick layers and construction workers	3.09	0.03	3.12
Production workers VI: Wood, paper, rubber, printing etc.	1.45	0.24	1.69
Production Workers VII: food, beverages and tobacco	2.63	3.88	6.51
Farmers and Cultivators (including allied activities)	95.73	53.47	149.19
Low end occupations (Mainly manual labourers)	88.84	46.73	135.57
Occupations not identified	0.81	0.72	1.52
Total	308.82	148.48	457.30

Note:* includes farm managers and farm machine operators.

Source: same as Table 1

The occupational groups of the workers presented in Table 8 indicate about the broad pattern of types of skills of the Indian workforce possesses. The break up of the first group *i.e.* 'Legislators, senior officials and managers' shows that the group is overwhelmingly dominated by more than 11 million small and tiny enterprise owners and managers. Legislators and senior officials constitute only up to 0.4 million with additional 1.1 million corporate managers. The occupational group of 'professionals' is largely represented by primary level teachers (4.7 million) followed by higher secondary and high school teachers (2 million). Other professionals such as

physical scientists, engineers, physicians, architects etc. taken together constitute up to approximately 4 million. At the technicians and associate professional levels, teaching associates (para-teachers and non-formal education teachers) again dominate the group. Total number of teacher associates is approximately 2 million. After the teaching associates, life science and health professional associates such as nursing, sanitary and other medical and health technicians etc. are approximately 1.4 million in numbers. In general, agriculture and farm sector is largely constituted of unskilled or very low skilled workforce. However, within this sector a small group of workers can be identified with some special skills. These workers are farm managers, farm machine operators and fishery workers. These workers (mainly represented by fishery workers) constitute up to 27.2 million (*i.e.* only up to 6% of the total workforce in India). The number of workers reported in the group of brick layers and construction workers in Table 7 does not include casual manual labourers. After excluding all casual manual labourers in construction and building trades, total number of construction workers is approximately 4.83 million represented in two different groups (production workers IV and V) in the Table 8.

3.5 Classifying Levels of Skill

Estimating skill base in India is a complex issue. Any assessment of the stock of skill in a particular year in the country must consider all the information (like information on general and technical education of total population and youth, occupational profile of workers etc.) in an integrated manner to arrive at an unbiased estimate of not only the total skill base in the country but also levels of skills. The present section collates all these information together to determine the levels of skills of population of age 15 years and above and the labour force and assess the total skill base in the country. The classifications of the levels of skills has been done in a hierarchal manner of 'high', 'medium' and 'low', based on the general and technical educational achievements of all population, workers and non-workers separately for 15 years and above. According to the criteria for classifying the skills mentioned in the methodology section of this paper, the total magnitude and proportion of 'high', 'medium' and 'low' skill is presented in Table 9.

Table 9
Number and Percentage Distribution of Workers, Non-Workers and Total Population above Age 15 Years by Levels of Skills, 2004-05

Levels of skill	Number and % of workers, non-workers and population		
	Workers	Non-workers	All
Numbers (in millions)			
No Skill	336.3	197.4	533.7
Low	70.8	58.4	129.2
Medium	33.9	21.1	55.0
High	5.5	2.2	7.7
All	446.5	279.1	725.6
% distribution			
No Skill	75.32	70.72	73.55
Low	15.86	20.92	17.81
Medium	7.59	7.56	7.58
High	1.23	0.80	1.06
All	100	100	100

Source: based on Appendix Table III

Based on the present classification, *i.e.* skill related educational achievements, approximately 644 million persons, *i.e.* approximately 89% do not possess any skill as on the one hand they do not possess any technical education and on the other their general educational achievement is also very low, ranging from illiterate to middle standard in majority of cases. Some of these persons (up to 17%) are also educated up to secondary levels. This also implies that approximately 11% of total adult population (*i.e.* 81 million adult persons) do possess some kinds of skill. The percentage is little higher among workers (more than 12%) than among non-workers (less than 10%).

However, the present estimate of population with skill may be considered slightly on lower side as information on vocational training in the 2004-05 database is available only for the youths (age 15-29 years). If even half of the percentage of vocational training

among youth is assumed to be present in the age group of 30 years above, an additional 25 million persons might be estimated to be vocationally trained. This essentially leads to an estimated approximately 115 million skilled persons in the age group of 15 years and above in the year 2004-05. In its 50th Round (1993-94) EUS survey, NSSO had canvassed a separate question on skill along with the questions on education and technical education. Analysis of this data also reveals that more than 90 per cent of the total population did not have any skills. Approximately 10 per cent of population (i.e. 91.2 million) reported as having skills (NCEUS, 2009). The 2004-05 EUS indicates that the proportion of adult population (age 15 years and above) having any kind skills may be in the range of 15%.

Further, the classification of all skills into 'high', 'medium' and 'low' skills as presented in Table 9 indicates that an overwhelming proportion of skilled population, in fact, have low levels of skills. Only 1.2% of total workers have high levels of skills and only 2.84% of the workers possess 'medium' level of skills. The levels of skills among workers can further be understood by classifying different occupations of workers into varied levels educational achievements. Analyzing the 2004-05 NSSO LFS data Sasikumar (2008) has classified detailed occupational groups of workers into four educational groups *viz.* a) illiterate & below primary; b) elementary; c) secondary and d) higher secondary & above. It is evident from the results presented in Sasikumar (2008) that most of the workers with top end occupations such as Scientists, architects, engineers, physicians, surgeons, managers and other professionals have higher levels of educational qualifications. In contrast, workers with occupations such as agriculture and allied activities, service workers, artisans, sales workers etc are in the lower education brackets. These results clearly indicate about levels of skills among different occupation groups of workers.

Although general and technical educational achievements of workers in general may be a good indicator of levels of skills among workers, the present paper does not follow the same typical method of identifying the levels of skills of workers mainly because of the following reasons:

1. A detailed analysis of educational achievements of workers at a highly disaggregate levels of occupational groups has already been recently done in Sasikumar (2008);
2. At highly dis-aggregated levels significant mismatch between educational achievements of workers and their nature of occupations is identified leading to unrealistic results; and
3. A significant proportion of workers in India learn different skills through informal sources such as hereditary learning, informal sources etc. which mostly remains uncovered in the formal learning system.

Because of these reasons, the present paper presents an alternative method of identifying skills and levels of skills among workers. At a highly dis-aggregated level of occupational groups, the nature of occupation itself identifies the types and levels of skills of a worker. As for example, *pima facie*, the occupations of all engineers, physicians, surgeons, top professionals, scientists, architects etc necessarily are related to high skill professions. Similarly, all technicians, professional associates, managers and proprietors, complex machine operators, etc. may be considered as workers with medium level skills. In contrast sales workers, service workers, artisans etc have some lower levels skill while agricultural workers, labourers, other manual workers etc are basically unskilled workers. Based on the available information in the EUS, 2004-05, following groups (Chart 1) of occupations have been formed with different levels of skills:

Chart 1
Estimates of Occupation with High, Medium and Low Skills, 2004-05

1.1. Occupations with High Skill

Name of occupations	Estimated No. in 2004-05
Physical scientists	64,201
Architects, technologists, surveyors, and town planners	113,043
Civil Engineers	229,142
Electrical and electronic engineers	230,409
Mechanical engineers	153,663
Other engineers (chemical, metallurgy, mining and industrial)	45,721
Overseers and Technicians	732,533
Aircraft and Ships engineers and Technicians	41,919
Life scientists and Technicians	103,949
Physicians and Surgeons, Allopathic	500,881
Physicians and Surgeons, Ayurvedic	160,193
Physicians and Surgeons, Homoeopathic	136,616
Pharmacists	154,103
Other physician and surgeons	263,824
Mathematicians, Statisticians, Economists and Related Workers	317,104
Social scientists	202,620
Accountants, Auditors and Related Workers	828,171
Teachers: University college	484,129
Administrative and Executive Officials, Government and Local Bodies	497,427
Corporate Managers, Working Proprietors, Directors	703,508
Production workers: Metal processors	596,087
Total number	6,559,243

1.2. Occupations with Medium Skill

Name of occupations	Estimated No. in 2004-05
Medium enterprise Proprietors, Directors and Managers	891,033
Vaccinators, Inoculators, Medical Assistants	153,615
Nurses	375,336
X-Ray Technicians, Opthemetrists & Opticians, Physio-Therapists and Occupational Therapists	125,782
Jurists	550,574
Teachers: Higher Secondary & High School	2,023,991
Poets, Authors, Journalists and Related Workers	93,636
Sculptors, Painters, Photographers and Related Creative Artists	428,183
Composers and Performing Artists	283,674
Production workers: Miners, Quarrymen, Well Drillers etc.	1,340,340
Production workers: wood, paper, chemical processors	961,396
Production workers: Spinners, Weavers, Knitters, Dyers and Related Workers	6,266,131
Production workers: Machine and electric fitters, instrument makers, electronic workers etc.	7,333,745
Production workers: Plumbers, Welders, Sheet Metal and Structural Metal Preparers and Erectors	1,662,693
Production workers: Jewellery and Precious Metal Workers and Metal Engravers	1,808,098
Production workers: Glass Formers, Potters and Related Workers	1,414,497
Production workers: Rubber and Plastic Product Makers	465,327
Total number	26,178,053

1.3. Occupations with Low Skill

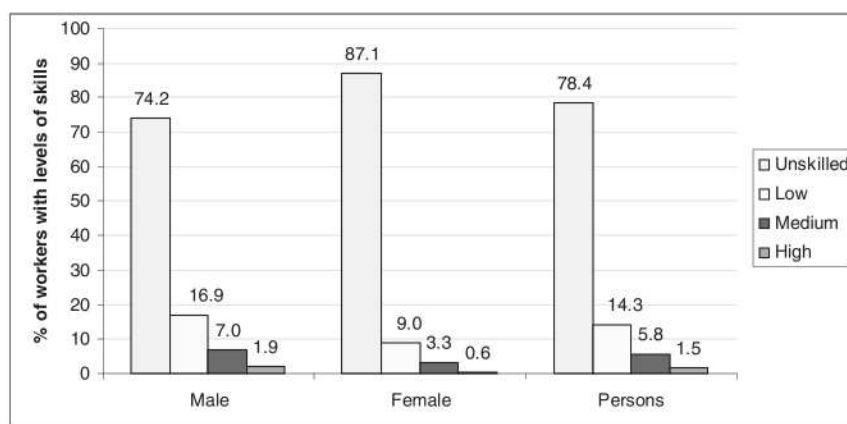
Name of occupations	Estimated No. in 2004-05
Small enterprise owners/managers	11,807,847
Production workers: Tailors, Dress Makers, Sewers, Upholsterers	9,027,036
Midwives and Health Visitors	117,102
Nursing, Sanitary and Other Medical and Health Technicians,n.e.c.	513,893
Dental, Veterinary and Pharmaceutical Assistants	202,741
Teachers: Primary and Middle	4,869,682
Transport and Communication workers	1,413,542
Telephone and Telegraph operators	348,859
Service workers: Hotel and Restaurant keepers, House Keepers, Matrons and Stewards, Waiters, Bartenders etc.	4,620,357
Service workers: Protective service	3,129,798
Production workers: Shoemakers and Leather Goods Makers	998,293
Production workers: Food and Beverage Processors	2,891,687
Production workers: Artisans-carpenters, stone cutters, Blacksmiths, tool makers and operators etc	10,441,898
Production workers: Printing and Related Workers	703,279
Production workers: Equipment Operators Oiler and Greaser, Material Handling, Transport Equipment Operators	13,042,719
Total number	64,128,733

All the workers classified under the above mentioned three categories provide higher estimates of skilled workers under all the three levels of skills than estimated only on the basis of educational achievements. On the basis of educational classifications of skill levels, approximately 5.5 million workers are classified under high skill. On the basis of occupational groupings, the figure increases to approximately 6.5 million. Similarly, number of medium skill and low skill workers also increase from 12.7 million and 37 million respectively on the basis of educational qualifications to 35 million and 59 million respectively on the basis of occupational groupings. However, it is interesting to note that in the case of high skilled workers both the estimates are pretty close. Most of the increase in the medium and low skilled workers under the occupational groupings is observed mainly at the cost of unskilled workers. Here it is important to reiterate again that since a large number of workers in India acquire varied levels of skills through informal sources, the same is not captured in the typical method of identifying skills and levels of skills by formal educational achievements of workers. This is particularly true in case of medium

and lower levels of skills, which workers may acquire also through experience rather than a formal education system.

Total number of workers with different skills levels in 2004-05, as identified through the occupational groupings, is estimated to be approximately 100 million (78 million male and 22 million women) *i.e.* 22.5% of the total adult workforce in the country. A gender based division of the levels of skills indicates that at all the skill levels proportion of female workforce is significantly lower to their male counterparts. In contrast, the proportion unskilled female worker is approximately 85% as compared to 74% unskilled male workforce. On the basis of the dis-aggregated occupational group data generated from the 2004-05 labour force survey, proportion of male and female workers with varied levels skills is presented in Figure 3.

Figure 3
Percentage of Male and Female Workers with Varied levels of Skills, 2004-05



Source: Authors' estimates

Further, it will be interesting to note the pattern of concentration of skilled workers by levels of skills across different sectors of the economy. At the broad sectoral levels (16 classifications) it is evident that agriculture has almost negligible share of workers with any type of skill (Table 10). Manufacturing sector has approximately 80% of the workers with some or other types of skill although a large

proportion of the skilled workers possess low levels of skills. Utilities (electric, gas and water supply) also has a large share (69%) of workers as skilled workers and most of the skilled workers possess high or medium levels of skill. Within the service sector, hotels and restaurant, transport, health and education has fairly high share of workers as skilled workers. However, construction sector is largely dominated by unskilled workers as approximately 90% of the workers in construction sector are unskilled.

Table 10
Percentage Distribution of Workers by Levels of Skill at Broad Sectoral Level, 2004-05

Sectors of employment	Levels of skill				
	high	medium	low	All skilled	unskilled
Agriculture	0.01	0.04	0.16	0.21	99.79
Mining and quarrying	3.10	54.75	20.71	78.56	21.44
Manufacturing I (15-22)	0.65	20.5	58.18	79.33	20.67
Manufacturing II (23-37)	6.59	33.2	40.30	80.09	19.91
Utilities	15.57	41.44	11.98	68.99	31.01
Construction	0.71	5.53	4.22	10.46	89.54
Sale: Retail and Wholesale	0.33	9.14	11.37	20.84	79.16
Hotel and restaurant	0.55	0.95	84.25	85.75	14.25
Transport, storage etc.	1.37	3.42	69.92	74.71	25.30
Financial intermediation	10.82	3.54	7.09	21.45	78.54
Real Estate	2.42	4.73	35.98	43.13	56.87
Other business	21.65	22.77	23.59	68.01	32.00
Public administration & defence	11.92	5.24	24.80	41.96	58.05
Education	5.20	17.59	46.16	68.95	31.05
Health	34.61	16.35	23.23	74.19	25.81
Other services	0.52	3.61	10.83	14.96	85.04
Total	1.46	5.84	14.32	21.62	78.38

Source: same as Table 1 and definitions of levels of skill as discussed in methodology section

The classification of levels of skill on the basis of occupation groups also reflects a regional picture of concentration of skill in different Indian states. First of all one definite pattern that emerges from the state level analysis is important to note. Most of the

developed Indian states have higher proportion of high and medium skilled workers as compared to those in poorer and less developed states in general. Proportion of unskilled workers total workers in developed states/union territories *viz.* Chandigarh, Delhi, and Punjab are in the range of 50 to 70 percent. In Maharashtra, Haryana and Uttaranchal the same is in the range of 70 to 80 per cent. In contrast to this proportion of unskilled workers in most less developed states like Bihar, Chhattisgarh, Madhya Pradesh, Orissa, Jammu Kashmir, Jharkhand and Rajasthan is in the range of 80 to 90 per cent.

As far as the regional distribution of workers within each categories of levels of skill is concerned this shows a straightforward pattern. Either the populous or developed Indian states share bulk of the skill workforce. As for example only two populous states Maharashtra and Uttar Pradesh share more than 27% of the total high skilled workforce in the country. More than 52% of the total high skilled workforce is concentrated in only five states *viz.* Maharashtra, Uttar Pradesh, Tamil Nadu, Andhra Pradesh and West Bengal. These states are also home of bulk of the medium skilled and low skilled workforce. The two states of Maharashtra and Uttar Pradesh share more than 28% of the medium skilled workforce as well. Followed by these two big and populous states, Andhra Pradesh, Tamil Nadu, Karnataka, Gujarat also share bulk of the high and medium skilled workforce in the country (Table 11).

3.6 Skill among Non-Workers

It has already been mentioned that there is significant number of persons with varied levels of skills who report themselves as unemployed and out of labour force. On the whole approximately 26.1 million persons have been identified in 2004-05 possessing different levels of skills and they are not part of the Indian labour force (See Table 9). Considering the normal course of growth among the non-workers, the magnitude of total non-workers possessing skills could be approximately 30 million in 2009-10. Further, more than 62% (*i.e.* 16.3 million) of this human resource are women, who do not participate in the labour market for variety of reasons. Moreover, approximately 68% of these persons are youth and as high as more than 80% (*i.e.* 24 million) are in the prime working age group of 15-40 years. In addition percentage concentration of skill is significant also in the age groups of 40-49 years in case of women (Table 12).

Table 11
Percentage Distribution of Different Levels of Skilled Workers and Unskilled Workers by States, 2004-05

STATE	Levels of skill				
	High	Medium	Low	No Skill	Total
Maharashtra	17.06	11.87	11.47	10.92	11.13
Uttar Pradesh	10.4	16.23	12.62	13.51	13.41
Tamil Nadu	8.99	7.64	10.83	6.48	7.32
Andhra Pradesh	8.3	9.62	10.33	9.09	9.32
West Bengal	7.72	7	7.87	7.22	7.34
Karnataka	6.66	4.1	5.87	6.41	6.23
Gujarat	4.7	5.73	6.47	5.24	5.47
Rajasthan	4.2	5.55	4.54	5.72	5.48
Madhya Pradesh	4.14	5.85	4.69	7.08	6.57
Delhi	3.63	2.5	2.32	0.8	1.17
Punjab	3.61	3.15	2.39	1.93	2.08
Kerala	3.5	4.47	4.75	2.32	2.84
Haryana	2.81	2.86	2.23	1.75	1.89
Bihar	2.57	2.59	3	6.11	5.39
Orissa	2.39	2.69	3.18	3.89	3.7
Assam	1.85	0.98	1.36	2.48	2.22
Jharkhand	1.64	2.16	1.75	2.48	2.32
Chhattisgarh	1.46	1.84	1.08	3.03	2.62
Uttaranchal	1.02	0.69	0.52	0.87	0.81
Himachal Pradesh	0.77	0.49	0.49	0.79	0.73
Chandigarh	0.49	0.2	0.16	0.07	0.09
Jammu and Kashmir	0.39	0.53	0.87	0.5	0.57

Table 12
Percentage Distribution of Male and Female Who Possess Skills but Are Out of Workforce, 2009-10

Age groups (years)	Male	Female	Total
15-19	20.78	10.89	14.61
20-24	40.00	29.63	33.53
25-29	14.08	24.03	20.28
30-34	3.21	11.47	8.36
35-39	0.78	7.60	5.03
40-44	0.54	4.99	3.31
45-49	0.70	4.15	2.85
50-54	1.16	2.41	1.94
55-59	2.78	2.21	2.43
60 & above	15.98	2.62	7.65
Total	100	100	100
Total number (in million)	11.59	18.14	29.73

Source: NSSO, 2004-05; extrapolated for the age group wise population of 2009-10

It is important to note that a significant proportion of the skilled non-workers also possess technical education of various levels. An overwhelming proportion (approximately 50%) is simple graduate or has attained some or other non-technical professional degrees while the rest possess technical degree of different levels. Proportion of non-technical skill is high among non-worker women as compared to that among their male counterparts. However, 4.79 million female and 3.45 million male even after receiving vocational training are not the workforce (Table 13).

Table 13

Distribution of Total Number (in millions) of Male, Female and Persons, who are not in Workforce by Levels of Technical Education, 2009-10

Skill Levels	Male	Female	Persons
Simple graduate and professional degree	4.79	10.20	14.99
Vocational training	3.45	4.79	8.24
Diploma/certificate in agriculture	0.03	0.03	0.06
Diploma/certificate in engineering/technology	1.14	0.40	1.54
Diploma/certificate in medicines	0.10	0.18	0.28
Diploma/certificate in crafts	0.05	0.18	0.23
Diploma/certificate in others	0.81	1.24	2.06
Degree in agriculture	0.06	0.05	0.11
Degree in engineering/technology	0.35	0.25	0.60
Degree in medicines	0.05	0.04	0.09
Degree in crafts	0.03	0.06	0.08
Degree in others	0.29	0.53	0.82
Other technical degree	0.44	0.20	0.64
Total	11.59	18.14	29.73

Source: NSSO, 2004-05; extrapolated for 2009-10

The most ironical fact is that 2.34 million persons with degree level technical education is not in the workforce, *i.e.* either report unemployed or not in labour force in the reference year. Similarly more than 4 million diploma/certificate holders are also not in the workforce (Table 13).

A large proportion (approximately 28%) of the persons in the youth and other prime working age groups do not join workforce mainly because they pursue further higher education. However, among women attending domestic duties is the prime reason

(approximately 43%) that keeps even skilled women out of labour force. Approximately 29% men and 13% women from this group of population also reported that they '*did not work but was seeking and/or available for work*' (i.e. reported to be unemployed).

Such a high proportion of skilled persons remaining outside of the workforce on the one hand reduce the skill base of the Indian labour market and results into sheer wastage of skill and human resources on the other. Although high unemployment rates among educated and skilled persons in India have been widely discussed in recent literature, some of the reasons of this wastage of human resource transcend the territories of labour and education policies. Some of these reasons may be identified as follows: a) weak labour markets information system; b) mismatch between demand and supply of skill; c) high reserve wages; d) disliking about nature of available jobs; e) inadequate work place and commuting security for women workers; f) inadequate social and family support system for women; and g) inadequate information on and support system for internal and international migration.

IV. GROWTH PATTERN OF DEMAND FOR SKILL AND PROJECTIONS FOR FUTURE

This section presents a detailed pattern of growth of demands for skilled workforce over the last two decades and a future scenario in India. The future estimates are presented mainly to identify the types of skills which are likely to be present in the emerging scenario. The growth in demand and future scenario is presented at three levels a) macro (aggregate) level; b) meso (broad disaggregation) level; and c) micro (highly disaggregated) levels. First, a sectoral scenario (both at broad as well as disaggregated level) is presented in order to observe the emerging skill intensive sectors of the economy. The analysis at the broad sectoral levels is followed by a detailed disaggregated analysis of the occupational structure in India.

At the broad sectoral levels, actual total employment has been estimated for the year 2004-05 in ten broad sectors of the economy. To reiterate, the year 2004-05 is the latest year for which detailed and comprehensive employment information is available in India. Further, in order to observe the trends at lower levels, a few major sectors with significantly large proportion of skilled workers have been divided into two to three sub-sectors. Manufacturing has been

divided into two sub-sectors: i) manufacturing of NIC 15 to 22 (*i.e.* industries with primary processing such food processing, wood, paper, leather and related products) and ii) modern manufacturing industries (NIC 23 to 37) such as plastic, chemical, petroleum, engineering, metallic and non-metallic industries. Similarly, within the service sector the sectors of 'trade, hotel and restaurant', 'financial and real estate', and 'community services' have been further disaggregated into smaller sub-sectors. Such divisions are likely to provide estimates on the types of skills over the years.

The estimates of sectoral employment for the year 2009-10 and total employment for the years 2009-10 and 2014-15 have been arrived at by estimating employment elasticity with respect to gross domestic product (GDP) at the sectoral and sub-sectoral levels. Similar methodology has been adopted also in Rangarajan *et al.* (2006) and Islam (2002). The Rangarajan *et al.* (2006) estimates of total employment for the year 2006, 2008 and 2009 are 482 million, 501 million and 529 million respectively. The estimate of total employment in the present study for the year 2009-10 is approximately 519 million (509 million for the adult person, age 15 years and above). The estimate in the Rangarajan *et al.* (2006) is higher to the estimates in the present study mainly because the former estimate was arrived at before the 'economic slowdown' period of 2008-09. Considering approximately 8 to 9 million shortfall in the employment generation during the year 2008-09 in India, the two estimates are pretty close.

The latest GDP data at the broad sectoral levels are available for the year 2009-10. Domestic product at the sub-sectoral levels in manufacturing have been worked out by extrapolating the domestic products data at two-digit levels of the year 2008-09. Within the service sector, sub-sectoral estimates have been worked out by extrapolating the factor income data for the latest year available. The projected sectoral employment for the year 2014-15 is arrived at by using the methodology adopted in NCEUS (2009). The projections for the year 2014-15 are presented in view of three different scenario of economic growth. First, the projection is made if the present economic growth (between 2004-05 and 2009-10) of approximately 8% per annum continues up to 2014-15. Since India had already realised an economic growth of more than 9% per annum during 2007-08 and in near future this is likely to repeat, the second scenario presented is total employment estimate under 9% economic growth between 2009-10 and 2014-15. A third scenario is

presented if Indian economy achieves a higher growth trajectory of double-digit, say 10% per annum. The actual employment for the 2004-05 and the projected employment (age 15 years and above) for the years 2009-10 and 2014-15 at the broad sectoral levels and sub-sectors is presented in Table 14.

The projected employment estimates indicate that while the manufacturing sector is likely to create 10 to 13 million additional jobs by the year 2014-15, sectors such as utilities, public administration and personal services are likely to have negative employment growth by the same year. With increased capital inflow in India a large part of the manufacturing sector are also realising enhanced capital and technology infusions. This, on the one hand, will lead to increased demand for skilled labour, the emerging situation, on the other, may also lead to labour dis-placements leading in turn to stunted employment growth in a few capital intensive sub-sectors of manufacturing. This is reflected by increasingly slower employment growth in manufacturing (NIC 23-37) by 2014-15. Agriculture will continue to provide employment to the largest share of the workforce but the growth of employment will decline to less than 1% per annum by the year 2014-15 (Table 14).

The most significant increase in employment in 2009-10 and 2014-15 is witnessed in the service sectors *viz.* transport storage & communication, trade, hotels and restaurant, financial and real estate, and community services like education and health. Among these financial services, growth in real estate business is most significant as it may reach double digit in coming years. Similarly health and education sectors are also likely to have fairly high growth of employment providing significant fillip to demands for teachers, doctors, and para-medical workforce. All these sectors employ workforce with varied levels of skills. It is important to note that a large part of the service sector, particularly, tourism, financial and real estate, health and education, is highly labour intensive resulting in high employment growth in these sectors. While construction sector employs very large proportion of unskilled and low skilled workers, a large proportion of workforce in health, education and business sectors are high to medium skilled workers. A cross classification of employment by sectors and occupations also provides information on projections for types of occupations (or skills) for future years.

Table 14
Sector-wise Actual and Projected Employment in India: 2004-05 to 2014-15 (age 15 years and above)

Broad sectors of employment	2004-05	2009-10	2014-15		
	Actual	Estimated	Projected with GDP growth		
			at 8%	at 9%	at 10%
1. Agriculture and allied	251.83	258.18	267.48	271.63	275.82
2. Mining and quarrying	2.61	2.59	2.49	2.53	2.57
3. Manufacturing	54.06	65.87	81.43	82.69	83.96
3.1 Manufacturing (15-22)	34.87	41.14	51.59	52.39	53.20
3.2 Manufacturing (23-37)	19.18	23.35	29.83	30.30	30.76
4. Utilities	1.29	1.24	1.14	1.16	1.18
5. Construction	25.66	41.21	59.04	59.95	60.88
6. Transport, storage and communication	18.30	22.74	29.61	30.07	30.53
7. Trade, hotel and restaurant	48.43	69.10	72.39	73.51	74.64
7.1 Wholesale and retail trade	42.58	60.56	63.13	64.11	65.10
7.2 Hotels and restaurants	5.85	8.44	9.26	9.40	9.55
8. Financial and real estate	7.64	11.23	19.53	19.83	20.13
8.1 Banking and insurance	3.09	3.85	4.74	4.81	4.89
8.2 Real estate, ownership of dwellings and business services	4.55	9.89	14.79	15.01	15.25
9. Public administration	8.83	8.16	7.64	7.76	7.88
10. Community and personal services	27.78	28.99	35.78	36.34	36.90
10.1 Education	11.25	14.32	18.47	18.76	19.05
10.2 Health	3.70	4.92	6.94	7.05	7.16
10.3 Personal and other services	12.83	11.39	10.37	10.53	10.69
Total	446.41	509.43	577.10	586.04	595.10

Notes: 2004-05 figures are from NSSO data, 2009-10 is based on employment growth worked out on the basis of employment elasticity with respect to GDP, The projections for the year 2014-15 is based on methodology presented in Annexure II.

Source: Authors' estimates.

Given the sectoral and sub-sectoral growth rates of employment for the years 2009-10 and 2014-15 and needs of specific skills in these sectors, a linear projection of types of occupations can be made for the respective years. These occupations are also indicative of the types of skills of workers. On the basis of high share in total employment and high growth over the years the occupational categories with different skill levels as identified are presented in Chart 2.

Chart 2

**Occupation Groups with High, Medium and Low Levels of Skills
having High Share in Total Employment and High Growth between
2004-05 and 2009-10**

High skill	Medium skill	Low skill
Physical, mathematical and engineering science professionals (2 to 2.3 million)	Overseers and Technicians in civil and mechanical engineering (0.86 to 1.1 million)	Spinners, Weavers, Knitters, Dyers and Related Workers (7 to 9 million)
Physicians and Surgeons, (Allopathic) (0.6 to 0.9 million)	Nurses, health assistants and related workers (0.5 to 0.7 million)	Tailors, Dress Makers, Sewers, Upholsterers (10.5 to 13.5 million)
Corporate managers, executives (1.2 to 1.5 million)	X-Ray Technicians, Opthemetrists & Opticians, Physio-Therapists and Occupational Therapists (0.16 to 0.22 million)	Machine and electric fitters, instrument makers, electronic workers etc. (9.6 to 11.2 million)
Production workers: Metal processors (0.7 to 0.9 million)	Teachers: Higher Secondary & High School(2.5 to 3 million)	Artisans-carpenters, stone cutters, Blacksmiths, tool makers and operators etc(12.5 to 16 million)
Hospitality workers, managers, senior executives (1 to 1.5 million)	Medium industries' managers, executives (1.5 to 2 million)	Production workers: Equipment Operators Oiler and Greaser, Material Handling, Transport Equipment Operators(16 to 20.5 million)
	Hospitality workers, House Keepers, Matrons and Stewards (1.5 to 2.5 million)	Sales workers: Merchants, agents, salesman etc. (12 to 15 million)
		Construction workers (24 to 36 million)

*Note:*1. Figures in parentheses stand for total number of workers estimated to be between the years 2009-10 and 2014-15; 2. Worked out on the basis of Table 12 and Chart 1.

Source: Authors' estimates

Since unorganised sector in India is very small, to the extent of 86% of the total workforce (NCEUS, 2009), a large proportion of these skilled workers are engaged in unorganised sectors and work

under compromised situations for variety of reasons. Nonetheless, all these occupations constitute a significant proportion of employment in India and have reflected high growth over the years, particularly during the present decade.

Further, distribution of these workers across Indian states is not uniform. Most of the high skilled workers are concentrated in states like Maharashtra, Uttar Pradesh, Tamil Nadu, Haryana, Gujarat, and Andhra Pradesh. These six states taken together contribute more than 60 per cent the total high skilled exportable workers identified in Chart 2. In addition to these states, West Bengal, Karnataka, Delhi and Punjab contribute up to additional one fifth of the total number of high skilled workers.

V. IN LIEU OF CONCLUSION

The foregoing discussions essentially reflects the fact that although the skill base of the Indian labour market is small, with approximately one fifth of the total number of workers having some or other kinds of skill, total magnitude of skilled workforce in the country is significant. In addition there are also a significant number of persons with variety of skills but are out of the labour markets. Some of the key policy initiatives which could further augment the supply of skill and thus enhance the preparedness of the Indian economy to meet the emerging requirement of skills include: Comprehensive mapping of skill base in India including skills acquired through informal process; evolving a national level system of formalising variety of skills acquired through informal sources; equal emphasis on professional degrees along with medium level skill formation; standardisation and gradation of skills across different trades and skill providing centres; weeding out outdated modules and trades of skill and upgrading the curriculum with international standards; evolving a standardised and effective system of accreditation of skills of workers with significant work experience; establishing national accreditation agency to provide quality assurance, which will also work as the nodal agency for skill identification and certification; establishing effective labour markets information system on demands for and supply of skill with regional level variations on a continuous basis; forging effective public-private partnership to establish skill providing institutions with access to the less advantaged sections and regions..

NOTES

1. The link between demographic change and economic has been widely discussed in literature, (for example see: Bloom, Canning, and Sevilla, 2003).
2. The projection in the CEDEFOP (2008) Report has been done for the period 2006 to 10015.
3. On the basis of economic activity status, total population is divided into three parts *viz.* a) workers, b) unemployed – non workers but seeking jobs, and c) out of labour force – non workers and also not seeking job.
4. For a good review on youth employment and role of skill formation among youth, see Higgins 2001.
5. This is based on the National Classification of Occupations (NCO), 1968. The aggregation in broad categories is based on the three-digit classification of NCO available in the NSSO data base at the unit level. Most of the occupational categories at the three digits levels are comparable with International Standard Classification of Occupation (ISCO).

REFERENCES

- Agarwal, P., (2008), *Higher Education and the Labour Market in India*, Indian Council for Research on International Economic Relations (ICRIER), New Delhi.
- Bloom, D., D. Canning and J. Sevilla, (2003), "The Demographic Dividend: A New Perspective on the Economic Consequences of Population Change." *Population Matters Series*, Santa Monica, California: Rand
- Bloom, E. David and David Canning (2006), "Booms, Busts and Echoes; How the Biggest Demographic Upheaval in History is Affecting Global Development", *Finance and Development*, September, Vol. 43, No. 3.
- The European Centre for the Development of Vocational Training (CEDEFOP) (2008), *Future Skill Needs in Europe: Medium Term Forecasts*, Synthesis Report, CEDEFOP, Office for Official Publication of the European Communities, Luxemburg.
- Leney, T. (2008), "Developing Core Competencies and Skills", Power Point Presentation at the World Bank, Washington DC, April 2008.
- Ministry of Labour and Employment (MoL&E) (2009), *National Policy on Skill Development*, Ministry of Labour and Employment, Government of India, New Delhi.

- Nam, Yoo Jeung Joy, (2009), *Pre-Employment Skills: Development Strategies in the OECD*, SP Discussion Paper, No. 0923, Social Protection & Labour, the World Bank.
- National Commission for Enterprises in the Unorganised Sector (NCEUS) (2009), *Skill Formation and Employment Assurance in the Unorganised Sector*, NCEUS, Academic Foundation, New Delhi.
- National Commission for Enterprises in the Unorganised Sector (NCEUS) (2009), *The Challenge of Employment in India: An Informal Economy Perspective*, Volume I – Main Report, NCEUS, Academic Foundation, New Delhi.
- National Sample Survey Organisation (NSSO) (2006), *Employment and Unemployment Situation in India, 2004-05*, Report No. 515(61/10/1), NSSO, Department of Statistics and Programme Implementation, Government of India, New Delhi.
- O'Higgins, Niall, (2001), *Youth Unemployment and Employment Policy: A Global Perspective*, International Labour Office, Geneva.
- Planning Commission (2008), *Eleventh Five Year Plan 2007-12, Inclusive Growth*, Vol. I, Government of India, New Delhi.
- Rangarajan C, Padma Iyer Kaul and Seema (2006), "Revisiting Employment and Growth", *Money and Finance*, September.
- Sasikumar, S.K. (2008), *Skill Profiling and Skill Certification in India in the Context of Promoting Migration from India to Europe*, Ministry of Overseas Indian Affairs and International Organisation for Migration, New Delhi.
- Sasikumar and Anup Karan, (2009), *Global Slowdown and Export Sector in India: Impact on Production, Export and Employment (with special reference to Textiles, Handicrafts and Diamond Sectors)*, Report of the Research Study commissioned by Department of Commerce, Ministry of Commerce and Industry, Government of India, New Delhi.

