Job reservations and career choices

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Abstract

We examine the effect of introduction of reservations in formal sector jobs for a section of the population whose access is limited due to high training costs. Although reservations succeed in having a better representation of the disadvantaged group in the formal sector, it does not necessarily translates to higher incomes for the group as a whole. Reservations have no impact on aggregate income if only sections of each population type apply for formal sector jobs or the whole population applies. Reservations decrease aggregate income if the whole population of the general category and a section of the disadvantaged category apply for formal sector jobs after reservation. Reservations increase aggregate income if everyone from the disadvantaged category and some from the general category apply for a formal sector job after reservation.

JEL classifications:

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1 Introduction

Public policy has often taken to the option of reservations for disadvantaged sections of society when their representation is below what is thought to be desirable. Many nations have reservation of seats in legislative councils for women, and for sections of society whose economic profile is much worse than the general population at large. In India, reservation of seats in legislative assemblies and in jobs have been in existence for over five decades. Recent debates have centered around the government proposal of a 33% reservation for women in all elected bodies of the government. Pande (1998) and Dufflo and Chattopadhyay () have looked into the effect of reservations for sections of society in elected bodies in India. There is however, no work on the effect of job reservations on income levels of targeted groups and our work precisely addresses this question.

The paper is organised as follows: the next section describes the model, sections 3 and 4 discuss the incomes of each group with no reservation, and whether the group benefits or loses with reservations. Section 5 looks into the social cost of reservation. Section 5 concludes.

2 Model

Consider a society where citizens are indexed by category $c \in \{g, d\}$, where g is general and d is disadvantaged. Let π_c proportion of people in the total population in each category. Therefore $\pi_g + \pi_d = 1$. Any individual in the population lives for two periods. In period 1, he/she has the option of going for an informal sector job paying y_l, else he/she can go for training at a cost of T_c. We assume that the training costs for the disadvantaged category is higher than that of the general category $T_d > T_g$. In period 2, the individual continues to earn y_l if he/she never undertook training in the first period. If the individual undertook training in period 1, he/she would try for a formal sector job. If the individual succeeds in getting the formal sector job with probability p, he/she gets y_h, $y_h > y_l$, otherwise he/she receives y_l from a job in the informal sector. Given a discount factor of one over the two periods, any person from category c would earn $2y_l$ if he never underwent any training or applied for a formal sector job, and if he did try for a job in the formal sector job his/her expected total income over the two periods would be

$$\begin{aligned} E(y_c) &= -T_c + py_h + (1-p)y_l \\ &= 2y_l + max[0, (p - k_c)(y_h - y_l)] \end{aligned} \tag{1}$$

where $k_c = \frac{y_l + T_c}{y_h - y_l}$. Only when probability of getting a formal sector job for an individual of any category c is strictly greater than a threshold level k_c is expected income of an individual of the given category c greater than $2y_l$, the income of any individual if he/she did not try for a formal sector job at all. Since $T_d > T(g)$, $k_d > k_g$, the general category would apply for formal sector jobs for a lower threshold probability of getting through. Therefore, if any individual from the from the d category applies for the formal sector job, all individuals from the g category apply for it. Moreover, if $p = k(d)$, then $p > k(g)$

Let J be the number formal sector jobs as a proportion of total population and A_c be the applicants in category c as a proportion of total population. Therefore the probability of getting a formal sector job is

$$p = \frac{J}{\sum_c A_c} \tag{2}$$

3 Applications and Incomes without Reservation

The probability of getting a job depends on the number of formal sector jobs in the economy. When jobs are less only a few people from the population will apply, when they are large, almost the whole of the population will apply. Since number of jobs determine the number of applicants for the job, we can consider four cases:

1. $J < k_g\pi_g$

2. $k_g\pi_g \leq J \leq k_d\pi_g$

3. $k_d\pi_g < J \leq k_d$

4. $J > k_d$

We now discuss in detail, the number of applications that will be filed in each of these situations, and expected income of an individual of each group, general and disadvantaged.

When $J < k_g\pi_g$, if all people from the general category were to apply for jobs, and none from the disadvantaged category were to apply, the probability of getting a job would be $\frac{J}{\pi_g}$. Since this probability is less than k_g, an entry by a person from the reserved category would further reduce this probability. Therefore, since the probability of getting a job lies below the threshold level for the reserved category k_d, no person from the reserved category will apply for a job. It is also not feasible for all people from the general category to apply for a formal sector job, in equilibrium applicants from the general category will be such that $p = \frac{J}{A_g} = k_g$. In this situation no person from the general category has the incentive to switch on strategies regarding job choice, and the expected income of any person whether he/she applies for a formal sector job or not is $2y_l$. Since none from the disadvantaged category were to apply, their income would also be $2y_l$. Therefore in this situation the expected income of the general category who might be applying for formal sector jobs is exactly equal to that of the disadvantaged category who are not applying at all.

When $k_g\pi_g \leq J \leq k_d\pi_g$, if all individuals from the general category and none from the disadvantaged category were to apply, then the probability of getting a job is $\frac{J}{\pi_g}$, which is greater than their threshold probability, k_g. However, it is less than that of the disadvantaged category k_d, therefore there is no incentive for any individual from the disadvantaged category to apply for the job. Therefore in equilibrium all people from the g category apply and a representative individual of this group earns an expected income greater than $2y_l$and none from the d category apply, and an individual from the d category earns $2y_l$ too.

When $k_d \pi_g < J \leq k_d$, if all people from the g category and none from the d category apply, the probability of getting a job $\frac{J}{\pi_g} > k_d > k_g$. It is still profitable for any individual from the g category to try for formal sector jobs, so they will still try. Even after everyone from the general category has applied, it is also profitable for some individuals of the d category to apply, but not for all of them, since then the probability of getting a job is J, which is less than k_d. Therefore, in equilibrium, all people from the g category people will apply and some from reserved category will apply and the probability of getting a job will be k_d. The expected income of an individual from the general category will be $2y_l + (k_d - k_g)(y_h - y_l) > 2y_l$ (see Appendix) while that of the disadvantaged category is still $2y_l$.

When $J > k_d$, and if the whole population were to apply for jobs, the probability of getting a job would be J, which is greater than the threshold probability of both groups g and d. In this situation the expected income of an individual of any category c would be $2y_l + (J - k_c)(y_h - y_l) > 2y_l$.

4 Applications and incomes with reservation

Given its higher cost of training, the disadvantaged category d, do not apply for formal sector jobs, especially when jobs are low, and do not find adequate representation in the formal sector. We now investigate the impact of a public policy reserving a proportion θ, $(0 < \theta < 1)$, of the available jobs J in the formal sector. These policies are with the explicit aim of transferring a part of the high earnings earned from the formal sector to the d category. We assume that d category applicants can also apply for jobs open to the g category. Since θJ jobs are already reserved, $(J - \theta J) = (1 - \theta)J$ jobs are available for all citizens. The probability of getting a job for the g category, p_g then is

$$p_g = \frac{(1 - \theta)J}{A_g + A(d) - \theta J} \tag{3}$$

The probability of getting a job for the d category is the probability of getting a jobs from those reserved for them, as well as those that are open to everyone else. The probability of getting a job for the d category thus is:

$$p_d = \frac{\theta J}{A_d} + \{1 - \frac{\theta J}{A_d}\}\frac{(1-\theta)J}{A_g + A_d - \theta J} \tag{4}$$

The number of applications and group incomes from each category in this situation, will depend on the number of jobs available. We therefore, need to look for situations when it is actually successful in doing so and situations when it does not. In this situation too, results are sensitive to the number of formal sector jobs available, and the analysis is done in the same manner as in the no reservations case.

When $J < k_g\pi_g$, with the availability of some jobs for certain for the d category, there will be incentive for d category individuals to try for formal sector jobs. However, if all of them step in, the probability of getting a job becomes so low such that the expected payoff from trying for a formal sector job becomes lower than that obtained from the informal sector for certain. Equilibrium will be when the probability of getting a job, p_c for both categories is equal to k_c, the threshold probability at which any individual from category c between trying and not trying for a formal sector job. Therefore irrespective of the level of reservation, θ, the expected income of any person both categories will again be equal to $2y_l$, the income they obtain had they not tried for a formal sector job in the first place. The availability of high paying formal sector jobs does not benefit the d category as a group, since the high incomes of those who get jobs is compensated by the loss in incomes of those who try for it and fail. Likewise, the expected income of the g does not fall with low availability of jobs, since, with fewer jobs, there are fewer people trying but not getting through. The results can thus be summarised as:

When $k_g\pi_g \leq J \leq k_d$, with no reservations, the probability of getting a job for the general category remains higher than k_g, therefore all individuals from the g category apply, and none from the d category apply. With positive reservations, there is incentive for for some individuals in the d category to start applying for formal sector jobs and in equilibrium $p_g = k_g$. Therefore reservations to the extent of θ will be associated with $\frac{\theta J(1-p_g)}{k_d-p_g)}$ applications from the d category. Increasing reservations is accompanied by a fall in the probability of getting jobs for the general category and for a critical level of reservations $\theta^* = \frac{J-k_g\pi_g}{1+ck_g-k_g}$, where $c = \frac{1-p_g}{k_d-p_g}$ the probability of getting a job for the general category p_g is exactly equal to k_g. Above this level of reservation, there is a drop in the number of applications from the g category, $p_g = k_g$ and expected income of the g category is $2y_l$.

With the introduction of reservations to the extent θ in this case, is accompanied by $\frac{\theta J(1-p_g)}{k_d-p_g}$ applications from the disadvantaged category. For the extent of reservations θ^d, where $\theta^d = \frac{\pi_g(k_d-p_g)}{J(1-K_g)}$, number of applications for formal sector jobs is exactly equal to the number of individuals in the disadvantaged category, that is $A_g = \pi_g$. Since, the probability of getting a job for the d category is increasing in θ, the expected income of d category is larger than $2y_l$ for $\theta > \theta^d$.

When $J > k_d$, the introduction of reservations make the job prospects even better for the d category, and all individuals from the d category still apply for a job in the formal sector. All individuals from the g category still apply for jobs in the formal sector as long as the level of reserved jobs is lower than $\theta^* = \frac{J-k_g\pi_g}{J[1+k_g(c-1)]}$. The expected income of the g category is decreasing in θ for $\theta \leq \theta^*$. and is constant for $\theta > \theta^*$. With increasing reservations, a larger number of jobs become available to the d category, while applications remain constant at π_d. Since their probability of getting a job increases with θ, the expected income of the d category is larger than $2y_l$ and is increasing in θ. The results can therefore be summarised as

Proposition 1 *When the number of jobs $J \leq k_g\pi_g$. reservations has no effect on group incomes , When $J \geq k_g\pi_g$, at least one group income changes for all $\theta notin[\theta^*, \theta^d]$.*

5 Reservations and Welfare

To analyse the welfare implications of reservations, we look into the total expected income of both groups with the introduction of reservation. When $J < \pi_g k_g$, irrespective of the level of reservation θ, expected incomes of both groups remain unchanged at $2y_l$. Therefore in such a situation introduction of reservations have no impact on either group or total welfare. If with even after the introduction of reservations, the whole population still applies for a formal sector job, as happens in situations when $J > \pi_g k_g$, an increase in reservations will imply a fall in expected income of the g category and a in expected income of the d category, but total income remains the same. Therefore introduction of reservations imply an income transfer from the general to the disadvantaged category. If with the introduction of reservations, applications from the general category fall, but the whole population of the reserved category applies for a formal sector job as happens when $J > \pi_g k_g$, then increasing reservations for $\theta > max[\theta^*, \theta^d]$, is accompanied by increasing total expected income. Therefore the introduction of reservations increase total expected welfare in this case. This happens since with increasing reservations, total number of formal sector jobs does not shrink, but applications from the general category decline with a lowering of the training cost, therefore aggregate welfare increases as a whole. In situations when $J > \pi_g k_g$, when increasing reservations lead to a decline in expected income of the general category while that of the disadvantaged category remains the same, total expected income would decline. Therefore the results may be summarised as:

Proposition 2 *Introduction of reservations from a situation of no reservations leads to a decline in the level of welfare. Given that reservations exist, an increase in reservations may be accompanied with larger welfare some general category applicants and all disadvantaged category applicants were applying for the formal sector jobs before the increase in reservations. It is associated with lower welfare if all general category applicants apply, and some disadvantaged category applicants apply for formal sector jobs before the increase in reservations. In situations when the whole population applies for formal sector jobs or only a part of both category applicants apply for formal sector jobs, increasing reservations have no impact on welfare.*

6 Conclusion

We examine the effect of introduction of reservations in formal sector jobs for a section of the population whose access to the same is limited due to high training costs. Although reservations succeed in having a better representation of the disadvantaged group in the formal sector, it translates in higher incomes for them only when the number of formal sector jobs are high. Access to formal sector jobs is accompanied by a larger number of people training themselves for jobs in the formal sector, and the higher incomes of people who get through formal sector jobs is compensated by the excess training costs of individuals who try and fail to get access to the formal sector. Increased reservations imply lower access to jobs in the formal sector for the general category people, it translates into lower incomes, only in a situation when all individuals apply for the formal sector jobs in a situation of no reservations. Subsidising the training costs of the disadvantaged groups to ensure a level playing field for all sections to access to jobs in the formal sector maybe an alternative to reservations.

Appendix 1

The expected income when an individual of category c applies for a formal sector job would be

$$\begin{aligned} E(y_c) &= -T_c + py_h + (1-p)y_l \\ &= -T_c + p(y_h - y_l) + y_l \\ &= 2y_l + p(y_h - y_l) - (y_l + T_c) \\ &= 2y_l + (p - \frac{y_l + T_c}{y_h - y_l})(y_h - y_l) \\ &= 2y_l + (p - k_c)(y_h - y_l) \qquad (5) \end{aligned}$$

where $k_c = \frac{y_l + T_c}{y_h - y_l}$. Only when probability of getting a formal sector job for an individual of any category c is strictly greater than a threshold level k_c is expected income of an individual of the given category c greater than $2y_l$, the income of any individual if he/she did not try for a formal sector job at all.

Appendix 2

With the introduction of reservations with $J > \pi_g k_g$, equilibrium will be defined by the following equations:

$$\frac{(1-\theta)J}{\pi_g + A(d) - \theta J} = p_g > k_g$$

$$and$$

$$\frac{\theta J}{A_d} + \{1 - \frac{\theta J}{A_d}\}\frac{(1-\theta)J}{pi_g + A_d - \theta J} = p_d = k_d \tag{6}$$

The equilibrium number of applications from the d category is obtained by solving for A_d from 6. Therefore:

$$A_d = \frac{\theta J(1-p_g)}{k_d - p_g} \tag{7}$$

Therefore $A_d = \pi_d$, when $\theta^d = \frac{\pi_g(k_d - p_g)}{J(1-K_g)}$.

Appendix 3

With the number of jobs J in the range $k_g\pi_g \leq J \leq k_d\pi_d$, a reservation of θJ jobs is accompanied by $c\theta J$ applications from the d category with $c > 1$ (see Appendix 5, eq. **??**). Everyone from the general category will continue to apply as long as the probability of getting a job for the g category is greater than or equal to k_g, that is $\frac{(1-\theta)J}{\pi_g + c\theta J - \theta J} > k_g$.

As long as everyone from the g category is applying for a formal sector job, the change in the probability of getting a job with a change in the reservation level θ is given by

$$\frac{\partial\,(1-\theta)J}{\partial\theta\pi_g + (c-1)\theta J} = \frac{1}{[\pi_g + (c-1)\theta J]^2}\Big[\{\pi_g + (c-1)\theta J\}(-J) - \{(1-\theta)J\}(c-1)\Big] \tag{8}$$

Since $\{\pi_g + (c-1)\theta J\}$ and $\{(1-\theta)J\}(c-1)$ are both positive, $\frac{\partial (1-\theta)J}{\partial\theta \pi_g + (c-1)\theta J} < 0$. Therefore, there exists a value of θ at θ^*, at which $\frac{(1-\theta)^* J}{\theta^* \pi_g + (c-1)\theta^* J} = k_g$. Therefore, solving for θ^*, we get $\theta^* = \frac{J - k_g \pi_g}{J[1 + k_g(c-1)]}$. Therefore for $\theta < \theta^*$, $A_g = \pi_g$ and $A_d = (c-1)\theta J$, and therefore total applications $A = A_d + A_g$ is increasing in θ. When $\theta > \theta^*$, in equilibrium $\frac{(1-\theta)J}{A - \theta J}$ holds. The total number of applications is then $A = \frac{J - \{1 - k_g\}\theta J}{k_g}$, which is declining in θ.