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Workfare versus transfers in rural India ☆

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ABSTRACT

Prevailing methods for evaluating workfare schemes are inconsistent with the arguments made for workfare in poor rural economies. Those arguments emphasize the existence of higher involuntary underemployment among the poor and the fact that the type of work provided by these schemes gives disutility, deterring non-poor households from participating. To include these features, the consumption-based welfare metric used in past assessments of workfare schemes in underemployed developing countries is generalized to incorporate a welfare loss from casual manual work, while allowing the government to independently value the work done for other reasons. Using data for India's National Rural Employment Guarantee Scheme (NREGS), the paper shows that the policy ranking switches in favor of a basic-income guarantee (BIG) over workfare. Allowing for a welfare loss from casual manual labor implies a more "poor-poor" targeting performance, but this is not sufficient to compensate for the direct welfare loss from the work requirement for plausible parameter values. A BIG dominates NREGS for a given total outlay on workfare wages.

1. Introduction

The ways that social programs are evaluated are sometimes in tension with the government's rationale for the intervention. For example, a common practice in policy discussions has been to use consumption expenditure or income as the measure of household economic welfare in assessing the poverty impacts of social programs. Yet the policy motivation typically assumes that people themselves do not care solely about their consumption or income. Indeed, both the motivation and mechanism design are often anchored to a broader concept of welfare. Thus there is an inconsistency between the policy and how it is evaluated.

An example—the focus of this paper—is found in the context of the longstanding policy issue of the choice between "workfare" and "welfare" programs as antipoverty policies. Workfare has been widely used in crises and by countries at all stages of development.[1] The key theoretical paper on the policy choice between workfare and welfare is Besley and Coate (1992). That paper made a valuable contribution in deriving conditions under which imposing a work requirement on welfare recipients yields a more cost-effective policy against poverty than transfers without such requirements. Workfare permits screening of the poor from the nonpoor, given imperfect information on abilities. This is the longstanding "self-targeting" argument for workfare.

Yet the BC analysis has features that are inconsistent with the arguments made by policy makers in favor of workfare schemes in poor rural economies, which have emphasized the existence of higher involuntary underemployment among the poor and the fact that the type of work provided gives disutility.[2] BC assume instead that there is full employment and that the policy maker attributes no welfare loss to the type of work done.[3] The latter aspect is common

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[1] Famously, workfare programs were a key element of the New Deal introduced by US President Franklin D. Roosevelt in 1933 in response to the Great Depression. They were also a key element of the Famine Codes introduced in British India around 1880 and have continued to play an important role to this day in the sub-continent. Relief work programs have helped in responding to, and preventing, famines in Sub-Saharan Africa.

[2] In keeping with the BC model, unemployment is assumed to generally take the form of underemployment (too little work), rather than full unemployment. On the implications of the latter for the BC model see Brett (1998).

[3] This is also true in the generalized framework developed in Besley (1995).

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to past empirical evaluations of workfare programs in developing countries.[4] It is known, however, that the theoretical case for work requirements can alter when one allows for the disutility of work (Brett and Jacquet, 2015).

The paper re-examines the case for workfare relative to transfer programs. We provide a more general welfare criterion than found in past evaluations—more consistent with the rationale of the program than the consumption-based criterion commonly used, while also allowing for the existence of unemployment. Since our approach departs from the assumptions of the classic BC model of the choice between workfare and transfers, the Appendix provides a generalized BC model to allow for both unemployment and the disutility of work, thus providing a theoretical foundation for our empirical analysis.

We apply our approach to India's Mahatma Gandhi National Rural Employment Guarantee Act (MGNREGA). This Act initiated NREGS, which is clearly the largest workfare scheme in the world. The scheme is premised on the view that involuntary underemployment is an important cause of poverty in this setting.[5] To reduce poverty, the scheme promises 100 days of work per year per household to all rural households whose adults are willing to do unskilled manual labor at the statutory minimum wage rate notified for the program. The scheme is seen as self-targeted to poor people.

Much has already been written on NREGS, typically focusing on its performance in reducing poverty as measured by household consumption per person.[6] However, consumption of commodities cannot be considered a satisfactory metric of welfare in this context, given that it ignores the fact that the work involved is physically demanding and unpleasant.[7] Typical work involves digging raw earth with crude tools, breaking large stones with a basic hammer, and moving loose earth in baskets on one's head. Workers often toils for long hours doing such manual labor in the open sun at high temperatures, with poor facilities and little or no likely job satisfaction. While formal-sector employment is known to promote subjective wellbeing and even mental health in more developed economies, this is not a setting in which such effects are likely to be important. Nobody would do this work without being paid for it. Any reasonable ethical observer, whether a policy maker or an evaluator of the scheme, would conclude that casual manual labor in rural India is especially hard and unpleasant work by any standards and that such work entails a welfare loss at given consumption.

The fact that there is underemployment of labor invalidates the standard model of optimal unrationed labor supply. But it does not justify ignoring the welfare loss from work in assessing the gain to poor people from an extra workfare job. Nor is it plausible that people in this setting would choose casual manual labor over regular non-manual work when available. Anyone who can get a regular non-manual job will take it in preference to doing casual manual labor. Furthermore, it is rare that someone does both.[8]

Yet the evaluation methods found in practice typically attach no welfare penalty to doing casual manual work. Two people with the same real consumption expenditure are deemed to be equally poor even if one of them derives all that consumption from hard grinding toil while the other enjoys leisure time or some relatively pleasant form of work. Such inconsistencies between the outcome measure used for evaluation and the policy-maker's rationale for the intervention are troubling. The fact that the work involved is unpleasant is one reason why workfare programs have long been used to fight poverty, in both rich and poor countries. The policy maker (implicitly or explicitly) agrees that the work is unpleasant and would almost certainly not consider doing it. The underlying mechanism design is based on incentives constraints in which work enters negatively in utility functions. How then can the policy maker justify ignoring the fact that the work is unpleasant when assessing the welfare gains from the program?

This is clearly problematic within a welfarist approach whereby "welfare" should only be assessed by whatever people maximize. The evaluations in practice of workfare programs for developing countries have typically been non-welfarist.[9] However, we argue here that even a non-welfarist evaluation should be consistent with the policy maker's rationale for intervention. If the policy maker judges that there is unemployment and that people are worse off doing this work at any given consumption level, then these features need to be built into the evaluation.[10] This does not presume that the policy maker uses the same utility function as participants in assessing their welfare.

Thus it is of interest to see whether incorporating a welfare loss from the type of work done (even if different from participants' actual utility loss) alters the case for NREGS and its evaluation.[11] Theoretically, there are two opposing effects of allowing for a welfare loss from the work. It is plain that, for any given participant, we will tend to over-estimate the benefits of the program by ignoring a welfare cost of doing the kind of work that NREGS provides. However, that does not imply that we will under-estimate the poverty impact of the scheme. To the extent that participants tend to come from households that already do casual manual labor, ignoring any welfare cost of doing that work will lead one to understate how well targeted such a program is to poor people, who will be even poorer (in terms of welfare) than their consumption suggests. And some participants who are not considered poor when any welfare cost of the type of work they do is ignored will now be seen to be poor. Which of these two effects dominates determines how the gains from the program are distributed across the population and whether or not the poverty reduction from the scheme is underestimated by prevailing methods that ignore the welfare cost of work.

The paper examines the sensitivity of past assessments of the cost-effectiveness of workfare to ignoring any welfare loss from casual manual work. We consider the case of an evaluator caring about welfare losses implied by casual manual wage labor. The policy maker is not necessarily welfarist (caring only about utility) or attaching the same value to work as the target population. More generally, however, we allow the possibility that the policy maker attaches a positive value to poor people working, independently of their current utility. This can be rationalized in a number of ways. There may be a value of the work done or a concern about poor

[4] Examples include Ravallion and Datt (1995), Gaiha (1997), Jha et al. (2009, 2013), Ravi and Engler (2015) and Murgai et al. (2016).

[5] The "MGNREGA manual" recognizes explicitly the correlation between unemployment and poverty. The manual is available on the administrative website of the Ministry of Rural Development of the Government of India: see http://nrega.nic.in/netnrega/WriteReaddata/Circulars/MGNREGA_manualjuly.pdf.

[6] Dutta et al. (2012) provides an assessment. Also see the discussions in Jha et al. (2009, 2013), Gaiha (1997), Imbert and Papp (2011), Bhalla (2011) and Murgai et al. (2016).

[7] This was confirmed in field work observations by one of the authors at numerous NREGS work sites in Andhra Pradesh, Bihar, Madhya Pradesh and Rajasthan. The literature on the scheme often notes that the physically demanding nature of the work is a key aspect of the self-targeting mechanism (see, for example, and Dutta et al., 2014, and McCartney and Roy, 2015).

[8] In India's National Sample Survey for 2010, only 7.6% of all rural households reported a casual manual work activity *and* another paid activity, and among those reporting at least one casual manual activity 77.4% did not report any other paid activity. It appears that the vast majority of casual manual workers have little access to other paid activities, including regular non-manual work.

[9] See the examples in footnote 4. In the broader context of antipoverty policy see Kanbur et al. (1994), Kanbur and Keen (1994) and Ravallion (2016). The only welfarist evaluation of the NREGS that we know of is Imbert and Papp (2015).

[10] Notice that the policy maker can think that the work is so unpleasant as to deter the non-poor but still believe that the extra work brings a net welfare gain to the poor.

[11] By welfare loss we do not refer here to households' utility loss, but rather to a consistent government's paternalistic assessment. Hence our approach differs from Besley (1995) who compare income maintenance and utility maintenance workfare programs.

people becoming dependent on assistance such that a social value is attached to work by poor people. Without taking a position on these possibilities we propose an encompassing metric for the evaluation.

Assuming that the worker can supply as much labor as she wants (and demand whatever she wants) subject to her budget constraint has long been a powerful way of identifying the parameters of an individual welfare metric.[12] Since that assumption precludes unemployment in equilibrium, it is inconsistent with the rationale for the public program under study. So we need to consider a wider range of welfare parameters. Consistently with the existence of the program and the setting, we conservatively assume that the policy maker judges that a casual manual worker is better off with the extra work provided if she chooses to do it. Thus we can use the prevailing wage rate as an upper bound on the range of admissible welfare penalties attached to that extra work. Importantly, our approach is operational with the same data currently used by most researchers in assessing the targeting and poverty impacts of NREGS.

On allowing for an imputed welfare cost of casual manual labor, we show that poverty measures for rural India are appreciably higher and that the program performs much better in reaching the poor. However, despite the better targeting, we find that the scheme (in the one state of India for which the required survey data are available) has somewhat lower effect on poverty when we discount the welfare gains to participants. On balance, the net earnings gains do not reduce poverty as much as a basic-income guarantee (BIG) entailing untargeted cash transfers for the same budget outlay.

The next section describes the data we shall use for testing the implications of the model. Section 3 explains our empirical approach. Our results are found in Section 4. Section 5 concludes. As noted, the Appendix provides a generalized BC model to allow for both a welfare loss from the work done and unemployment.

2. Setting and data

We use two household data sets to study the cost-effectiveness of workfare relative to welfare. The first is the 66th round (July 2009–June 2010) of the Employment Schedule ("Schedule 10") of the nationally representative National Sample Survey (NSS). These data include household characteristics (including demographics, NREGS participation, social groups) and information on household members' education, principal and subsidiary activity and time disposition during the week ended (NSS, 66th round, block 5.3). The questionnaire also includes a block on monthly household expenditures during the last 30 days (NSS, 66th round, block 9). We observe the weekly supply of casual manual work and also the daily wage rate for this type of work during the week ended (in block 5.3). The daily wage rate of a household is defined as its total earnings from casual manual work divided by total number of days spent on such work across all household members during the week ended (status code 41, 42 and 51). Table 1 gives summary statistics.

To facilitate estimation of the net gains to participants and to test the robustness of our results using the NSS, we will also use another household dataset collected in rural areas of the state of Bihar with support from the World Bank (Dutta, Murgai, & Ravallion, 2014). This is the same data set used by Murgai, Ravallion, and van de Walle (2016). Two rounds of survey data were collected for 3000 randomly chosen households from 150 random villages spread across Bihar. The first round was between May and July of 2009 and the second during the same months one year later. A two-stage sampling design was followed, using the 2001 Census list of villages as the sampling frame. Data were collected through several survey instruments, including household surveys and individual surveys, the latter for one adult male and one adult female in each household. Dutta et al. (2014, Chapter 3) contains a fuller description of the survey design. In this paper, we only report results for the first round of the Bihar survey, which is designed to be representative of rural Bihar. However, we did all our analysis for the second round as well and all qualitative findings reported for Round 1 were found to be robust.

The Bihar Survey contains similar variables to the NSS but provides more detail on participation and other variables related to NREGS.[13] Importantly, the Bihar survey includes self-reported estimates of expected forgone work and earnings for NREGS participants. These are answers to the questions: *"If you were doing some other work instead of this during these days, how many days do you think you would have worked?"* and *"If you were doing some other work instead of this during these days, what wage would you might have earned per day?"*.[14] The mean reported forgone earnings of NREGS participants accords quite closely with the casual wages reported by workers no in the scheme (Dutta et al., 2014, Table 5.2). There are some gender differences. For example, migration was more often reported as a forgone option for men than women. Men were also more likely to identify a non-farm employment option. Forgone earnings tended to be lower for women.[15]

The Bihar Survey also contains a block on time spent on casual work during the week ended, with total number of days and incomes for each activity. Thus we are able to estimate income gains (net of forgone earnings) from NREGS in Bihar, and effects on poverty directly from the data. As a stylized fact, virtually the only options NREGS participants have for earning income in this setting are from casual manual work for a local landowner or on some non-agricultural activity. Most participants are landless and have lived in the villages for generations. They can be presumed to have a clear idea of their labor–earning options throughout the agricultural year, and hence can be expected to have reasonably reliable estimates of their forgone earnings. Dutta et al. (2014) discuss the reliability of this method and show that it gives results that are in agreement with other evidence on the likely forgone earnings of NREGS participants.

One of the explicit goals of MGNREGA is to provide work to poor and underemployed households. This is consistent with a long-standing characterization of rural India as having higher unemployment rates among the poor. This is confirmed by what we see in Fig. 1, which shows the link between low wage rates, unemployment and position along the per capita consumption distribution in the NSS for rural areas. We see that unemployment is more prevalent for the bottom part of the consumption distribution, which also shows lower wage rates.[16] Among working households, the lower the wage rate in the household, the more prone it is to be unemployed. Proposition 3 in the Appendix derives the implications of the existence of this correlation between underemployment and consumption for the standard theoretical analysis of the choice between workfare and welfare.

[12] Empirical contributions in the context of labor supply include Blundell et al. (1988), Apps and Savage (1989), Bargain et al. (2013) and Decoster and Haan (2015).

[13] One difference is that we do not have the split manual/non-manual work in the Bihar survey: we only know if the activity was or was not casual work. This implies higher participation rate in this type of work in the Bihar Survey (21.1% in the NSS data on rural Bihar versus 39.8% in the Bihar Survey).

[14] For further discussion see Dutta et al. (2014). The NSS does not contain these questions, which were developed for the Bihar survey.

[15] For details and further discussion see Dutta at al. (2014, Chapter 5).

[16] The figure shows reported unemployment, some of which may be voluntary. We expect that some of the unemployment observed in the upper part of the consumption distribution is voluntary. If so then the relationship between involuntary unemployment and consumption per capita would be even steeper.

Table 1
Summary statistics for consumption (C), labor supply (L) and wage rate (W).

	NSS			Bihar Survey		
	C_i	L_i	W_i	C_i	L_i	W_i
mean	236	2.4	95	171	1.1	76
s.d.	205	1.5	48	100	0.8	38
N	59,129	13,793	13,793	3000	1201	1194
min	9	0.1	8	13	0.1	1
$y(25)$	143	1.3	67	109	0.6	60
$y(50)$	193	2.0	87	149	0.9	70
$y(75)$	267	3.2	110	202	1.3	100
max	14,738	7.0	2000	2376	7.0	890

Note: W is in rupees per day, calculated as the total wages received for casual manual work divided by the total number of days of such work provide by the household; C is in rupees per person per week, calculated as total household consumption per week divided by the number of people in the household; L is in days per capita, calculated as total number of days of casual manual work divided by household size. Statistics for L and W are reported for households with at least one member doing casual work in the week ended. $y(p)$ denotes the value of each variable at the p'th percentile.

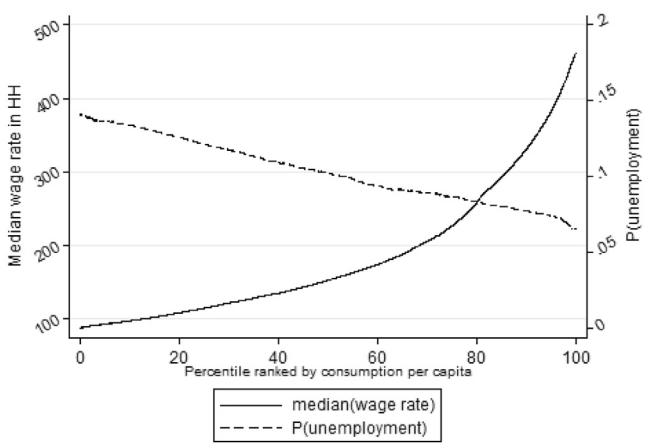

Fig. 1. Wage rates, unemployment and consumption per capita in rural India 2010. Note: P(unemployment) is an estimate of $\mathbb{P}(unemployment|F_C(C))$ the conditional probability to have at least one adult household's member reporting at least one half day of unemployment in the week ended in the NSS. Wages in Rupees per day. Source: Authors' calculations from the National Sample Survey for 2009/10.

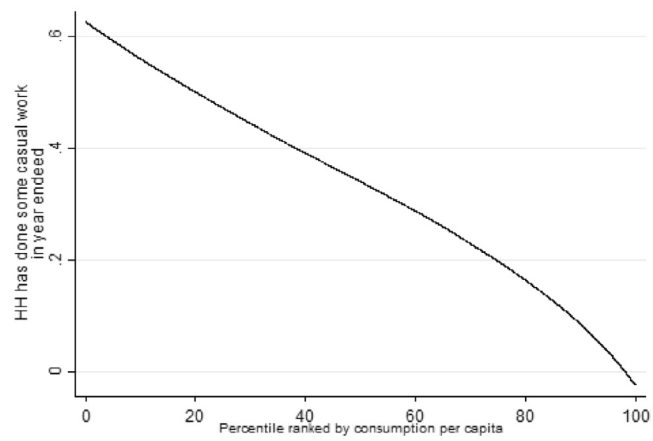

Fig. 2. Participation rate in casual manual work as a function of household consumption per capita in rural India using NSS. Note: This curve is an estimate of $\mathbb{P}(somecasualmanualwork|F_C(C))$, the conditional probability to have at least one household's member reporting casual manual work as principal activity in the NSS. The curve's fit allows for district, quarters and years fixed effects.

We focus on the disutility of casual manual labor. There are other types of unpleasant work in this setting, but we want to define a welfare measure consistent with the motivation of MGNREGA, which aims to provide casual manual work on demand. While in more developed economies formal sector work can provide job satisfaction, this is not plausible in this setting; the overwhelming direct welfare effect is negative—to be balanced against the positive value of the gain in earnings. We comment on the likely direction of bias in our main results if the evaluation allows for other (non-casual, non-manual) work entailing a welfare loss.

The literature on poverty in India has also emphasized the link with casual manual labor and the real wage rate for that work.[17] This is seen to be mainly driven by the strong correlation between rural landlessness and poverty, such that the rural poor are more likely to depend on agricultural labor. This is illustrated by Fig. 2, which gives the non-parametric regression function of the participation rate in casual manual labor in rural India against the percentile of household consumption per person; the regression allows for state effects.[18] We see a marked decline in the average participation rate from almost 50% for the poorest percentile to zero for the richest. This presumably reflects both the disutility of casual manual work and the availability of better options for richer households in the form of regular, non-manual, work, which is more pleasant and better-paid.

3. Methods

We assume that regular non-manual work dominates in both its remuneration and enjoyment, such that the worker will do as much of that work as available (given her skills, experience and constraints on the casual manual labor market) before contemplating any casual manual labor. We acknowledge that this is a strong assumption in the abstract, but we believe it is plausible and appropriate in this context. As a stylized fact, casual manual workers in rural India do not have the option of accessing non-manual regular jobs. Support for this can be found in the survey findings for the state of Bihar in Dutta et al. (2014). Their survey asked NREGS participants what they think they would have been doing if not for the work they obtained on the scheme. Amongst male respondents, 45% said they expect they would have been doing casual work (farm or non-farm), and about the same proportion said they would be unemployed, searching for work. The rest said they would be working on their own land or in their home. Women expected to get less casual work and were more likely to be working at home. Strikingly, none of the (male or female) survey respondents identified non-manual regular employment as an

[17] See, for example, Bardhan (1984), van de Walle (1985), Datt and Ravallion (1998), Deaton and Drèze (2002).

[18] The estimation used the partial linear regression routine, PLREG, in Stata (Lokshin, 2006). The district, quarters and years effects entered as additive dummy variables (see note in Fig. 2).

option. Of course, NREGS workers are a selected sample. However, Dutta et al. (2014) find almost no observable differences between NREGS workers and other casual laborers. The reality on the ground appears to satisfy an even stronger assumption than we require here, namely that the labor market is segmented, with all those having access to a regular non-manual job doing that job, and doing no casual manual labor, while the rest do as much casual work as they can find.

A tradition in labor economics assumes that people are free to choose their labor supply and that the policy goal is solely utility-based. By this approach one assumes that casual labor supply maximizes subjective utility and one finds preference parameters econometrically that are consistent with that assumption. Welfare measures are then derived subject to certain identifying assumptions.[19] We question the relevance of this approach to the setting at hand. Consistently with the presumption that there is widespread underemployment, our measure does not assume that workers are free to work as little or as much as they prefer. Nor do we assume that the welfare metric used by the policy maker/evaluator coincides with whatever people maximize.

To our knowledge, it is rare for any impact evaluation to claim that the outcome variable used for assessing impact coincides with the utility function maximized by participants. Rather, it is the norm to impose a non-welfarist objective. While we do not take issue with that approach here, we do question whether it is consistent to advocate a program as being effective because it targets poor households by imposing forgone income and welfare losses on them (though not so much that they cease to participate) while ignoring those losses when we come to assess the program.

Non-welfarist work penalty: Consider the following standard static model of a household's casual labor supply choice. Preferences over consumption and leisure are represented by a utility function $U(C_i, T - L_i)$ where consumption is C_i and leisure $T - L_i$ where T is total available time (constant for all i) and the amount of casual manual labor is L_i, these three variables being defined per capita. The function U is strictly increasing and quasi-concave in both arguments. The casual wage rate is denoted W, and is treated as a constant across workers, and income from all other sources (formal sector earnings and profits from own enterprises, including farming) is denoted π_i, which varies. There is a maximum amount of casual work available, denoted L^{max}. So the problem is to maximize $U(C_i, T - L_i)$ subject to $C_i = WL_i + \pi_i$ and $L_i \leq L^{max}$. In the regime in which the constraint on the available work is not binding, maximum utility is $V(\pi_i,\ W,\ T)$. When the work constraint is binding it instead takes the form $U(WL^{max} + \pi_i,\ T - L^{max})$. In either case, it is evident that unearned income, π_i, is a valid money metric of utility, meaning that it is a strictly increasing and interpersonally constant function of the maximum attainable utility. One can extend this approach to allow the casual wage rate and the maximum available time and work to vary across workers, and to allow for heterogeneous preferences. For example, in the unrationed case (L^{max} not binding) one solves $V\left(\pi_i^*,\ W,\ \bar{T},\ \bar{x}\right) = V(\pi_i,\ W_i,\ T_i,\ x_i)$ for π_i^* where $\bar{W},\ \bar{T},\ \bar{x}$ denote fixed reference values and x_i is a vector of characteristics that shift the utility function.[20]

In this framework, the "fully welfarist" policy assessment can focus solely on income from other sources, besides casual labor. More generally, we can imagine that the government also puts a value on work independently of the worker's utility. We assume that the evaluator (or policy maker) judges that casual labor is welfare diminishing at given consumption level but that, nonetheless, the typical casual worker is deemed to be better off with extra work if she chooses to do it (households are free to participate or not). This is defensible in this context, for it would be hard to imagine why a policy such as MGNREGA would exist at all if the work provided was not deemed to increase welfare, even if not by as much as the increment to consumption alone would indicate. This simply tells us that if the government in this setting internalizes the welfare loss implied by the type of work required, then it cannot consistently do it at a rate exceeding the typical wage rate paid for casual manual work.

Motivated by these observations, we propose the following welfare metric for assessing the policy, which we call "adjusted consumption":

$$C_i^A = C_i - \omega L_i = \pi_i + (W - \omega)L_i \tag{1}$$

Here ω is the government's preference parameter for casual work. The formulation in (1) encompasses the "fully welfarist" and "fully non-welfarist" welfare metrics as special cases. Notice that if the work constraint is not binding and the free parameter of the government's welfare metric ω is equal to the wage rate then the government is being fully welfarist in that it assesses welfare solely according to π_i, an exact money-metric of utility. However, if the government sets ω to zero then it is using a non-welfarist criterion of total consumption in assessing the welfare of workers on the program. This is the assumption often made in past literature on workfare in developing countries, as noted in the Introduction.

As long as the government attaches a positive (or at least non-negative) value to work independently of the worker's money-metric utility the value of ω is bounded above by the wage rate W. And as long as the government accepts that there is a welfare loss from work (consistently with its rationale for the program) the value of ω is bounded below by zero and so the government's adjusted consumption is less than actual consumption whenever casual work is done (recalling that $\pi_i = C_i - WL_i$).

We thus have a simple and intuitive functional form that delivers an empirically tractable non-welfarist metric allowing for a welfare loss from casual work. Importantly, our measure can be implemented with the same data used by the received method on this setting in which welfare is solely measured by consumption. Eq. (1) is not, of course, the only way one might adjust the welfare measure for the welfare loss deemed to be associated with doing casual manual work. As noted, more complex functional forms could allow for other sources of heterogeneity in welfare. Here we adopt a simple generalization of the standard consumption-based approach to allow for both the disutility of work and the government's value attached to work.

The implications of this adjustment for measures of poverty are ambiguous in theory, and will depend on the data, notably how L_i varies with C_i. It is instructive to consider one special case, namely when L_i is decreasing in C_i, as suggested by Fig. 1. Measured consumption is adjusted downwards for the poorest with a higher magnitude than for the richest. There will not be first-order dominance, but all standard poverty measures will increase for poverty lines up to the mean. Just how much the poverty measures are affected is (of course) an empirical issue and depends on the particular functional form used by the evaluator.

The implications for a workfare scheme's impact on poverty are also ambiguous in theory. As discussed in the Introduction, we expect our adjustment for the disutility of casual manual work to reveal better targeting to poor people who are more likely to do this type of work, as provided by NREGS. Against this, the effect on the welfare gains to participants of allowing for the welfare loss from the work provided will go in the opposite direction.

[19] For a useful overview of this approach see Blundell et al. (2007). For an example in this context see Imbert and Papp (2015).

[20] This is an instance of the "rent criterion" for monetary welfare measurement discussed by Fleurbaey (2008).

Assessing welfare change: There are two aspects of performance to consider. The first is targeting performance. Here we analyze the relationship between the participation rates in NREGS and the position along the distribution of consumption per capita. Using the two different welfare measurements, C_i and C_i^A, we estimate p and p^A defined as non-parametric regression functions between the participation rate (*PR*) and the position along the distribution of these two measurements:[21]

$$PR(x_i) = p(F_C(x_i)) + \varepsilon_i \quad (2)$$

and similarly for the adjusted consumption, for which the non-parametric function is denoted p^A. Thus $PR(x)$ is the participation rate observed for a given level of consumption x and $F_C(.)$ is the cumulative distribution function (CDF) of consumption. p and p^A are smooth non-parametric functions to be determined empirically.[22] If the program is indeed better targeted in terms of adjusted consumption C^A then we should observe that the function p^A has a lower gradient than p.

Second, we study the impact of our adjustment on the gains from the scheme. For this purpose we use household-specific estimates of forgone income for men and women from the Bihar Survey (as discussed in Section 2). The *post-NREGS* distribution of consumption is that observed in the data. Without the adjustment for the welfare loss from manual labor, the *pre-NREGS* distribution is derived from the post-NREGS distribution simply by subtracting the net gains from the scheme, as given by gross wages less the imputed forgone income as reported by the household.[23] The gain from the scheme is then defined as (in obvious notation) $G_i = C_i^1 - C_i^0$. The calculation is more complicated for the adjusted consumption, for which the gain is $G_i^A = C_i^{A1} - C_i^{A0}$ where $C_i^{Aj} = C_i^j - \omega L_i^j$ (j = 1, 0). We then analyze the relationship between the net gains and the position along the consumption distribution, both original and adjusted, following a similar non-parametric approach described above for participation.

In aggregating these gains we use the popular headcount index (H), given by the proportion of the population living in households with mean consumption below the poverty line. However, it is of interest to also look at two "higher-order" measures, for which we use the poverty gap (PG) index, to also reflect the depth of poverty, and the squared poverty gap (SPG) index, which penalizes inequality amongst the poor, and can thus be interpreted as reflecting the severity of poverty.[24]

Costs effectiveness: In assessing NREGS we consider the poverty reduction from a counterfactual program in which the government's outlay on NREGS wages is used instead to provide a uniform lump-sum transfer to all, whether poor or not, i.e., a basic income guarantee (BIG). We do this with and without internalizing any welfare loss from participating, which makes sense considering the high observed unemployment rates among the poor.

In practice, we calculate H for pre- and post-adjusted and unadjusted consumption per capita, which gives the effect of NREGS on poverty as directly observed from the data. We then evaluate what would be the poverty reduction achieved by a welfare program with the same cost, i.e., we give to all households an equal share of the observed government's outlay on the top of their consumption in the absence of the scheme. We then re-calculate the poverty measures with this counterfactual consumption C_i.

Note that this comparison does not take account of any other benefits to the poor from MGNREGA, though it does allow the government to attach a value to the work done (recalling that $\omega \geq 0$). Few casual observers of the scheme have noted likely benefits to poor people from the assets created, although this is not emphasized as a goal of the scheme and benefits to the non-poor appear to be somewhat more common.[25] It has also been argued by the scheme's advocates that it's demand-driven nature helps empower workers, which may well have benefits in other respects. There may also be other (indirect) benefits of a BIG.

4. Results

We first consider the effects of the adjustment for the welfare loss from casual manual work on measures of poverty based on the post-NREGS distributions.[26] Table 2 summarizes the joint distribution of C_i and C_i^A. We consider values of ω up to 1.5 times the median wage rate observed in the Bihar survey, namely 70 rupees per day per capita. Given that there is a higher incidence of casual manual work in the poorer segments of the population, it is to be expected that the lower part of the distribution is impacted more by the consumption adjustment. Our adjustment for the welfare loss from work has an impact on measured poverty. Fig. 3 gives the cumulative distribution function.[27] As is evident in Fig. 3, we do not have first-order dominance, so the ranking in terms of any standard measure of poverty will depend on the precise measure used and the poverty line (Atkinson, 1987). Poverty measures are higher under our adjustment for the welfare loss from work up to about the 40th percentile.

Turning next to assessments of targeting performance, we estimate p^A and p for the NSS data (rural households only) using $\omega = 70$. The result is found in Fig. 4 (top). For both $p^A$and$p$ the participation rate decreases as consumption rises. Using the original consumption (without our adjustment) we see that participation rates are lower than average for roughly the richest 50%, but we see no clear sign of better targeting within the poorer half of the distribution ($p(F_{C_i}(x))$ is quite flat for $F_{C_i}(x) \in [1, 50]$). However, after adjusting for the welfare loss from work, we see much better targeting performance among the poor, particularly for$F_{C_i^A}(x) \in [10, 40]$. Except when the two curves cross (around the median, i.e. $x = 50$) and for the richest quintile, 95% pointwise confidence bands do not overlap.

We test for robustness with respect to the choice of the government's parameter ω. For this purpose, we repeat the analysis using several values for ω (Fig. 5). We test with $\omega = 35$ and 105, respectively half of the median and 1.5 times the median.[28] We observe an improvement of measured targeting performance when increasing the rate at which welfare from casual manual loss is internalized.

Redoing the same estimation on the Bihar Survey, we find that $p(x)$ is flatter than $p^A(x)$ for the poorer half of the distribution

[21] We used the method of cubic spline smoothing. For Fig. 1 and Fig. 7 we use a running-line least-squares smoother. When applying these methods, we use an arbitrary smoothing parameter to obtain a sufficiently smooth regression function.

[22] Alternatively we can focus directly on the relationship between *PR* and x (rather than $F(x)$). However, using $F(x)$ for the horizontal axis assures an even spread of data points, giving an incidence graph that is less prone to outliers.

[23] See Dutta et al. (2014) and Murgai et al. (2016) for further discussion of the data on foregone earnings and their validity and robustness, including potential biases. For example, it might be argued that, to the extent that they perceive that the scheme is intended for unemployed workers, respondents may be drawn to understate foregone earnings. We cannot rule this out, but we do not think it likely given that the rules of the scheme do not require that participants be unemployed. Anyone who wants the work is supposed to get it.

[24] All three measures are members of the Foster-Greer-Thorbecke (1984) class of additive measures.

[25] This point is discussed further in Dutta et al. (2014).

[26] Recall that we can only measure the net gains due to the program using the specially-designed World Bank Bihar survey. Thus we can only derive pre-NREGS consumptions for that dataset.

[27] Here and elsewhere we use household weights (expansion factors) to assure that the sample-based calculations are representative of the population in the base year.

[28] These values of ω are in the range of the welfarist estimate derived by Imbert and Papp (2015).

Table 2
Distribution across quintiles before and after adjustment (%, $\omega = 70$) NSS all rural India.

NSS all rural India

		C_i					
Quintiles		1	2	3	4	5	Total
	1	8.4	5.1	3.5	2.4	0.6	20.0
	2	11.6	3.1	3.0	1.7	0.7	20.0
C_i^A	3	0.0	11.8	6.6	1.2	0.5	20.0
	4	0.0	0.0	7.0	12.2	0.9	20.0
	5	0.0	0.0	0.0	2.7	17.3	20.0
	Total	19.9	20.0	20.0	20.0	20.1	100.0

World Bank Bihar survey

		C_i					
Quintiles		1	2	3	4	5	Total
	1	11.0	4.6	2.2	1.9	0.5	20.2
	2	9.1	5.5	3.4	1.6	0.3	19.9
C_i^A	3	0.0	9.9	7.6	2.2	0.4	20.0
	4	0.0	0.0	6.9	11.9	1.2	20.0
	5	0.0	0.0	0.0	2.4	17.6	20.0
	Total	20.0	20.0	20.0	20.0	20.0	100.0

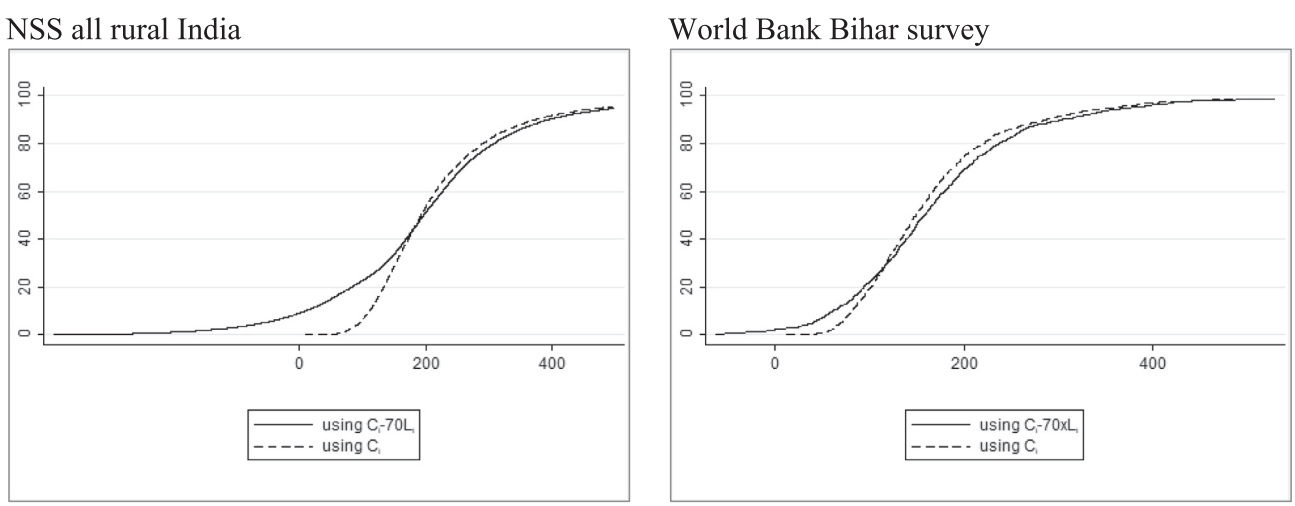

Fig. 3. Cumulative Distribution Functions, Note: As explained in the main text the two welfare measures used here are not level comparable. For the purpose of this graph we normalize C_i^A such that it has same mean as C_i and we comment in the text on the curvature of these CDFs.

(Figure 4). In the Bihar Survey, the adjusted version shows good targeting performance on the entire wealth distribution with $\frac{\partial p^A(F_{C_i^A}(x))}{\partial x} < 0, \forall F_{C_i^A}(x) \in [1, 100]$.[29] We see better targeting performance when using C_i^A instead of C_i, with less impact of the adjustment among the richest 30%.

It will be recalled that the above calculations only adjust for the welfare loss from casual manual wage labor. As noted in the introduction, this is a type of work in this setting that is likely to be regarded by the policy maker as yielding disutility—far more so than self-employment on one's own farm or regular salaried work. But that is an assumption on our part. If in fact these other forms of work are also seen as yielding disutility then we expect that the corrected targeting performance will not be as pro-poor as we report above, using only our adjustment for the welfare loss from casual manual wage work. Given that we will show that the improvement in measured targeting performance is not great enough to outweigh the reduced benefits of participation in NREGS when we allow for the welfare loss from the work provided, our main qualitative conclusion concerning the poverty impacts will remain valid.

Using the Bihar survey we can also study the distribution of the net gains from the scheme along the distribution of C_i^A andC_i. Fig. 6 shows the mean net gains against pre-NREGS consumption, with and without our adjustments, for various values of ω. We see that

[29] This result is qualified when checking for robustness with respect to the choice of ω as in Fig. 6.

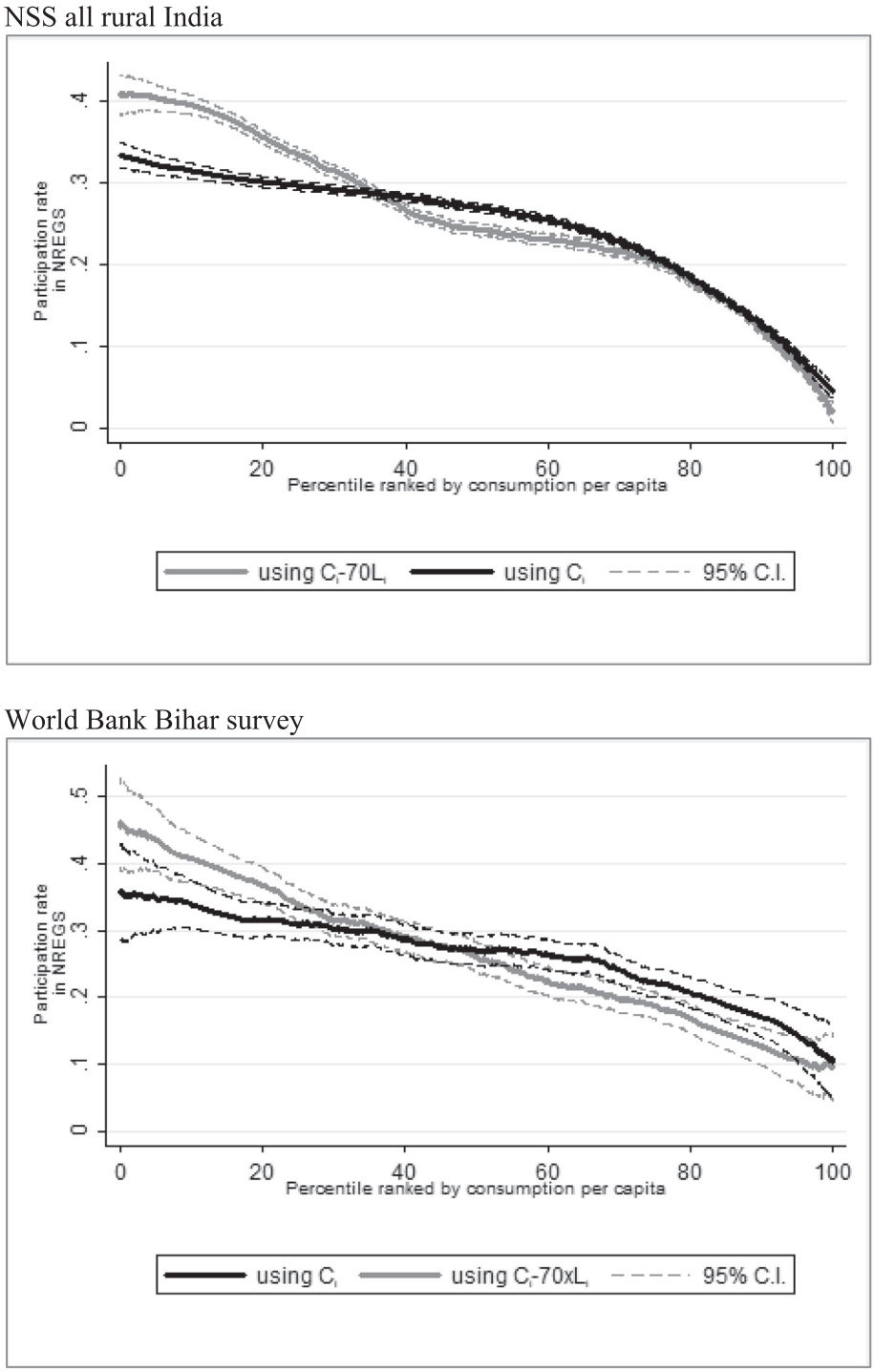

Fig. 4. NREGS participation rates. Note: non-parametric regression function, estimates based on cubic splines.

the net gains from the scheme are highest for the poorest using unadjusted consumption, but the impacts are attenuated when we adjust for the welfare loss from the work provided by the scheme. This is mechanically implied by the fact that poor participants are more prone to be unemployed would they not be participating.

Table 3 gives the impacts of NREGS earnings on poverty for both the population as a whole and for the sub-sample of NREGS participants for $\omega = 35, 70, 105$. We give results using a poverty line set at the median of the post-NREGS distribution of adjusted consumption in the absence of the scheme. Notice that we now compare H for C_i^{A1} and C_i^{A0} which are level comparable for a given ω. We see that the poverty measures (both post-NREGS and pre-NREGS) are generally higher with our adjustment for the welfare loss from casual manual labor. The impact estimates for the H and PG (post-NREGS less pre-NREGS) are found to be lower for both poverty measures after adjusting for the welfare loss from labor.[30] For the SPG index the internalization seems to improve the impact measured.

[30] Notice also that the impact on the income-gap ratio—namely the mean distance of the poor below the line, as a percentage of the line (i.e., the ratio of the PG index to the headcount index)—is also lower with our adjustment.

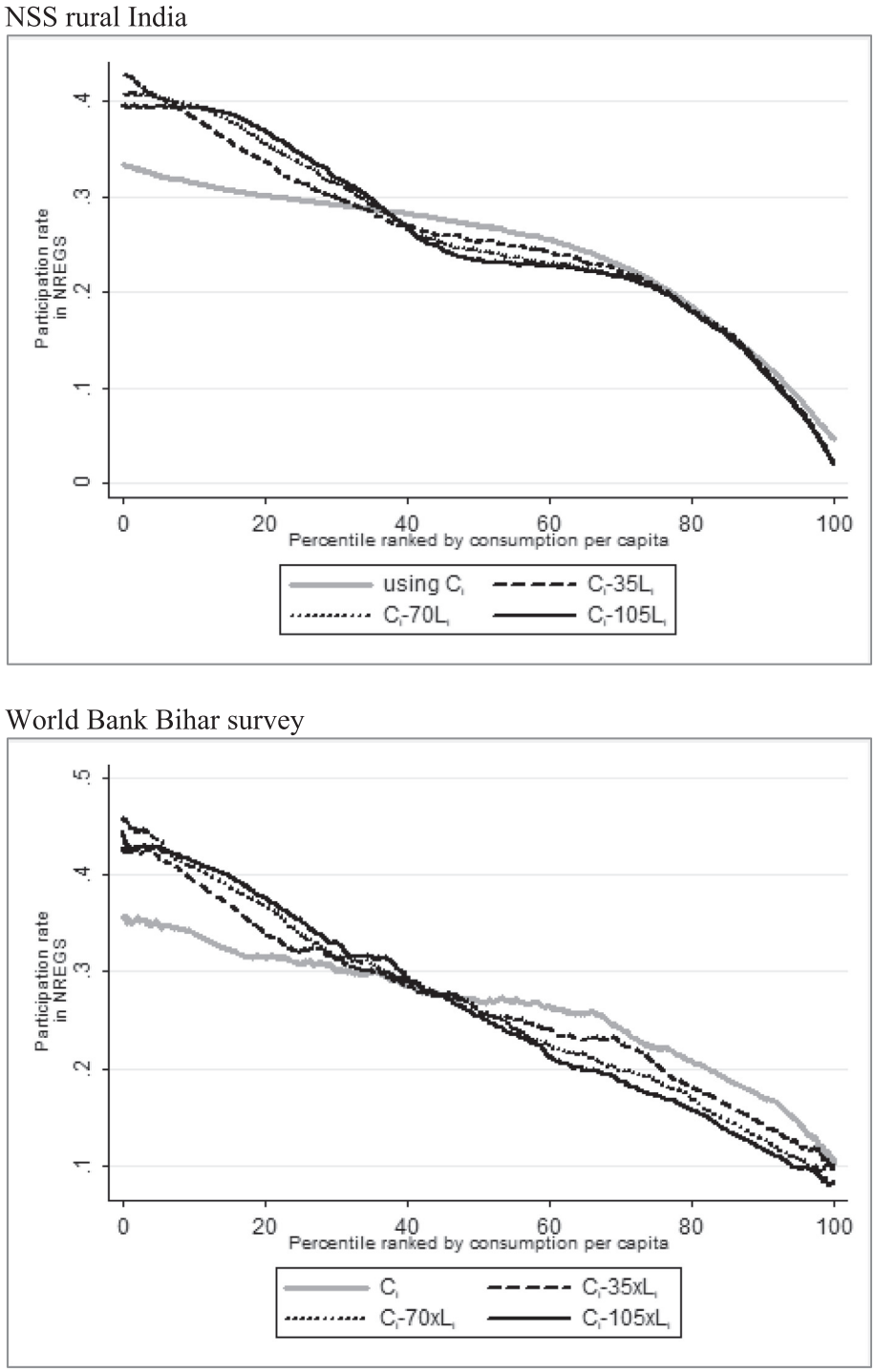

Fig. 5. NREGS participation rates for alternative parameter values. Note: non-parametric regression function, estimates based on cubic splines.

In simulating the counterfactual BIG the question arises as to how much leakage there might be, where leakage is defined as the share of the budget outlay that does not reach the intended recipients. This could be due to administrative costs (though these will probably be low for a large national scheme) or some form of corruption. Murgai et al. (2016) assume that a cash transfer scheme would have no greater leakage rate than NREGS, and (for Bihar) they calculate that 20% of the public expenditure declared in the official data did not reach rural households (based on the same Bihar survey we have used). On testing various leakage rates we found that BIG had greater impact on the poverty rate for anything up to about 40% leakage on the BIG scheme. A leakage rate of 40% also corresponds closely to the non-labor share of the budget cost of NREGS. Table 4 gives the poverty impacts of the welfare scheme providing an untargeted transfer to all, in amount determined by the outlays on wages under the scheme as observed in our data. We sum all reported NREGS wages and share the total among all households adding it to their consumption per capita in the absence of the scheme. Recall that this counterfactual BIG can be seen as a conservative one because it assumes substantial leakage equivalent to the non-wages costs of the scheme. Comparing Tables 3 and 4 we

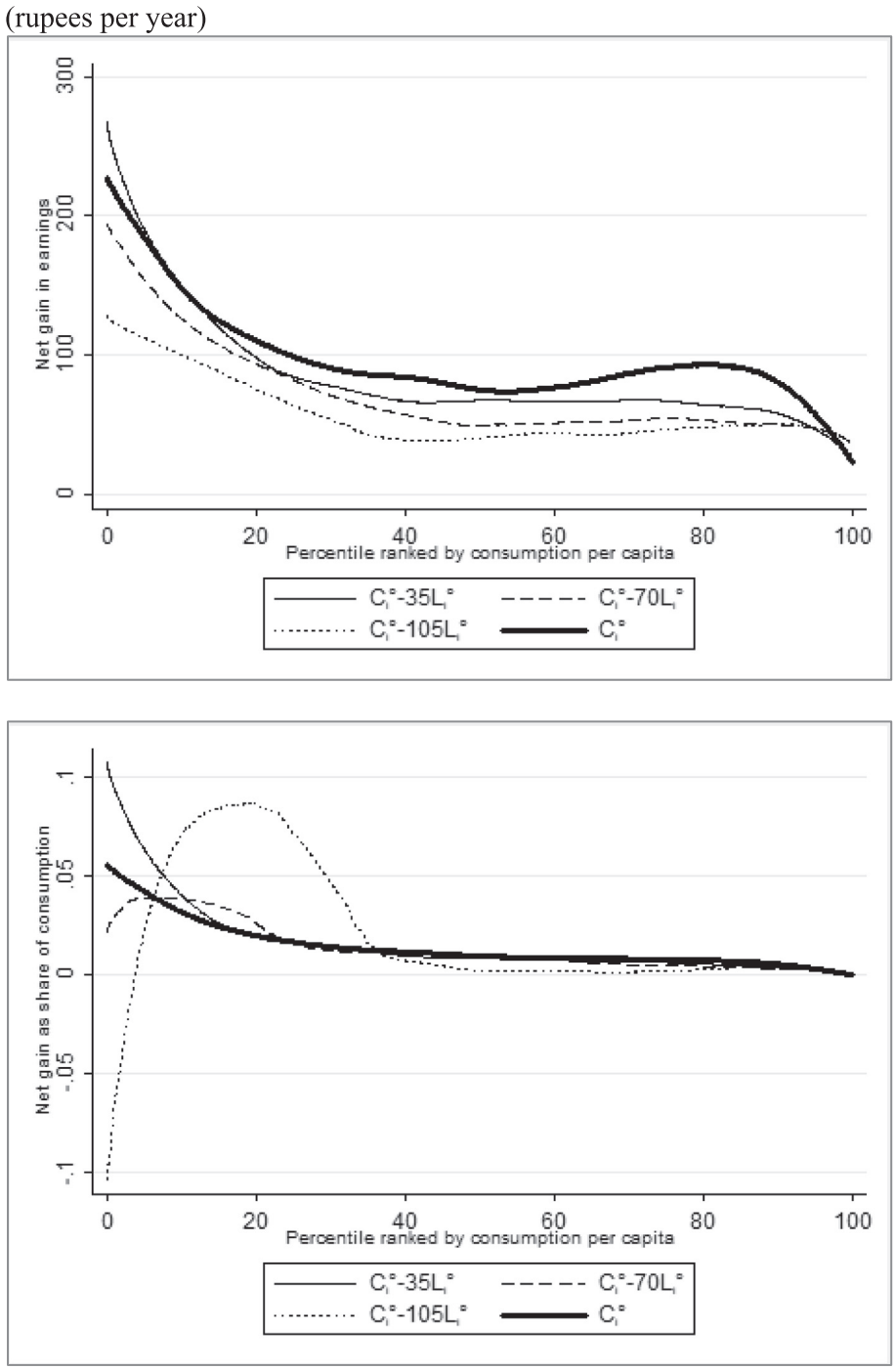

Fig. 6. Net gains from NREGS using World Bank Bihar Survey.

see that for $\omega = 0$ the poverty impacts are very similar. In this setting, workfare and untargeted welfare programs are equally cost-effective if the evaluator does not internalize participants' net effort. However, at higher values of ω we see that the welfare scheme dominates the workfare scheme, as predicted by our theoretical model. Fig. 7 gives results for various values of ω and a wide range of poverty lines. We find that an untargeted basic income dominates for almost all lines. One of the few exceptions is for $\omega = 0$ at the poverty line used in Table 3. Plausibly lower leakage rates than 40% would make BIG even more cost effective than workfare.

5. Conclusions

Workfare schemes in poor countries typically, and deliberately, offer unpleasant work. In the case of India's National Rural Employment Guarantee Scheme the work provided is monotonous manual labor, toiling for long hours in the open sun. Nobody is likely to enjoy this work, and that is undoubtedly part of the reason that relatively well-off people appear to only rarely turn up to do the work offered, in addition to their probably higher opportunity costs on the private labor market. Yet, while the disutility of work is an old idea in economics, and the "self-targeting" mechanism is a

Table 3
Impacts of NREGS on poverty in Bihar with and without the adjustment for a welfare loss from casual manual work.

			$\omega = 0$	$\omega = 35$	$\omega = 70$	$\omega = 105$
Population as a whole	H	C_i^0-ωL_i^0	50	49.9	50	50
		C_i^1-ωL_i^1	48.5	49.2	49.6	49.6
		Impact	**1.5**	**0.7**	**0.4**	**0.4**
	PG	C_i^0-ωL_i^0	13.7	16.5	23.6	32.1
		C_i^1-ωL_i^1	13.2	16	23.1	31.7
		Impact	**0.5**	**0.5**	**0.5**	**0.4**
	SPG	C_i^0-ωL_i^0	5.3	8	17.4	35.5
		C_i^1-ωL_i^1	5	7.6	17	35
		Impact	**0.3**	**0.4**	**0.4**	**0.5**
NREGS participants	H	C_i^0-ωL_i^0	50	49.9	50	50
		C_i^1-ωL_i^1	54	59.5	65.4	66.7
		Impact	**6.1**	**2.9**	**1.9**	**1.4**
	PG	C_i^0-ωL_i^0	18.5	23.3	33.2	44.9
		C_i^1-ωL_i^1	16.4	21.1	31.1	43.1
		Impact	**2.1**	**2.2**	**2.1**	**1.8**
	SPG	C_i^0-ωL_i^0	7.7	11.7	23.7	45.3
		C_i^1-ωL_i^1	6.5	10.2	21.7	43.3
		Impact	**1.2**	**1.5**	**2**	**2**

Note: The poverty lines are the adjusted medians for (adjusted) pre-NREGS distributions for the population as a whole ($Q_{50}(C_i^0\text{-}\omega L_i^0)$). H = headcount index, PG = poverty gap index, SPG = squared poverty gap index.

Table 4
Impact on poverty of a welfare scheme providing an untargeted basic income with the same total transfer as the wage bill under NREGS.

			$\omega = 0$	$\omega = 35$	$\omega = 70$	$\omega = 105$
Population as a whole	H	C_i^0-ωL_i^0	50	49.9	50	50
		C_i	48.5	48.2	48.8	48.5
		Impact	**1.5**	**1.7**	**1.2**	**1.5**
	PG	C_i^0-ωL_i^0	13.7	16.5	23.6	32.1
		C_i	12.9	15.6	22.7	31.1
		Impact	**0.8**	**0.9**	**0.9**	**1**
	SPG	C_i^0-ωL_i^0	5.3	8	17.4	35.5
		C_i	4.9	7.4	16.5	34.2
		Impact	**0.4**	**0.6**	**0.9**	**1.3**
NREGS participants	H	C_i^0-ωL_i^0	60.1	62.4	67.3	68.1
		C_i	59.2	60.1	66.6	67.2
		Impact	**0.9**	**2.3**	**0.7**	**0.9**
	PG	C_i^0-ωL_i^0	18.5	23.3	33.2	44.9
		C_i	17.5	22.1	31.9	43.5
		Impact	**1.0**	**1.2**	**1.3**	**1.4**
	SPG	C_i^0-ωL_i^0	7.7	11.7	23.7	45.3
		C_i	7.1	10.9	22.4	43.4
		Impact	**0.6**	**0.8**	**1.3**	**1.9**

Note: The poverty lines are the adjusted medians for (adjusted) pre-NREGS distributions for the population as a whole ($Q_{50}(C_i^0\text{-}\omega L_i^0)$). H = headcount index, PG = poverty gap index, SPG = squared poverty gap index.

key aspect of the rationale for such schemes, the fact that the type of work is unpleasant for participants has been generally ignored in past assessments of the impact of workfare schemes in developing countries. Nor has it been included in the theoretical models that underpin the evaluations of such programs relative to a welfare program using cash transfers. This is a troubling inconsistency.

We have demonstrated that removing this inconsistency has bearing on the case for using workfare relative to policy alternatives. We have assessed empirically how much removing this inconsistency matters to the evaluation of the poverty reduction from of a major workfare scheme in India. In principle the outcome could go either way. On the one hand, targeting performance will probably improve, but on the other hand the welfare gains to poor people will be lower. To test the sensitivity of past assessments of the cost-effectiveness of India's workfare program we have adjusted measured household consumption allowing for some welfare loss from casual manual labor. This is a simple non-welfarist metric consistent with the particular goal of the scheme, as expressed in the scheme's legislation.

The proposed adjustment affects the assessment of targeting performance. Whereas the choice between the unadjusted consumption and our adjusted version does not make a significant difference among the 30% richest, the assessed targeting performance improves appreciably among the poorest half when we allow for a welfare loss from doing casual manual work. However, allowing for a welfare loss also devalues the benefits to participants who are often underemployed in the absence of the scheme. Using survey data for Bihar, we find that this effect dominates the gains from

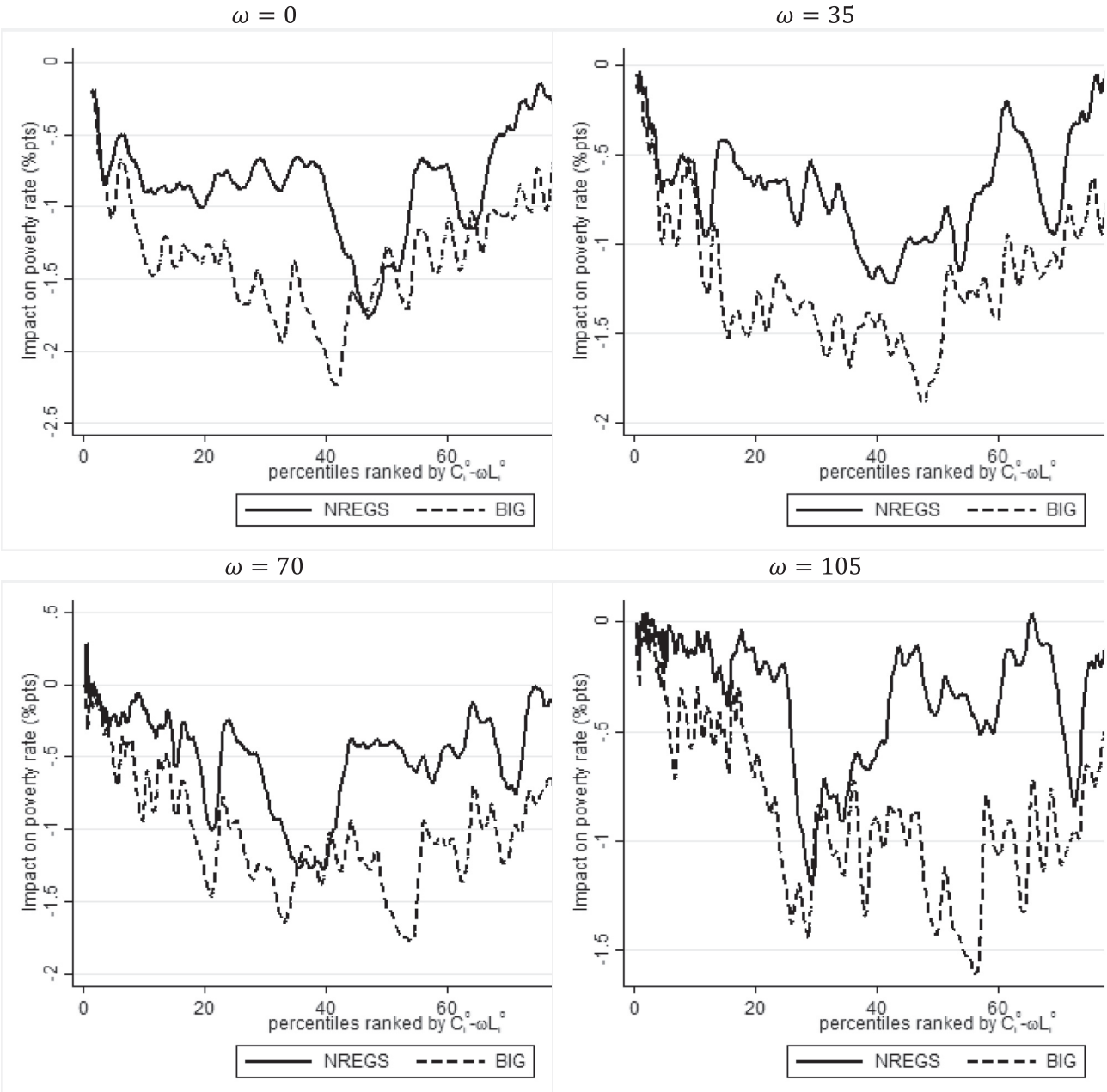

Fig. 7. Impact of NREGS and a simulated BIG on poverty rates in Bihar at any percentiles ranked by welfare measure in the absence of the scheme.

better targeting performance implied by allowing for the welfare loss from the type of work done. The scheme reaches even poorer people, but it does less to raise their welfare because participating requires extra effort.

In the standard evaluation method in which the evaluator ignores any welfare loss from the type of work offered, the wage earnings from the scheme have about the same impact on poverty as an untargeted basic income guarantee in which everyone receives the same amount whether poor or not. This changes if the evaluator internalizes some welfare losses associated with the type of work offered. Then, even an untargeted basic income clearly dominates workfare. MGNREGA would need to generate sizable indirect benefits to participating workers through the assets created or the empowerment benefits before it dominates an untargeted cash transfer scheme when everyone involved, including the evaluator, agrees that the work is unpleasant.

6. Disclosure

None.

Appendix. A Generalized Besley-Coate model

We generalize the Besley-Coate (BC) model (Besley and Coate, 1992) to derive the theoretical implications of an internalization of the welfare loss from work requirements, allowing for involuntary unemployment negatively correlated with consumption. We focus on the screening argument, which is consistent with the primary goal of workfare programs in targeting direct transfers to poor people.

There is a continuous type of Nagents characterized by their wage rate $\alpha_i \in [\underline{\alpha}, \bar{\alpha}]$ with cumulative distribution function F_α. A

program is defined by a set of contracts (B, PW) where B and PW are the benefit level and the public-work requirement, which are constant over participants.[31] Let $l^1(B, PW, \alpha_i)$ and $l^0(\alpha_i)$denote private labor supply in the presence of the workfare scheme and in its absence respectively. The absence of involuntary unemployment on the private labor market calls for:

$$l^1(B, PW, \alpha_i)_{\alpha_i \in [\underline{\alpha}, \alpha^-]} = \begin{cases} l^0(\alpha_i) - PW & \text{if } PW < l^0(\alpha_i) \\ 0 & \text{otherwise} \end{cases} \tag{A1}$$

This is equivalent to $l^1 + PW^* = l^0 = l^*$ where l^* is the optimal labor supply of an unrationed household on the private labor market. For now, we assume that Eq. (A1) holds, but we relax this later. Earnings on the private sector are given by:

$$y(PW, \alpha_i)_{\alpha_i \in [\underline{\alpha}, \alpha^-]} = \begin{cases} \alpha_i(l^0(\alpha_i) - PW) & \text{if } PW < l^0(\alpha_i) \\ 0 & \text{otherwise} \end{cases} \tag{A2}$$

Notice that, as in BC, any income effect from the benefit B is turned off. Utilities are linear in income and with a disutility of work given by a function $h(.)$:

$$v(B, PW, \alpha_i)_{\alpha_i \in [\underline{\alpha}, \alpha^-]} = B + y(PW, \alpha_i) - h(l^1(B, PW, \alpha_i) + PW) \tag{A3}$$

For now the function $h(.)$ is increasing, strictly convex and such that l^0 is not a corner solution in the household's optimal choice of its labor supply, i.e. $h'(0) = 0$ and $h'\left(\bar{l}\right) > \bar{\alpha}$ where $\bar{l}$ is the maximum hours a household can supply given physical and market constraints.[32] This implies the absence of involuntary unemployment in Eq. (A1). A person takes up the program on a contract (B, PW) if $v(B, PW, \alpha_i) \geq v(0, 0, \alpha_i)$.

Now consider the screening argument in a situation in which the evaluator cares about the welfare loss implied by the work requirement. In our set up, the government aims to bring everyone above a poverty line, z. Consistently with the literature, we assume that in the absence of the scheme low-wage workers are poor and high-wage ones are rich and that they are separated by a given poverty line z where households are characterized by wage rate α_z. However, we modify this assumption allowing the welfare loss to be internalized by the government:

$$y(0, \alpha_i) - f\left(l^0(\alpha_i)\right) < z < y(0, \alpha_j) - f\left(l^0(\alpha_j)\right), \quad \forall \alpha_i < \alpha_z < \alpha_j \tag{A4}$$

Here $f(.)$ is the paternalistic welfare loss identified by the government. Notice that for $f = h$ this problem is close to a *utility maintenance program*, as described in Besley (1995). We do not assume that the government internalizes the welfare loss caused by the work requirement in a utilitarian way. We only assume that, consistently with the underlying incentive compatibility, working more at a given consumption level reduces households' welfare in the government's view, i.e., $f'(l) > 0$. The objective of the government is to get low-wage workers above the poverty line at minimum cost:

$$B + y(PW, \alpha_i) - f\left(PW + l^1(B, PW, \alpha_i)\right) \geq z \quad \forall \alpha_i < \alpha_z \tag{A5}$$

Full information: First consider the case when the government observes wage rates and private earnings. The government faces participation and poverty alleviation constraints:

$$v(B, PW, \alpha_i) \geq v(0, 0, \alpha_i) \quad \forall \alpha_i \tag{A6.1}$$

$$B + y(PW, \alpha_i) - f\left(PW + l^1(B, PW, \alpha_i)\right) \geq z \quad \forall \alpha_i \tag{A6.2}$$

respectively. In this case, the cost minimizing program is obviously a welfare program $(PW = 0)$. Any public work requirement $(PW > 0)$ implies forgone earnings that the government would have to compensate for—against no gains from targeting. The government then offers:

$$(B_j, PW_j) = \{0, 0\} \quad \forall \alpha_j > \alpha_z \tag{A7.1}$$

$$(B_i, PW_i) = \left\{z - y(0, \alpha_i) + f\left(l^0(\alpha_i)\right), 0\right\} \quad \forall \alpha_i < \alpha_z \tag{A7.2}$$

The costs of the program is given by:

$$N \int_{\underline{\alpha}}^{\alpha_z} \left[z - y(0, \alpha_i) + f\left(l^0(\alpha_i)\right)\right] F_\alpha(\alpha_i) d\alpha_i \tag{A8}$$

This is higher than the costs derived in BC if $f\left(l^0(\alpha_L)\right) \neq 0$, otherwise it is exactly the same.

Asymmetric information: Suppose now that the government cannot observe wage rates and private earnings. In the absence of a public work requirement, high wage workers will masquerade and take up the program to receive benefits. Then the government can use a public-work requirement at a low wage-rate for screening. This targeting advantage of workfare comes at a cost, namely that the net gain to poor people is lowered by the cost of complying with the work requirement. Intuitively, workfare is more likely to be the better option when the poverty rate is lower and/or the forgone income of workfare participants is lower. Following BC, we show that a sufficient condition for workfare to be more cost-effective than welfare is that $\left(\alpha_z - \underline{\alpha}\right) > F_\alpha(\alpha_z)\alpha_z$ or $\underline{\alpha} < (1 - F_\alpha(\alpha_z))\alpha_z$.[33]

The internalization of the welfare loss does not impact this condition. Indeed, whether the government cares about the participants' welfare loss does not matter if they can supply as much work as they want to on the private labor market in the absence of the scheme. Essentially, low wage workers pay, in the form the work requirement, for being screened as poor but under the full employment assumption they would anyway spend this time working. The scheme implies no net welfare loss and the only trade-off faced by the government remains that between limiting cash transfers to high wage workers and having to compensate low wage workers for forgone incomes implied by the time spent on public work.

We can summarize the implications as follows (formal proofs and closed form solutions for all propositions of this section are available from the authors):

Proposition 1. *Under the labor-market clearing condition, whether or not the evaluator cares about the welfare loss implied by the work requirement does not alter the BC condition for the workfare program to be cost-minimizing, namely that* $\left(\alpha_z - \underline{\alpha}\right) > F_\alpha(\alpha_z)\alpha_z$. *However, internalizing part of the welfare loss increases the length of the work requirement and the transfers needed for poverty alleviation.*

The increase in work requirement may appear counterintuitive here, but the intuition is restored if one observes that the benefits increase with the length of the work requirement.

[31] Here we depart from Besley (1995) where the government can define an optimal set of contracts for each ability type. Assuming a workfare with a single contract simplifies our derivations, but more importantly it is also consistent with what NREGS offers to rural households, which is essentially a single wage rate for a day's work.

[32] This characterization is consistent with Besley (1995).

[33] See Besley (1995) for a technical discussion on whether a solution to the government's costs-minimizing program does exist depending on assumptions on the distribution of α_i's and on the shape of $h(.)$.

Introducing involuntary underemployment: We now relax the assumption that poor households can supply as much work as they want on the private labor market. Then the time spent working on public works overlaps only partly with the time the participant would spend working in the absence of the scheme. We thus modify the labor supply schedule as follows:

$$l^1(B, PW, \alpha_i)_{\alpha_i \in [\underline{\alpha}, \alpha^-]} = \begin{cases} l^0(\alpha_i) - s_i PW & \text{if } s_i PW < l^0(\alpha_i) \\ 0 & \text{otherwise} \end{cases} \quad \text{(A9)}$$

This is equivalent to $l^* \geq l^1 + PW \geq l^0$, meaning we do not assume anymore that $h'\left(\bar{l}\right) > \bar{\alpha}$. Labor supply in the absence of the scheme may now be a corner solution ($l^0 = \bar{l}$), i.e. some households would be ready to work more, but the labor demand is too low. Let s_i denote the share of the work requirement that the individual would spend working in the absence of the scheme. $s_i = 1$ means that workers supply as much work as they want in the absence of the scheme, and $s < 1$ means they are rationed on the labor market. While $s_j = 1$ can be seen as realistic for rich households, we must relax this for low wage workers. We assume instead that:[34]

$$s_k \leq s_i < 1, \quad \forall k, i, z \text{ such that } \alpha_k \leq \alpha_i < \alpha_z$$

Notice that the unemployment is involuntary: at the offered wage rate on the private market, poor households would be typically willing to supply more work. Poverty is now correlated with both low wages and involuntary unemployment.[35] Earnings from the private sector are now:

$$y(PW, \alpha_i)_{\alpha_i \in [\underline{\alpha}, \alpha^-]} = \begin{cases} \alpha_i(l^0(\alpha_i) - s_i PW) & \text{if } s_i PW < l^0(\alpha_i) \\ 0 & \text{otherwise} \end{cases} \quad \text{(A10)}$$

The poverty alleviation constraint becomes, $\forall \alpha_i$:

$$B + y(PW, \alpha_i) - f\left(PW + l^1(B, PW, \alpha_i)\right) \geq z \quad \text{(A11.1)}$$

$$B + y(PW, \alpha_i) - f\left((1 - s_i)PW + l^0(\alpha_i)\right) \geq z \quad \text{(A11.2)}$$

In the full information case, the result is unchanged. The government offers a welfare program($PW = 0$) with no transfer to high wage households and it gives to each low-wage worker:

$$z - y(0, \alpha_i) + f\left(l^0(\alpha_i)\right), \quad \forall \alpha_i < \alpha_z \quad \text{(A12)}$$

The costs are the same as before and unemployment has no bearing on the costs of the welfare program.

In the asymmetric information case, incentives are unchanged ($s_j = 1, \forall s_j \geq s_z$). If the government does not internalize the welfare loss ($f(.) = 0$) then we can summarize the modified BC conditions in the following proposition:

Proposition 2. *If the poor face higher involuntary unemployment in the absence of the scheme than the non-poor and the evaluator does not internalize the welfare loss implied by the program then the modified BC condition for the workfare program to be more cost-effective than welfare is that* $\left(\alpha_z - s\,\alpha\right) > F_\alpha(\alpha_z)\alpha_z$.

This is intuitive: if the poor do not find other work during the time spent satisfying the work requirement then the forgone earnings implied by workfare are lower than in the market clearing case, which reduces the transfers needed for poverty alleviation. Notice that the standard BC condition $\left(\alpha_z - \alpha\right) > F_\alpha(\alpha_z)\alpha_z$ remains sufficient but is more restrictive than the modified condition in Proposition 2 in that:

$$\left(\alpha_z - \alpha\right) > F_\alpha(\alpha_z)\alpha_z \Rightarrow \left(\alpha_z - s\alpha\right) > F_\alpha(\alpha_z)\alpha_z$$

The combination of unemployment and internal consistency on the part of the government's evaluation ($f(.) \neq 0$) further alters the BC conditions for workfare to be more cost effective, as in the following proposition:

Proposition 3.. *If the poor face unemployment in the absence of the scheme and the government internalizes the welfare loss implied by workfare then the modified BC sufficient condition for the workfare program to be more cost effective than welfare is that* $\left(\alpha_z - s\alpha\right)K > F_\alpha(\alpha_z)\alpha_z$ *where*

$$K \equiv 1 + \frac{f\left(l^0\left(\alpha\right)\right) - f\left(\left(1 - s\right)PW^* + l^0\left(\alpha\right)\right)}{z - \alpha\, l^0\left(\alpha\right) + f\left(\left(1 - s\right)PW^* + l^0\left(\alpha\right)\right)} < 1$$

Evidently this case is more restrictive than the previous one for any f; indeed $\left(\alpha_z - s\alpha\right)K > F_\alpha(\alpha_z)\alpha_z, K < 1 \Rightarrow \left(\alpha_z - s\alpha\right) > F_\alpha(\alpha_z)\alpha_z$. However, it is not clear whether Proposition 3 condition is tighter than the BC condition; that depends on the particular choice of f.

We see that in the presence of unemployment positively correlated with low ability and poverty, the internalization of the welfare loss tightens the sufficient condition for workfare to be more cost effective than welfare.

From this theoretical discussion, we conclude that workfare program evaluation in practice should internalize the welfare loss implied by the type of work observed when poor participants would be more often involuntary unemployed than richer ones in the absence of the scheme. We also see that such an internalization can switch the cost-effectiveness ranking in favor of a welfare program.

[34] In theory, our model can always fit the data if one define the poverty line as the α above which no one is involuntary unemployed, meaning the only assumption we really need is s increases with α and reaches its upper bound for some interior values: $\exists\, \alpha < \bar{\alpha} \,|\, (\forall \alpha_i > \alpha, s_i = 1)$.

[35] We do not explain where involuntary underemployment comes from, and how it relates endogenously with other variables of our model; see Basu (2013) for an example of an explicit model. Nor do we explore any causal relationship between wage rates, unemployment and poverty. All we need for our results is the statistical correlation between those variables, which is widely documented in the literature and observed in the data we use later.

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