



ESRC Pathfinder Programme on Collaborative Analysis of Microdata Resources: Brazil and India  
**Assessing the impact of higher education expansion on economic restructuring,  
occupational change and access to opportunities in Brazil and India**

## Exploring increasing Graduate Intensity in Occupations in India

**Jeemol Unni**

Institute of Rural Management (IRMA), India  
[jeemol@irma.ac.in](mailto:jeemol@irma.ac.in)

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## Exploring Increasing Graduate Intensity in Occupations in India

Jeemol Unni<sup>1</sup>

India has seen a rapid growth in knowledge intensive industries. At the same time there appears to be a major surge in the demand for higher education, both technical and non-technical. There is now an understanding among the youth that unless they acquire relevant skills, they will not be able to gain from the current growth of knowledge and technology intensive industries. This is a challenge for India today, to match the education/skills and relevant jobs for its youth.

In this paper we will analyze the links between changes in higher education and occupational structure through a new classification method developed in the UK (Elais and Purcell, 2004a). These changes are analyzed by comparing among the age cohorts 21-35 years and 40-54 years for the year 2004-05 and between 1993-94 and 2004-05 (NSSO data). We address the questions: How has the demand for higher education changed in various occupations over a decade?

The paper begins with a broad review of the context and policy options in higher education in India. The second section discusses the supply of graduates through enrolments among adult cohorts and occupied population. In the third section we construct the new Standard Occupational Classification SOC(HE), and use it to analyze which occupations have a greater graduate density and whether there is an increase in demand for higher education. The influence of higher education on participation in SOC (HE) occupations is analyzed through a probit model. In section four we explore the issue of graduate wage premiums. We explore the issue of earnings further through earnings functions that estimate returns to education and the effect of occupations on earnings in section five. Section six concludes the discussion with the highlights of the paper.

### The Context

Given India's age pyramid with more than one third of its population below the age of 14 years and given its low literacy levels, the major debates in education have concentrated on elementary education. The arena of higher education is relatively under-researched. As India grows rapidly into a knowledge economy, concerns with regard to whether its higher education system can match up to the challenge of producing the kind of skilled workforce necessary for this growth has arisen. A recent University Grants Commission report on higher education (UGC, 2003) discussed the issues and concerns in higher education in India today. The report addressed three themes, namely 1) Management of Higher Education; 2) Reorientation of

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Higher Education and 3) Quality Assurance in Higher Education. Two eminent reports have been brought out in recent years, the National Knowledge Commission headed by Sam Pitroda (GOIa, 2009) and the Committee on Renovation and Rejuvenation of Higher Education headed by Yashpal (GOIb, 2009).

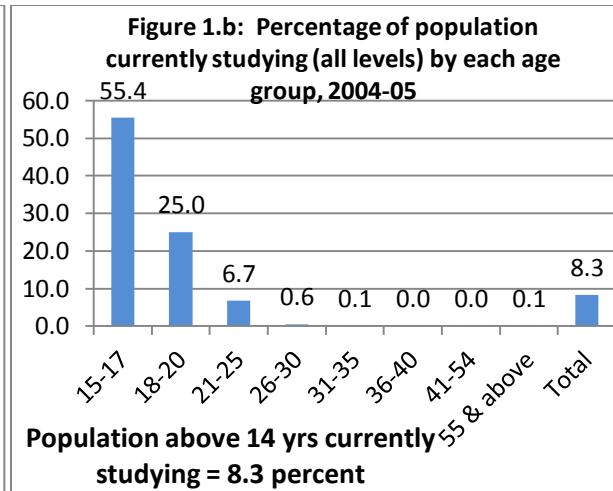
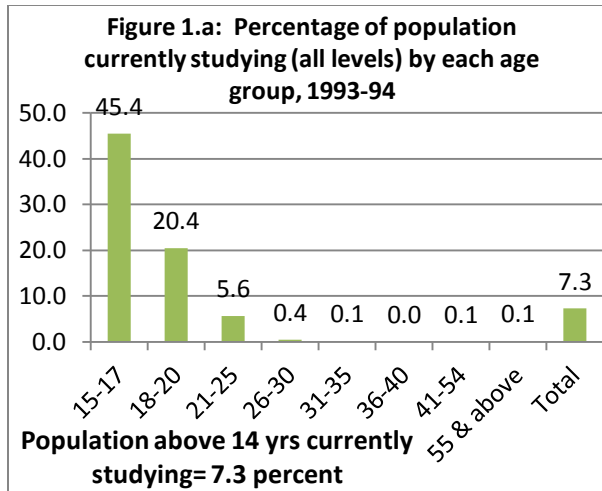
Four Bills have been introduced in Parliament: Foreign Educational Institutions (Regulation of Entry Operation) Bill, 2010; Prohibition of Unfair Practices in Technical, Medical Educational Institutions and Universities Bill; the Educational Tribunal Bill and the National Accreditation Authority Bill. The Foreign Educational Bill is the most controversial, but the basic premise is that every foreign educational service in India, existing or planning in future, should register with a designated authority. The provision in the Bill against repatriation of surpluses will prevent purely commercial institutions from entering. The other Bills propose to make accreditation mandatory, prevent malpractices in higher education and help speedy disposal of disputes through a special tribunal (Anandkrishnan, 2010).

There has been an increasing skill premium in the labour market in India. This has been attributed to skill biased technical change which allows a rapid increase in supply of workers with graduation and above degrees or diplomas to co-exist with increasing skill premium (Unni and Rani, 2008). However, others argue that this rapid increase in skill premium exposes a paradox in India's labour market, in the sense that this enormous pool of skilled workers is relatively shallow (Kapoor and Mehta, 2007). They argue that the higher education system produces poor quality graduates and neither serves as a screening or signaling device, nor prepares students to be productive and responsible citizens.

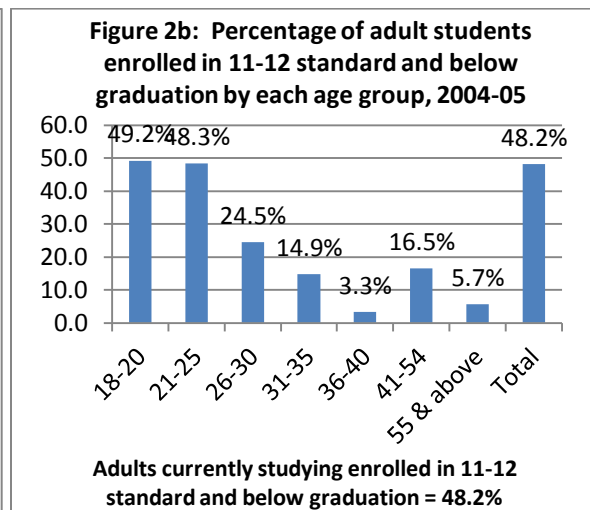
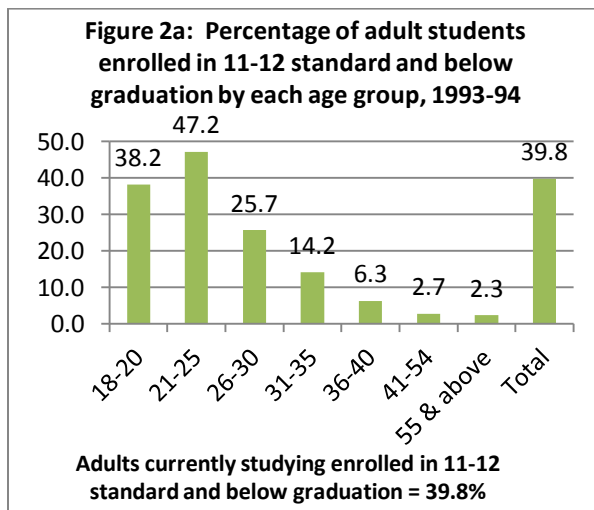
## **Supply of graduates**

### ***Currently Studying Adult Population***

To get an idea of the current interest in education among adults in each of age group, we look at the percentage of population currently studying at any level of education. Only 8.3 percent among total population above 14 years of age reported to be currently studying in 2004-05. This had increased by only one percentage point over the decade. While about 55 percent of 15 to 17 year olds were currently studying at any level, only a quarter of the population aged between 18 to 20 years was enrolled in educational institutions (Figure 1a and b). It is encouraging that there was a 10 and 5 percentage point increase in enrolment of young adults 15-17 years and 18-20 year olds respectively. In the age group of 21-25 years, merely 6.7 percent and for the rest of the adult population a negligible percentage were currently studying and the increase over the decade was negligible.

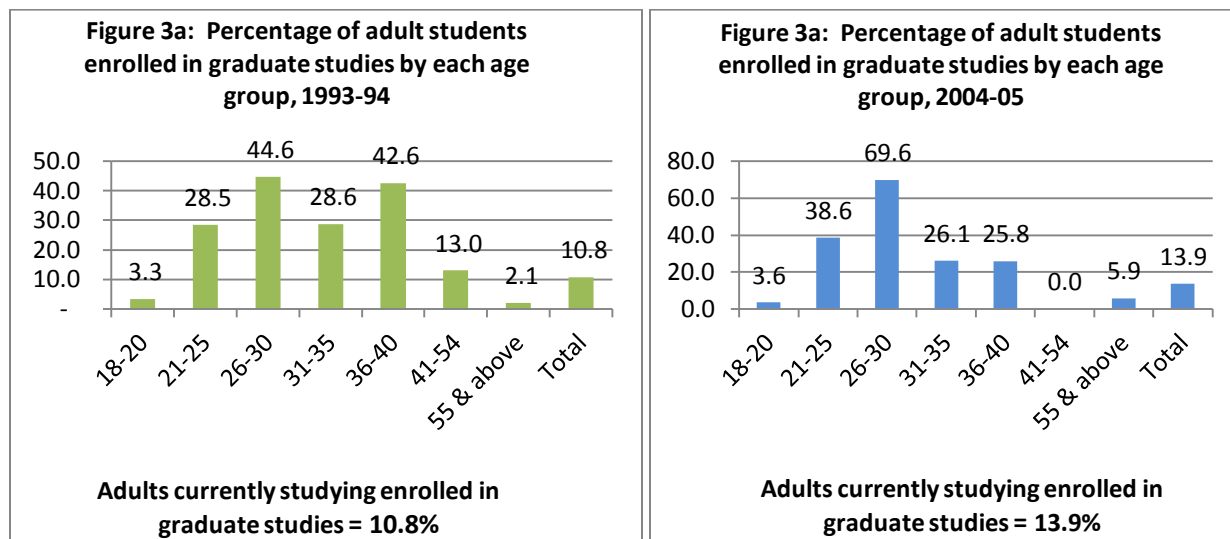


Among all adults 18 years and above who were currently studying, 48.2 percent were attending 11-12 standard or other courses below graduation in 2004-05. This had risen from nearly 40 percent in 1993-94 (Figure 2a and b)<sup>2</sup>. Around half of those in age group of 18-20 and 21-25 years were studying below graduate courses in 2004-05. As noted above the major increase in enrolment was among the young adults 18-20 years during the decade. About a quarter of persons currently studying aged between 26 to 30 years were attending below graduate studies. Nearly 15-16 percent of adults aged 31-35 and 41-54 years were also currently enrolled in either completing 11-12th standard or undertaking some diploma or certificate training. Thus while we noted a negligible percentage of persons in the later age groups currently studying, the major change over the decade was an increase in the older cohorts making efforts to improve their educational levels or training.

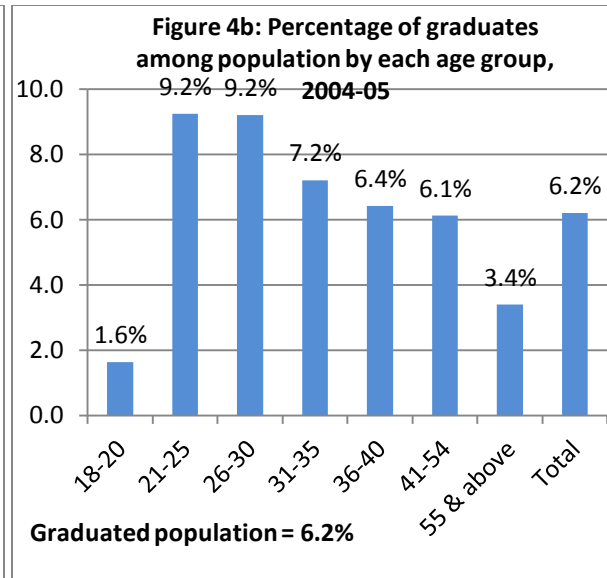
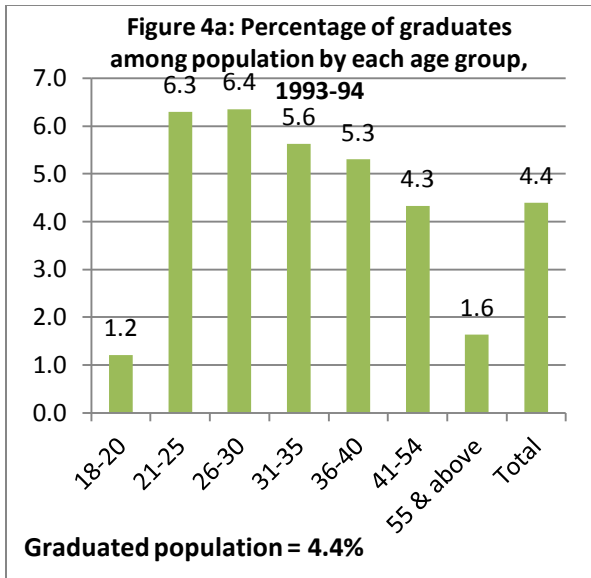


<sup>2</sup> Only 4.1 and 5 percent of 15 to 17 year olds in 1993-94 and 2004-05 respectively were studying in secondary and below graduate levels.

Nearly 14 percent of adults aged 18 years and above were enrolled in graduate studies in 2004-05 and this had risen from little less than 11 percent in 1993-94 (Figures 3 and b). There was a 10 percentage point increase in graduate enrolments in the age group 21-25 years and nearly 25 percentage point increase among 26-30 year olds during the decade. This is indeed very encouraging for the growth of higher education.

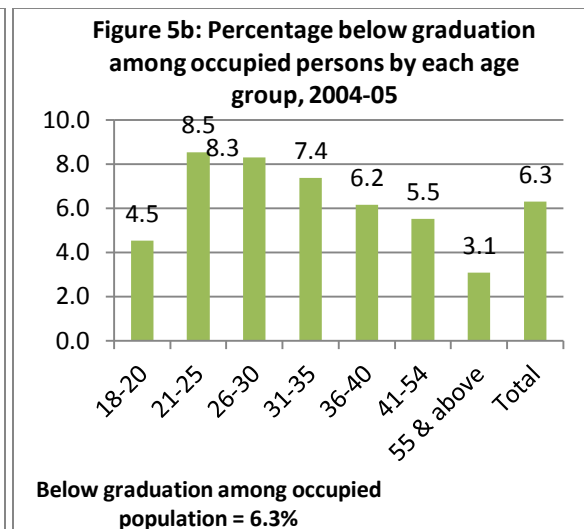
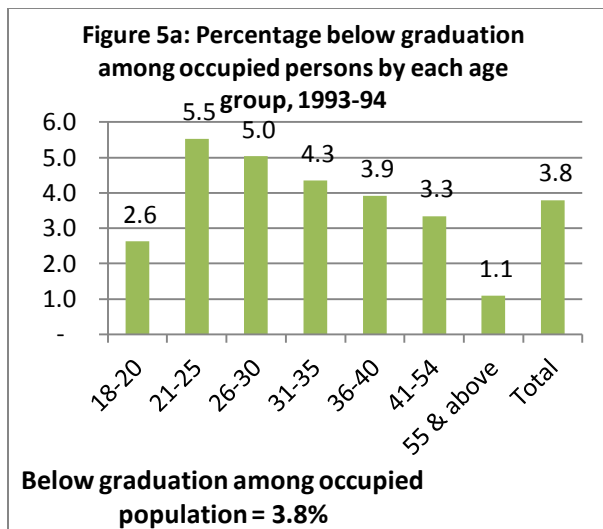


In this paper we take graduation as the minimum level of education to qualify for higher education. Only 6.2 percent adults, 18 years and above, were found to have a graduate degree in 2004-05 (Figure 4). This had risen by 2 percentage points over a decade from 4.4 percent in 1993-94. Adults of the age groups 21-25 and 26-30 years had the highest percentage of graduates, just 9.2 percent each in 2004-05. These younger cohorts saw an increase in graduates of about 3 percentage points during the decade. The graduate population in each successive 5 year cohort declined with only 3.4 percent among those 55 years and above in 2004-05. One cannot really call this rapid expansion of higher education among the youth in India, but given the large increase in enrolment of younger adults (15-17 and 18-20 years, Figures 1a and b) and with nearly 50 percent of the students in age cohorts 18-20 and 21-25 years attempting to complete below graduate education (Figures 2a and b) we can expect the graduate population to increase more rapidly in the coming years. This is part of the expectation of an increasing supply of educated labour force in the country.

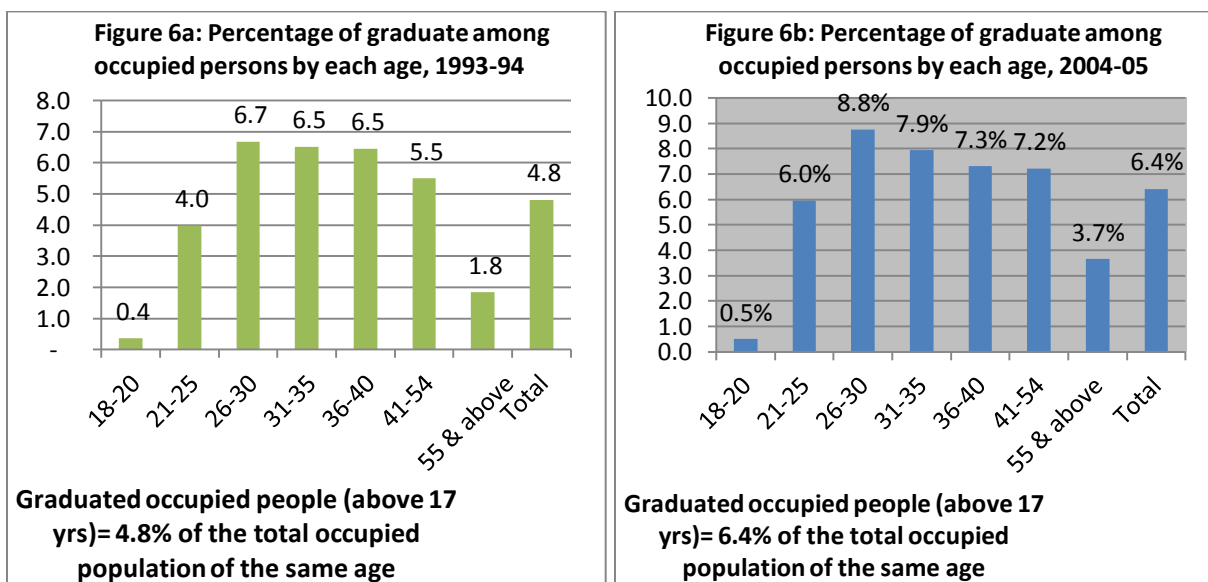


### ***Under graduates and Graduates among occupied population***

In spite of all the discussion on the demand for skilled workers and the increase in supply of qualified persons, the reality is that a very small percentage of workers have actually acquired higher education. A reality check showed that in 2004-05 only 6.3 and 6.4 percent of occupied persons above 18 years had below graduate and graduate education respectively. The positive feature was that this had risen from 3.8 for below graduates and 4.8 for graduates over the decade (Figures 5a,b and 6a,b). Among occupied persons the cohorts with high percentage of below graduates, about 8.5 percent, were 21 to 25 and 26 to 30 year olds in 2004-05 (Figure 5b). The below graduate population among workers declined gradually for each older age cohort being the lowest, 3.1 percent for 55 years and above. The good news is that in all age cohorts there has been an improvement in the percentage of occupied below graduates during the decade (Figures 5a and b).



Among occupied persons, the highest percentage of graduates was 8.8 percent among the 26 to 30 year olds in 2004-05, which had risen from 6.7 percent in 1993-94 (Figure 6a and b). It was lower at 6.0 percent among the 21-25 year cohort and 7.9 among the older 31-35 year old cohort. About 7.3 percent were graduates among 36 to 40 and 41-54 year olds, but declined to 3.7 percent among the above 55 year olds. The graduate intensity increased in each age cohort over the decade.



The above analysis shows that there is a major drop out of people from the education system after the age of 17 years implying that a very minor proportion of the youth proceed for higher education in India. Only a quarter of the 18-20 year olds and less than 7 percent of the 21-25 year olds were currently enrolled in educational institutions. India is the only country whose demographics allow for a growth of its less than 25 year old population till 2020. If India is to reap the benefits of this demographic dividend it has to get more of its youth into the educational system and provide good quality education. The growth process would otherwise be constrained by a lack of qualified persons. While this sobering thought a comparison over the decade presented hope. In every cohort there was an increase in enrolment and educational attainment among occupied populations in both the below graduate and graduate education. With this positive thought we go ahead to analyze which occupations absorb this increase in graduate population.

## Higher Education and Occupational Structure

The question we ask ourselves here is to what extent do various occupations require highly qualified labour and how has this been changing over the past decade? That is, is the demand for higher education increasing rapidly in certain occupations? Using graduate education as a measure of higher education we divide the occupations into graduate and non-graduate occupations, that is where less than 8 percent of the work force were graduates were noted as non-graduate occupations. Further, we use the classification developed in the UK, named Standard Occupational Classification (Higher Education) SOC(HE), to distinguish various graduate occupations into four groups with varying level of absorption of graduates. Next we observe changes in these occupations over time in two ways: by comparing among the age cohorts 21-35 years and 40-54 years for the year 2004-05 and the same age cohorts between 1993-94 and 2004-05 using NSSO Employment and Unemployment Survey data. This method was developed as below in the UK.

### **SOC(HE) Classification:**

SOC(HE) is based, at first instance, on two quantitative parameters: i) the rate of graduates' participation in each occupation; and ii) the gaps between younger and older cohorts (under the premise, well verified in the UK case, that the younger cohort will display the same or higher percentages of graduates than the older).

In a detailed analysis of employment change since 1980, Elias and Purcell (2004b) identified five distinct occupational categories, on the basis of the qualifications required to get these jobs, the skills used in them and the proportions of those holding them who had a degree in different age-bands, at different points in time over the period. They then classified every occupation listed in the UK Labour force survey into one of these in order to be able to measure change in 'graduate' employment. *Table 1* illustrates this occupational classification SOC(HE) and illustrates how it works. The five categories identified were: 'traditional' graduate occupations (e.g. doctors, solicitors, teachers and scientists); 'modern' graduate occupations (e.g. programmers, writers, primary school teachers and managers); 'new' graduate occupations (e.g. marketing, physiotherapists, designers); 'niche' graduate occupations (e.g. midwives, nurses, sports professionals); and 'non-graduate' occupations.

**Table 1: The new categories of graduate employment**

<b>Type of job</b>	<b>Context</b>	<b>Example occupations</b>
<b>Traditional graduate occupations</b>	The established professions, for which, historically, the normal route has been via an undergraduate degree programme	Solicitors, medical practitioners, HE and secondary education teachers, biological scientists/biochemists
<b>Modern graduate occupations</b>	The newer professions, particularly in management, IT and creative vocational areas, which graduates have been entering since	Directors, chief executives, & software professionals, , primary school teachers, authors/ writers/journalists



	educational expansion in the 1960s	
<b>New graduate occupations</b>	Areas of employment, many in new or expanding occupations, where the route into the professional area has recently changed such that it is now via an undergraduate degree programme	Marketing & sales managers, physiotherapists, occupational therapists, management accountants, welfare, probation officers, countryside/park rangers
<b>Niche graduate occupations</b>	Occupations where the majority of incumbents are not graduates, but within which there are stable or growing specialist <i>niches</i> which require higher education skills and knowledge	Leisure and sports managers, hotel/accommodation managers, nurses, midwives, retail managers
<b>Non-graduate occupations</b>	Graduates are also found in jobs that are likely to constitute under-utilization of their higher education skills and knowledge.	<i>Sales assistants, Filing and record clerks, Routine laboratory testers, Debt, rent and cash collectors</i>

Source: Elias and Purcell 2004b: 61

Examination of the information from the 2001-2003 Labour Force surveys in UK led to the adoption of a set of rules which assisted in the process (adapted from Elias and Purcell, 2004b):

- Traditional:** The proportion of employed people holding a first degree is greater than 60% in the older age group and generally considerably higher than this in the younger age group.
- Modern:** The group has not been classified as a 'Traditional graduate occupation' and the proportion of employed people holding a first degree is greater than or equal to 40% in the 40-54 age group and greater than or equal to 50% in the 21-35 age group.
- New:** The proportion of employed people in the younger age group is greater than or equal to 40%, the unit group has not been classified as 'traditional graduate occupations' or 'modern graduate occupations', and the proportion with a degree in the younger age group is 10 or more percentage points higher than in the older age group.
- Niche:** This classification is less clear. It consists of mainly non-graduates, but displaying a tendency for persons from the younger cohorts to be graduates.

**Non-graduates:** All other occupations not classified above.

In classifying the Indian occupational groups into the SOC(HE) classification, the first parameter of the rate of graduate participation worked well. But the second parameter of the differences between the older and younger cohort was difficult to verify in many occupation groups. Hence we adopted a slightly simplified method of classification of occupations by SOC(HE) for India. The criteria used for the Indian case are as follows:

- Traditional: The proportion of employed people holding a first degree is greater than 60 percent in either age cohort in each occupation.
- Modern: The occupation group has not been classified as a 'Traditional graduate occupation' and the proportion of employed people holding a first degree is greater than or equal to 40 to 59 percent in either of the age cohorts.
- New: The proportion of employed people holding a first degree greater than or equal to 15 to 39 percent in either age cohort and the occupation group has not been classified as 'traditional graduate occupation' or 'modern graduate occupation'.
- Niche: The proportion of employed people holding a first degree is greater than or equal to 7 to 14 percent in either age cohort and the occupation is not classified in any above.
- Non-graduates: All other occupation groups not classified above and with the proportion of employed graduates of < 7 percent.

### ***Summary of India's Graduated Occupations***

We present in Table 2 a summary of the SOC(HE) classification for 1993-94 and 2004-05 in India. About 7.4 percent of adults aged 21 to 54 years were graduates in 2004-05, having risen from 5.9 percent in 1993-94. On average the younger cohort had a slightly higher percentage of graduates in both years, with the gap being only slightly higher at 0.6 percentage points in 2004-05. Overall we must also note that nearly 78 percent of the occupied population 21 to 54 years old were in non-graduate occupation in 2004-05, having declined from 82 percent a decade earlier. The corollary, only slightly above one fifth of the occupied persons were in graduate occupations. Among the graduate occupations, the traditional and modern occupations had about 3.3 percent each, the new had nearly 6 percent and the niche constituted just above 9 percent of the occupied population in 2004-05. All these groups, except the modern occupations saw an increase in the graduate population over the previous decade. It was the new occupations which registered the largest (above 2 percentage point) increase in occupied population over the decade.

The traditional occupations, by definition had the highest percentage of graduate occupations, about 69 to 71 percent in both years and both age cohorts. Unlike the UK experience, these traditional activities did not see a higher percentage of graduates in the younger cohort. In fact, the modern occupations was the only group that saw the classic 10 percentage point higher graduated occupations among the younger cohort compared to the older one, which was actually sustained over the decade, that is in both 1993-94 and 2004-05. The new occupations which had registered a 2 percentage point increase in occupied population, had about 19 to 22 percent graduates, being only 1 percentage point higher among the younger cohorts compared to the older in both years. The niche occupations which had between 6 to 12 percentage of graduates, saw nearly 4 percentage point higher graduate density among the younger age cohort in both years. Thus while the traditional occupations retained its need for higher

educated population, it was the modern occupations and to some extent the niche occupations that appeared to increase their demand for higher education in India during this decade.

**Table 2: Summary SOC(HE) Classification for India, 1993-94 and 2004-05 (Average percentage of graduates in each group)**

SOC(HE)	Cohort 1 (21-35 years)	Cohort 2 (40-54 years)	21-54 years	Percentage distribution
<b>1993-94</b>				
Traditional (>60%)	69.7	70.9	70.9	2.6
Modern (40-59%)	48.5	33.2	41.4	3.8
New (15-39%)	22.3	18.8	21.4	3.6
Niches (7-14%)	10.1	6.5	9.2	7.7
<b>Sub-Total Classes</b>	<b>27.8</b>	<b>25.9</b>	<b>27.7</b>	<b>17.8</b>
Non-Graduate (<7%)	1.5	0.7	1.2	82.2
<b>Total Graduates (%)</b>	<b>5.7</b>	<b>5.3</b>	<b>5.9</b>	<b>100.0</b>
<b>2004-05</b>				
Traditional (>60%)	69.1	71.3	70.8	3.1
Modern (40-59%)	50.7	41.8	47.0	3.3
New (15-39%)	22.5	19.1	21.8	5.7
Niches (7-14%)	12.0	8.7	10.7	9.3
<b>Sub-Total Classes</b>	<b>27.9</b>	<b>27.1</b>	<b>28.0</b>	<b>21.5</b>
Non-Graduate (<7%)	2.2	1.3	1.8	78.5
<b>Total Graduates (%)</b>	<b>7.6</b>	<b>7.0</b>	<b>7.4</b>	<b>100.0</b>

### ***Detailed picture of graduated occupations***

Now that we get some understanding of the nature of changes in demand for higher education in the SOC(HE) classification of occupations we go on to discuss in more detail the actual occupations that constitute these broad groups. We begin by concentrating on the 2004-05 occupational structure (Table 3).

*Traditional occupations:* The traditional occupations in India were quite similar to that noted in the UK study, consisting of occupations that have always had requirement for highly qualified people. The examples were solicitors, medical practitioners, higher education and secondary education teachers and biological scientists. All these occupations were found in the traditional occupation classification in India as well. Besides the traditional occupations included architects/engineers, accountant, auditors, mathematicians/statisticians and senior administrators, Directors, and managerial executives, IT professionals and surprisingly poets, authors and journalists. The last three qualified to be in modern occupations in the UK.

*Modern occupations:* The number of occupations in the modern groups were few. As we had noted earlier they were the only group that had also seen a decline in the proportion of occupied persons engaged in them. However, the striking feature of the modern groups was the higher

density of graduated population in the younger cohort. These were mainly engineering, medical and scientific technicians, social scientists and economists and technical salesmen. Primary and middle school teachers were the occupation groups similar to the UK modern occupation group. There was definitely a change in the demand for better and highly qualified people among these modern occupations. We can say that with the advent of the knowledge economy in India these jobs were being upgraded in terms of their need for better qualified personnel.

*New occupations:* Among the groups found in the UK, only the marketing and sales managers were identifiable as a new occupation in India. Nurses and midwives, who qualified as new occupations in India were in niche occupation group in the UK. Other new occupations were working proprietors (self employed enterprises), village officials, artists and composers, transport conductors, mail and telephone related occupations.

*Niche occupations:* Most of the incumbents in these occupations were non-graduates, but a small percentage was graduates. A number of these occupations also saw a large increase in the percentage of graduates in the younger cohort in 2004-05, for example, ticket collectors and checkers, merchants, shopkeepers, salesmen, service workers n.e.c., chemical processors, rubber, plastic product and paper and paper board workers. It also included farm plantation and dairy workers and metal processors, occupations that actually saw the opposite of a decline in the graduate density in the younger cohort. It is possible that while the first set were occupations that required new skill sets in the new economy, the latter were occupations from which the young and better educated were moving out.

*Non-graduate occupations:* More than three fourth of the occupied population were engaged in non-graduate occupations in India. This made sense given the low level of graduate population in the country. A very large proportion of these were engaged in agriculture, such as cultivators, agricultural and plantation labourers, forestry and fishing workers. The non-agricultural non-graduate occupations were mainly in the manufacturing sector, street trading, workers in hotels and restaurants, and personal services such as housemaids, hair dressers, construction workers and other manual labourers.

**Table 3: Detailed SOC(HE) Classification for India, 1993-94 and 2004-05**

1993-94				SOC(HE)	2004-05			
NCO68 2 digit	Graduates cohort 1 (21-35yrs)	Graduates cohort 2 (40-54yrs)	N (sample)		NCO68 2 digit	Graduates cohort 1 (21-35yrs)	Graduates cohort 2 (40-54yrs)	N (sample)
00 Physical scientists	60.0	47.9	38	Traditional	00 Physical scientists	100.0	99.8	21
01 Physical scientists technician	61.9	65.8	24		02 Architects, engineers	66.0	50.4	230
02 Architects, engineers	60.8	57.3	379		04 Aircraft & ships officers	1.0	95.7	8
04 Aircraft & ships officers	24.9	63.6	16		05 Life scientists	75.8	54.5	36
07 Physicians & surgeons	63.8	60.7	440		06 Life science technician	22.2	65.3	9
10 Mathematician, statistician	84.2	70.2	46		07 Physicians & surgeons	57.9	63.2	440
12 Accountants, auditor	83.1	66.9	366		10 Mathematicians, statistician	78.1	88.2	74
14 Jurists	90.6	85.0	226		12 Accountants, auditor	69.6	76.5	222
150-1-9 Teachers, University & colleges,HS, secondary & n.e.c	71.4	84.4	1470		14 Jurists	88.5	87.6	243
16 Poets, authors, journalists	94.3	27.9	32		150-1-9 Teachers, University & colleges,HS, secondary & n.e.c	73.7	83.1	1,831
21 Administrative & exec	74.4	66.3	218		16 Poets, authors,journa	65.3	60.9	24
23 Directors & managers,	71.6	81.5	225		21 Administrative & exec	77.7	78.1	243
29 Administrative execut	59.0	58.5	85		23 Directors & managers,	80.2	89.6	155
330 Book keepers, cashier	64.1	50.2	260		29 Administrative execut	75.5	70.2	147
331-9 Cashiers & related, n.e.c	64.8	61.0	136		30 Clerical & other supervisors	60.4	57.4	558
05 Life scientists	39.0	52.2	40		32 Stenographers, typist	51.3	61.2	87
09 Scientific medical &	49.6	44.3	20		330 Book keepers & Accounts clerks	57.8	61.7	195
152-6 Teachers, middle school, primary, pre-primary, special education & craft	47.0	28.5	1,071		34 Computing machine operators	65.0	64.4	136
30 Clerical & other supervisors	54.9	45.5	606		42 Technical salesman &	67.0	22.6	47
32 Stenographers, typist	46.6	44.6	144		03 Engineering technician	43.3	31.0	138
34 Computing machine ope	59.4	15.1	45	09 Scientific medical &	41.8	13.2	17	
350-6 & 9 Clerical & related wo	47.7	30.0	1,151	13 & 11 Social scientists & related & Economists	28.8	52.0	53	
42 Technical salesman &	53.0	40.2	55	152-6 Teachers, middle school, primary, pre-primary, special education & craft	55.0	41.1	1,940	
03 Engineering technician	39.3	21.6	132	350-6 & 9 Clerical & related wo	45.8	41.1	981	
06 Life science technician	34.4	19.1	13	36 Transport & communication	37.4	44.9	50	

08 Nurses & other medical	17.0	11.3	91	New	01 Physical scientists technician	10.7	35.5	6
13 & 11 Social scientists & related & Economists	31.1	35.1	67		08 Nurses & other medical	26.8	19.7	134
17 Artists	4.6	17.3	13		17 Artists	23.8	10.7	31
18 Composers & performin	24.6	1.8	16		18 Composers & performing	14.5	16.9	15
20 Elected & legislative	24.4	26.2	8		19 Professional workers,	14.9	14.4	87
22 Working proprietors, directors & managers, wholesale & retail trade	16.6	15.1	150		20 Elected & legislative	35.1	11.8	9
24 Working proprietors, directors & managers, mining construction, manufacturing & related concerns	22.9	21.9	498		22 Working proprietors, directors & managers, wholesale & retail trade	21.4	18.1	278
25 Working proprietors, directors, managers & related executives, transport, storage & communication	16.4	15.9	80		24 Working proprietors, directors & managers, mining construction, manufacturing & related concerns	18.4	18.9	441
26 Working proprietors, directors & managers, other services	12.5	15.8	122		25 Working proprietors, directors, managers & related executives, transport, storage & communication	21.4	19.3	159
31 Village officials	30.8	11.3	48		26 Working proprietors, directors & managers, other services	23.8	23.6	289
37 Transport Conductor &	29.2	31.5	61		31 Village officials	30.3	25.1	61
39 Telephone & telegraph	26.5	18.0	42		331& 9 Cashiers & related, n.e.c	36.9	39.5	99
41 Manufacturers' agents	31.1	17.6	125		37 Transport Conductor &	19.0	16.7	37
44 Insurance, real estat	31.4	21.2	163		38 Mail distributors & r	17.0	5.4	26
45 Money lenders & pawn	21.6	13.2	11		39 Telephone & telegraph	32.5	27.4	54
51 House keepers, Matron	15.7	7.5	6		41 Manufacturers' agents	27.3	15.2	114
86 Broadcasting station	16.3	14.7	8		44 Insurance, real estat	37.3	26.1	222
91 Paper & paper board p	1.4	34.4	5		45 Money lenders & pawn	23.9	13.7	10
19 Professional workers,	12.5	7.1	47		49 Sales workers, N.E.C	17.2	18.6	12
36 Transport & communication	14.1	9.4	27		51 House keepers, Matron	22.0	9.2	6
38 Mail distributors & r	10.0	3.9	24	92 Printers & related wo	16.2	13.1	31	
40 Merchants & shopkeeper	10.3	6.1	968	Niches	67 Hunters & related workers	3.2	18.6	2
57 Protective service wo	11.1	5.8	149		357-8 Ticket collectors, checkers & examiners & office attendants	7.0	1.6	51
59 Service workers, n.e.c.	9.3	6.5	20		40 Merchants & shopkeepers	14.0	10.8	1299
60 Farm plantation, dairy	7.0	29.7	20		430& 3-9 Salesman, shop assist	11.6	3.9	231
74 Chemical processors &	12.3	8.0	19		57 Protective service wo	11.0	11.4	192
85 Electrical fitters &	7.1	5.5	80		59 Service workers, n.e.c.	14.5	3.5	15
90 Rubber & plastic prod	13.0	13.7	31		60 Farm plantation, dairy	3.0	10.3	16
92 Printers & related wo	9.0	14.6	34		72 Metal processors	2.1	7.1	13
357-8 Ticket collectors, checkers & examiners & office attendants	2.1	0.6	17		74 Chemical processors &	11.8	6.5	20
430 & 9 Salesman, shop assist	6.3	5.8	104		85 Electrical fitters &	7.0	6.4	99

431 Street vendors	1.6	0.3	26	Non-Graduates	86 Broadcasting station	7.4	13.9	7
49 Sales workers, n.e.c.	4.2	0.0	5		90 Rubber & plastic prod	9.3	3.6	17
50 Hotel & restaurant ke	5.6	1.2	19		91 Paper & paper board p	16.6	1.9	8
52 Cooks, waiters, bartender	0.0	0.2	1		96 Stationary engines &	5.4	12.4	8
53 Maid & related house	0.0	0.1	1		431 Street vendors	2.5	1.0	38
54 Building caretakers,	0.3	0.0	1		53 Maid & related house	1.9	0.2	9
55 Launderers, dry cleaner	0.7	0.1	6		50 Hotel & restaurant ke	2.2	3.7	34
56 Hair dressers, Barbers	1.3	0.4	9		52 Cooks, waiters, bartenders	1.5	0.9	12
61 Cultivators	2.5	0.9	989		54 Building caretakers,	0.3	0.4	8
62 Farmers, other than c	2.5	1.1	63		55 Launderers, dry cleaner	1.5	0.6	9
63 Agricultural labourer	0.2	0.0	40		56 Hair dressers, Barbers	3.0	0.6	19
64 Plantation labourers	0.7	0.1	6		61 Cultivators	3.6	2.1	1583
65 Other farm workers	1.1	0.1	3		62 Farmers, other than c	2.1	1.8	99
66 Forestry workers	5.0	2.4	17		63 Agricultural labourer	0.4	0.1	47
67 Hunters & related workers	0.0	1.2	1		64 Plantation labourers	0.7	0.0	3
68 Fisherman & related w	0.0	0.7	5		65 Other farm workers	1.0	0.3	10
71 Miners, quarrymen, we	1.0	1.5	11		66 Forestry workers	2.1	5.4	35
72 Metal processers	2.5	3.7	13		68 Fisherman & related w	1.1	0.1	12
73 Wood preparation work	3.0	1.9	7		71 Miners, quarrymen, we	3.6	0.1	14
75 Spinners, weavers, knit	1.9	0.5	46		73 Wood preparation work	0.4	1.0	2
76 Tanners, fell mongers	0.0	8.5	3		75 Spinners, weavers, kn	1.5	0.9	56
77 Food & beverage proce	1.7	0.5	21		76 Tanners, fell mongers	6.4	4.1	4
78 Tobacco preparers & t	0.2	0.5	4		77 Food & beverage proce	2.9	0.3	35
79 Tailors, Dress makers	1.0	2.0	35		78 Tobacco preparers & t	0.8	0.0	3
80 Shoemakers and leather	2.1	2.0	8		79 Tailors, Dress makers	5.3	1.2	76
81 Carpenters, cabinet &	0.7	0.5	11		80 Shoemakers and leathe	4.3	1.7	10
82 Stone cutters & carve	0.8	1.5	2		81 Carpenters, cabinet &	1.6	0.1	23
83 Blacksmiths, tool-mak	1.7	1.4	22		82 Stone cutters & carve	0.0	0.7	1
84 Machinery fitters mac	4.6	2.4	56		83 Blacksmiths, tool-maker	6.9	4.9	28
87 Plumbers, welders, sh	1.6	2.6	15	84 Machinery fitters machanic	6.1	5.0	82	
88 Jewellery & precious	3.0	2.1	28	87 Plumbers, welders, sh	3.9	1.9	20	
89 Glass formers, potter	1.6	0.8	6	88 Jewellery & precious	4.7	5.7	36	
93 Painting	1.3	1.7	5	89 Glass formers, potter	1.4	0.2	4	
94 Production & related	1.0	1.2	12	93 Painting	1.1	1.1	10	
95 Bricklayers & other c	0.8	0.7	37	94 Production & related	3.4	1.2	30	
96 Stationary engines &	1.6	2.4	8	95 Bricklayers & other c	1.3	0.6	64	
97 Material handling & r	1.2	0.4	14	97 Material handling & r	0.9	0.2	13	
98 Transport equipment op	1.5	0.6	50	98 Transport equipment op	1.8	2.3	119	
99 Labourers	0.4	0.1	14	99 Labourers	0.6	0.4	46	

Note: N are samples of the number of graduates in each occupation group.

### ***Changes in graduated occupations over the decade***

Over the decade there was an increase in number of occupations within the traditional (by 3) and niche (by 2) occupation group. Among the niche occupations, we had earlier noted a larger increase in the proportion of total occupied population in it.

*Traditional occupations:* Among the striking changes observed, five occupations had moved from the modern to traditional category over the decade, these being life scientist, computing machine operators, clerical and supervisors, stenographers and technical salesmen (Table 4). Life science technicians had upgraded from new to traditional occupation group. While these occupations cannot really be categorized as having traditionally required graduates, the nature of activities performed by these categories of workers may have changed in the knowledge economy requiring highly qualified people.

*Modern occupations:* Three occupations were found to upgrade to modern occupations in the decade. Engineering technicians and social scientists and economists improved their graduate needs and moved from new to modern occupations. A third occupation upgraded from niche to modern occupation, transport and communications.

*New occupations:* Four occupations upgraded its graduation status to new occupations. Three that came from niche occupations were professional workers, mail distributors and printers and related workers. Sales workers n.e.c came from non-graduate occupations in 1993-94.

*Niche occupations:* Four occupation groups increased its graduate requirements over the decade and moved from non-graduate to niche occupation groups. These were ticket collectors and checkers, salesmen and shop assistants, miners and quarrymen and stationary engine related workers.

*Occupations that downgraded its graduate status:* The opposite had happened to four occupations. Physical scientist technicians and cashiers and related workers in the traditional group in 1993-94 were downgraded to new occupations in 2004-05. Broadcasting station and paper and paper board workers were downgraded from new to niche occupation group.

It is very interesting that the downgrading of occupations by their higher education required were only four. Most of the occupation groups either improved its need for graduate populations or remained unchanged. This gives some indication of the increasing demand for higher educated persons in the labour market.



**Table 4: Occupations with improved or reduced graduate population during the decade 1993-94 to 2004-05**

<b>Occupation with improved graduate population in the decade</b>	<b>1993-94</b>	<b>2004-05</b>
05 Life scientists	Modern	Traditional
30 Clerical & other supervisors	Modern	Traditional
32 Stenographers, typist	Modern	Traditional
34 Computing machine operators	Modern	Traditional
42 Technical salesman &	Modern	Traditional
06 Life science technician	New	Traditional
03 Engineering technician	New	Modern
13 & 11 Social scientists & related & Economists	New	Modern
36 Transport & communication	Niche	Modern
19 Professional workers,	Niche	New
38 Mail distributors & related	Niche	New
92 Printers & related workers	Niche	New
49 Sales workers, n.e.c.	non-grad	New
357-8 Ticket collectors, checkers & examiners & office attendants	non-grad	Niche
430 & 9 Salesman, shop assist	non-grad	Niche
71 Miners, quarrymen	non-grad	Niche
96 Stationary engines & related	non-grad	Niche
<b>Occupation with reduced graduate population in the decade</b>		
01 Physical scientists technician	Traditional	New
331-9 Cashiers & related, n.e.c	Traditional	New
86 Broadcasting station	New	Niche
91 Paper & paper board products	New	Niche

### Higher Education as Determinant of Participation in SOC Occupation groups

The key purpose of this exercise is to ascertain if graduate intensity of occupations has been changing. Changing graduate intensity in occupations could imply a number of things. First, it could mean that the nature of the occupation is changing, so that the activity now requires more qualified people. Second, it would also mean that there is an oversupply of graduates and certain employers now use graduation as a screening device, so that increasing graduate intensity in certain occupations may indicate over-educated workers.

Simple graduate intensity of the SOC classification raises the expectation that graduates are most likely to be selected into the traditional occupations, which has more than 60 percent graduate workers, but it also leaves open the possibility that persons with a graduate degree may be selected into a niche occupations, with 7-14 percent graduates. One of the main factors affecting this would be the stream of education in which the person has obtained a degree, such as a medical doctor would be in the traditional occupation. But the overwhelming number of graduates in India are in liberal arts or humanities. Such persons could be in a number of

occupations and so could management graduates, and even IT professionals. Besides the stream of education, a number of other exogenous factors would affect this result, for example the age and sex of the individual, the opportunities available in the economy and the social status of the household of the individual.

To confirm whether graduate intensity has been changing in occupations we estimate a simple Probit model on participation in the various SOC occupational groups. We expect the probability of graduate participating in the traditional occupation to be the highest followed by modern, new and niche occupations. We begin with a model of participation in SOC occupations in 1993-94. We use the other factors, age and sex, noted above as controls in an equation of participation in SOC and higher education. A dummy for state is used as a proxy for opportunities available in the economy and a dummy for scheduled caste or tribe status of the household is used a proxy for social status of the household.

Over the decade 1993-94 to 2004-05 we observed an increase in the number of occupations and proportion of workers in the higher graduate intensity occupations, such as traditional, modern etc. In order to confirm this increasing graduate intensity in various occupations over the decade we keep the SOC classification fixed in 2004-05 as in 1993-94. The Probit model of probability of graduate participation in SOC groups is estimated for 2004-05. The expectation is that the probability of participation in each of these groups should be higher in 2004-05 as compared to 1993-94.

The dependent variable in the Probit model is a dummy variable, where participation in the SOC group is equal to 1 and otherwise 0. That is 4 separate Probit equations are estimated for 1993-94 and four for 2004-05. The model is as follows:

$$P(\text{SOC}) = F(\text{age, sex dummy, graduate and above, State dummy, SC/ST dummy})$$

Where the dependent variables in the four equations are: P(traditional occupation) = 1, the rest is 0; P(modern occupation) = 1, the rest is 0; P(new occupation) = 1, the rest is 0; and P(niche occupation) = 1, the rest is 0.

**Table 5: Probability of Participation in Graduate Intensive SOC (HE) occupations, 1993-94 and 2004-05 (Marginal Effects)**

	SOC(HE)							
	Traditional		Modern		New		Niche	
	dF/dx	P>z	dF/dx	P>z	dF/dx	P>z	dF/dx	P>z
	50th Round 1993-94							
Graduate + dummy	0.2590	0.000	0.2148	0.000	0.0645	0.000	0.0191	0.000
	61st Round 2004-05							
Graduate + dummy	0.2184	0.000	0.2018	0.000	0.0899	0.000	0.0256	0.000

Note: SOC groups of occupation according to 50th Round. The complete model is presented in the Appendix Tables 1 and 2

In 1993-94 the marginal effects show that with one percent increase in graduate education nearly 26 percent increase in participation in traditional occupations, 21 percent in modern occupations, 6.5 percent in new and only about 2 percent in niche occupations (Table 5). This is the expected result.

In 2004-05, the marginal effects show that a one percent increase in graduates raises the participation in traditional occupations by nearly 22 percent that was a nearly 4 percentage point decline since 1993-94 (Table 5). In fact, there is an increase in participation of graduates in new by nearly 2.5 percentage points, and a smaller increase in niche occupations. The result of a shift in the graduate intensity of occupations from the traditional to the new and niche occupations is confirmed.

### **Wage and Wage Premiums for Graduates**

Do graduates have a wage premium and does this differ by the graduate intensity in the occupation? We have computed the average wage for persons with wage employment in each occupation and computed a wage premium for graduate jobs.

$$\text{Wage Premium for Graduates} = \frac{\text{Graduate Wage} - \text{All Wage}}{\text{All Wage}} * 100$$

Average wage and wage premium for all employees, men and women employees and their wage premiums are arranged according to SOC(HE) occupation categories in Table 6. In general graduate wages are higher than wages of all workers. Further, men's wages are generally higher than women's, except in many occupations in the traditional occupational group where the proportion of graduate is very high and wages of women workers are on par or sometimes higher than men (Table 6). There is hardly any wage premium for graduates in the traditional occupations where almost everyone is a graduate and even in modern occupations where there is nearly 50 percent graduate intensity.

Wage premium is the highest in the non-graduate occupations (more than 100 percent) and niche occupations. In niche and new occupation, since the arrival of graduates is a new phenomenon, they extract a premium of about 45 percent. The thesis of over qualification does not seem to hold for these occupations, as why would the employer pay higher wages if he can extract the same work from graduates? Something in the nature of work of these occupations must have changed to allow the entry of graduates at higher wages.

Overall, the premiums obtained by graduates in occupations with lower graduate intensity do not support the over-qualification or over-education thesis. It implied that the increase in graduate intensity was not just supply driven. Of course, more confirmatory analysis is required to fully understand the phenomenon of premium for higher education.

**Table 6: Average Daily Wage (Rs.) and Wage Premiums by SOC (HE) and Sex (21-54 years) 2004-05**

NCO_68		Person			Male			Female		
		All	Graduate	Wage Premium	All	Graduate	Wage Premium	All	Graduate	Wage Premium
Traditional	Physical scientists	360.4	386.4	7.23	346.0	372.6	7.70	516.6	498.9	-3.43
	Architects, engineers	475.0	488.3	2.80	471.7	484.3	2.66	527.7	540.6	2.44
	Aircraft & ships officers	765.3	719.8	-5.95	765.3	719.8	-5.95			
	Life scientists	426.2	456.6	7.14	426.2	456.6	7.14			
	Physicians & surgeons	443.9	498.7	12.35	444.0	508.0	14.42	443.4	468.5	5.65
	Mathematicians, statisticians	389.5	435.8	11.91	378.2	424.4	12.23	462.7	498.9	7.83
	Accountants, auditor	335.9	388.1	15.52	336.0	389.4	15.91	335.4	375.1	11.82
	Jurists	318.1	343.3	7.94	329.3	358.4	8.84	159.0	159.0	0.00
	Teachers, University & colleges, HS, secondary & n.e.c	296.5	315.9	6.55	318.5	331.8	4.19	253.2	281.9	11.33
	Poets, authors, journalists	250.3	257.9	3.01	226.9	227.3	0.21	833.2	833.2	0.00
	Administrative & exec	501.4	538.8	7.47	509.0	550.0	8.06	418.0	425.3	1.73
	Directors & managers,	677.6	722.9	6.67	691.2	737.5	6.69	531.8	561.6	5.62
	Administrative executive	509.1	566.5	11.27	510.1	568.2	11.38	890.4	554.9	37.68
	Clerical & other supervisors	303.5	333.2	9.79	302.3	333.6	10.36	311.3	330.6	6.19
	Stenographers, typist	246.2	269.9	9.62	251.7	273.9	8.81	235.1	257.4	9.46
	Book keepers & Accounts clerks	203.2	247.8	21.95	202.5	253.9	25.34	206.9	223.8	8.14
	Computing machine operators	227.3	267.6	17.74	231.5	272.7	17.75	215.4	253.3	17.60
	Technical salesman &	221.8	251.4	13.33	221.9	251.4	13.28			
Average	340.8	374.9	9.99	354.8	390.8	10.14	283.8	317.6	11.91	
Modern	Engineering technicians	408.1	508.7	24.65	417.9	525.9	25.83	289.4	316.2	9.27
	Scientific medical &	273.5	342.2	25.12	300.7	363.0	20.72	178.4	219.2	22.85
	Social scientists + Economists and related	159.4	293.8	84.28	189.6	294.6	55.35	104.8	291.8	178.2
	Teachers, middle school, primary, pre-primary, special education & craft	205.9 2	213.4 5	3.66	231.6 2	235.7 5	1.78	166.0 8	173.4 2	4.42
	Clerical (350-356,359)	219.4	247.1	12.62	223.4	254.3	13.85	203.4	223.5	9.89
	Transport & communication	257.6	332.9	29.19	265.6	342.3	28.86	192.7	267.1	38.59
	Average	220.1 9	240.0 4	9.01	240.5 8	261.8 3	8.83	174.3 2	189.7 2	8.84
New	Physical scientists t	169.1	233.5	38.06	165.1	233.5	41.37			
	Nurses & other medical technicians	208.4	221.7	6.40	209.2	216.1	3.29	207.6	229.5	10.58
	Artists	154.6	239.6	55.02	150.3	212.9	41.63	204.1	361.9	77.26
	Composers & performing Artists	141.1	187.1	32.63	146.3	201.0	37.42	85.29	87.50	2.59
	Professional workers,	135.9	226.9	66.94	134.2	226.4	68.72	166.5	233.9 5	40.47
	Elected & legislative	103.0	187.6	82.14	131.0	230.7	76.10	57.62	101.4 3	76.03
	Working proprietors, Directors	317.4	442.3	39.33	330.6	452.9	36.99	180.1	214.2	18.93

		8	4		7	9		8	9	
	Working proprietors,	451.0 6	588.7 8	30.53	459.4 9	595.9 0	29.69	288.9 8	443.6 7	53.53
	Working proprietors,	437.7 7	479.1 5	9.45	410.2 9	436.6 0	6.41	890.4 8	890.4 8	0.00
	Working proprietors,	303.1 9	363.1 4	19.77	299.9 6	369.1 3	23.06		334.8 8	
	Village officials	180.2 4	222.8 6	23.65	192.7 2	229.6 3	19.15	97.37	135.2 3	38.89
	Cashiers & related, n.e.c	265.2 5	312.3 9	17.77	274.3 2	322.1 5	17.43	167.7 1	199.0 8	18.70
	Transport Conductor &	181.2 4	266.3 3	46.95	181.0 6	266.3 3	47.09	198.8 1		
	Mail distributors & r	141.6 1	161.6 8	14.17	140.1 2	155.9 4	11.29	172.8 6	303.5 7	75.62
	Telephone & telegraph	224.0 3	294.9 7	31.67	226.4 8	281.7 4	24.40	214.7 4	323.8 3	50.80
	Manufacturers' agents	176.5 1	245.8 0	39.25	175.1 4	242.6 5	38.54	217.3 5	295.7 1	36.06
	Insurance, real estate	139.5 9	193.0 1	38.26	144.1 8	200.2 2	38.86	80.97	102.8 6	27.03
	Money lenders & pawn	105.9 2	235.7 1	122.5 4	125.9 6	235.7 1	87.14	45.16		
	Sales workers, N.E.C	101.5 1	166.4 0	63.93	95.65	135.3 8	41.55	207.4 6	489.8 6	136.1 2
	Hotel & restaurant keepers	117.5 8	184.5 2	56.93	135.5 1	215.1 0	58.73	90.84	153.9 5	69.48
	Hunters & related workers	175.5 9	262.0 7	49.25	195.8 7	262.0 7	33.80	25.00		
	Printers & related work	115.2 3	186.2 8	61.66	121.2 0	197.3 0	62.80	60.07	103.5 7	72.42
	<b>Average</b>	<b>200.5 3</b>	<b>296.5 8</b>	<b>47.90</b>	<b>202.9 2</b>	<b>303.0 6</b>	<b>49.35</b>	<b>186.6 6</b>	<b>258.5 5</b>	<b>38.51</b>
<b>Niche</b>	Ticket collectors, checkers & examiners & office attendants	159.3 4	210.2 5	31.95	165.5 9	216.3 9	30.68	124.1 4	152.7 9	23.08
	Merchants & shopkeepers	103.8 7	184.4 8	77.61	107.0 2	184.4 8	72.38	65.18		
	Salesman, shop assist, Related	83.96	123.6 7	47.30	84.64	125.2 6	47.99	69.60	107.0 7	53.84
	Protective service workers	190.5 5	280.9 2	47.43	190.7 7	280.1 1	46.83	183.0 4	326.8 8	78.58
	Service workers, n.e.c	92.65	291.0 6	214.1 4	104.2 1	319.9 5	207.0 3	44.88	60.00	33.68
	Farm plantation, dairy	231.0 0	316.3 1	36.93	238.0 1	314.1 1	31.97	135.4 6	357.1 4	163.6 5
	Metal processors	166.3 6	205.4 0	23.47	169.1 0	205.4 0	21.47	72.94		
	Chemical processors &	149.2 2	172.9 5	15.90	156.5 3	181.5 6	16.00	92.16	40.00	- 56.60
	Electrical fitters & related	186.9 5	226.9 2	21.38	188.1 3	230.5 4	22.54	122.6 7	174.8 9	42.57
	Broadcasting station	173.9 9	468.2 6	169.1 3	165.8 4	493.8 2	197.7 7	366.0 0	366.0 0	0.00
	Rubber & plastic prod	112.9 9	183.2 6	62.19	121.7 6	189.7 4	55.83	45.56	83.29	82.80
	Paper & paper board	124.0 5	164.1 4	32.32	135.0 3	164.1 4	21.56	29.74		

	Stationary engines &	167.7 8	318.2 4	89.68	166.8 9	318.2 4	90.69	191.0 6		
	<b>Average</b>	<b>149.3</b>	<b>216.4</b>	<b>44.95</b>	<b>151.9</b>	<b>219.8</b>	<b>44.73</b>	<b>112.7</b>	<b>157.4</b>	<b>39.59</b>
<b>Non-Graduate</b>	Street Vendors	73.14	194.5 8	166.0 5	74.99	194.5 8	159.4 6	43.13		
	Hotel & restaurant keepers	117.5 8	184.5 2	56.93	135.5 1	215.1 0	58.73	90.84	153.9 5	69.48
	Cooks, waiters, barter	90.34	143.3 5	58.68	103.3 8	149.2 2	44.34	48.26	41.67	- 13.66
	Maid & related house	47.33	122.8 2	159.5 0	79.78	145.2 5	82.06	44.69	109.7 3	145.5 2
	Building caretakers,	99.75	151.2 5	51.63	111.9 6	147.5 0	31.74	76.60	203.7 5	165.9 8
	Launderers, drycleaner	74.30	100.0 0	34.58	90.36	100.0 0	10.66	43.83		
	Hair dressers, Barbers	60.52	107.1 4	77.04	62.57			52.71	107.1 4	103.2 5
	Cultivators	63.60	159.7 3	151.1 5	70.44	169.2 4	140.2 6	40.60	42.86	5.57
	Farmers, other than cultivators	68.54	291.7 9	325.6 9	75.47	291.7 9	286.6 5	44.08	40.00	-9.25
	Agricultural labourer	44.81	51.94	15.91	51.71	52.59	1.71	34.24		
	Plantation labourers	69.15	40.00	- 42.16	78.12	40.00	- 48.80	54.08		
	Other farm workers	89.36	222.8 6	149.3 9	94.75	222.8 6	135.2 1	53.03		
	Forestry workers	153.7 7	307.2 2	99.80	162.9 0	307.2 2	88.60	76.44		
	Fisherman & related w	106.2 0	261.3 8	146.1 2	104.5 1	107.1 4	2.52	135.5 2	338.5 0	149.7 8
	Miners, quarrymen, we	159.8 5	288.8 3	80.69	172.7 8	288.8 3	67.17	50.32		
	Wood preparation work	108.8 9	325.6 1	199.0 2	111.8 3	325.6 1	191.1 7	87.04		
	Spinners, weavers, knitters	84.98	158.5 4	86.57	90.80	164.2 6	80.90	55.13	115.2 4	109.0 3
	Tanners, fellmongers	97.61	281.8 9	188.8 1	101.6 0	281.8 9	177.4 6	43.44		
	Food & beverage processors	81.89	177.2 6	116.4 5	88.74	156.9 7	76.89	56.05	317.8 6	467.1 3
	Tobacco preparers & Product Makers	30.70	45.00	46.59	42.58	67.69	58.97	25.08	22.31	- 11.04
	Tailors, Dress makers	85.34	147.6 2	72.97	90.04	147.4 7	63.78	65.85	148.3 3	125.2 8
	Shoemakers and leather goods makers	92.28	273.1 0	195.9 4	102.7 9	273.1 0	165.6 9	45.72		
	Carpenters, cabinet &	117.7 0	80.24	- 31.83	117.7 8	80.24	- 31.88	108.0 4		
	Stone cutters & carve	78.33	321.4 3	310.3 5	84.30	321.4 3	281.2 7	47.04		
Blacksmiths, tool-makers	129.8 7	230.1 7	77.23	132.7 6	230.1 7	73.38	49.01			
Machinery fitters machine assemblers	151.9 3	223.2 0	46.91	152.6 6	220.2 0	44.24	98.05	400.0 0	307.9 6	
Plumbers, welders, sheet metal etc.	128.7 3	176.9 6	37.46	129.3 7	176.9 6	36.79	26.32			

Jewelry & precious metal workers	99.99	120.0 0	20.01	101.3 5	120.0 0	18.41	64.53		
Glass formers, potter	81.27	300.0 0	269.1 3	88.07	300.0 0	240.6 4	49.62		
Painting	100.4 7	89.58	- 10.84	101.8 1	89.58	- 12.01	32.18		
Production & related	92.51	173.6 6	87.72	105.9 7	173.6 6	63.88	43.28		
Bricklayers & other c	85.24	146.1 1	71.41	88.99	146.1 1	64.18	58.31		
Material handling & r	92.57	214.7 9	132.0 4	95.49	221.2 8	131.7 3	55.76	110.0 0	97.28
transport equipment o	129.6 4	195.1 5	50.54	129.7 8	196.1 4	51.13	107.6 4	135.7 1	26.09
Labourers	70.14	98.86	40.94	73.47	100.9 7	37.43	49.32	58.67	18.94
<b>Average</b>	<b>77.20</b>	<b>177.0</b>	<b>129.3</b>	<b>88.91</b>	<b>179.6</b>	<b>102.0</b>	<b>43.15</b>	<b>140.4</b>	<b>225.4</b>

Note: Wages in occupations, mainly female, where there are no graduates is not presented.

### Impact of Education and Occupation on Earnings

The literature on returns to education has pointed out that education has a strong and positive impact on wage earnings. The standard human capital theory follows the neo-classical theory of labour supply, that is, individuals take the decision to participate in the labour market based on a reservation wage. People will enter the labour force only if the actual wage is higher than their reservation wage. The actual wage they receive is determined by their education, human capital, individual, family and regional characteristics. We employ the standard Mincerian semi-logarithmic earnings function to investigate the determinants of earnings. Since the earnings are observed only for wage earners and not the self employed (in the NSS data) and non-workers we need to correct for selectivity bias. The selectivity corrected earnings function using the Heckman two-step procedure is used here. The earnings function is:

$$\ln Y_i = \beta X_i + \mu_i$$

where  $\ln Y_i$  is the natural log of earnings of the  $i$ th worker,  $X$  is a vector of variables that influence earnings,  $\beta$  is a vector of coefficients and  $\mu$  an error term representing unobserved traits. However, the wage variable is truncated since it is observed only for wage workers. For self selected samples, the mean value of the error term in the earnings function is not zero and the error term may be correlated with included variables, leading to biased estimates. Following Heckman (1979) the earnings equation can be corrected for sample selection by estimating Lambda ( $\lambda_i$ ) from the predicted probabilities of the work-participation probit model, and then including it in the earnings equation, so that

$$\ln Y_i = \beta X_i + c \lambda_i + \tilde{u}_i$$

where  $\tilde{u}_i$ , the new error term is uncorrelated to  $X$ . The identifying variable is whether the household owns land, which is taken to affect the participation in wage employment, but does not affect individual earnings.

The purpose of this exercise is to estimate the varying returns to education. But the additional dimension we add in this analysis is the effect of occupation on earnings, over and above education. We estimate number of variants of the model in an attempt to separate the effects of education, particularly graduation, and occupation. The results are presented in Table 7.

A few control variables added are sex (female) dummy, whether the person belongs to scheduled caste or tribe (SC/ST), and region codes for North, South, West and East, where Central region is the reference category. While SC/ST dummy is expected to capture the social factors that influence participation, the region dummies are expected to capture the economic opportunities and demand for labour. The probit participation equation includes the identifying variable size of land owned, which is not included in the earnings equation.

The standard Mincerian equation includes a variable experience and its square. Experience variable (EXP) is computed based on age and years of education as follows:

For person who are illiterate or with < 9 years of formal education:

$$\text{EXP} = \text{Age} - 14 \text{ (assuming the person joined the work force at the age of 15 years)}$$

For persons who had formal education  $\geq 9$  years:

$$\text{EXP} = \text{Age} - \text{Years of education} - 5 \text{ years (assuming children enter formal schooling at the age of 5).}$$

### ***Empirical results***

The probit equation for participation in wage work and earnings function are run for all persons in the age groups 15-54 years as in the SOC(HE) analysis earlier<sup>3</sup>. The pure Mincerian equation shows that each extra year of education give marginal returns of 11.4 percent. When the control variables are included the marginal returns declines slightly to 10.5 percent. When we include the SOC(HE) variables the returns decline to 6.4 percent. This clearly shows that the occupation of the individual has an impact on his earnings, which in regressions without the SOC(HE) variable is captured in variable mean years of education.

What is even more interesting is the declining returns to the SOC(HE) occupational categories. The SOC(HE) traditional occupations has an 86 percent higher return than non-graduate occupations (the reference group), while modern occupations has 60 percent, new occupations has 36 percent and niche occupations has 26 percent higher returns.

In the next set of models we relax the assumption of linearity of the education variable and replace with education dummies where illiterate is the reference category. Literate without formal education is not significant. The education dummies show increasing returns to

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<sup>3</sup> We estimated similar equations for the age group 15 to 64 years as well. The results are exactly the same, with a very small variation in the value of coefficients.



education. The dummies for diploma holders, graduates and post graduates are highly significant and have large coefficients.

When the SOC(HE) occupation dummies are included in the equation with education dummies the results remain the same, but the value of the coefficients of all the education dummies declines. This again shows significant returns to occupation on earnings. The traditional occupations with high graduate intensity have the highest, nearly 73 percent higher than non-graduate earnings. The returns to occupations decline with decreasing graduate intensity as observed earlier.

Finally we have a set of equations with a dummy for persons with graduate education instead of the education splines. The coefficient for graduate dummy falls as the control variables and the SOC(HE) categories are added, When graduate dummy is included without control variables and SOC(HE), the returns are 127 percent higher than the reference category of non-graduate. When control variables are included returns to graduate education falls to 119 percent and finally with the SOC(HE) categories it drops to 41 percent. This reinforces that fact that occupation has an impact of returns, which otherwise is appears as returns to graduate education.

SOC(HE) captures categories by graduate intensity of occupations. Hence the decline in returns to education when the SOC(HE) category is included is much higher with a graduate dummy than with average years of education.

We finally also estimated an earnings function with graduate dummy, 10 occupation dummies with production workers as the reference category, and an interaction term of graduate dummy with each occupation category (Table 8). Among occupations the dummy for technicians had the largest coefficient, 94 percent higher than production workers, followed by administrative and executives (84 percent), professionals (74 percent), clerical workers (54 percent) and transport equipment operators (20 percent).

Most of the interaction dummies were not significant (Table 8). The only interesting result was that graduate service workers had 33 percent more significant returns than production workers, while the service occupation (dummy) alone had only 3 percent higher returns than production workers. Thus while having a graduate degree did not have a separate impact on other occupations, being graduate perhaps provided better source of jobs in the service sector. It is possible that while graduates in services were in the financial or business services, the non-graduates were barbers, maids, protection services workers etc. Such stark variation in graduate intensity was perhaps not visible in the other occupations, which either had high graduate intensity or very low intensity.

**Table 7: Heckman Log Wage model, 21-54 years, 2004-05**

Log wage	Pure Mincerian	With control variables	With SOC	Education dummies	With control variables	Education dummies with controls & SOC	Graduate dummy	Graduate dummy with controls	Graduate dummy with controls & SOC
Age/Exp	0.060	0.058	0.053	0.063	0.0615	0.055	0.049	0.050	0.046
Exp square	-0.001	-0.001	-0.001	-0.001	-0.0008	-0.001	-0.001	-0.001	-0.001
<b>Avg. yr of schooling</b>	0.115	0.110	0.068						
Graduate							1.447	1.415	0.466
<b>Education Splines</b>									
Literate without formal schooling: EGS/NFEC/AEC, TLC, Others				0.151	Not sig	Not sig			
Literate but below primary				0.181	0.095	0.095			
Primary				0.353	0.235	0.202			
Middle				0.639	0.498	0.405			
Secondary				0.998	0.850	0.612			
Higher secondary				1.288	1.173	0.787			
Diploma/certificate course				1.664	1.562	1.099			
Graduate				1.787	1.681	1.117			
Post-graduate & above				2.058	1.976	1.300			
<b>SOC</b>									
Traditional			0.870			0.737			1.296
Modern			0.621			0.533			1.108
New			0.364			0.319			0.705
Niche			0.263			0.270			0.526
<b>Control variables</b>									
Female		-0.375	-0.4376		-59.8	-0.456		-0.630	-0.572
SC/ST		0.063	0.03157		6.64	0.033		Not Sig	Not Sig
<b>Region</b>									
North		0.436	0.441		37.89	0.447		0.493	0.468
South		0.325	0.321		26.6	0.328		0.457	0.382
West		0.306	0.312		27.24	0.319		0.450	0.379
East		0.296	0.286		28.23	0.300		0.342	0.295
Constant	2.627	2.435	2.754	2.676	72.09	2.762	3.045	2.826	3.063
Lambda	Sig	Sig	Sig	Sig	Sig	Sig	Sig	Sig	Sig

**Table 8: Heckman Log Wage model 21-54 years- Results with interaction term**

<b>Log wage</b>	<b>With occupation dummy &amp; occupation*education interaction</b>	<b>with control variables</b>
Age/Exp	0.047364	0.043965
Exp square	-0.00068	-0.00063
Graduate	0.766959	0.791
<b>Occupational category</b>		
1-Professional	0.733245	0.742
2-Technicians	1.060689	0.917
3-Administrative, executive & managerial Workers	0.493616	0.837
4-Clerical & related workers	0.792974	0.573
5-Merchants	-0.737	not sig
6-Sales workers	-0.162	-0.142
7-Service workers	-0.026	0.031
8-Farmers, fishermen, hunters, loggers & related workers	-0.791	-0.490
9-transport equipment operators	0.251	0.202
10-Labourers	not sig	-0.262
<b>Edu_dummy#Occupational_vategory (edu_dummy=1 if graduate, 0-Production base level occupation)</b>		
graduate+#1-Professional	-0.233	-0.284
graduate#2-Technicians	Not sig	Not sig
graduate#3-Administrative, executive & managerial Workers	0.499	Not sig
graduate#4-Clerical & related workers	-0.177	-0.135
graduate#5-Merchants	Not sig	Not sig
graduate#6-Sales workers	Not sig	Not sig
graduate#7-Service workers	0.524	0.333
graduate#8-Farmers, fishermen, hunters, loggers & related workers	Not sig	Not sig
graduate#9-transport equipment operators	Not sig	Not sig
graduate#10-Labourers	Not sig	Not sig
<b>Control variables</b>		
Female		-0.496
SC/ST		-0.025
<b>Region</b>		
North		0.443
South		0.329
West		0.336
East		0.311
Constant	3.491	3.527
Lambda	Sig	Not sig

## Conclusions

India has seen an increase in enrolment on 15-17 and 18-20 year olds in the educational institutions over the decade 1993-94 to 2004-05. There was also a large increase in students enrolled in graduate education over the same period. Thus, even though only about 7 percent of the occupied prime-aged population was graduates we can expect a surge in the supply of higher educated graduates in the coming decade.

Little above one fifth of the occupied persons were in graduate occupations in India in 2004-05, classified on the basis of the percentage of graduates employed. The traditional occupations such as doctors, lawyers, biological scientists and university teachers retained their high density of graduates in younger and older cohorts and over the decade of study. The modern occupations, mainly engineering, medical and scientific technicians, social scientists and economists and technical salesmen and primary and middle school teachers showed an increased demand for better and highly qualified people, we could say with the advent of the knowledge economy. The new occupations with a slightly lower density of graduate population were nurses, working proprietors (self employed enterprises), village officials, artists and composers, transport conductors, who showed a smaller increase in graduates among the younger cohort. The niche occupations, were mainly non-graduates but saw a large increase in the percentage of graduates in the younger cohort in 2004-05, for example, ticket collectors and checkers, merchants, shopkeepers, salesmen, and service workers n.e.c. The nature of activities in these occupations may have changed so as to require a more qualified workforce. Only a few occupations, four in the two digit classification of nearly 90 occupation groups, actually showed a decline in graduate density over the decade. This definitely indicates an increase demand for better educated work force in recent years.

Confirmatory analysis estimating a Probit model of the effect of graduation on participation in SOC(HE), showed that over the decade the nature of occupations had changed so that there was an increase in graduates in new and niche occupations. Graduates in these occupations also obtained a wage premium, implying that this was not just supply driven or employment of over-educated persons.

Our exploration with returns to education and occupations using earnings functions yield the clear result that besides education, the occupation engaged in had a clear effect on earnings. The returns to education fell from nearly 11 percent in a pure Mincerian function and to about 7 percent when the SOC(HE) dummies were included. Traditional occupations with high graduate intensity had much higher earnings than non-graduates, followed by modern occupations. The new and niche occupations also had higher earnings than production workers, but were much lower than that to traditional and modern occupations.

Overall, it is possible to conclude that there is an increasing supply of graduates in the labour market and there is also an increasing return to education and occupations with higher graduate intensity.

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