Quota-Based Affirmative Action in Higher Education: Impact on Other Backward Classes in India

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ABSTRACT While quota-based and other affirmative actions remain on the policy radar of nations faced with social inequalities, there is limited evidence informing policy choices at the national level. This paper estimates the mid-term impact of quota-based affirmative action in higher education (HE) in India implemented from 2008, which mandates that 27 per cent of seats are to be reserved for the Other Backward Classes (OBC) in public funded institutions of HE. Exploiting the differences in participation across social groups, age cohort, s and geographies with varied histories of affirmative action, our triple difference method estimates the impact of the Act by the year 2011–2012. Our results indicate that southern and northcentral states that already had quotas in place for a fairly long period of time, do not contribute much in further expansion of enrolment of OBCs; instead, the eastern region, where such a policy did not exist for long has about 0.12 points improvement in enrolment. Our estimates are robust to different specifications and the impact seems to be non-existent amongst the richest. It suggests that future policy initiatives need to be more nuanced considering regional differences in policy histories, supply of institutions, and extant rates of HE participation of the disadvantaged sections.

1. Introduction

Affirmative action, through positive discrimination policies in employment and education domains has been in place around the world for close to a century (Sowell, 2004). But the form, content, and efficacy of such policies have varied widely across nations (Alon & Malamudb, 2014; Chan & Eyster, 2003; Cunningham, 2002; Hinrichs, 2014). To encourage higher participation of the historically disadvantaged groups, India was one of the first countries to implement these policies (Khanna, 2016). In fact, a few fragmented initiatives in different regions of the country date back to several decades before the formation of the Indian republic (Osborne, 2001; Zwart, 2000).

At the federal level, quotas for the Scheduled Castes (SCs) and Scheduled Tribes (STs) in education and employment domains have been implemented in India since independence, while reservations for the Other Backwards Classes (OBCs) were initiated much later, first in government jobs and then in higher education (HE). In the year 2008, the Central Educational Institutions (Reservations in Admissions) Amendment Bill (henceforth the Act) was passed in the Indian parliament, recommending its implementation in a phased manner but starting the process
immediately. This Act requires 27 per cent reservations of seats for OBC students in public funded institutions of higher education in the country. The bill was amended in the year 2012 again, with a guideline to complete the implementation by the year 2014. Apart from this federal mandate, certain state governments have been implementing quotas for OBCs for several years and these reservation policies continued even after the implementation of the Act in 2008. The private educational institutions, minority institutions, and a few institutions of national importance, as declared by the government of India, still remain outside the purview of this nationwide caste-based reservation policy. However, it is to be noted here that the growth of private HE institutions is a comparatively new phenomenon in India, which has started to pick up in the present century (Figure A2). According to the reports of the All India Survey of Higher Education (Government of India, 2011), out of a total of 621 universities in India, only 178 were managed by private bodies by the year 2010–2011. In India, higher education has been historically managed by the public sector, and due to concerns regarding quality and difference in cost, even after a recent spur in growth of private institutions, public institutions still remain the most preferable option for students.

Since the implementation of the OBC quota, questions have been raised about the adequacy of the quota level, basis of including various castes in the OBC list across Indian states, and its likely impact. Interestingly, the list of castes designated as OBCs are prepared separately at the federal and state levels. Hence, certain castes categorised as OBCs for the purpose of federal government jobs, may not be listed as OBCs in state government jobs and vice versa (Galanter, 1984). This complicates the implementation of caste-based reservations. Political mobilisation around demands for including certain castes in the OBC list and acceptance of some of these demands (for example cabinet decisions to include Jats, a subgroup, in the list of OBCs) just before parliamentary elections in 2014 reflect the political importance of this caste based policy instrument in India (Ghildiyal, 2014; Osborne, 2001). However, its efficacy needs to be assessed empirically through a systematic analysis of how this Act has impacted the participation of OBCs in higher education. No such studies are available and our paper makes an effort in this direction by using the latest available nationally representative data for India, collected during the year 2011–2012.

Among others, our effort faces two critical analytical challenges. One, the Act being very recent, its impact may not manifest itself in 2011–2012, the year of our analysis, as all phases of the implementation were to be completed across institutions only by 2014. Two, since implementation of OBC reservation through state level legislations varied widely across Indian states before the implementation of the federal Act in 2008, the impact of the Act is also likely to vary widely across states, confounding the estimates of the overall impact at the national level. The expectation is that the impact of the reservation would be higher in those states where OBC reservation barely existed prior to the implementation of the federal Act. We deal with the challenges by developing a methodology which not only provides ‘quick’ (a rough and ready) impact estimates by circumventing the problems faced by us but also has a potential to prove very effective as a tool to analyse the impact of this policy as more recent data becomes available.

We argue that in the short-run, the impact of the legislation would be felt by OBCs who were eligible to go to college at the time of the implementation of the Act, that is, who had completed higher secondary education. Typically, these persons would be in the age cohort of 18–23 years in 2011–2012; participation of persons in the older age group would not have been affected by the Act. Therefore, following Duflo (2001) and Muralidharan and Prakash (2017), we consider the younger cohort (of 18–23 years) to be the treated group, and the elder cohort (of 24–29 years) to be the control group. To account for the time varying omitted variables, we compare the above difference between the OBCs and the General caste groups, as the former are the beneficiaries of the Act. Using the data for the year 2011–2012, we expect that the Intent-to-Treat (ITT) effect of the Act can be estimated from the above double difference.

Considering the regional differences across groups of states with different histories of affirmative action, we estimate the double difference separately for different regions. The Act being almost new to the eastern region, unlike the southern or northcentral regions, the quota is not expected to have
been fully or partially exhausted. However, as we reject the parallel pre-programme trends assumption between the OBCs and the general groups in South region, our preferred estimation strategy turns to the triple difference, where we exploit this regional difference in history of implementation of quota-based reservation policy to generate additional variation for identification of the ITT effects. We compare the second level of difference in the eastern region (having a comparatively recent history of affirmative action, hence treated) with the southern and northcentral regions (having a relatively longer history of affirmative action, hence controlled). The triple difference estimate indicates a significant positive impact in the eastern region, which is robust to several specifications. Since the double difference estimates for the South region do support the pre-programme parallel trends assumption, we cannot claim it to be the estimates of the treatment effect. We cannot completely ignore the fact that the regional differences in the history of implementation needs to be taken into account while evaluating the effectiveness of such a policy. Additionally, we find the policy had impact on the poorest among OBCs, but no effect among the richest, as expected, even in the eastern region.

However, as the implementation was yet to be completed by the year 2012, our findings can also be interpreted as a mid-term impact evaluation of the Act, which can be repeated in a few years to monitor outcomes. We also believe that this methodology can be adapted to analyse the impact of policies in other contexts as well. To reiterate the purpose of the study once again, this work should not be considered as end-term impact evaluation, rather, what we propose to do is to design a new methodology that can be used in future for evaluation of this and similar policies. One can use this mechanism every five or 10 years to understand the effectiveness and nuances of the policy. Moreover, the methodology provides scope for policy analysis that takes regional differences into account, and distinguishes between regions that have recently adopted the policy from those where the long-existing quota system may have already exhausted the reservation potential.

To our knowledge, this is the first study attempting to measure the causal impact of a nationwide affirmative action policy for OBCs in higher education participation in India after considering the regional differences. The complexity of caste based affirmative action in a nation where educational policies are both state and federal subjects is addressed throughout the paper. Affirmative action policies in different domains being an increasingly popular policy issue globally, the simplified research design of this paper can be adapted to other domains, geographies, and policy contexts.

The rest of the paper is organised as follows. Section 2 discusses the context of reservation policies in India, and the relevant literature. Section 3 develops the conceptual framework, and describes the data and the empirical strategy. Section 4 discusses key findings with relevant extensions, and the final section concludes with policy recommendations.

2. Policy context and extant literature

2.1. History of caste based reservations in India

Reservations in India date back to early nineteenth century. The British Indian Government implemented a policy of reserving places for Muslims in Indian educational institutions in the year 1882 (Hunter Commission). But during that period reservation was only meant to provide equal opportunity and not based on the representation of any group in total population. The caste based reservations for the SCs and the STs across a few Indian states started in the year 1935, with the operation of the ‘Pune Pact’ between Mahatma Gandhi and B. R. Ambedkar. It received constitutional support at the national level in the year 1950. The Supreme Court of India mandated in 1963 that reservations in any institution could not exceed the quota of 50 per cent (Kaur & Suri, 2009, p. 113). The 93rd amendment of the Indian Constitution also mandated a maximum of 50 per cent reservation in state and centrally funded higher education institutions (HEIs). The Mandal Commission, set up by the federal government to study the status of OBCs, recommended in 1981, a 27 per cent reservation in employment and education. Debates and nationwide protests delayed the implementation to the year
1992, when OBC reservation of 27 per cent in public sector employment was rolled out throughout the country. The implementation of OBC reservation in the education domain could not achieve the desired support at that time.

However, without the support of any nationwide mandate, affirmative action for OBCs was being practiced more in certain parts of the country. Table SM1 (henceforth, all tables or figures in Supplementary Materials are prefixed with SM) summarises the historical patterns of reservations in employment and higher education across different states and union territories of India. The four southern states of Tamil Nadu, Kerala, Karnataka, and Andhra Pradesh started implementing a reservation policy for OBCs as early as the 1970s (Bayly, 1999). Apart from the four southern states, reservations for OBCs at the state government institutions have been in place in the northcentral states, but in a less systemic manner than the southern states. The OBC reservations started in a fragmented manner during the late 1970s and 1980s in the northcentral states of Gujarat, Rajasthan, Maharashtra, Bihar, Uttar Pradesh, Punjab, Haryana, and Himachal Pradesh (Parikh, 2001). In the eastern states of West Bengal, Orissa, and Assam, the OBC reservation started only in the 1990s. However, the OBC reservation did not exist in most of the northeastern states till the central legislation was passed in 2008, due to negligible representation of the same community.

2.2. Relevant literature and analytical challenges

Very few studies focus on the impact of reservation policies. The literature in this area is mostly limited to discussions of the eligibility of the OBCs, or even SCs, STs as a group to receive such positive discrimination (Galanter, 1984; Thorat, Tagade, & Naik, 2016), or the rationales for extension of reservation policies to private sectors (Bertrand, Hanna, & Mullainathan, 2010). Some studies do show that participation of OBCs has increased over the years (Azam & Blom, 2008). However, it is yet to be established that the increased participation was indeed an effect of ‘positive discrimination’ policies. Moreover, the estimates of participation of both the stock and flow measures, using the 61st round of the National Sample Survey (NSS) data (Basant & Sen, 2010), indicate that an appropriate measure of deficit may change the debate around affirmative action towards the issue of supply side constraints. Deficit measures based on eligible population do not show significant deficits for marginalised groups; the deficits for OBCs being almost non-existent at the national level. Using the NSS data of the last decade, Basant and Sen (2014a) show that the overall hierarchy of participation has not changed over years but convergence can be seen if appropriate measures are used.

A recent study by Surendrakumar., Epple, and Taylor (2016) measures the causal impact of the affirmative action policy in India for all social groups, using data from one engineering college. However, the recent reservation policy targeting OBCs is yet to be evaluated. Apart from a few studies to document the progress of these disadvantaged groups over the years (Basant & Sen, 2014a), there is no published literature available that evaluates the impact of this particular policy at the national level. Bhattacharjee’s (2016) work is the closest to ours that attempts to measure the impact of this nationwide policy using SCs as the control group. Using difference in difference method, she finds a 5.1 per cent increase in likelihood of OBC participation in higher education post-policy. Our estimates are different from her due to two reasons. One, the difference between OBCs and SCs seem to be much higher historically, in terms of socio-economic conditions and educational participation (Basant & Sen, 2010, 2014a, 2014b), than the difference between OBCs and the general population. So, her estimate may be an upper bound of the programme effect. Second, she estimates the nationwide impact without considering the regional differences, which is a major consideration in our paper. Our double difference estimates (presented in Supplementary Materials), done separately across different regions, produce further evidence for that; the reason for which is elaborated in the next section. The other work (Khanna, 2016) that attempts to measure the impact of this policy is on labour market outcomes. By calculating the ‘intensity’ of the programme across states if India, he
suggests that the states with extremely intensive affirmative action programmes in employment may be detrimental to the minority groups.

The challenges involved in such an exercise are many. One, in India, education being a state subject as well, reservation for OBCs in higher education has existed to varying degrees for different periods of time across different states of India. So, even if the nationwide law applies from the year 2008–2009 onwards, finding a suitable counterfactual for identification of the programme effect is a challenge. Two, the impact of such an Act on participation can take time as in higher education neither demand nor supply is generated overnight. With the passage of time, the Act should also encourage supply side expansions of institutions to meet the higher demand that gets generated due to the policy change. The supply side expansion can result in higher enrolment. So, it is important to disentangle the direct impact of the Act on enrolment and its indirect effect through the supply side expansion.

The next section discusses the conceptual framework, the data, and the empirical strategy applied in the paper to address the existing gap in literature.

3. Conceptual framework, data, and identification strategy

3.1. Conceptual framework

The affirmative action policies in India are caste-based, and the country identifies a total of four major caste categories for the purpose of social sector policies. The SCs and the STs have been the most disadvantaged and have had the benefit of such positive discrimination policies for a long time in the field of HE. The OBCs are the most recent inclusion. The remaining category, known as ‘general’, remains outside the purview of such policies.

The 2009 Act is expected to increase the HE enrolment of OBCs via two channels. The first one is through increased demand, which will have impact on HE enrolment in immediate terms. As only a short time has elapsed since implementation of the policy, we start with the premise that the immediate effect may take the form of higher enrolment of OBCs in HEIs, with impact limited to only those in the relevant age cohort among the OBC population who are eligible to go to college, that is, those who have crossed the high school (HS) threshold. In the long-run, such affirmative action can potentially create incentives for OBCs to cross the school threshold to become eligible to join a HEI, which cannot be captured within two to three years of implementation.

With respect to the first channel, the southern and northcentral groups of states have similarities in the shares of OBC in their total population, in population crossing the threshold of higher secondary, or in completing the higher education have been higher than the reserved 27 per cent as mandated by the central government (Table A1 in Appendix). It leaves barely any room for the eligible OBC population to increase participation through that channel in the immediate term. They can still have higher participation, but that can only happen by enrolling in non-reserved seats. Therefore, these states may not see much immediate impact of the federal Act through the demand channel.

The eastern states did not have any initiative until the late 1990s, and after that, the reserved seats in the state-funded institutions have still been much lower than the representation of the OBCs in the state population (Government of India, 2014). The 27 per cent designated quota is comparatively higher than the percentage of their existing participation in HE, which generates a channel for the immediate impact of the reservation in eastern states.

However, the northeastern states did not do much towards affirmative action for the OBCs as the latter have always been a very insignificant proportion of the population in those states (Table A1). Also, because the OBCs are not much different from the general population in any respect in the northeastern states (Table SM3), it leaves little scope of further improvement for them even in HE participation. Due to the reason that in this group, of five (six, in alternate specification) northeastern states, the share of OBC population is not large enough to expect a significant impact, with a very
small and economically well-off share of OBCs, we leave the northeastern states out from this treatment effect framework in the following sections.

The second channel is via supply side expansion. Affirmative action may increase overall demand for HEIs, resulting in the increase in the number of HEIs, both in the private and the public sectors. States with a history of affirmative action may have seen such a supply response in the earlier period. However, states with no history of reservations in higher education may not have adequate supply of HEIs to absorb increased enrolment needs.

Due to the differential state level initiatives (as noted in Table SM1), the southern and northcentral states have been more pro-active in setting up private higher education institutes. The proactive southern states had simultaneous expansion of HEIs, with a higher share of private institutions, followed by the northcentral states. The expansion of private HE institutions have been almost negligible until 2000 in the eastern states (as indicated in Appendix Figures A1–A2). Since the Act applies to public institutions only, Figures A3 and A4 present the growth of those separately across state groups. The south and northcentral states had an expansion of both types simultaneously even before the Act came into existence; whereas the east and northeast states barely had any growth of private institutions.

Broadly then, we identify three groups of states from our sample with different expected programme effects. In the first group, we have four (or five, in alternate and broader specification) southern states with a long and systematic history of implementation of affirmative action, for which the 2008–2009 Act is not expected to make much difference. The second group consists of the seven (11, in alternate specification) northcentral states mentioned earlier with some history of affirmative action policies, but less systematic than the southern states. These states are also not expected to have large benefits from the new federal policy of 2008–2009 through the channels as explained above. In the third group, we have the eastern group of three (or five) states who are expected to benefit the most, as the state level initiatives in those states have been quite limited in number and have been very recent in terms of timing of introduction. Appendix Table A1 shows that the share of OBCs among HE participants in the year (2009–2010) immediately after the act has been as high as 53 per cent in the south, around 28 per cent in the northcentral, and about 15 per cent in the the east.

3.2. Data

We use the unemployment and employment round of the NSS Data, which is a nationally representative household level sample survey collected by the National Sample Survey Organization of the Government of India. This quinquennial cross section household survey collects details of all individuals in a selected household, including information on their employment, education, rural land ownership, household expenditures, and so forth.

To measure the impact of reservation policy for OBCs in state-funded HEIs that is implemented throughout the country at a specific point of time, is difficult. The fact that only a few years have elapsed since the policy roll-out adds to the difficulty in measuring the impact. We primarily use the data from 68th round, collected in the year 2011–2012, as that is the only employment/unemployment round that is available after the implementation throughout the country. However, to test the assumptions of the model, we also use the other three rounds of this data, collected in 1999–2000, 2004–2005, and 2009–2010. NSS is not a panel data so households are different for each year. Unlike the other three rounds, 2011–2012 data is not part of major quinquennial surveys but the survey is similar and the sample size is marginally smaller. Since the 2009–2010 data almost coincides with the implementation of the legislation, we do not expect any impact so soon. Therefore, we primarily use the data for 2011–2012, the next nationally representative round of the NSS.

The data on district level educational infrastructure is collected from the online list of Ministry of Human Resource Development that covers all HEIs across the country. This online database helps us generate the district level statistics of number of educational institutions (both public and private) to capture the district-wise and state-wise statistics of number of HEIs, and their growth during the
period of our study. But we do not have data on the actual capacity of each of these institutions. So, all our final models include only state fixed effects to control for the growth of HE institutions. However, in a separate specification, not presented in the text, we include the growth pattern of HE institutions as covariates (in place of state fixed effects) for the test of robustness, which does not change our results.

It would have been useful to separate the nature of the supply response. Increases in public sector HEIs may have a higher impact on OBCs as the reservation is in these institutions but there can be spillovers to other institutions if the supply is not adequate for the eligible population. Private sector HEIs can enhance participation of the ‘general’ category more as the seats in public sector HEIs for them are frozen and new public sector institutions can enhance opportunities for them too. It may therefore be difficult to interpret the public-private division of HEIs.

3.3. Identification strategy

Given the above context, we expect the affirmative action for OBCs will result in faster growth (or a lower decline) of enrolment of eligible OBCs in HEIs than the enrolment of the eligible population not benefiting from affirmative action. If OBCs do not experience a faster growth or lower decline than those who are not benefiting from quotas, the change may simply reflect trends in overall participation rates which are not caused by the policy intervention. Therefore, in the double difference (DD) estimation of intent-to-treat effects, the first difference compares HE enrolment outcomes of OBCs aged 18–23 years (‘young’) to OBC aged 24–29 years (‘old’), in the year 2011–2012. For both age cohorts we have included those who are currently studying (enrolled) as well as those who have completed HE. Since the difference could be confounded by other factors affecting these two cohorts differently, we use the general population of the same age cohort as a control group in our second level of difference, because they would have gone through the same changes that took place during this time, but were not eligible for quotas.

We estimate the following model and conduct the analysis separately for the three state groups.

\[
Y_{ihds} = \beta_0 + \beta_1 O_{ihds} * T_{ihds} + \beta_2 O_{ihds} + \beta_3 T_{ihds} + \gamma_1 S_s + \delta_1 X_{ihd} + u_{ihds} 
\]

Where \(Y_{ihds}\) is the indicator for current enrolment or completion of HE among 18–29 year olds (= 1) individual \(i\), in household \(h\), in district \(d\), and in state \(s\). \(T_{ihds}\) is the indicator for the person being in the young cohort (of age group 18–23, as against the old cohort being in age group 24–29), \(O_{ihds}\) is the indicator for an individual belonging to the social group OBC. \(S_s\) (= 1) indicates that the individual is living in state \(s\). \(X_{ihd}\) is the vector of individual, household level covariates, as explained below. Since high school education in India usually ends by the age of 18, and is to be followed by four to five years of higher education for the HE participants, we restrict our treatment group to 18–23 years, which is a common practice in higher education literature (see Basant & Sen, 2014a, 2014b for some of those literatures).

If ‘programme’ effect is heterogeneous among individuals, then pre-treatment differences in observed characteristics can generate differences in outcomes. Hence, we control for individual and household level factors, which could be causally linked to the difference in participation between the ‘young’ and the ‘old’ groups. For time-invariant individual control, we use sex dummies. To control for the changes in standards of living, we use a few categories of average household expenditures as covariates, categories being created on the basis of poverty lines. We also control for the dependency ratio in the household, defined by the ratio of the total number of people below 18 years and above 60 years, to the total household size. As parent’s education is found to be highly correlated to children’s participation in HE (Basant & Sen, 2014b), we use the educational level of household head as a proxy for parental education, because the latter is not reported in the data.

However, comparing the OBC from different states may also include the impact of time-invariant state specific effects that may have benefited OBCs from the two groups of states differently, which
would bias our estimation results. We address this problem by including state fixed effects in all our final specifications. For the test of robustness, in a different specification not presented with the text, we include state-specific variables such as state level growth in number of HE institutions, both private and government, instead of state fixed effects. We also control for the state specific-time trend instead of the control for the Young cohort (captured by $T_{\text{inds}}$) in a different specification (Table SM15). The findings remain unchanged.

We restrict the analysis to the population who has already crossed the threshold of school education and are eligible for higher education for two reasons: one, through this way we minimise the unobservable difference between OBCs and the general population that would influence their decision to participate in HE differently, making our estimates biased and inconsistent; second, the immediate impact of the policy can only be seen among the population who are eligible for HE participation. Admittedly, the Act would create incentives for the OBC population to cross the school threshold and become eligible for college admissions as participation in HE is now facilitated through quotas. However, our sample of the eligible population will not be affected much because the Act was implemented in 2008–2009 and only a small percentage of the population had an opportunity to complete high school education, known as HS, before the date of data collection in 2011–2012.

Figure 1(a) and 1(b) plot the HE participation of OBCs at each age by region using a broader definition of regions. However, all our results are found to be robust with respect to both the narrower and broader definitions of state groups or regions. The broader definition of region includes five states in south (Pondicherry being the additional one), 11 states in northcentral (four additional are Chandigarh, Delhi, Daman Diu, A N Islands), six states (Lakhsadweep being the additional) in northeast, and five states in east (Manipur and Sikkim being the additional ones, for the reason explained earlier).

Figure 1(a) plots participation among the entire population of 18–45 years at each age, Figure 1(b) plots the same among the population who have completed higher secondary education. Figure SM2 plots the same estimation as Figure 1(b), by using the narrower definition of regions. The figures indicate that participation has been much lower among older cohorts, whereas, for the northeast region, the trend is not as clear. The overall HE participation of OBCs among the eligible has been very high in the latter.

We test for parallel trends in OBC and general enrolment growth in two periods prior to the programme (1999–2000 and 2004–2005) and one coinciding with the programme (2009–2010) in a separate analysis, assuming the one coinciding with programme implementation will not see a major change in enrolment. We cannot reject the null hypothesis of coefficients of double interaction terms being the same over the years for the northcentral and eastern state groups (panel A of Appendix Table A2). However, for the southern group of states, the double interaction term is statistically significant at the 10 per cent level, for the year 2004–2005 in both types of samples, indicating a weak violation of the assumption.

Panel B of Appendix Table A2 produces the interaction coefficients of OBCs with the year dummy among the treated cohort. It reveals the same fact that the parallel trends assumption is satisfied in the northcentral and the eastern states only, but not for the southern states in both types of samples. Panel B of Appendix Table A2 shows that we cannot reject the null hypothesis of coefficients of double interaction terms being the same over years, as the triple interaction terms including the years prior to the Act are not statistically significant for the northcentral and eastern regions. This indicates that the DD estimations are expected to provide estimates for valid treatment effects for the above two regions only if we use the 18–23 years cohort as treated against 24–29 years cohort as control group.

Following Duflo (2001), we also produce (in Table A3) the coefficients of interactions between the OBC and age dummy with full model, including the age fixed effects, for the year 2011–2012 of both types of samples. None of the coefficients are statistically significant in the eastern states for both sample types. In the northcentral states, the sample with a narrower definition had statistically
Figure 1. (a) HE participation of 18–45 year old full sample OBC by age from 2011–2012 data (Broader definition of region): NSS data. (b) HE participation of 18–45 year old eligible OBC from 2011–2012 data (Broader definition of region): NSS data.

Notes: Y-axis plots HE participation (= 1, else 0) of OBCs at each age among 18–45 year olds in the given region.
significant coefficient at the 10 per cent level for the age cohort 28 and 31 years only. However, the parallel trend assumption is not satisfied for the southern states group.

This reiterates further that our DD estimation would provide valid and consistent estimates for the northcentral and eastern states groups only with the assumption that the time-varying effects other than the Act should not have affected the OBCs and general population differently. The only available data after the implementation being from the year 2011–2012, we do not have a way to control for the above fact.

Since the pre-programme parallel trend assumption seems to be violated in the southern group of states, our preferred estimation strategy is the triple difference method (DDD), where we compare the double difference computed above of the eastern states, with the same double difference in the southern group of states. The latter group serves as a counterfactual as the programme is not expected to make a major difference in southern states, for the reasons explained earlier. Also, the pre-programme trends among the young cohort in enrolment for OBCs and general have been the same in these regions in the DDD settings. We also construct the similar triple difference estimate where the eastern states are treated and the northcentral states are the control group.

The shares of OBCs and the general population do not add up (sum of rows in Table A1) to 100 per cent because the other shares are taken by the SCs and the STs (not presented here, please see the note of the table). So, even if the shares in eligible population and in HS participation are the same number, that still keeps room for higher participation by taking away seats from the general population, SCs, or STs. This is the primary premise of our triple difference strategy, that the quota being in place in southern states long before the 2008 Act, the OBCs in those states started participating more in HS, and the policy is not ‘new’ to them anymore. So, the shares of OBCs is HS and HE have increased for them, which may have taken the shares from other categories (again, noting the fact that all shares together should be 100%), and in some cases leading to a participation rate much above the quota limit. If participation is above that 27 per cent quota limit, the new Act bringing the quota in place may not have any immediate impact as increase in participation has to happen through the unreserved seats only. This encourages us to use the southern states or northcentral states as two different control groups in the triple difference (DDD) strategy. Table A1 indicates that the share of OBC population has increased in all the regions of India over the last decade, whereas, that of the general population has shrunk. However, that differential trend persists across the 18–23 and 24–29 year old cohorts in similar fashion, keeping our estimation of treatment effects consistent.

Even though we are unable to extract the exact percentage of quota allotted for HEIs in each state before the 2008 Act, Table SM1 provides reasonable information from various sources on the regional difference in implementation of the quota, which helps us to initiate such a grouping of states. Moreover, our identification strategy not being dependent on percentage of quota in each state, we can safely use the above information to group the states across regions based on different expected programme effects as outlined in Table 1.

We expect the triple difference estimate of the following model to produce an unbiased estimate of the Act on HE enrolment of OBCs when the analysis is restricted to east in comparison to south (or northcentral in alternative specification), otherwise similar in educational achievements of both the groups.

\[
Y_{ihds} = \beta_0 + \beta_1 O_{ihds} * E_{ihds} + \beta_2 O_{ihds} * \text{age}_{ihds} + \gamma_1 S_s + \gamma_2 S_s * \text{age}_{ihds} + \delta_1 X_{ihd} + u_{ihds}
\]  

All specifications are the same as Equation (1). \( E_{ihds} \) takes a value of one if the individual belongs to the state group east. Otherwise, it takes a value of zero for individuals from south (or northcentral in the alternative specification). \( \text{age}_{ihds} \) controls for age fixed effect, which is a proxy for birth year fixed effects. We include caste group fixed effects, state fixed effects, along with state-time linear trend and age fixed effects throughout all our triple difference specifications. We estimate the models for the year 2011–2012 data for the sample of 18–29 years cohort in the state groups of east versus south and east versus northcentral regions. \( \beta_1 \) is our coefficient of interest expected to produce the ITT effect.
We test the parallel trend assumption in period 1999, 2004, and 2009 and find that we do not reject the null hypothesis of parallel trends in either pair of regions, with the coefficients on the triple (columns 1 and 3 of Tables 2 and 3) and quadruple interaction terms (columns 2 and 4 of Tables 2 and 3) not being statistically significant.

Our ‘Act’ variable would pick up all year-specific, state-specific effects including the effects of the Act. Therefore, in the triple-difference estimation strategy, we include a control group from both groups of states for which the Act should make no difference. The ‘general’ being the closest to the OBCs amongst caste groups in terms of socio-economic conditions, and both remaining outside the positive discrimination policy in higher education until the 2008 Act, we use ‘general’ as a comparison group. Therefore, we compare a ‘second level treatment’ group (OBC) and ‘second level control’ group (general population) among ‘young’ and ‘old’ age cohorts, in each group of states (South or Northcentral), for whom the Act made no difference, as against the group of states (East), for whom the Act mattered. The inclusion of treatment (caste) group dummy variable helps us

\[ \text{Table 1. Hypotheses and expected effects leading to triple difference estimation strategy} \]

| Differential effects on participation as expected | Control state group: Southern/NC | Third Difference: Between state groups (East – South/NC States) |
|--------------------------------------------------|---------------------------------|--------------------------------------------------|
| Treated caste group: OBC | Positive effect | Positive or no effect | Positive effect |
| Control caste group: General | Positive or no effect | Positive or no effect | No effect |

**Second Difference: Between Treated Caste group and Control Caste group (OBC – General)**

| Positive effect | Positive or No Effect | Positive effect |

**Notes:** See Table SM1 for further details on differences across states. aQuota started from late 1990s and after, at a very slow rate; maximum quota never crossed 27 per cent before the central legislation. bFor some states the quota started before the 1950s, all had quota by the 1990s, and maximum quota reached much above 27 per cent in most cases even before the central legislation.

We test the parallel trend assumption in period 1999, 2004, and 2009 and find that we do not reject the null hypothesis of parallel trends in either pair of regions, with the coefficients on the triple (columns 1 and 3 of Tables 2 and 3) and quadruple interaction terms (columns 2 and 4 of Tables 2 and 3) not being statistically significant.

Our ‘Act’ variable would pick up all year-specific, state-specific effects including the effects of the Act. Therefore, in the triple-difference estimation strategy, we include a control group from both groups of states for which the Act should make no difference. The ‘general’ being the closest to the OBCs amongst caste groups in terms of socio-economic conditions, and both remaining outside the positive discrimination policy in higher education until the 2008 Act, we use ‘general’ as a comparison group. Therefore, we compare a ‘second level treatment’ group (OBC) and ‘second level control’ group (general population) among ‘young’ and ‘old’ age cohorts, in each group of states (South or Northcentral), for whom the Act made no difference, as against the group of states (East), for whom the Act mattered. The inclusion of treatment (caste) group dummy variable helps us

\[ \text{Table 2. Testing of parallel trends assumption in triple difference (DDD) model: sample of east compared to south} \]

| Triple interaction with year | Quadruple interaction with year |
|-----------------------------|--------------------------------|
| Region I | Region II | Region I | Region II |
| OBC#East#Young#2004 | 0.103 | 0.091 |
| OBC#East#Young#2009 | 0.137 | 0.122 |
| OBC#East#2004 | -0.02 | -0.019 | -0.079 | -0.071 |
| OBC#East#2009 | -0.031 | -0.031 | -0.116 | -0.104 |
| OBC#Young#2004 | -0.131*** | -0.13*** |
| OBC#Young#2009 | -0.045 | -0.044 |
| East#Young#2004 | -0.045 | -0.042 |
| East#Young#2009 | 0.042 | 0.043 |
| OBC#East#Young | -0.133 | -0.128 |
| N | 24165 | 26374 | 24165 | 26374 |

**Notes:** Results from OLS regression with individual, household and state covariates as in Equation (1). Young = 1 is 18–23 years, Young = 0 is 24–29 years. Robust standard errors clustered at district levels are in parentheses. *p < 0.1; **p < 0.05; ***p < 0.01. Region I includes East I and South I groups of thee and four states respectively. Region II includes East II and South II groups of five states each.
to control for treatment specific time-invariant national level differences, which leads us to estimate the difference-in-difference-in difference model. The test for difference in means in some of the household level indicators within each age-group (treated and control) indicates that it is important to control for those (see Table SM3 providing basic statistics of both caste groups for the regional samples).

One may consider the fact that the difference between socio-economic conditions of the OBCs and the general caste groups across different regions may have influenced the growth of private institutions, other than the Act itself. For example, if OBCs are richer than general in the south or northcentral region, as compared to the east, the former may have higher growth of HE institutions, as the cost of private HE is comparatively higher. However, it is difficult to argue that the growth of private institutions would be based on economic conditions of one particular caste group, rather, the demand is expected to be generated based on the overall economic conditions of the region, including all caste groups put together. The distribution of households across different income groups in Table SM3 (that is, the mean of income group dummies) indicates that the difference between OBCs and general are very similar in the south and east, whereas it seems to be very different in the northcentral region. This indicates further that the growth of HE institutions may not have been driven by the difference in economic conditions of OBCs and general castes. Moreover, our specification of state fixed effects with the state-age linear trend should be able to take care of the time-variant, and time-invariant state level differences.

4. Results

4.1. Discussion of results

The DD estimates of the east and northcentral samples where parallel trends assumptions are not violated, are presented as Supplementary Materials (Tables SM8–SM9). The eastern sample (in Table SM8) produces positive and statistically significant treatment effects, supporting our a-priori expectations. However, triple difference estimate being our preferred estimation strategy, the estimates from the sample of the east as compared to the south, and the east as compared to the northcentral regions are presented in Table 4(a) and 4(b) respectively. The first panel (Region I) follows the narrower definitions of states groups with east and northcentral having three and seven states.
respectively. The last three columns (Region II) use the broader definition, with five and 13 states respectively. The difference across columns are in the number of covariates included, as indicated in the last few rows of the tables. The last column is our preferred full model. The robust standard errors clustered at the district levels are presented in parentheses. However, all our results are robust to the specifications when the standard errors are clustered at the state level (see Table SM14).

The estimates for the triple interaction terms are positive and statistically significant across all specifications, whether the east is compared to the northcentral states or the southern states. The participation of OBCs may have increased by as large as 0.12 to 0.13 points in the eastern states, as compared to the southern or northcentral states. This indicates that ‘newly exposed’ eastern states

| HE Participation | (1) | (2) | (3) | (4) | (5) |
|------------------|-----|-----|-----|-----|-----|
| **Panel A: Region I**
| OBC*Young*East | 0.184 | 0.133 | 0.172 | 0.114 | 0.125 |
| | (0.034)*** | (0.033)*** | (0.033)*** | (0.042)*** | (0.039)*** |
| OBC | -0.082 | -0.083 | -0.060 | -0.026 | -0.027 |
| | (0.025)*** | (0.026)*** | (0.024)*** | (0.026) | (0.026) |
| $R^2$ | 0.01 | 0.03 | 0.11 | 0.12 | 0.12 |
| $N$ | 9,216 | 9,216 | 9,216 | 9,216 | 9,216 |
| **Panel B: Region II**
| OBC*Young*East | 0.185 | 0.135 | 0.172 | 0.114 | 0.125 |
| | (0.033)*** | (0.032)*** | (0.031)*** | (0.040)*** | (0.038)*** |
| OBC | -0.083 | -0.084 | -0.061 | -0.027 | -0.028 |
| | (0.025)*** | (0.026)*** | (0.024)*** | (0.026) | (0.026) |
| $R^2$ | 0.01 | 0.03 | 0.11 | 0.12 | 0.12 |
| $N$ | 10,026 | 10,026 | 10,026 | 10,026 | 10,026 |

Notes: Robust standard errors clustered at district levels are in parentheses. *$p < 0.1$; **$p < 0.05$; ***$p < 0.01$. Region I includes East I, South I and Northcentral I, with three, four, and seven states respectively. Region II includes East II, South II and Northcentral II with five, five, and 13 states respectively. The Dependent variable is HE participation (= 1). The difference across columns are in covariates as indicated in the last few rows. Other controls are sex, dependent ratio in the household, dummies for the standards of living, categories of head’s profession, head’s education level, and dummies for rural and female headed households, as listed in Table SM2. Young = 1 is 18–23 years, Young = 0 is 24–29 years.

Table 4. (a) Triple difference (DDD) estimates of impact of being exposed to the Act on HE participation of eligibles: Sample of East (= 1) and South (East = 0)

Panel A: Region I

| OBC*Young*East | 0.146 | 0.105 | 0.114 | 0.119 | 0.123 |
| | (0.033)*** | (0.033)*** | (0.034)*** | (0.038)*** | (0.036)*** |
| OBC | -0.045 | -0.053 | -0.012 | -0.021 | -0.020 |
| | (0.015)*** | (0.016)*** | (0.015) | (0.014) | (0.014) |
| $R^2$ | 0.00 | 0.02 | 0.09 | 0.11 | 0.11 |
| $N$ | 15,840 | 15,840 | 15,840 | 15,840 | 15,840 |

Panel B: Region II

| OBC*Young*East | 0.147 | 0.107 | 0.116 | 0.122 | 0.125 |
| | (0.032)*** | (0.032)*** | (0.032)*** | (0.037)*** | (0.035)*** |
| OBC | -0.052 | -0.061 | -0.014 | -0.023 | -0.022 |
| | (0.016)*** | (0.017)*** | (0.014) | (0.014) | (0.014) |
| $R^2$ | 0.00 | 0.02 | 0.09 | 0.11 | 0.11 |
| $N$ | 15,840 | 15,840 | 15,840 | 15,840 | 15,840 |

Age fixed effects
Other controls
State dummy
State*age

Notes: Robust standard errors clustered at district levels are in parentheses. *$p < 0.1$; **$p < 0.05$; ***$p < 0.01$. Region I includes East I, South I and Northcentral I, with three, four, and seven states respectively. Region II includes East II, South II and Northcentral II with five, five, and 13 states respectively. The Dependent variable is HE participation (= 1). The difference across columns are in covariates as indicated in the last few rows. Other controls are sex, dependent ratio in the household, dummies for the standards of living, categories of head’s profession, head’s education level, and dummies for rural and female headed households, as listed in Table SM2. Young = 1 is 18–23 years, Young = 0 is 24–29 years.
seem to have benefited from the Act, as compared to ‘partially exposed’ northcentral or southern states. Estimates for all other covariates of the model have signs as expected.\textsuperscript{13}

The findings from both the double difference estimation done at regional levels (presented in Tables SM8–SM9), and triple difference estimation for two seemingly comparable pairs of regions point out that the impact of the Act is different across regions and the difference follows the pattern as expected. The Act seems to have worked in newly exposed states only.

For falsification tests, we also compare our treatment effects from DD and DDD models (full model specifications) with the estimation from the falsely treated years or cohorts and present in Table 5. The estimates for the interaction term from the full model for the years 1999–2000, 2004–2005, and 2011–2012 are presented in the first three columns, whereas the third column estimates are ‘true effects’ presented earlier in Table 4(a) and 4(b). For the east and northcentral samples, the double interaction terms are not statistically significant in 1999–2000 or 2004–2005 data (panel A of Table 5), reiterating the validity of the parallel trend assumption of the model, as well as validating our strategy of expecting no impact before the implementation of the federal Act. Also, the triple difference estimations in both pairs of regions seem to produce the supporting evidence towards validity of our strategy, as none of the triple difference terms in falsified treatment years seem to be statistically significant (panel B of Table 5).

In the fourth column of Table 5, using the 2011–2012 data, when we change the treated group to a placebo-treated older cohort of 24–29 years and control group to age cohort 30–35 years, none of the interaction terms are statistically significant any more. This indicates that the DD model provides

| Table 5. Falsification tests with alternate definitions of treated years and treated cohort for the double difference (DD) and triple difference (DDD) estimates |
|----------------------------------|---------|---------|---------|------------------|
| **Panel A: DD**                  | (1)     | (2)     | (3)     | (4)               |
| East                             | 1999–00 | 2004–05 | 2011–12 | 2011–12           |
| OBC#Young                        | −0.040  | −0.056  | 0.145   | −0.058            |
| (0.076)                          | (0.073) | (0.060)** | (0.068) |
| OBC                              | 0.045   | 0.015   | −0.061  | 0.005             |
| (0.057)                          | (0.054) | (0.047) | (0.060) |
| N                                | 2,609   | 2,523   | 2,720   | 2,416             |
| Northcentral                     |         |         |         |                   |
| OBC#Young                        | 0.054   | 0.055   | 0.019   | 0.030             |
| (0.035)                          | (0.034) | (0.035) | (0.034) |
| OBC                              | −0.103  | −0.056  | −0.030  | −0.032            |
| (0.029)**                        | (0.029)* | (0.026) | (0.024) |
| N                                | 9,500   | 10,170  | 11,791  | 9,188             |
| **Panel B: DDD estimates**       |         |         |         |                   |
| East and South                   | (1)1999–00 | (2)2004–05 | (3)2011–12 | (4)2011–12         |
| OBC#Young#East                   | −0.126  | −0.033  | 0.125   | −0.097            |
| (0.087)                          | (0.079) | (0.039)** | (0.088) |
| N                                | 7,825   | 7,880   | 9,216   | 7,184             |
| East and Northcentral            | (1)1999–00 | (2)2004–05 | (3)2011–12 | (4)2011–12         |
| OBC#Young#East                   | −0.082  | −0.115  | 0.123   | −0.106            |
| (0.087)                          | (0.080) | (0.036)** | (0.075) |
| N                                | 12,109  | 12,693  | 14,511  | 11,604            |

Notes: Robust standard errors clustered at district levels are in parentheses. *p < 0.1; **p < 0.05; ***p < 0.01. All results follow Region I definitions to keep consistencies with older data, with five, five, and 11 states in east, south, and northcentral respectively. The specifications of the first three columns in panel A are the same as in the third columns of Tables SM8–SM9. For panel B, the specifications are the same as the last columns of panel A of Table 4(a) and 4(b) respectively. These are all full models, where the placebo years are used in columns 1 and 2. Column 3 reproduces true effects from Tables SM8–SM9 (panel A) or Table 4(a) and 4(b) (panel B) for comparison. For columns 1–3, Young = 1 is 18–23 years, Young = 0 is 24–29 years. Column 4 uses the falsely treated, 24–29 years cohort (Young = 1) as compared to the control cohort of 30–35 years (Young = 0).
consistent estimates for the east and northcentral states, whereas, the DDD model provides consistent estimates for both pairs of states.

One could also argue that our model does not include a proxy capturing student’s ability or motivation, and past exam performance. Therefore, the coefficient on the interacted term could be capturing all these omitted and perhaps endogenous variables, biasing our estimates. However, even if the ability or motivation may differ between the OBCs and the general population, the difference is assumed to be time-invariant on average unless there is a policy shift targeting to change that. We are not aware of any such policy change which would create this difference across OBCs and general. School quality, university quality, and opportunity costs of investing in education could be a few other time-variant attributes, that may also potentially bias the estimates. But the difference in these attributes across cohorts (or time) can safely be assumed to remain the same for the OBCs and the general population cohorts for similar reason as explained above. Also, our estimates are robust to controlling for age fixed effects and age-state linear trends.

Higher education enrolment in India typically starts at the age of 18 (or 19 for late entrants), with an undergraduate degree being typically three to four years duration, the 18–23 year age range seems to have the minimum noise. This is considered to be the standard age cohort for higher education participation in India (current enrolment), and is used widely in the education literature (Basant & Sen, 2010, 2014a, 2014b). However, our results are robust to alternative specifications of the treated cohort. Appendix Table A4 supports this evidence while narrowing down the treated cohort further, a few specifications reduce the impact only by a few decimal points.

4.2. Impact among rich and poor

We do not expect this policy to impact the richest group of society even among the OBCs, as their HE participation may not have depended on the quota-based reservation. However, such initiatives should be more beneficial to marginalised groups, so to the poorest among the OBCs.

Table 6 produces similar evidence, where the first two columns present the estimates among the richest households by interacting the triple difference terms with the richest group. Following the same categories of four expenditure groups of households as used earlier, the richest category (high income) is used here for interaction, while the three other categories (vulnerable, middle class, and very poor) are pulled together as a comparison group. In the next two columns, using a similar strategy, the poorest group (very poor) is used for quadruple interaction, while the other three groups are pulled together as a comparison. The impact does not seem to be different from zero among the richest group (in the first two columns for both region specifications) as expected; and seem to be positive in both region specifications for the poorest group. However, the impact among the poorest

| Table 6. DDD estimation: checking heterogeneity of programme effects among rich versus poor |
|----------------------------------|----------------------------------|----------------------------------|----------------------------------|----------------------------------|
| **Dependent Var: HE participation = 1** | **(1) Region 1:** | **(2) Region 2:** | **(3) Region 1:** | **(4) Region 2:** |
|                                 | **Rich** | **Rich** | **Poor** | **Poor** |
| OBC*Young*East*Rich             | 0.051    | 0.051    | 0.502    | 0.454    |
|                                 | (0.039)  | (0.039)  | (0.087)** | (0.106)** |
| \( R^2 \)                       | 0.10     | 0.10     | 0.10     | 0.10     |
| \( N \)                         | 14,511   | 14,511   | 14,511   | 15,840   |

Notes: All specifications are same as the full model from last columns of Table 4(a) and 4(b), except for the fact that instead of controlling for different income groups, in the first two columns we control for the richest income group and estimate the effects among them as against other households put together. Similarly, in the last two columns, we estimate the impacts among the poorest income groups as against other households put together. Robust standard errors clustered at district levels. *\( p < 0.1 \); **\( p < 0.05 \); ***\( p < 0.01 \).
seems to be quantitatively lower than our primary estimates because of the pulling of income groups together in the comparison group.

4.3. Supply side expansion

These findings lead us to explore if the supply side capacity expansion in India could be correlated with higher HE participation simultaneously. The available data indicates a steep expansion of HE institutions in southern states between the year 2004–2005 and 2009–2010 (about 855 institutions per year), followed by a much slower growth (223 institutions per year) in the second period (Table SM18 and figures SM3–SM4), and corresponds positively to the rate of OBC participation in southern states between these two periods. The northcentral region also showed a similar trend with 705 institutions per year in the first period and 241 in the second.

In the eastern region too, the rate of expansion in first period has been larger than second period, although not as large a difference as in southern states (a yearly growth of 47 institutions in the first period as against 16 institutions in the second period). Without having data on the capacity of these institutions, it is not possible to draw any conclusion on the simultaneous impact of the supply side expansion. However, our estimates should not be affected by the capacity expansion as that would generate similar opportunities for the OBCs and the general population, conditional on the economic status of households. The government institutions had to expand their capacities for accommodating the designated ‘quota’ of OBCs, without compromising space for the general population. Private institutions do not fall under this legislation. In the northeast region, there has been marginal expansion in the number of HE institutions between the two periods (growth of six institutions per year in the first period as against 3.5 institutions per year in the second period). In a separate specification not presented here, we estimate the same model after replacing the state-fixed effects, by the growth in number of public and private HE institutions in the states between the years 2004–2005 and 2011–2012. The findings do not change.

5. Conclusion

There has been a policy change to encourage participation in higher education among OBCs and the general trend indicates that participation of OBCs has indeed increased over the years. But whether that can be attributed to the reservation policy or it is merely a representation of the overall trend cannot be established without estimating a causal model. Current enrolment of OBCs in HE has increased post-2009 (Table SM18), but if the positive discrimination through quota is to be credited for that, then higher OBC participation should be reflected through: one, higher increase in age-relevant enrolment among OBCs as compared to groups which did not benefit from affirmative action; two, higher age-relevant enrolment of OBCs in states which newly introduced this policy; three, more enrolment in government institutions; and four, more enrolment in states that have experienced faster expansion of HE institutions.

Our estimation strategies are able to explore the causal relationship through the first two channels. For the all India sample (not presented in this version), the HE participation has increased over years for both the OBCs and general population, but the OBC participation has been less than the general population for the older cohort. While quotas in HE existed for OBCs in some states, the federal Act introduced them in a few new states of India. We analyse the impact of the Act among three regions which have had, over time, varying degrees of exposure to quotas.

The expectation was that the Act would have higher impact in states which have no or very limited experience of affirmative action (newly exposed states) as compared to those having some history of affirmative action prior to the implementation of the Act (already exposed states). As we compare the former states for which the policy is expected to have a stronger impact, with the latter group of states (with already existing policies), the intent-to-treatment effect is positive and statistically significant in the newly exposed states (eastern region). Apparently, the Act has not had a significant positive
impact on OBC participation in states which had introduced this policy long ago, through state level initiatives. This difference in findings across regions raises concerns regarding the generalised nationwide policy for issues which are more regional in nature. It indicates that national-level reservation policies may have little effect, when states have already implemented these policies much earlier, bridging the deficits faced by the marginalised groups.

An evaluation of the deficits in HE participation by different socio-religious groups has shown that if one focuses on the population in the relevant age group which is eligible to go to college, OBCs do not show any deficits; their share among the enrolled in fact is slightly higher than their share in the eligible population (Basant & Sen, 2010). In such a situation, the incremental impact of the 2008 Act may not be very significant as the bulk of those among the eligible population who wanted to participate in HE are already doing so. The impact may become evident if OBC reservation incentivizes more and more persons in the social group to cross the school threshold, the effect of which can only be evaluated after the passage of a few more years. But, as has been argued by Basant and Sen (2014a), such an increase in demand may face supply constraints at the school level. One may expect to see little impact in the immediate term, when the implementation is yet to be complete, and if the existing quota has already been exhausted by the prospective participants desiring to take advantage of the benefit.

The supply side constraints may also be operational at the HE level. Consequently, one can argue that encouraging participation through capacity expansion of the HE system is a better policy option to address such problems of lower participation. This may be even more relevant as a complement to the policies of affirmative action, as evident from the correlation between higher enrolment and in supply side expansion across regions. The Act is expected to affect enrolment in public institutions of higher education, leaving private ones unaffected. Hence, one could present a comparative picture to show that public institutions are admitting OBC students at a higher rate. However, the decision to enrol in private and public HE institutions should be endogenous because cost of education is much lower at public institutions and, most times, they are of better quality. The introduction of a quota in public institutions could encourage the new private institutions to be established (as happened in the south earlier). So, among OBCs, who could not be eligible to be enrolled in public institutions even after the Act, could also move to private institutions due to the supply side expansion. Hence, interpreting the changes in enrolment figures across public and private institutes would be more complicated. Due to paucity of data that can capture capacity of HE institutions in India (public and private), we are unable to design a measure to estimate the causal impact of capacity expansion. Consequently, the last two channels remain unexplored but they remain important areas for future work.

Since the implementation is mandated by the Federal Act, the institutions were directed to implement the quota long before the year of data collection (2011–2012). Consequently, we argue that whoever had crossed high school in the year 2011–2012, should be able to take advantage of the 2008 Act, because the institutions had started to prepare for implementation from the year 2008. However, this does not mean that complete implementation of the 27 per cent quota had taken place by the time of data collection in 2011–2012, or the evaluation mechanism cannot be established with a smaller percentage of quota being implemented. However, as a note of caution, one should mention that the policy of OBC reservation is still quite recent and a decent amount of time may be required to assess its impact and to reach an unequivocal verdict. In that context, our exercise can be seen as a first step of evaluating the policy and can be replicated after a lapse of a few years, to ascertain if the same findings persist before articulating a clear policy recommendation. Also, in order to control for the fact that the impact may not be immediate, one could use the lagged treatment variable analysis after a few years, which cannot be done so soon.

Finally, when people ask if affirmative action programmes are successful, they are usually asking if the protected group has made advancement in quality of living; that is, if they are earning higher incomes, able to reach careers that were previously closed to them, and so forth. So our examination is at the most basic level, which does not answer if it actually opens doors to opportunities. Obviously, it is too soon to look at such outcomes – but are there any hints of what is to come? For example, one might think that OBCs could meet with a chilly reception from faculty and fellow students at their institutions.
Therefore, an entry into HEIs may not translate into higher graduation rates and an enhancement in higher expected lifetime earnings. Once inside, are they staying there and, if they stay, are they equipped to make the best of the opportunity? The point being made in this paper is that in order to reach that goal, the basic minimum requirement is to enrol in HEIs. Has that started to happen in a significant way? If yes, since the institutions started to implement the ‘quota’ from 2009 onwards, by 2011–2012 students who have crossed the school threshold would have shown some positive progress towards enrolment in higher education irrespective of regions. However, our results suggest that states that already had these quotas in place for a fairly long period of time, do not contribute much in further expansion of enrolment of OBCs. Instead, the eastern region, where such a policy did not exist, is showing significant improvement in enrolment. Our results seem to indicate success of earlier reservation policies and suggest that future policy initiatives need to be more nuanced and consider regional differences in policy histories, supply of HEIs, and extant rates of HE participation of the disadvantage sections.

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We have primarily used the National Sample Survey (NSS) data, which is a proprietary of Government of India, and can be purchased by anyone after paying required fees. The details on procuring the NSS data is available at mospi.nic.in/file_downloads/data_discremination/ratelist_UnitData.pdf. However, we will provide the Stata codes for replication of our exercise to bona fide researchers, if requested.

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Disclosure statement

No potential conflict of interest was reported by the authors.

Notes

1. See Weisskopf (2004) for a comparison of policies in the United States and India; Hinrichs (2014) and Kwon (2018) on affirmative action ban in the United States; Arcidiacono et al. (0, 2014), Alon and Tienda (2007), and Loury and Garman (1995) on affirmative action and mismatch in the United States; and Bertrand et al. (2010) on India.
2. Unlike the SCs and STs, the OBCs were not formed from any homogeneous set of caste groups; it was a list of groups to be decided by the centre or the states, based on their status on being historically disadvantaged (Deshpande, 2011; Iversen, Kalwij, Verschoor, & Dubey, 2014).
3. The Central Educational Institutions (Reservations in Admission) Act, 2006 was introduced in 2006 but passed in 2008. The original Act and consequent amendments to the Act can be found at http://www.judis.nic.in/ accessed on 1 May 2014.
4. The majority of the Jat population resides in the states of Uttar Pradesh, Uttarakhand, Rajasthan, Haryana, and parts of Madhya Pradesh and Gujarat, constituting the power lobby of Indian politics and a significant share of electoral seats.
5. Explained in the next section.
6. The state of Bihar includes Jharkhand, and the state of Uttar Pradesh includes Uttarakhand, as both states were carved out in first decade of twenty-first century, and NSS data can only identify them from 2004–2005 onwards.
7. Comprising the states of Assam, Manipur, Nagaland, Mizoram, Tripura, and Meghalaya. Manipur is left out from the eastern state groups because this is the only state in that region having a comparatively large share of OBCs and having
reservations of some form at the state level. In the broader specifications, we include Manipur as part of the eastern state group to make the study more inclusive and results do not change.

8. As the existing capacity was limited and the academic sessions were on, it took at least a year for the institutions to start implementing the Act.

9. This is done because most of the persons in the 24–29 age group would have enrolled before the implementation of the Act and would have completed HE by 2011–2012. Currently enrolled persons in this age group would typically be those who are undergoing post-graduate education. Admittedly, a small proportion of the enrolled persons in this age group could have benefited by the Act; these would be those who benefited from affirmative action for their enrolment in post-graduate courses. However, our estimates are robust to a different specification where we use only enrolment rates for both cohorts, instead of combining completion and enrolments.

10. In different specifications, not shown in the text, we control for district-level school infrastructure as available from the DISE (District Information System in Education) data of the Government of India, instead of state-level infrastructure of higher education or state-fixed effects model. Our findings remain the same even with that specification.

11. The poverty lines estimates are taken from the documents of the erstwhile Planning Commission, Government of India, for the respective years. We create four categories to capture living standards of households from monthly per capita household expenditures. Households having expenses below poverty line are considered very poor. Households with expenses above the poverty line and below double, are the next group, vulnerable. The ones between double the poverty line but below triple the poverty line are considered the next richest, middle income, group. Households spending more than triple the poverty line are considered richest.

12. Estimates are robust to the alternative specification where we use household size and number of children, instead of dependent ratio.

13. See all full model DDD results in Appendix Tables SM10–SM13.

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References

Alon, S., & Malamud, O. (2014). The impact of Israel’s class-based affirmative action policy on admission and academic outcomes. Economics of Education Review, 40, 123–139.

Alon, S., & Tienda, M. (2007). Diversity, opportunity, and the shifting meritocracy in higher education. American Sociological Review, 72(4), 487–511.

Arcidiacono, P., Aucejo, E., Coate, P., & Hotz, V. J. (2014). Affirmative action and university fit: Evidence from proposition 209. IZA Journal of Labor Economics, 3(1), 7.

Arcidiacono, P., Aucejo, E., Fang, H., & Spenner, K. (2011). Does affirmative action lead to mismatch? A new test and evidence. Quantitative Economics, 2(3), 303–333.

Azam, M., & Blom, A. (2008, December). Progress in participation in tertiary education in India from 1983 to 2004 (Policy Research working paper 4793). South Asia Region: Human Development Department, The World Bank.

Basant, R., & Sen, G. (2010). Who participates in higher education in India? Rethinking the role of affirmative action. Economic and Political Weekly, 45(39), 62–70.

Basant, R., & Sen, G. (2014a). Access to higher education in India: An exploration of its Antecedents. Economic and Political Weekly, 49(51), 38–45.

Basant, R., & Sen, G. (2014b). Parental education as a criterion for affirmative action. World Development, 64, 803–14.

Bayly, S. (1999). State policy and ‘reservations’: The politicisation of caste-based social welfare schemes. In S. Bayly (Ed.), Caste, society and politics in India from the eighteenth century to the modern age (The New Cambridge History of India, pp. 266-305). Cambridge: Cambridge University Press. doi:10.1017/CHOL9780521264341.009

Bertrand, M., Hanna, R., & Mullainathan, S. (2010). Affirmative action in education: Evidence from engineering college admissions in India. Journal of Public Economics, 94(1–2), 16–29.

Bhattacharjee, A. (2016). Cast into casts? Targeting persistent caste-based inequalities using affirmative action (Unpublished manuscript).

Chan, J., & Eyster, E. (2003). Does banning affirmative action lower college student quality? American Economic Review, 93(3), 858–873.

Cunningham, C. D. (2002). Affirmative action: Comparative policies and controversies. In N. J. Smelser & P. B. Baltes (Eds.), International encyclopedia of the social & behavioral sciences (pp. 210–214). Amsterdam: Elsevier.

Deshpande, A. (2011). Grammar of castes: Economic discrimination in contemporary India. India: Oxford University Press.

Duflo, E. (2001). Schooling and labor market consequences of school construction in Indonesia: Evidence from an unusual policy experiment. The American Economic Review, 91(4), 795–813.

Galanter, M. (1984). Competing equalities: Law and the backward classes in India. Berkeley: University of California Press.
Ghildiyal, S. (2014, March 31). UPA’s poll sop: Cabinet okays inclusion of Jats in OBC list. Times of India. Retrieved from http://timesofindia.indiatimes.com/india/UPAs-poll-sop-Cabinet-okays-inclusion-of-jats-in-OBC-list/articleshow/31299546.cms

Government of India. (2011). All India Survey on Higher Education (AISHE) Report 2011-12. Ministry of Human Resource Development. Retrieved from http://aishe.nic.in/aishe/reports

Government of India. (2014, August). Status of reservation of OBC in various states. Press Information Bureau, Ministry of Social Justice & Empowerment. Retrieved from http://pib.nic.in/newsite/PrintRelease.aspx?relid=108754

Hinrichs, P. (2014). Affirmative action bans and college graduation rates. Economics of Education Review, 42, 43–52.

Iversen, V., Kalwij, A., Verschoor, A., & Dubey, A. (2014). Caste dominance and economic performance in rural India. Economic Development and Cultural Change, 62(3), 423–457.

Kaur, H., & Suri, R. K. (2009). Reservation in India, recent perspective in higher education. New Delhi: Pentagon Press.

Khanna, G. (2016). Incentivizing Standards or Standardizing Incentives? Affirmative action in India (Unpublished manuscript).

Kwon, S. (2018). The effects of affirmative action bans on low-income college access and upward mobility (Unpublished manuscript). University of Connecticut.

Loury, L. D., & Garman, D. (1995). College selectivity and earnings. Journal of Labor Economics, 13(2), 289–308.

Muralidharan, K., & Prakash, N. (2017). Cycling to school: Increasing secondary school enrollment for girls in India. American Economic Journal: Applied Economics, 9(3), 321–350.

Osborne, E. (2001). Culture, development, and government: Reservations in India. Economic Development and Cultural Change, 49(3), 659–685.

Parikh, S. (2001). Affirmative action, caste, and party politics in contemporary India. In J. D. Skrentny (Ed.), Color lines: Affirmative action, immigration, and civil rights options for America (pp. 297–312). Chicago: University of Chicago Press.

Sowell, T. (2004). Affirmative action around the world – An empirical study. New Haven: Yale University Press.

Surendrakumar., B., Epple, D., & Taylor, L. (2016). Does affirmative action work? Caste, gender, college quality, and academic success in India. American Economic Review, 106(6), 1495–1521.

Thorat, S., Tagade, N., & Naik, A. K. (2016). Prejudice against reservation policies -how and why? Economic and Political Weekly, 51(8), 61–69.

Weisskopf, T. E. (2004). Affirmative action in the United States and India: A comparative perspective. London: Routledge.

Zwart, F. D. (2000). The logic of affirmative action: Caste, class and quotas in India. Acta sociologica, New Delhi: Sage Publications, Ltd, 43(3), 235–249.
### Table A1. Share of OBC and general category population all over India divided among state groups across years

| State Group | 1999 | 2004 | 2009 | 2011 |
|-------------|------|------|------|------|
| **South II** |      |      |      |      |
| Share of OBC in Population | 49.79 | 54.64 | 57.36 | 61.02 |
| Share of OBC in HS eligible | 38.2 | 49.16 | 54.88 | 59.35 |
| Share of OBC in HE | 34.72 | 46.18 | 53.09 | 56.52 |
| **Share of General in Population** | 25.91 | 22.99 | 20.83 | 17.87 |
| **Share of General in HS eligible** | 51.09 | 38.93 | 32.82 | 27.47 |
| **Share of General in HE** | 55.45 | 42.29 | 35.93 | 30.18 |
| **Northcentral II** |      |      |      |      |
| Share of OBC in Population | 36.65 | 44.44 | 44.08 | 46.52 |
| Share of OBC in HS eligible | 20.24 | 28.01 | 30.99 | 32.71 |
| Share of OBC in HE | 16.78 | 24.01 | 28.35 | 30.79 |
| **Share of General in Population** | 37.14 | 29.41 | 29.45 | 28.31 |
| **Share of General in HS eligible** | 68.3 | 59.34 | 55.62 | 53.44 |
| **Share of General in HE** | 72.83 | 64.33 | 59.31 | 56.57 |
| **Northeast II** |      |      |      |      |
| Share of OBC in Population | 10.78 | 9.9  | 8.88 | 7.02 |
| Share of OBC in HS eligible | 7.24 | 7.12 | 7.16 | 6.17 |
| Share of OBC in HE | 7.32 | 8.01 | 6.94 | 6.46 |
| **Share of General in Population** | 24.61 | 18.14 | 16.23 | 15.93 |
| **Share of General in HS eligible** | 35.39 | 30.2 | 23.64 | 18.33 |
| **Share of General in HE** | 35.22 | 31.53 | 24.86 | 20.29 |
| **East II** |      |      |      |      |
| Share of OBC in Population | 14.8 | 16.88 | 18.44 | 18.55 |
| Share of OBC in HS eligible | 12.53 | 16.44 | 15.75 | 17.48 |
| Share of OBC in HE | 11.85 | 15.72 | 15.2 | 16.37 |
| **Share of General in Population** | 51.1 | 49.34 | 47.75 | 47.26 |
| **Share of General in HS eligible** | 73.57 | 69.53 | 65.87 | 64.93 |
| **Share of General in HE** | 74.3 | 71.62 | 67.01 | 67.18 |
| **Rest of India** |      |      |      |      |
| Share of OBC in Population | 32.22 | 34.65 | 31.88 | 34.3 |
| Share of OBC in HS eligible | 21.36 | 23.5 | 23.98 | 28.11 |
| Share of OBC in HE | 18.47 | 19.13 | 22.84 | 26.12 |
| **Share of General in Population** | 29.68 | 27.89 | 27.32 | 26.88 |
| **Share of General in HS eligible** | 60.28 | 62.8 | 55.69 | 59.87 |
| **Share of General in HE** | 63.58 | 69.23 | 59.87 | 59.85 |

**Notes:** All Indian states divided across state groups according to the broader definition of regions (viz. Region II) to provide a more inclusive picture. Number of states in each group: South II – five, East II – five, Northcentral II – 11, Northeast II – six. Rest of India includes other remaining states that are not part of the above four state groups. For each year, the shares of (OBC + General + SC + ST) should make 100 per cent in each category. The corresponding shares SC and ST are not presented here. **Source:** NSS data, 1999–2000, 2004–2005, 2009–2010, and 2011–2012.
### Table A2. Parallel trend for double difference (DD) estimation—dependent variable is HE participation

|                  | South I | East I | Northcentral I | South II | East II | Northcentral II |
|------------------|---------|--------|----------------|----------|---------|-----------------|
| **Panel A:** 18–23 years (Young = 1) eligibles, reference year 1999–2000 |         |        |                |          |         |                 |
| OBC#2004         | −0.086  | −0.072 | 0.05           | −0.086   | −0.077  | 0.043           |
|                  | (0.046)*| (0.074) | (0.033)        | (0.046)* | (0.07)  | (0.032)         |
| OBC#2009         | −0.001  | 0.021  | 0.025          | 0        | 0.018   | 0.029           |
|                  | (0.044) | (0.078) | (0.036)        | (0.044)  | (0.073) | (0.034)         |
| OBC              | 0.01    | 0.039  | −0.059         | 0.009    | 0.046   | −0.056          |
|                  | (0.034) | (0.068) | (0.026)**      | (0.034)  | (0.065) | (0.025)**       |
| 2004             | 0.081   | 0.057  | 0.006          | 0.081    | 0.06    | 0.012           |
|                  | (0.043)*| (0.037) | (0.022)        | (0.043)* | (0.037) | (0.02)          |
| 2009             | 0.061   | 0.087  | 0.061          | 0.061    | 0.09    | 0.056           |
|                  | (0.043) | (0.039)**| (0.020)**      | (0.043)  | (0.039)**| (0.019)**       |
| **N**            | 9528    | 3996   | 16965          | 9805     | 4838    | 18360           |

|                  |         |        |                |          |         |                 |
| **Panel B:** 18–29 years eligibles, reference year 1999–2000, Young = 1 is 18–23 years, Young = 0 is 24–29 years |         |        |                |          |         |                 |
| OBC#Young#2004   | −0.133  | −0.029 | −0.008         | −0.132   | −0.041  | −0.019         |
|                  | (0.050)**| (0.123) | (0.048)        | (0.050)** | (0.115) | (0.046)         |
| OBC#Young#2009   | −0.047  | 0.082  | −0.015         | −0.045   | 0.067   | −0.014         |
|                  | (0.051) | (0.122) | (0.049)        | (0.05)   | (0.115) | (0.047)         |
| OBC#Young        | 0.095   | −0.029 | 0.063          | 0.094    | −0.025  | 0.065           |
|                  | (0.037)**| (0.081) | (0.035)*       | (0.037)**| (0.076) | (0.033)*        |
| OBC#2004         | 0.027   | −0.05  | 0.056          | 0.026    | −0.043  | 0.061           |
|                  | (0.041) | (0.096) | (0.044)        | (0.041)  | (0.089) | (0.042)         |
| OBC#2009         | 0.039   | −0.064 | 0.037          | 0.038    | −0.055  | 0.04            |
|                  | (0.037) | (0.092) | (0.038)        | (0.037)  | (0.086) | (0.036)         |
| Young#2004       | 0.117   | 0.071  | 0.067          | 0.117    | 0.074   | 0.07            |
|                  | (0.045)**| (0.056) | (0.029)**      | (0.045)**| (0.056) | (0.026)**       |
| Young#2009       | 0.103   | 0.142  | 0.099          | 0.104    | 0.145   | 0.097           |
|                  | (0.047)**| (0.069)**| (0.029)**      | (0.047)**| (0.069)**| (0.026)**       |
| OBC              | −0.066  | 0.058  | −0.11          | −0.065   | 0.059   | −0.111          |
|                  | (0.030)**| (0.059) | (0.029)**      | (0.030)**| (0.054) | (0.027)**       |
| Young            | −0.003  | 0.023  | −0.008         | −0.003   | 0.02    | −0.004          |
|                  | (0.032) | (0.037) | (0.016)        | (0.032)  | (0.037) | (0.015)         |
| 2004             | −0.026  | −0.017 | −0.059         | −0.025   | −0.016  | −0.057          |
|                  | (0.034) | (0.032) | (0.023)**      | (0.034)  | (0.032) | (0.021)**       |
| 2009             | −0.047  | −0.061 | −0.036         | −0.048   | −0.06   | −0.038          |
|                  | (0.039) | (0.05)  | (0.024)        | (0.039)  | (0.05)  | (0.022)**       |
| **N**            | 16600   | 7565   | 30066          | 17126    | 9248    | 32782           |

**Notes:** Number of states (in Region I): South I – four, East I – three, Northcentral I – seven, and Northeast I – five. Number of states (in Region II): South II – five, East II – five, Northcentral II – 11, and Northeast II – six. Results from OLS regression with individual, household covariates, and state fixed effects as in full model of Equation (1). *p < 0.1; **p < 0.05; ***p < 0.01. Robust standard errors clustered at district level in parentheses. Source: NSS, 1999–2000, 2004–2005, and 2009–2010.
Table A3. Coefficients of interaction of OBC dummy (General = 0) with age

| Coefficients: OBC#age | South I | East I | Northcentral I | South II | East II | Northcentral II |
|----------------------|---------|--------|----------------|----------|---------|-----------------|
| 18                   | -0.148  | 0.346  | 0.002          | -0.150   | 0.351   | 0.003           |
|                      | (0.102) | (0.278)| (0.075)        | (0.102)  | (0.261) | (0.073)         |
| 19                   | 0.045   | 0.271  | -0.080         | 0.047    | 0.272   | -0.069          |
|                      | (0.120) | (0.265)| (0.083)        | (0.120)  | (0.249) | (0.081)         |
| 20                   | -0.027  | 0.147  | -0.017         | -0.027   | 0.148   | -0.016          |
|                      | (0.102) | (0.263)| (0.078)        | (0.102)  | (0.247) | (0.076)         |
| 21                   | -0.200  | 0.192  | -0.073         | -0.193   | 0.193   | -0.077          |
|                      | (0.099)**| (0.260)| (0.077)        | (0.098)**| (0.243) | (0.076)         |
| 22                   | -0.120  | 0.296  | -0.072         | -0.116   | 0.295   | -0.073          |
|                      | (0.138) | (0.301)| (0.087)        | (0.138)  | (0.282) | (0.084)         |
| 23                   | -0.023  | 0.177  | 0.031          | -0.020   | 0.182   | 0.029           |
|                      | (0.108) | (0.316)| (0.106)        | (0.108)  | (0.296) | (0.102)         |
| 24                   | -0.046  | -0.032 | 0.001          | -0.047   | -0.023  | -0.011          |
|                      | (0.134) | (0.297)| (0.086)        | (0.134)  | (0.279) | (0.085)         |
| 25                   | -0.077  | -0.116 | -0.054         | -0.073   | -0.107  | -0.058          |
|                      | (0.111) | (0.274)| (0.095)        | (0.111)  | (0.258) | (0.093)         |
| 26                   | -0.153  | 0.263  | 0.012          | -0.155   | 0.264   | -0.004          |
|                      | (0.102) | (0.304)| (0.092)        | (0.102)  | (0.285) | (0.091)         |
| 27                   | -0.317  | 0.323  | 0.012          | -0.313   | 0.320   | -0.017          |
|                      | (0.120)**| (0.317)| (0.117)        | (0.120)**| (0.296) | (0.113)         |
| 28                   | 0.014   | 0.264  | -0.148         | 0.018    | 0.259   | -0.157          |
|                      | (0.111) | (0.313)| (0.091)        | (0.111)  | (0.294) | (0.089)*         |
| 29                   | -0.085  | 0.178  | 0.026          | -0.083   | 0.178   | 0.015           |
|                      | (0.109) | (0.327)| (0.094)        | (0.109)  | (0.310) | (0.091)         |
| 30                   | -0.067  | 0.306  | -0.044         | -0.065   | 0.288   | -0.044          |
|                      | (0.102) | (0.267)| (0.080)        | (0.102)  | (0.249) | (0.079)         |
| 31                   | -0.196  | 0.458  | -0.161         | -0.193   | 0.419   | -0.174          |
|                      | (0.118) | (0.284)| (0.101)        | (0.117)  | (0.267) | (0.099)*         |
| 32                   | -0.203  | 0.051  | 0.104          | -0.198   | 0.047   | -0.103          |
|                      | (0.111)*| (0.318)| (0.093)        | (0.110)*| (0.297) | (0.090)         |
| 33                   | -0.033  | 0.152  | 0.042          | -0.023   | 0.142   | 0.044           |
|                      | (0.120) | (0.311)| (0.110)        | (0.119)  | (0.291) | (0.106)         |
| 34                   | -0.187  | 0.166  | 0.147          | -0.188   | 0.170   | 0.167           |
|                      | (0.118) | (0.356)| (0.104)        | (0.117)  | (0.330) | (0.102)         |
| 35                   | -0.232  | 0.089  | -0.052         | -0.233   | 0.093   | -0.049          |
|                      | (0.111)**| (0.304)| (0.082)        | (0.111)**| (0.285) | (0.080)         |
| 36                   | -0.046  | 0.327  | -0.124         | -0.041   | 0.307   | 0.126           |
|                      | (0.109) | (0.287)| (0.089)        | (0.109)  | (0.270) | (0.087)         |
| 37                   | -0.221  | 0.119  | 0.149          | -0.214   | 0.114   | -0.148          |
|                      | (0.127)*| (0.317)| (0.098)        | (0.127)*| (0.290) | (0.096)         |
| 38                   | -0.209  | 0.154  | -0.038         | -0.204   | 0.159   | -0.051          |
|                      | (0.103)**| (0.265)| (0.088)        | (0.103)**| (0.248) | (0.086)         |
| 39                   | -0.265  | 0.070  | -0.035         | -0.260   | 0.056   | -0.041          |
|                      | (0.126)**| (0.316)| (0.118)        | (0.126)**| (0.291) | (0.110)         |
| 40                   | -0.157  | 0.361  | -0.027         | -0.157   | 0.326   | 0.071           |
|                      | (0.089)*| (0.258)| (0.084)        | (0.088)**| (0.240) | (0.082)         |
| N                    | 10,371  | 4,725  | 19,079         | 10,749   | 6,052   | 20,383          |

Notes: Results from OLS regression with individual, household covariates and state dummies as in Equation (1). Number of states (in Region I): South I – 4, East I – 3, Northcentral I – 7, Northeast I – 5. Number of states (in Region II): South II – 5, East II – 5, Northcentral II – 11, Northeast II – 6. Robust standard errors clustered at district level are in parentheses. *p < 0.1; **p < 0.05; ***p < 0.01.

Data: NSS 2011–12.
Table A4. DDD estimation: checking robustness with different treated (Young) and control (Old) cohorts

| Dependent Var: HE Participation | (1) Young:18–22 & Old:25–29 | (2) Young:19–22 & Old:25–29 | (3) Young:18–22 & Old:25–28 | (4) Young:19–22 & Old:25–28 |
|---------------------------------|-----------------------------|-----------------------------|-----------------------------|-----------------------------|
| OBC*Young*East                  | 0.104                       | 0.093                       | 0.100                       | 0.091                       |
|                                 | (0.048)**                   | (0.054)*                    | (0.045)**                   | (0.055)*                    |
| $R^2$                           | 0.12                        | 0.13                        | 0.11                        | 0.13                        |
| $N$                             | 8,452                       | 11,917                      | 12,792                      | 11,321                      |

Notes: Specifications are the same as the full model of Table 4A from the last column, except for change in treatment (young = 1) and control (young = 0) cohort for test of robustness of DDD results. The difference across columns are due to different specification of the young and old cohort using the full model specifications. Robust standard errors clustered at district levels. *$p < 0.1$; **$p < 0.05$; ***$p < 0.01$. 
Figure A1
Source: Institutional data extracted from online source of Ministry of HRD, Government of India (accessed through: mhrd.gov.in).

Figure A2
Source: Institutional data extracted from online source of Ministry of HRD, Government of India (accessed through: mhrd.gov.in).