An Alternative to India's Reservation Policy: A Unified Framework for Rigorous and Adaptive Measurement of Socio-Economic Status

ABSTRACT

Affirmative action in the form of reservations is a divisive and contentious topic of policy in India. In this paper, we create the first principled and data-driven model to design the reservations policy in India. We look at various issues that critics present against the current reservation policy and try resolve them, while pursuing a (provably) more effective and efficient system of empowerment. We use intelligent statistical modelling to create our new framework, RAMSES (Rigorous and Adaptive Measurement of Socio-Economic Status). RAMSES measures the multidimensional disadvantage faced by an individual as an "adjusted income". This adjusted income calibrates the quantum of compensatory aid required in the form of reservations for that individual to have a level playing field. A flexible and dynamically adaptive framework like RAMSES will empower policymakers, reduce bias, and become more broadly accepted in society as a foundation on which rational negotiations for reservations can happen, instead of the politically charged (and often violent) altercations that currently drive these processes.

Author Keywords

Authors' choice; of terms; separated; by semicolons; include commas, within terms only; this section is required.

CCS Concepts

•**Human-centered computing** → **Human computer interaction (HCI)**; *Haptic devices;* User studies; Please use the 2012 Classifiers and see this link to embed them in the text: https://dl.acm.org/ccs/ccs_flat.cfm

INTRODUCTION

India's caste system is based upon the Hindu *varnas*, a Sanskrit word meaning type, class, or colour. The caste system is an extremely resilient social structure with deep roots in religion, culture, and family (or clan) values. Among its effects is the marginalisation of a large set of people: caste crystallizes class into a rigid bloodline-based system where mobility is infeasible. Through centuries of its existence, the caste system systematically marginalised the lower castes – a large section of the Indian population. Reservations (or quotas) in government jobs, educational institutions, and the Parliament

is a method of *compensatory discrimination* which reserves a proportion of the available seats or opportunities for people from certain disadvantaged communities.

The reservation system is arguably India's most controversial policy for social transformation. In a country where many among the higher castes are also poor [18] or marginalised in other ways (e.g., access to electricity or medical care), there has been great resentment about the preferential treatment of lower caste individuals. The core of this resentment is the idea that poverty trumps all other kinds of marginalisation, and that reservations should consider the economic status of the applicants [2].

One of the more interesting reactions by upper-caste groups to this perceived unfairness is to claim that they are also "backward" and ask for their own reservations. Of late, India has seen political protests for reservations by relatively prosperous communities like the *Jats* in Haryana, the *Patels* in Gujarat, and the *Marathas* in Maharashtra [6]. It is important to note how devastating these protests can be: not mere rallies or picketing, but self-immolation and ritual suicide by several upper-caste individuals [11]. The common refrain is that, "In India, one has to be backward to move forward." These protests come in the backdrop of research which tells us that the current reservation system *does* disproportionately benefit the rich and "forward" castes among the Scheduled Castes (SCs) and Scheduled Tribes[1] (STs) [9].

On January 12, 2019, the Indian government passed the 124th Amendment to the Indian Constitution. Apart from the existing reservations for backward castes, this Amendment mandates 10% additional reservation to economically weaker sections of the society in jobs and educational institutions. Besides this, the government also gave percentage concessions to women in top-tier educational institutions like Jawaharlal Nehru University. In the backdrop of all these factors What factors? We have only given a summary of Indian reservations till now. We haven't made a strong case for our paper yet., we believe that our country needs to adopt a more holistic and multi-dimensional approach to reservations.

In this paper, we introduce a framework we call "RAMSES": Rigorous and Adaptive Measurement of Socio-Economic Status; and use it to derive a new reservation policy for India. Through the data that we feed into RAMSES, we seek to determine the exact disadvantage an individual faces due to various

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[1] SCs and STs were the groups of people who came at the bottom of the social hierarchy in the *varna* system.

factors. RAMSES is a *framework* which takes a dataset[2] as an input, and provides us with an "adjusted income" which is indicative of the disadvantage a person faces due to factors which are out of their own control: like their caste, gender, parental income, etc. This also means, and we emphasize, *that better the dataset available, better the "adjusted income" predictions will be.*

The aim of RAMSES is to provide a conceptual framework. The finer details about the methodology proposed in section 4 can be debated upon, refined and tested with more datasets. We can incorporate new datasets and methodology as per our need. Through this model, policymakers can choose to adopt a data-driven, multi-dimensional approach towards reservation.Add more details about what we are actually doing to the intro. A new metric – adjusted income, instead of a 0-100 scale, so that it makes use of the already existing perceptions of money in the minds of people. The fact that we only define a way to calculate this metric. Officials then decide what income is the minimum required to avail reservation. Etc.

Research Contributions
As discussed, there is a growing discontentment among the different caste groups who do not benefit from today's reservation system. In fact, there is also discontentment *within* the beneficiary SC and ST communities because only a few elite manage amongst them tend to benefit from the current systemcitation possible?. RAMSES is aimed to solve most of these concernsVery vague statement.. Specifically, we make the following key contributions:

- For the first time to the best of our knowledge, a robust, quantitative, and transparent approach is being proposed to take important policy decisions like granting reservation to individuals in educational institutions.

- With new datasets available, the Government doesn't have to rely anymore on scale of agitations and public perception of unfairness to design a just policy. Our model takes new datasets and methodology to measure the scale of unfairness on an individual level. It looks at socio-economic status of every individual and decides whether he/she should avail the benefit of reservationIs this correct? Does it decide whether they should avail the benefit of reservation? Afaik, it only provides an adjusted income. The Government/officials then decide the threshold of adjusted income to to provide reservation.

- The framework, RAMSES, is designed to be adaptive by ensuring modularity and extensibility. The datasets and methodologies used can be easily altered if required.

BACKGROUND
Reservation have been a contentious topic of Indian public policy for a very long time. In this section, we go over some important definitions, facts, and events in the history of Indian reservation policy that have shaped, and continue to shape, what it is today.

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[2]Nationally representative public datasets like the Indian Human Development Survey (IHDS) or National Sample Survey (NSS). What are these types of datasets called? Public datasets?

Scheduled Castes (SC) and Scheduled Tribes (ST)
The group of people which were at the bottom of the social hierarchy because of the Varna system are called "Dalits" or Scheduled castes. This group has been referred to as "Depressed classes" or "Harijans" in the past. There are also the "Adivasis" , "Vanvasis" or Scheduled Tribes; these are people who live predominantly in the forests of India.

The 2011 Indian census categorised 1,241 castes as Scheduled Castes and 705 tribes as Scheduled Tribes. Together they constitute 25.2% of the population [4] of India. In higher education institutions that receive government funding, 22.5 percent of available seats are reserved for Scheduled Castes and Scheduled Tribes students [22].

Other Backward Classes (OBC)
In 1979, Prime minister Morarji Desai established the Mandal Commission [14] which had the mandate to "identify the socially or educationally backward classes" of India. The commission used 1931 caste census and various field surveys to come up with a comprehensive list of OBCs and concluded that the "the approximate derived population of Other Backward Classes including Non-Hindu communities is 52%". The commission recommended that members of these classes be granted reservations for 27% of jobs under the Central government and public sector undertakings, thus making the total percentage of reservations for SC, ST, and OBC to 49%. Article 13.11 of the report states

> As stated in the last chapter (para12.22) the population of OBCs, both Hindu and Non-Hindu, is around 52% of the total population of India. Accordingly, 52% of all the posts under Central Government should be reserved for them. But this may go against the law laid down in a number of SC judgments wherein it has been held that the total quantum of reservation under Articles 15(4) and 16(4) of the Constitution should be below 50%. In view of this the proposed reservation for OBCs would have to be pegged at a figure which, when added to 22.5% for SCs and STs, remains below 50%. In view of this legal constraint, the Commission is obliged to recommend a reservation of 27% only, even though their population is twice this figure.

On 7 August 1990, the National Front government declared that it would provide 27 percent reservations to "socially and educationally backward classes" for jobs in central services and public undertakings, based on the Mandal Commission's findings. There was an immediate furore: Rajiv Goswami, a student of Deshbandhu College, Delhi, committed self-immolation in protest of the government's actions [12]. Subsequently, students of Delhi University protested in Kingsway Camp and college campuses, blocked roads and hijacked public buses [1].

Policy responses to contentions
The SC, ST and OBC communities are diverse and large. Thus, invariably, some elite among each group corner most of the benefits that the reservations offer to each community. In a Supreme Court case, *NM Thomas vs The State of Kerala*, the following argument was made:

Research conducted by the A. N. Sinha Institute of Social Studies, Patna, has revealed a dual society among harijans, a tiny elite gobbling up the benefits and the darker layers sleeping distances away from the special concessions [20].

This is a well recognized issue and different approaches have been suggested and implemented to resolve it.

- **List revisions** can be carried out to remove castes which have benefited disproportionately from the SC, ST or OBC reservations [13]. In practice, however, few castes have been completely removed from the list. The amendment of these lists to add new castes has been a delicate and contested area of political and social debates. The addition of new castes leads to discontent among the original members of the list as the marginal benefit enjoyed by their group goes down.

- **Sub-classification** of castes means creating more quotas among the already defined groups of SC, ST and OBC. This puts limits on how much of the group quota can a single caste benefit from. This approach, too, is often an instrument of political leverage and is again an issue which leads to bitterness and anger.

- A third approach is the exclusion of the **"creamy layer"** from the benefits of reservation. This currently only applies to the OBCs and consists of the top economic layer of the OBCs. This targets individuals and not groups; thus an individual having family income above a certain amount is not given the reservation benefits they are deemed to be economically advanced enough. The issue of *creamy layer* among OBC has been debated in the Supreme Court in the *Indira Sawhney vs Union of India 1992* [21] and *Indira Sawhney vs Union of India 1999* [19].

Reservation for Women

Article 15(3) of the Constitution permits the State to make "special provisions" for women. It states:

> Nothing in this article shall prevent the State from making any special provision for women and children.

In April 1993, the Indian Government approved a constitutional amendment that mandated that village councils hold regular elections and reserve one-third of the seats for women [16]. There is also a continuous discussion about providing a quota for women in the Lok Sabha, the lower house of the India Parliament [17]. Thus there exists a recognition that having women representatives is important and that women as a group face certain obstacles which they need to be compensated for.

As we have seen, all provisions of reservation invariably turn to the issue of an elite few usurping the benefits of many others from their group. Policy makers will have to ensure that all the benefits of reservation are not availed by well-to-do urban women.

Merit vs Affirmative Action

There has been a long-standing conflict between the upper caste's idea of merit and lower caste's support for affirmative action. As mentioned earlier, this conflict took new pathways following the Government's declaration to implement the Mandal Commission report in 1990. Deshpande et. al. (2006) say that Hindu upper Caste, Christians and Sikhs are over represented in the share of graduates. They also state that SC, ST and Muslims are severely underrepresented. The upper castes claim that their dominance in the share of graduate is solely due to their superior merit, and that there is nothing to be done about this situation since merit should indeed be the sole criterion in determining access to higher education. Any hindrance to this conventional idea of merit would undermine the quality of education and the credibility of graduates that pass out of these colleges. On the other hand, it can be argued in favour of affirmative action that the traditional route to caste dominance – namely, an upper caste monopoly over higher education – still remains effective despite the apparent abolition of caste. From this perspective, the status quo is unjust and requires state intervention on behalf of disadvantaged sections who are unable to force entry under the current rules of the game. They argue that upper castes cannot talk about admission/jobs solely on the basis of merit as long as the disadvantaged groups don't get the same opportunity to achieve the required merit.

124th Amendment Bill: Reservation for Economically Weaker Section

In the midst of all the criticism on existing reservation policy, Government recently passed the Constitution (124 Amendment) Bill 2019 in Lok Sabha and Rajya Sabha [10]. This bill aims to provide 10 per cent reservation in jobs and educational institutions to the economically weaker sections in the general category. The 10 per cent reservation will be in addition to the existing 50 per cent reservation given to Scheduled Castes, Scheduled Tribes and the Other Backward Classes, taking the total reservation to 60 per cent. General category individuals, all members of whose family together earn less than Rs 8 lakh per annum, and who have less than five acres of agricultural land, or having a house smaller than 1,000 square feet or have a residential plot smaller than 100 yards in a municipality or a residential plot of less 200 yards in a non-notified municipality are going to be eligible for the reservation.The bill amended article 16 of the Constitution and inserted the following clause:

> (6) Nothing in this article shall prevent the State from making any provision for the reservation of appointments or posts in favour of any economically weaker sections of citizens other than the classes mentioned in clause (4), in addition to the existing reservation and subject to a maximum of ten per cent. of the posts in each category.

This ruling has faced several criticism: people have questioned the rationale behind the cap of 8 lac/annum. A lot of forward caste tax payers who belong to middle class and lower middle class and may face no disadvantage whatsoever will enjoy fruits of the reservation, thus giving rise to a new creamy layer. The policy can be rendered futile as very poor upper caste Hindus who can't afford good schooling and accommodation would not be able to take benefit of the reservation.

Caste vs Class- Are they Orthogonal?

Through our previous discussion we see that there has been a conscious effort on the part of the policy makers to reduce inequality among caste groups like the SC, ST and OBC. With the introduction of the creamy layer provision in case of the OBC and even in case of the SC community to a certain extent (for promotions in government jobs), we as a society have accepted the idea that with some level of prosperity, caste disadvantage does start diminishing in an individual's life. With the introduction of the reservations for Economically Weaker Section, Government acknowledges that poverty (class) too plays an important role in the attainment of education. [3] says that the relationship between class and caste is very dynamic. Traditionally, caste and class overlapped each other to a very great extent. Even though there is still a significant overlap, class system is gradually disassociating itself with caste. "Although relations between classes have been undergoing change, this change has not kept pace with changes in the distribution of power. Ownership of land has shifted only in a small way from the old rentier class to the emerging class of farmers and owner-cultivators. Power, on the other hand, has shifted much more decisively from the traditional elite of the village into the hands of the new popular marginalized leaders " [3]. What Beteille talks about in 1965 is something that we see even today. With modernisation and the booming economy post the market liberalisation in 1991, economic prosperity is gaining a larger role in deciding privilege. Our recognition for the need of the creamy layer and reservation for the EWS signifies that class and caste are not completely orthogonal to each other. We do recognise that there are aspects to caste discrimination like dignity and pride which are community based. We concede that in a data driven exercise like ours, we cannot control for these aspects and we leave it to people more experienced than us in these matters to tweak the coefficients we generate for different castes to accommodate this deficiency.

MOTIVATION

We see that the current system of reservation has its own set of issues which policy makers and politicians have tried to address in different ways. The current reservation system provides and cares for group identities leading to the elite among the group to become the biggest beneficiaries. The provision to exclude the 'creamy layer' helps in keeping the economically elite OBCs out of the reservation system. The 'creamy layer' however does not take into consideration that there are other factors at play too which create an elite among a certain group. Should we not prioritise women over men when providing for reservation benefits if we see that men are better off on all parameters as compared to women? If yes, how will this prioritisation work? Scheduled castes from one state might be facing a lot more discrimination as compared to some other state. Should we not give more reservation benefits to the more backward scheduled caste?

Questions like these which deal with the fairness of the system are important and contentious moral and political issues. What we try to develop in this paper is a system which takes a holistic view of the individual and provides adequate access to reservation based on their personal characteristics. Such

a system, which might not have been possible in 1935 when the reservation system was first legally implemented, is today possible with access to nationally representative household data. We take a look at the IHDS 2012 study and present an alternative to the current reservation system.

We believe that we can't solely rely on public perceptions and the scale of their agitations to take important policy decisions such as granting reservation. Through our model, we will be able to calculate the disadvantage an individual from a particular social group faces and adequately compensate him/her in the reservation process. This model adapts itself to new datasets. This way, we can be assured that we don't have to stick to one single reservation policy for decades. We can have regular updates and checks to make sure that no social group is getting benefited more than what they deserve.

With so many complexities involved, it is not ideal to have a homogeneous reservation policy across the length and breadth of this country. Today, we have access to several datasets and econometric tools which can let us deal with fairness (or unfairness) of reservation policy at the level of the individual. To motivate discussion for the need of a quantitative framework, we plot some important distributions. We compare top 10% of Scheduled Castes and OBCs (income wise) with bottom 10% of Forward Castes (including Brahmins). We first plot the the distribution of number of Assets owned by each Household.
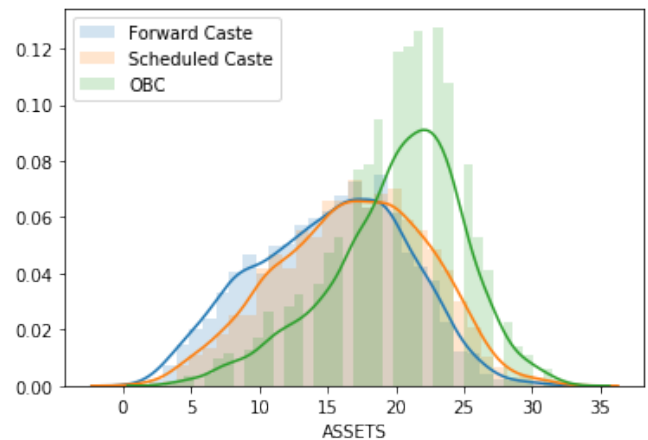

Figure 1. Distribution of assets owned

We can see in Fig 1 that distribution for Scheduled Castes and OBCs is to the right of that Forward Castes. if we plot the bar graph of mean assets owned, we get the same result (Fig 2).

We also plot the distribution of maximum education received by any member of the Household. According to [8], parental and household education has causal effect on child's education. In Fig 3, we see that the well to do Scheduled Caste Households have almost the same distribution as impoverished Forward Caste Households. Moreover, well to do OBC households have more educated household members.

We can also plot the distribution of household consumption expenditure and see the difference between affluent Scheduled Caste household and impoverished Forward Caste household.
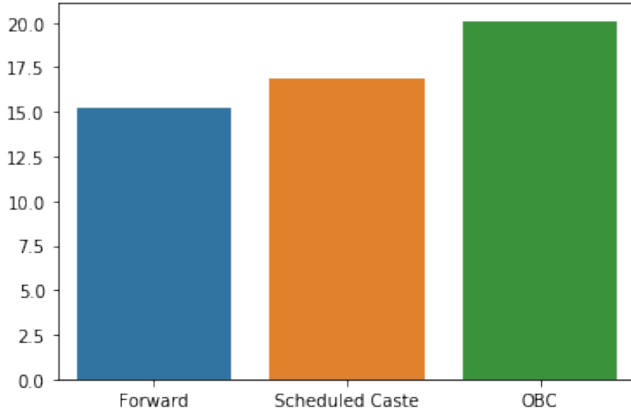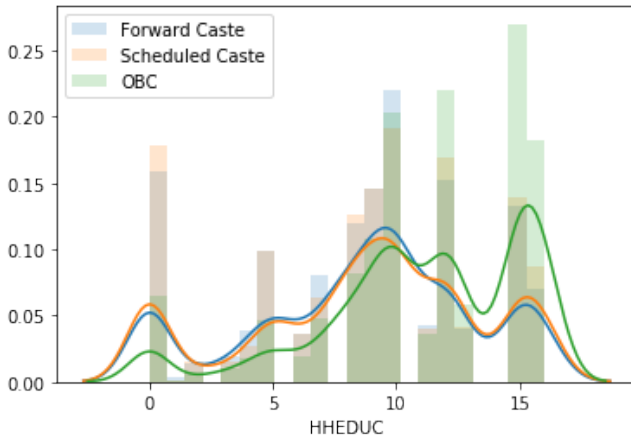
Figure 2. Mean of assets owned

Figure 4. Household Total Consumption Expenditure distribution

Figure 3. Household Education distribution
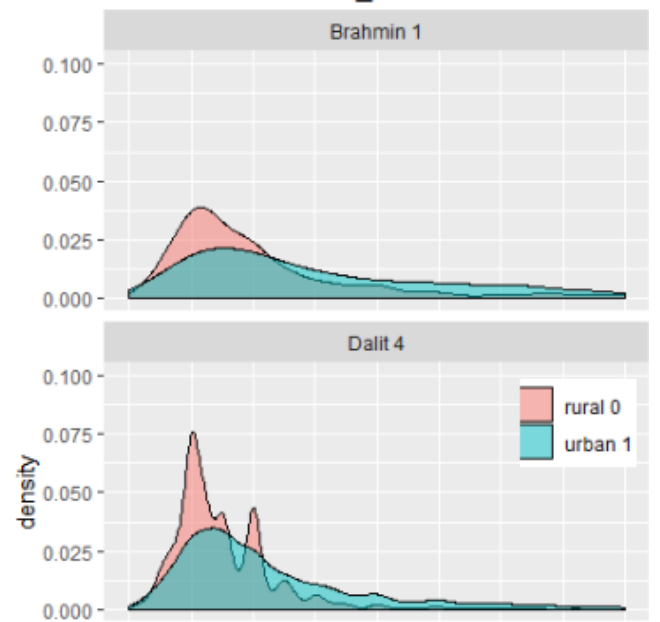
Figure 5. Caste-wise urban-rural income distribution

In Fig 4, we see that affluent Dalit families consume more than impoverished Forward Caste families.

Before we delve into the finer details of our model we would like to see the income distribution of all the Scheduled Caste and Brahmin earning individuals. In Fig 5, we see that the hourly wage distribution of rural Brahmins is the same as that of rural Scheduled Castes. It can be seen from the flat distribution that urban Brahmins have a much higher income than rural and urban SCs.

The purpose of these graphs is not to reach a conclusion. We can definitely say that even affluent SCs face very subtle forms of discrimination in their daily lives. However, with new datasets and estimation techniques at our disposal, we don't need to homogenize any community. Intra-caste socio-economic features change as we shift from urban to rural or across income group. We can see that assets held and consumption expenditure of impoverished Brahmin households is lower than that of affluent Scheduled Caste and OBC households. It is important that we don't push these results under the carpet. We need to debate on these granularities and come up with a more holistic model for reservations in educational institutions.
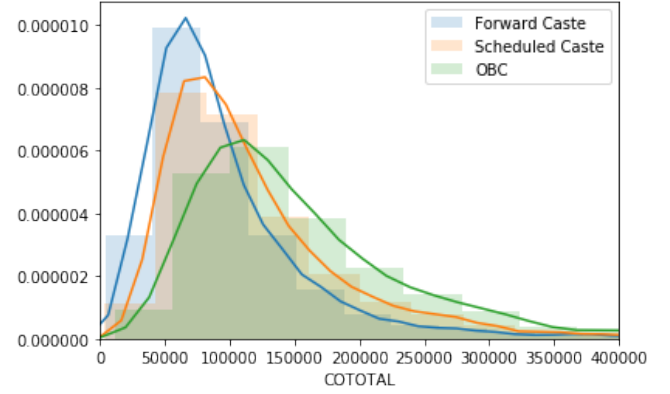
MODEL

Overview
As we have seen above, there are lots of complexities involved in the current reservation policy. In our model, we will try to come up with one figure for each individual which incorporates the disadvantages faced by that individual, ranging from their caste, gender and the state in which they live. This would help us rightfully compensate these individuals for the difficulties they face in life and create a more fair system.

What we propose is having a system in which every person's **adjusted income** is the only criteria which determines what reservation that person gets. Adjusted Income is a new variable that we generate taking into account all the relevant factors that might affect an individual in their life. The more the disadvantages, the smaller the adjusted income will be. The smaller the adjusted income, the greater the probability of getting reservation. The aim of this paper is to provide a framework of generating this adjusted income. The limit and

cap for reservation is to be decided by the policy makers. In this paper, we propose two methods of generating adjusted income.

Generating adjusted income

Method 1: Mincer Earning's equation

In the first method, we start by observing the parental income of the individual. We hypothesize that parent's income is probably the most important factor in determining the quality and years of education that a child will receive. Income in the labor market may depend upon several factors other than education and skill. There ca be 'taste for discrimination' in the labor market against certain castes and females. Therefore, according to our Mincer Earning's equation [15], the wage a parent or household receives is a function of factors like Caste, sex, age, education and residence. In our model, we calculate the impact of each parameter and accordingly adjust the income to derive adjusted income. As a result, the student is compensated for the disadvantage his/her parents face in the labor market. To calculate the adjusted income using this method, we use the individual data of Indian Human Development Survey (IHDS), 2011. The IHDS is a nationally representative, multi-topic survey of 41,554 households (2,00,000) individuals in 1503 villages and 971 urban neighborhoods across India [5]. Our estimation equation will look like this:

$$log(hourly\_wage) = \beta_0 + \beta_1 * Caste + \beta_2 * urban$$
$$+ \beta_3 * Male + \beta_4 * educ + \beta_5 * age + \beta_6 * age^2$$
$$+ districtFE + \mu \quad (1)$$

In equation (1), we only take individuals who are earning an income. Our independent variable is log of hourly wage which further depends on caste, residence, education and ability. As we are only providing a framework, researchers can include more control variables which can explain hourly wage of an individual.

Thus we apply a function on the parental income of every person. This function takes in consideration the caste of the person, whether they lived in rural or urban areas and their state. The output of this function will be the adjusted income that we will use to determine reservation benefits to people. There are two different ways of applying this function. First, as shown in equation 2, we modify the income by applying caste parameter and then modify this already modified income through the urban/rural parameter and so on. This makes the function non commutative and thus puts forth the challenge of deciding which parameters be applied first.

$$f_{State}(f_{Urban/Rural}(f_{Caste}(Income))) \quad (2)$$

There is another way which will be commutative. We apply all the parameters independently on the original income and then determine the adjusted income through the sum of all the modifications. Thus this second method will look like this:

$$f_{Caste}(Income) + f_{rural/urban}(Income) + f_{State}(Income) \quad (3)$$

Let us try to get the intuition through an example. Suppose the adjusted income limit to receive reservation is 8 Lakh rupees. This means that an individual belonging to a Scheduled Caste family and living in urban area with parental income of 8.5 Lakh rupees might not have their income adjusted to less than 8 lakh and thus they do not get the reservation benefits. On the other hand, in our model a Brahmin earning 8.5 lakh rupees and living in rural area can have his/her income adjusted to less than 8 Lakh and avail reservation benefits. The model has been visualized below for better intuition:

Person	Income	Caste	Rural/urban
1	I_1	C_1	U_1
2	I_2	C_2	U_2
3	I_3	C_3	U_3

Our data set will look like this matrix with each row corresponding to each individual. The columns in the matrix will be different parameters like caste, assets held, income, rural/urban, etc. Using the information given, our aim is to come up with a single figure for each individual which we will call as adjusted income.

With the parental income and parameters of each individual at our individual, we can transform the income to derive adjusted income in the following way: We begin by applying the function for caste:

$$f_{caste}(income) = x$$

According to the above equation, we reduce/increase the parental income of individual depending on his/her caste. The amount of reduction/increase is x

We will now apply the function for rural/urban:

$$f_{rural}(income) = y$$

we reduce/increase the parental income of individual depending on his/her residence. The amount of reduction/increase is y

We will now apply the function for State:

$$f_{state}(income) = z$$

we reduce/increase the parental income of individual depending on his/her residence. The amount of reduction/increase is y

We can follow the same process for different parameters like physical disability, type of school, etc. The total reduction/increase is $x + y + z$. As we discussed is section IVB, the transformation can be either commutative or non-commutative. In this paper, we will take the commutative approach.

So after transformation, our matrix will look like this:

Person	Adjusted Income
1	A_1
2	A_2
3	A_3

Method 2- Probit model

In this section, we will try to come with the coefficients through probit and marginal effects. We hypothesize that whether a person attends a grad/postgrad school depends on several factors. If we see that a Dalit has a lower probability, ceteris paribus, of continuing his/her education beyond class 12 than a Brahmin, we reduce the adjusted income accordingly. Our estimation equation is:

$$grad = \beta_0 + \beta_1 * Male + \beta_2 * urban$$
$$\beta_i * Caste_i + districtFE + \mu \quad (4)$$

For this method, we use the same data as method 1, i.e. IHDS 2011 Individual level data. In equation (4), grad is a dummy variable indicating whether the individual has continued education beyond class 12th. This further depends on factors like caste, sex and residence. To make this analysis accurate, we need information of parental income of each individual which unfortunately is not available in the dataset. It is possible that Dalit parents have lower income and therefore cannot send their children to college. We will present the results of the above mentioned estimation equation but unfortunately we cannot capture all the dynamics because of data limitations. Once we get relevant coefficients, we can do the same exercise to derive adjusted income. We can also use the coefficients we derive from the probit model to adjust percentage of individuals. This method would be similar to one which exists in JNU today.

To the best of our knowledge, this kind of model has not been described in the literature; the closest proposal we found was from 2006 [7]. This model proposed computing scores for **academic merit** and **social disadvantage** and then combining the two for admission to higher educational institutions. Social disadvantage score would be divided into its group and individual components. For the group component they considered disadvantages based on caste and community , size of city and gender. Individual component comprised parental occupation and the type of school where a person passed the high school examination. The weightage for academic merit and social disadvantage be distributed in the ratio of 80:20. The academic score could be converted to a standardised score on a scale of 0-80, while the social disadvantage score would range from 0 to a maximum of 20. JNU also has a system of deprivation points for students from backwards districts, women and Kashmiri migrants. This system, like ours, takes into account more than one aspect while analysing disadvantage.

RESULTS

In this section, we provide the regression table for the two estimation strategies discussed above.

While we have used real data and tested extensively for any biases within the data, these results should be seen only as examples of the kinds of outcomes and insights which can be derived from our model.

Mincer Earnings Function

We get the following table by estimating equation 1. Note that the omitted/base caste dummy is Brahmin.

Table 1

VARIABLES	lhourlywage
rural	-0.180***
	(0.00958)
Female	-0.337***
	(0.00601)
age	0.0305***
	(0.000991)
agesq	-0.000280***
	(1.20e-05)
Education years	0.0239***
	(0.000821)
English Ability	0.220***
	(0.00715)
Dalit	-0.107***
	(0.0190)
HighCaste	-0.0875***
	(0.0200)
Muslim	-0.150***
	(0.0207)
Adivasi	-0.111***
	(0.0202)
OBC	-0.122***
	(0.0190)
Sikh_jain_christian	-0.0364
	(0.0315)
Constant	2.111***
	(0.0656)
District FE	Yes
Observations	53,264
R-squared	0.422

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

In the table above, we can see that almost each variable is significant at 1% level. *Ceteris paribus*, an individual from urban area earns 18% more per hour compared to an individual from rural area. Similarly, *Ceteris paribus*, a Dalit earns 10% less than a Brahmin. This equation also confirms that wage is a quadratic function of age with variable 'age' being positive and 'agesq' being negative. In our estimation equation, we have controls such as education, English ability and district Fixed Effects. However, we understand that there are several other factors which go into wage determination. Unfortunately, due to limitations of the dataset we are using, we cannot control for the factors such as quality of school, school/college grades, parental education and other relevant parameters.

Probit model

We first run the probit model which gives us the direction of each parameter followed by marginal effects at means. Marginal effect will give us the coefficient of each paramenter. In this exercise, we only include individuals with age 18 or above.

Table 2

VARIABLES	grad_postgrad
Male	0.444805***
	(0.0015576)
Urban	0.1075508***
	(0.0015459)
Dalit	-0.1570935***
	(0.0049795)
HighCaste	-0.0588816***
	(0.0053005)
Muslim	-0.16349***
	(0.0050361)
Adivasi	-0.148915***
	(0.0054276)
OBC	-0.1296376***
	(0.0049485)
Sikh_jain_christian	-0.0522643***
	(0.0075309)
Observations	1,35,922
R-squared	0.422

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

The variable grad_postgrad is a dummy variable indicating whether the individual has completed graduation/postgraduation. The table 2 above gives us the marginal effect of each variable. Note that in this exercise, we have not included several controls which can influence the probability of an individual pursuing graduation. One such control is parental income. It is possible that Dalits due to lower income cannot afford college education, in which case the coefficient for Dalit has an upward bias. It is also possible that adivasis living in forests do not care about education at all which reflects negatively in the above table. This is just another method that we are proposing to estimate the impact of different parameters which can be strengthened using better controls and fixed effects. We did the same exercise with logit model and found almost similar coefficients.

USING RESULTS TO CALCULATE THE ADJUSTED INCOME

From the two tables we have got coefficients for different parameters. We will use these coefficients to come up with adjusted income for each individual. Suppose a Dalit individual from rural UP wants to take admission in a college. Using the results from Table 1, we do the following adjustment to her income:

- Her father's income is 5,00,000/*annum* and mother's income is 2,00,000/*annum*.

- We will calculate the adjusted income of mother and father separately.

- She comes from a rural area reduce the income of both mother and father by 18%. Father's income is reduced by 90,000 and mother's income is reduced by 36000.

- As she belongs to the Dalit community, his/her parent's income should be reduced by 10%. Therefore, father's income is reduced by 50,000 and mother's income is reduced by 20,000.

- As her mother is also earning, being a female her income should be reduced by 33%. This reduction is equal to 66,000.

- Thus total reduction = 90,000 + 36,000 + 50,000 + 20,000 + 66,000 = 2,62,000

- We reduce this amount from the household income to derive adjusted income. Therefore, adjusted income = 7,00,000 − 2,62,000 = 4,38,00

Therefore, if policymakers decide the cap for availing reservation to be the same as that of income tax ,i.e. INR 2,50,000, then a rural female Dalit from rural region with parental income of INR 7,00,00 is not eligible for reservation. Similarly, in our model, a Brahmin student who completed his/her school education from rural area with household income of INR 3,00,000 can avail reservation. Note that in this model, we are not giving more preference to a female candidate. This is because we are using parental income to derive adjusted income. However, we can get over this problem by lowering the percentage cutoff for a woman candidate by the amount predicted by the probit model in table 2 (the coefficients are biased due to several important omitted variables).

CONTRIBUTION AND CONTENTIONS

In our model rich Dalits and Adivasis might not be able to avail reservation benefits to the same extent as their economically disadvantaged counterparts. On the other hand, a poor Brahmin from rural India with inadequate schooling opportunities would get some advantages vs a rich, educated Brahmin. We also understand that we have not controlled for the Purchasing Power Parity index for different states. Thus it is assumed that *X* Rupees in state A have the same purchasing power in other state B.

This paper only provides a framework of the alternative reservation policy. This framework quantifies the disadvantage an individual/community faces and incorporates that in the reservation process. In the future, maybe we have better data-sets which allows us to capture other forms of disadvantage. The methodology can also be tweaked to give us more precise estimates for our parameters. Maybe, we can use panel data and do first difference to get rid of individual and household specific heterogeneity. There are several parameters which affect the parental income (Method 1) and probability of completing graduation/post graduation (Method 2) which we have not controlled for. This can lead to very biased results. We also acknowledge the limitations of quantifiable approach. As we will discuss below, there are several forms of disadvantages which cannot be quantified. However, the aim of this paper is to simply provide a multidimensional alternative to the current reservation system. In the points below, we have mentioned some factors which cannot be conventionally quantified.

Our model does not incorporate very subtle forms of discrimination that people of lower caste face. One of the motives behind reservation was to end caste based discrimination which has been a feature of Indian society for thousands of years. It was never a remedy for economic backwardness. That is why the creamy layer argument does not apply to Adivasi and SC communities. The argument goes as follows: Even though a financially stable Dalit family can afford good food and good schooling for their children, they still face subtle forms of discrimination. In 2016, after Dalit scholar Rohith Vemula committed suicide at Hyderabad Central University, his friends and family blamed caste discrimination at the elite institution. Unfortunaely, in our model, children from very affluent Dalit Households cannot avail reservation benefits. We can argue that rich Dalits have avenues to move beyond subtle forms of dicrimination like access to water, school and other public goods. However, if some dataset lets us quantify the amount of subtle form of disadvantage Dalits face, maybe we can incorporate that in our adjusted income. Moreover, by letting in poor people from forward caste, we are also tampering with one of the basic principles behind reservation.

One argument in favor of current reservation system is that of motivation. Scheduled Castes and Scheduled Tribes are underrepresented in educational institutions. Therefore, if an individual from the same community goes to college, that motivates several families to send their children for higher education. This network effect is much more effective for underrepresented communities like SC and ST than it is for upper caste. Therefore, even if a rich Dalit gets admission in Indian Institue of Technology through reservation, it has a much greater domino effect in his community. In our model, unfortunately a rich Dalit would not be able to get reservation which hinders this network effect. Alternatively, if there is some way to quantify this network effect, we can incorporate it in our model and adjust the income accordingly.

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