

# Examining the Efficiency and Reach of Open and Distance Education for Secondary Education in India: Econometric Analysis of Student Data from National Institute of Open School (NIOS)

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## Abstract

Open and Distance Learning (ODL) for secondary and higher secondary education in India is offered by National Institute of Open Schooling (NIOS) and State Open Schools (SOS) at the national and state level respectively. NIOS and SOS have the same vision of reaching out to the disadvantaged sections and contribute towards expansion of secondary education. In this paper, we deal with the following questions: (a) Who accesses the ODL system to pursue their secondary and higher secondary education; and (b) Does the flexibility offered, in terms of the five year duration allowed to complete the course, result in higher probability of completion? We examine these questions using Learners data from NIOS at All-India level, for the period 2008-2013. The raw student data of NIOS is not in the public domain and therefore has been analyzed for the first time. We use an ordinal logit model to estimate the probability of completion to understand whether the flexibility to complete in five year leads to higher completion rates by using NIOS data in conjunction with data from other national level large surveys such as National Sample Survey Organization (NSSO) and District Information on School Education (DISE). The estimates reveal a decreasing trend in probability of completion, where the highest probability is observed in the first year at about 22 per cent. In addition to total learners, we carry out disaggregated analysis for gender and for social groups, and conclude that the flexibility of five years has only marginal effect on completion rates.

## Introduction

In India, NIOS was established in 1989 with the mission to provide relevant, continuing, holistic education to the most marginalised sections of the society for equity and social justice.<sup>1</sup> The enrolment in secondary and senior secondary levels in NIOS has increased from 3,13,922 in 2008 to 4,29,726 in 2013. This growth in enrolment, about 6.15 per cent per year, is impressive especially since it is not concentrated in one or two states but is dispersed across the country. In 2008, Delhi, Haryana and Uttar Pradesh constituted 50 per cent of the enrolment in NIOS, wherein that concentration has reduced to 36 per cent by 2013 primarily due to increase in enrolment in states such as Kerala, Gujarat, Rajasthan and Jharkhand.<sup>2</sup> In recognizing the importance of NIOS in providing quality education, the Ministry of Human Resource and Development (MHRD) in its draft of New Education Policy (2016) has mentioned initiatives to revamp the Open and Distance Learning system (ODL) to achieve enhanced access, developing skills, capacity building, training, employability and life-long learning (MHRD, 2016). Therefore, at this juncture, it is important to examine the efficiency of the NIOS to increase its reach to the disadvantaged sections and contribute towards expansion of secondary education.

In this paper, we examine the reach and efficiency of the NIOS system and the idea of accessibility through two primary questions - i) who accesses the NIOS to pursue their secondary and higher secondary education and ii) Does the flexibility offered, in terms of the five year duration allowed to complete the courses, result in higher probability of course completion? These have been examined by using raw learners' data from NIOS for the period 2008-2013; this is the first such analysis of this data to our knowledge.

The paper is structured as follows: (a) brief introduction to the features of NIOS; (b) defining *efficiency* in the educational system context, especially NIOS; (c) description of methods used and its limitations; (d) discussion of results; and (e) finally conclude with discussion on whether the system is working efficiently.

## Institutional Context - NIOS:

NIOS primarily offers three kinds of courses: Secondary, Senior Secondary and Vocational. At secondary, a learner can opt from a pool of seventeen languages and ten additional subjects<sup>3</sup>; and a learner at senior secondary can chose between four languages and seventeen subjects<sup>4</sup>. The curriculum offered by NIOS is intended for self-learning; a provision for Personal Contact Programmes (PCP) has been included to facilitate the learning process. These are subject wise classes held at the Study Centres, known as Accredited Institutes (AIs) and Accredited Vocational Institutes (AVIs).

<sup>1</sup> Accessed from NIOS website [www.nios.ac.in](http://www.nios.ac.in) as on August 28th 2016.

<sup>2</sup> From 2008, Kerala, Gujarat, Rajasthan and Jharkhand have increased its enrolment by 40 per cent per year.

<sup>3</sup> For Certification (Secondary and Senior Secondary) , a minimum of five subjects including at-least one language or at-most two languages are compulsory.

NIOS offers flexibility to its learners at several levels to reach out to learners who due to several constraints are unable to continue with their formal schooling. First, there is no upper limit to age for an NIOS learner and admissions are open all through the year. Second, it offers sufficient scope for flexibility through a wide range of subjects and also the option to opt for any combination that the learners deem suitable. Learners in NIOS can also take exams all-round the year, using the facility for on-demand exams. NIOS provides for the option of 'transfer of credit' from other boards. This is especially incorporated to facilitate learners who could not complete the secondary or senior secondary board examination through the regular system. All the information and related forms that need to be filled by learners are available online. The fact that NIOS is highly internet dependent demands a fair amount of internet literacy to be present with learners.

In sum, NIOS is driven by two features, firstly it is open in nature, that is to mean that the system is flexible enough to allow for open admissions, and freedom of selection of what, when and where to learn and secondly, the system engages in an educational process where the teaching is conducted by someone who is removed from the learner through space and time, therefore is distanced. These features make the system suitable made for learners who are un-reached, the most marginalised sections of the society along with learners who find it difficult to access regular schools.

### Defining Efficiency of NIOS:

Efficiency is a state in which every resource is optimally allocated to serve each individual or entity in the best possible way. This is a very simplistic definition of efficiency which considers maximization of a given phenomenon within the existing constraints of the environment. The simplicity of the definition orients from the naïve assumption of a simple means to end relationship, although holds true in pure economic contexts. An education system cannot be evaluated in terms of an input-output production function, as the final outcomes of education are broad, relative and multiple in nature. Further, Cooze (1991), Thomas (1982), Thomas (1977) conclude that no two inputs or mix of inputs have the same outcome. It is, thus, important to identify, and define, the factors that comprises of the input and output in order to be able to define *efficiency* of an education system. Apart from this, the process through which the inputs are delivered to the learners becomes of utmost importance. Thus, the definition of efficiency of an education system should include aspects of access, equity and quality including learning achievements and cost effectiveness measures.

There are two kinds of efficiency, internal and external, which are discussed in the education literature (Chapman et al, 1986). Internal efficiency comprises of the output and outcome of the educational system. On the other hand, external efficiency is the measure of the translation of the competencies acquired through the education into private and social benefits. Therefore, internal efficiency can be seen in terms of enrolment, retention, pass percentages, completion rates and so on. The concept of external efficiency is larger and less tangible, where it includes more qualitative indicators like students transforming into sensitive citizens, having choices and freedoms. This paper concerns itself with the first, which is internal efficiency.

The discourse on efficiency in the ODL system conflates efficiency with effectiveness (Tattersall, 2006; Hulsmann, 2004). Qualitatively, a system can be seen as effective when it achieves its objectives/mission/goals. These objectives define the character, ways and means of operation for the educational institutions. While it is commonsense that the objective of all educational institutions is to provide quality education but the quality needs to be interpreted and understood with reference to the context. In a system that intends to cater to social, economically and educationally disadvantaged groups, quality cannot be attained without a focus on equity. The primary objective of any ODL system is reaching the unreached (Siaciwen et al 2008; Perraton 2000; UNESCO, 2002; Rupande, 2015). This population could be unreached due to several constraints such as non-availability of adequate number of school/college, infrastructural facilities, transport, communication, cultural factors that restrict mobility of a particular group (especially of girls in India), affordability, physiological disabilities and others. The essence of the ODL system rests on the premise of access; and the system strives to be accessible to those who cannot access regular systems of learning. Thus, we define efficiency of NIOS through its "*ability to reach the unreached in manner that it enables learners from disadvantaged communities, locations and backgrounds to access and complete the chosen level of schooling*".

### Data and Methods:

We make use of different datasets including large nationally representative surveys and raw datasets of both the formal and NIOS system to answer our research questions. The characteristics of students and enrolment rates at secondary and higher secondary levels are derived for the time period 2010-2012 using the raw datasets sourced from Secondary Education Management Information System (SEMIS). One of the limitations with SEMIS data is that it does not facilitate analysis by income or sector.

The 64th and 71st round of the National Sample Survey for the time period 2007 and 2014, respectively, is used to calculate the nationally representative estimations of *not currently attending* population between the age group 14 to 17 years to understand the proportion of out-of-school population (OoS, hereon) and the reasons for *not currently attending* the secondary education. It should be noted that the population that is *currently attending* includes learners from NIOS, SOS and other non-formal school systems.

The raw student dataset of NIOS for the time period 2008 to 2013 is used to examine the reach and flexibility of NIOS in increasing access and probability of completion. The dataset includes learners who had enrolled for both academic and vocational courses. However, important variables such as sector, income and transfer of credit are either not available or not entered properly, rendering difficult the analysis by these variables for the vocational learners.

While most of the analysis is carried through descriptive statistics, the probability of course completion within the five-year period is estimated using an ordinal logistic model for both the academic and vocation learners. The dependent variable is a categorical variable which has values for not completed, completed in one year, one-half year, two years, two and half years and three to five years. The equation used to estimate the ordinal logistic model is given below:

$$Y_{i,d,s,t} = \alpha_{i,d,s,t} + \beta_1 \text{Caste} * \text{Sex}_{i,d,s,t} + \beta_2 X_{i,d,s,t} + \beta_3 \text{state dummies} + \beta_4 \text{time dummies} + \epsilon_{i,d,s,t}$$

The dataset is at the level of learner and varies by district, state and time period. The sex and caste characteristics of the learner is interacted to understand the changing levels of probability of completion for male, and female, belonging to different caste groups. We also include a vector of other variables, denoted as X in the equation above, which comprises of learner's age group, education qualification before joining NIOS, mother's education, transfer of credit, total number of subjects in a course, medium of instruction

(english/non-english)<sup>5</sup>, sector (rural/urban), and income level<sup>6</sup>. The results that are presented will be the predicted probabilities estimated using the coefficients from the ordinal logistic model estimations.

## Results

### Who is supposed to access NIOS:

NIOS is supposed to serve as an alternate medium for learners who intent to attain secondary and senior secondary education but cannot access the regular school for a variety of reasons, as mentioned above including the rigid structure of rules and regulations regarding the age, curriculum and examinations. Therefore, we make use of the out-of-school population at secondary and higher secondary level to understand the socio-economic characteristics of the target population to whom NIOS is supposed to reach out.

Table 1: Gross Enrolment Rate (GER) at secondary and higher secondary level

Caste	2010-2011			2012-2013		
	Male	Female	Total	Male	Female	Total
<b>Secondary</b>						
SC	73.8	67.3	70.7	74	67.5	70.9
ST	57.1	49.1	53.3	57.1	49.1	53.3
Total	69.2	60.9	65.2	69	60.8	65
<b>Higher Secondary</b>						
SC	40.4	36.3	38.5	40.3	36.1	38.3
ST	32.7	24.8	28.8	32.7	24.8	28.8
Total	42.3	36.2	39.4	42.2	36.1	39.3

Source: Statistics of School Education, Ministry of Human Resource and Development, India, respective years.

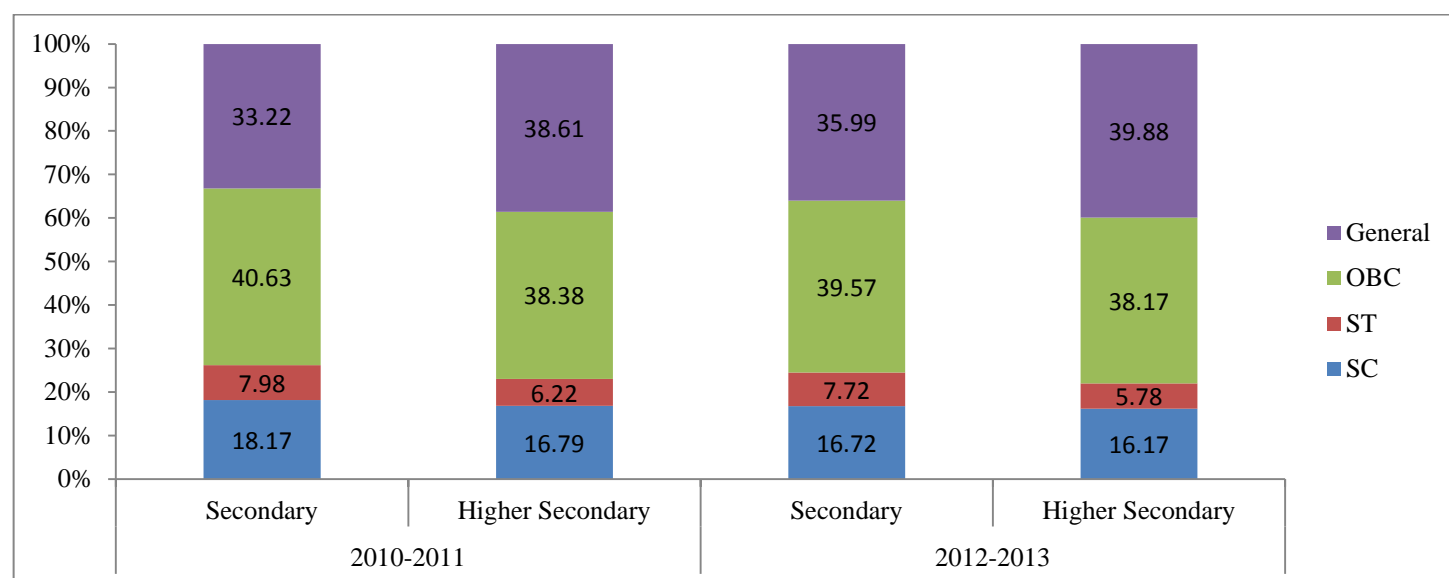


Figure 1: Percentage distribution of enrolment by caste

Source: Estimated from SEMIS raw data, respective years

The enrolment in secondary and higher secondary levels has increased by 6.59 and 12.97 percent per year in 2012-2013, from 377,75,568 and 213,45,953 in 2008 respectively. However, the population belonging to *other backward* (OBC) and *general* caste constitutes about 75 per cent of the enrolment. Data segregated at the level of sex shows that there is gender disparity against female. The Gross Enrolment Ratio (GER) for male is around 9 percentage points more than girls at secondary level, and 6 percentage points higher at the higher secondary level. While it may appear that the gender disparity in enrolment is lower at the higher secondary level, it should be noted that the general level of enrolment in senior secondary is significantly lower (around 39 percent of the total population in the 16-17 years age group) than that at secondary. This gap further widens when caste is considered: girls, especially those from the deprived sections (Scheduled Caste and Scheduled Tribe) are not able to access the formal school system at these stages (Table 1).

<sup>5</sup>Non-english languages includes hindi and all other local languages available for NIOS learners.

<sup>6</sup> It contains self-reported responses for four categories such as below Rs 50,000 HH income per annum; Rs 50,000 to Rs 1,00,000 HH income per annum; Rs 1,00,000 to Rs 1,50,000 HH income per annum; and above Rs 1,50,000 HH income per annum.

Table 2: Percentage of Out of School Children (OoSC) out of total population in India

Caste	Rural		Urban		Total	
	2007	2014	2007	2014	2007	2014
ST	50.26	32.92	28.68	15.07	48.34	31.23
SC	43.98	29.11	36.27	21.98	42.41	27.57
OBC	38.29	24.30	29.70	19.79	36.30	23.05
General	32.01	18.96	22.55	10.93	28.47	15.82
Total	39.22	25.23	27.73	16.62	36.30	22.85

Note: General includes a small proportion of minorities also.

Source: Estimated from National Sample Survey - 64th round and 71st round (2007 and 2014)

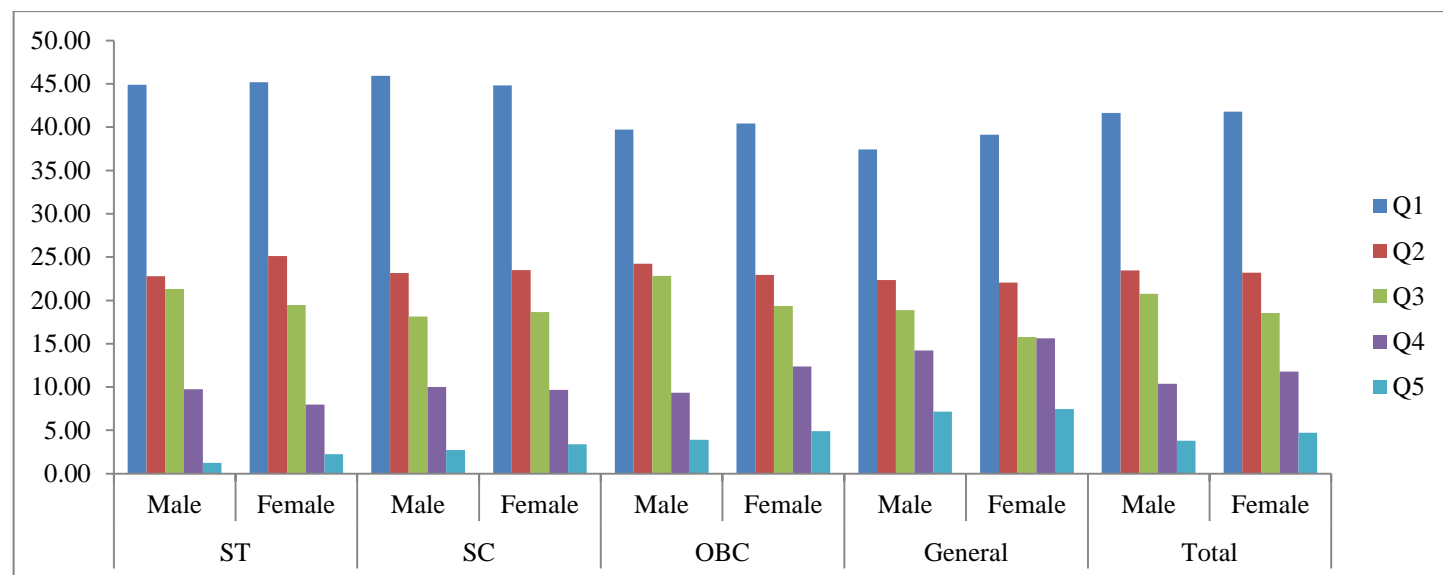


Figure 2: Percentage distribution of age-appropriate OoSC population by economic quintile, sex and caste (2014)

Note: General includes a small proportion of minorities also. The economic quintiles were estimated on the basis of total household expenditure per month. Q1 = poorest quintile; Q2 = poor quintile; Q3 = middle economic quintile; Q4 = rich quintile and Q5 = richest quintile.

Source: Estimated from National Sample Survey - 71st round, 2014

The proportion of Out of School Children (OoSC) population has reduced significantly from 36.30 percent in 2007 to 22.85 percent in 2014. But the share STs among OoSC is as high as 31 per cent as against their share of about 8 percent in population. Forty five percent of each of the ST and SC OoSC belong to the poorest economic quintile households. As evident from Figure 2, the percent of OoSC is sloping downward, as one moves from the poorest to the richest economic quintile. In the lowest two economic quintiles, where the OoSC is concentrated, gendered roles such as need to supplement household income for boys and domestic duties, or care giving, for girls are the primarily reasons for the age-appropriate population not attending either formal or non-formal schooling in both rural and Urban sectors (NSS 71<sup>st</sup> round, 2014). It could be concluded that any person belonging to lower caste and poorer households in the rural sector has a higher probability of being out of school. For girls, the improvements in the household economic status do not seem to change their status.

### Does NIOS reach the unreached?

The analysis focuses on the learners in academic courses as these constitute about 94 percent of enrolment during the period 2008-2013. In academic courses, the enrolment has increased significantly from 313,922 in 2008 to 429,720 in 2013. A closer examination reveals that the growth in enrolment from rural sector has been stupendous, where the per-year growth rate for the male and female is around 20 and 15 percent respectively. The urban sector, on the other hand, has experienced a per-year growth rate of 2 percent. This has led to bridging of the rural-urban divide in enrolment. On the other hand, girls are still under-represented, irrespective of their habitation in rural or urban sector. The cross-section of caste and income distribution reveals that the learners belonging to general caste and poor households constitute about 66 percent of the enrolment. The learners belonging to SC, ST and OBC constitute only around 9-10 percent of the enrolment in academic courses. NIOS has improved accessibility to learners in rural sector and those belonging to poor households but not necessarily of the socially disadvantaged groups.

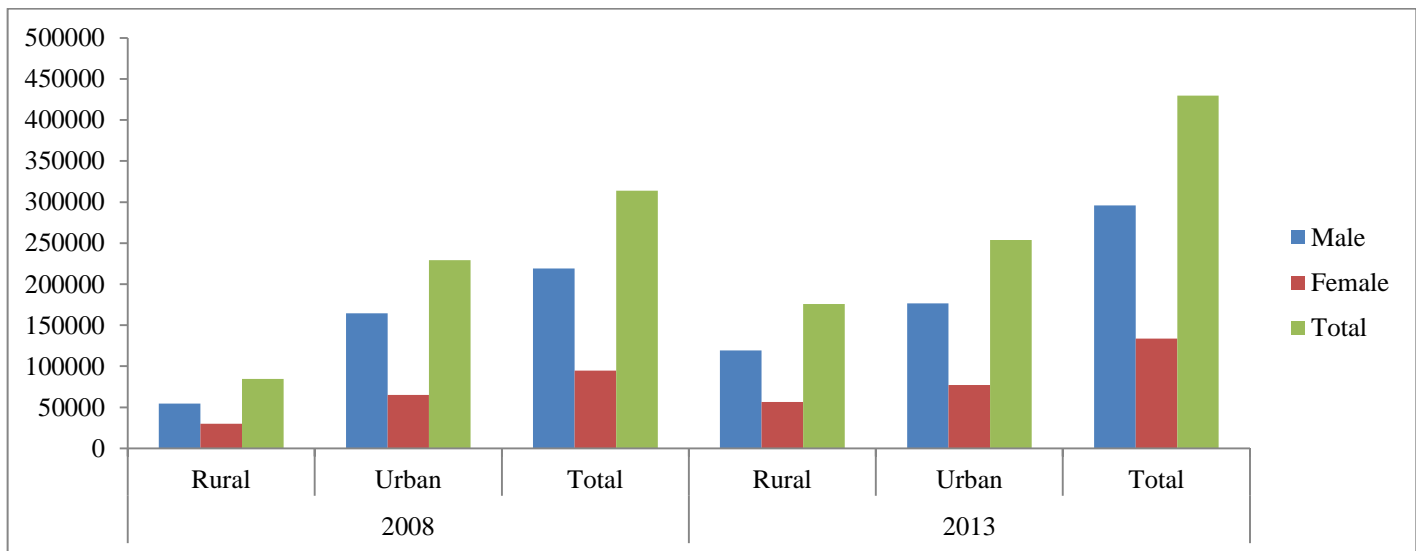


Figure 3: Trends in enrolment in academic courses (2008 and 2013)

Source: Calculated from the NIOS raw datasets, respective years

### Does NIOS flexibility increase the probability of completion:

According to the working definition of efficiency, the completion of the course opted for by the learners is one of the indicators of efficiency of the NIOS system. However, the calculation of completion rate in an ODL system which offers a five year time period to complete the course is difficult. The difficulty arises because the learner can stagger the completion over the stipulated time period, which in turn creates difficulty in estimating the degree of efficiency. To elaborate, the completion rate in a formal system would be the division of those who had completed the course in particular year by the total enrolled in that year. In the NIOS framework, the definition of those who completed the course has to be a flow concept, as it would include those who had enrolled and completed the course in the same year, and those who had completed the course but enrolled in the past. In order to circumvent this problem, we made use of probability of completion over the course of the stipulated five years rather than the actual completion rate.

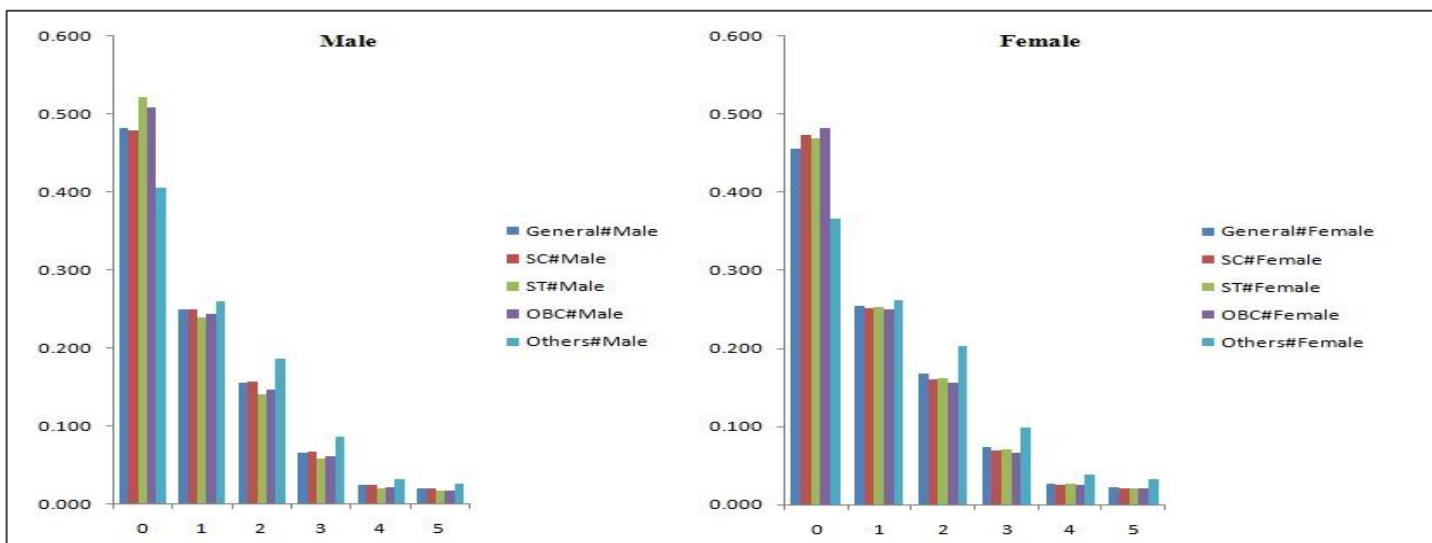


Figure 4: Predicted probability of completion - inter-sectionality of caste and sex

Note: 0 - Not completed; 1 - Completed in 1 year; 2 - Completed in 1.5 years; 3 - Completed in 2 years; 4 - Completed in 2.5 years; and 5 - Completed in 3 to 5 years.

Source: Estimated using learners' data from NIOS, 2008-2013

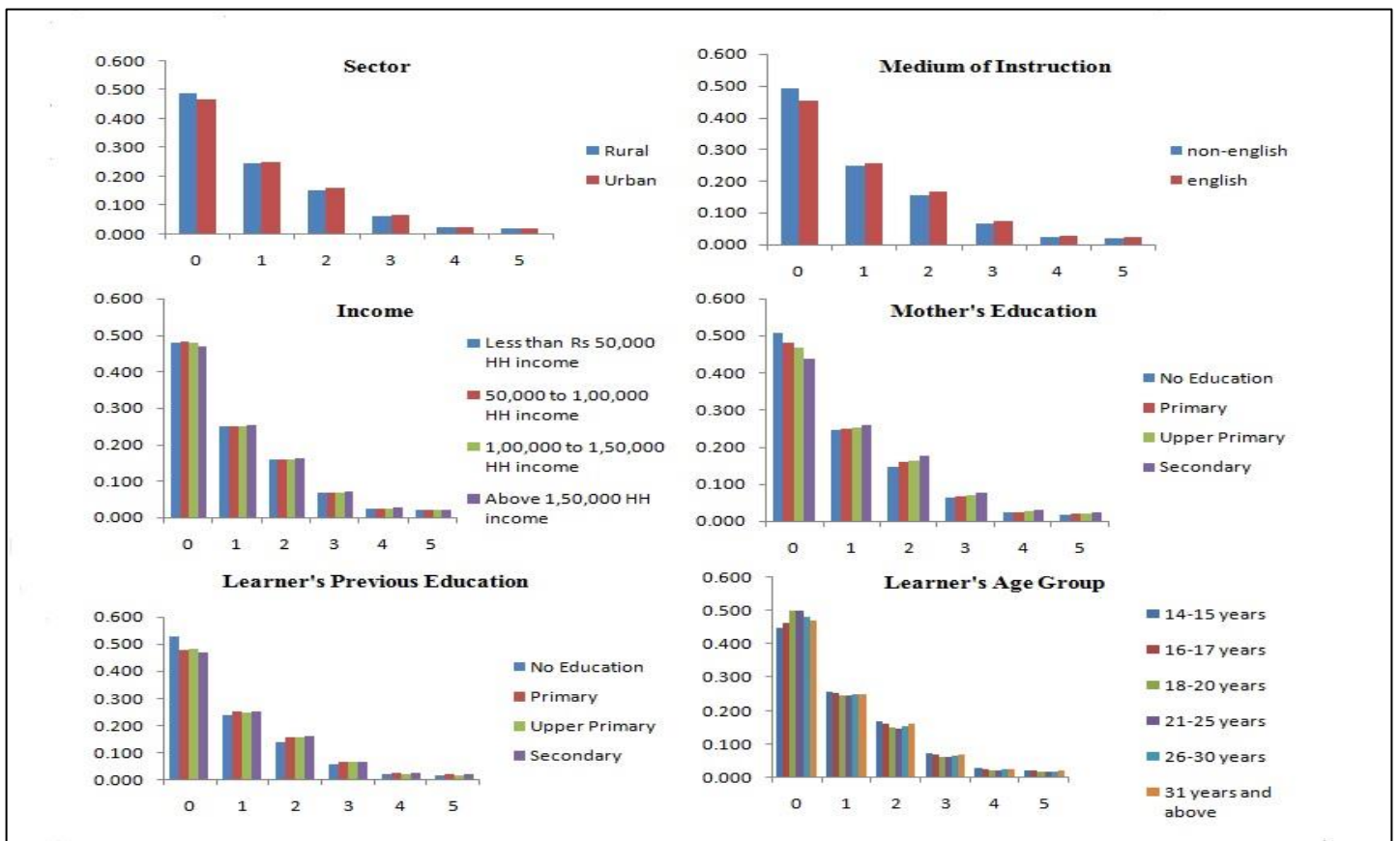


Figure 5: Predicted probability of completion by (significant) independent variables

Note: 0 - Not completed; 1 - Completed in 1 year; 2 - Completed in 1.5 years; 3 - Completed in 2 years; 4 - Completed in 2.5 years; and 5 - Completed in 3 to 5 years.

Source: Estimated using learners' data from NIOS, 2008-2013.

The probability of completion is estimated using the ordinal logistic model, as explained earlier. The predicted probabilities indicate that an average learner faces a higher probability of non-completion, of about 45 percent, even with the five year flexibility. The probability of successful completion is highest in the first year of enrolment (about 25 percent). After which, the probability decreases to 17 percent at the first one and half year of enrolment, and falls alarmingly to 7 percent in the second year of enrolment, and then to 2 percent thereafter. This result can be observed across other independent variables used in the equation.

An average female learner faces a relatively lower likelihood of non-completion than an average male learner. This difference in probability of non-completion between male and female learner is more prominent, and statistically significant, for general, OBC and SC groups. A similar significant difference can be observed in probability of completion in the first two and half years of enrolment after which the difference is not significant.

Interestingly, an average learner faces a little lower probability of non-completion (44 percent) if the mother is educated till the secondary level. This probability increases as one moves down the education qualification and up to 51 percent if the mother has never attended either formal or non-formal system. The same pattern is visible for the learner's previous education qualification: higher the education level of the learner, higher is the probability of completion in the first two years.

Further, it was observed that an average learner belonging to the top income class, Rs 1,50,000 and above, is more likely to complete the course relative to the learners in other income groups. It should be reiterated that the majority of learners belong to the poor household where the probability of non-completion is about 48 percent. In terms of rural-urban difference, an average learner from the rural sector faces a significantly higher probability of non-completion, about 49 percent, relative to 47 percent probability observed for an average learner from the urban sector. Therefore, the general picture that emerges is not a promising one as the probability of non-completion is significantly high, and any decent probability of successful completion can be experienced only within the first one-and-half year period of enrolment. Thus, the five year flexibility offered by NIOS has resulted in the exact opposite of the intended outcome.

The above results show that even though completion rate is low for learners from various socio-economic background, it remains true that the probability of completion is marginally higher for learners who come from a background of privilege. This privilege is attributed to their sex, education of their mothers and household income. To elaborate, a male learner whose mother is at least educated till secondary and comes from the top income quintile is more likely to complete the course in comparison to a female whose mother is not literate and has lower household income. This questions the enabling factors present in the system which support learners from a background of deprivation.

## Conclusion

The idea behind establishment of the NIOS was to reach the 'unreached'. The unreached are the population that are not able to access the formal education system due to deprivations of various kinds – economic, social, and physiological. Our analysis reveals that the enrolment in NIOS is dominated by the relatively privileged male upper caste residing in urban areas; even the recent surge in rural enrolment is concentrated among the male belonging to the upper caste. It appears that the majority of learners are those who have

had accessed the formal system earlier and could not cope rather than those who dropped because of the external circumstances.<sup>7</sup> The population which had never attended either the formal or non-formal system are still not covered, probably for a mix of reasons – perhaps NIOS has never targeted them directly through any outreach activities though they are eligible, and also for the fact that they are either too poor or illiterate to cope with the requirements of even a flexible system. Our consultations reveal that the process for enrolment is largely demand based. For instance, AIs are instituted in a particular village, or district or state only if it meets the required number of interested individuals to enrol. This implicit dependency on sufficient demand to institute an AI defeats the idea of distance-education itself in its actual sense. This points towards a gap in policy and practice where the policy is concerned with reaching the marginalized and requires a practice of target oriented access, but practices are more guided by demand. Jha et al (2016)<sup>8</sup> observe that the primary motivation to enrol with NIOS is to obtain the certificate of completion in order to pursue further education or economic opportunities. However, the low probability of completion indicates that the flexibility clause is not used widely, even for the sake of certification. Going by our definition of efficiency, as stated earlier, NIOS cannot be labelled as highly efficient.

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<sup>7</sup> The conference paper titled "*Tracing the Education and Employment Status of Open School Graduates in India.*", submitted to the PCF 8 conference, establishes this fact.

<sup>8</sup>ibid