SUPPLEMENTARY MATERIALS

A Data description

External data sources. Of the five government data sources described in the text, three are censuses, and hence there is no more to add in terms of sampling strategies or sample covered. One of the other two, the National Sample Survey, is well-documented (see below) and the basis for numerous papers written on India. The last, the District Statistical Handbook, provides very little documentation (but we use it only for supplemental Appendix tables). Table A.1 records the description and temporal scope of variables from these sources used in our analysis, and further documentation on each is available as follows:

- Socio-Economic and Caste Census (SECC): Collected by the Government of India, Ministry of Rural Development, the SECC has its own dedicated website at https://secc.gov.in/welcome.
- Livestock Census: Collected by the Government of India, Department of Animal Husbandry, further information is available at http://dahd.nic.in/about-us/divisions/statistics.
- Economic Census: Collected by the Government of India, Ministry of Statistics and Programme Implementation, further details are available at http://mospi.nic.in/economic-census-3.
- National Sample Survey (NSS): Collected by the Government of India, National Sample Survey Organization, further information is available at http://mospi.nic.in/NSSOa.
- District Statistical Handbooks: Collected by the Government of Andhra Pradesh and based on data from the Office of the Surveyor General of India, further information can be obtained at http://eands.dacnet.nic.in/.

Survey data and outcomes. We conducted two rounds of household surveys, a baseline survey in August-September 2010 and an endline survey in August-September 2012. At endline, we sampled 5,278 households, completing surveys with 4,943 (94%), identifying 200 as ghost households, and being unable to survey or confirm the existence of 135. The corresponding baseline numbers were 5,244, 4,646, 68 and 530 respectively. Note that these totals differ from those we report in MNS as the latter also include a separate sample of pension beneficiaries. We also surveyed one knowledgeable local leader (a village elder, schoolteacher, or local official); from this survey we use solely a question on prevailing private sector daily wages by month of the year.

The household survey was comprised of seven modules. Module A was the household roster, collecting demographic data on individual members and household characteristics. Module B asked about enrollment and experiences with Smartcards. Module C asked about payments and involvement with the welfare programs, with separate modules for SSP and NREGS samples. Module D asked about consumption, Module E about income, Module F about assets and Module G about other household balance sheet items. We administered all modules except B and C to either the male or female head of household, with supplemental responses on consumption obtained from the most knowledgeable person as necessary. We administered modules B and C, which asked about beneficiary experience with Smartcards and the welfare programs, to the individual beneficiaries themselves, collecting separate responses for each individual beneficiary within the household. Table A.1 describes each of the outcomes used in the main tables, along with a handful of other important variables used in the analysis.

Table A.1: Key outcomes and sources

Table #	Variable	Description	Timing	Source
1	Total income	Total household income, summed over 13 separate categories, and annualized	Last 12 months	Household survey, module E, household head
1	NREGA income	Earnings from employment in NREGS from all household members	Last 12 months	Household survey, module E, household head
1	Wage labor	The sum of earnings from agricultural labor and other physical labor, both done for someone else and specifically non-NREGS	Last 12 months	Household survey, module E, household head
1	Self-employment	The sum of earnings from own farm, livestock, and other businesses	Last 12 months	Household survey, module E, household head
1	Misc income	The sum of earnings from all other categories: pensions, government and other salaried positions, gifts, and miscellaneous	Last 12 months	Household survey, module E, household head
2	Reservation wage	Obtained by asking whether worker would be wiling to work for a given daily wage, starting with Rs. 20 and moving up in Rs. 5 increments until first "yes" response	Month of June	Household survey, module A, household head/ind worker
2	Wage realization	Average daily wage received on labor for someone else	Month of June	Household survey, module A, household head/ind worker
2	Days self-employed or not working	The sum of days where one was not paid by someone else, and days spent not working	Month of June	Household survey, module A, household head/ind worker
2	Days worked NREGS	The number of days spent working on NREGS, captured weekly and aggregated to month of June	Study period spanning June	Household survey, module C, ind beneficiary
2	Days worked private sector	The number of days spent doing labor for someone else for pay	Month of June	Household survey, module A, household head/ind worker
3	NSS price index	Index of NSS commodities purchased at least once in every village, using median village unit values from control group	NSS reference periods; 1 week to 1 year	NSS Round 68, 2012
3	NSS prices	Log unit values of individual commodities using all available data	NSS reference periods; 1 week to 1 year	NSS Round 68, 2012

3	Own-land profits	The response to question “if you were to sell your land (today) how much would you get for it” divided by number of acres of land owned	As of time surveyed	Household survey, module E, household head
3	Land value per acre	The annualized value of earnings from own land	Last 12 months	Household survey, module E, household head
4	SECC income brackets	Monthly income of highest earning household member, by category	As of time surveyed	SECC 2012
5	# enterprises	All units engaged in production or distribution of goods and services other than for purposes of own consumption, other than establishments engaged in crop production, public administration, defence, and illegal activities	As of time surveyed	Economic Census 2013
5	# employees	All persons (including children under 15 years of age) working in an establishments either as owners, members of the household working as co-owner or partner or helping the owner in running the establishment, whether hired or not, besides regular and salaried employees, casual/ daily wage labourers would be considered as workers for that establishment	As of time surveyed	Economic Census 2013
5	Firms in Livestock sector	Includes rearing of livestock, any support services for the same, and hunting/trapping and related activities	As of time surveyed	Economic Census 2013
5	Firms in Manufacturing/Construction	Includes all manufacturing of all goods, repair, and installation of machinery; as well as firms involved in construction	As of time surveyed	Economic Census 2013
5	Firms in Wholesale/Retail	Includes all firms in wholesale and retail trade	As of time surveyed	Economic Census 2013
5	Firms in other sectors	Includes forestry and logging, fishing, power and water supply, mining,	As of time surveyed	Economic Census 2013
6	Herfindahl index	Herfindahl index based on all landholdings in the village	As of time surveyed	SECC 2012
7	Annualized expenditure	The household’s estimated annual expenditure in Rupees	As of time surveyed	Household survey, module E, household head
7	Total savings	The sum of savings in bank accounts, self-help group accounts, and cash	As of time surveyed	Household survey, module E, household head

7	Total loans	The total amount of outstanding loans from all sources	As of time surveyed	Household survey, module G, household head
7	Owns land	Whether the household owns land	As of time surveyed	Household survey, module E, household head

This table provides the description of key outcome variables used in our analysis and their datasets of origin. The first column (#) denotes the table number in which the variable is used. In the fifth column, "Household survey" indicates the NREGS household survey, followed by the unit of analysis; "SECC" indicates the Socio-economic and Caste Census (2011); and "NSS" indicates the National Sample Survey and its corresponding round and year.

B Robustness to alternative spatial specifications

This appendix examines the sensitivity of our main spatially-adjusted estimates of the total effect of treatment on the treated (the "Adjusted TE") to alternative assumptions about how to model the relationship between outcomes in a GP and the treatment status of its neighbors.

B.1 The handling of buffer mandals

We default to treating GPs in mandals assigned to the second, "buffer" wave as control mandals when calculating neighborhood intensity measures. This is because, while we do not have information on the specific timing of treatment onset in each of these mandals, we know that treatment generally rolled out much later than in the treatment group (where even after two years only 50% of transactions were biometrically authenticated).

To examine sensitivity to this assumption we re-calculate results for our main outcomes under the alternative assumption that GPs in buffer mandals were treated $X\%$ as intensively as those in treatment mandals, for $X\% \in \{10\%, \ldots, 50\%\}$. Table B.1 reports the results. Qualitatively the results are very stable across these perturbations to the specification. Quantitatively we see for most outcomes a pattern of larger estimated effects for higher values of $X\%$, which suggests that our default specification may if anything slightly under-estimate total treatment effects on the treated.

B.2 The selection of a radius

By default we calculate neighborhood treatment intensity at a 20km radius. We aim to use a radius that is large enough to plausibly capture spillovers effects due to labor market interactions, and thus in particular large enough to include distances over which a worker might plausibly travel to work. At a typical flat-surface human walking speed of 5km / hour, the 20km radius captures locations to which a worker could walk in 4 hours, which seems a reasonably conservative upper bound on the time a worker might be willing to commute for work. At a reasonably fast bicycling speed of 20km / hour, it captures locations to which workers who own bicycles could travel in 1 hour. That said, results should be interpreted keeping in mind that effects may "ripple" across markets substantially farther than any individual worker might commute.

To examine sensitivity to this assumption, we also re-calculate results for our main outcomes under alternative assumptions about the spillover radius ranging from $R = 10$km to $R = 30$km.[61] Table B.2 reports the results. Point estimates and hypothesis tests are generally quite stable across these alternative assumptions. Effects on the indicator for land ownership are perhaps the one exception, as these are significant only for $R = 20$ and $R = 25$. For labor market outcomes there is some tendency towards both larger estimates and standard errors at higher values of R, which is consistent with the idea that higher values of R capture spillovers more thoroughly but also with less experimental variation, as we apply the law of large numbers to averages taken over larger areas.

B.3 Additional sensitivity checks

In Table B.3 we report the results of three additional sensitivity checks (with our main results reproduced in Column 1 for comparison).

61. In Egger et al. (2020) one of us took an alternative approach, pre-specifying an algorithmic approach to selecting an optimal radius using the data. That approach was motivated in part by the preliminary results from this project, which had been released before Egger et al. (2020) began data collection.

In Column 2 we examine an alternative kernel function. By default we use a binary kernel, giving equal weight to the treatment status of all GPs within a given radius and no weight to those further away. This is our preferred approach as it is relatively easy to interpret and allows us to discipline the selection of the relevant parameter (i.e. the radius) using basic descriptive information about travel time and costs in our setting (see above). As a sensitivity check we also examine results using the smooth kernel $k(r) = (1 + \alpha r)^{-\theta}$ to weight observations at distance r. In the context of "gravity" models of trade, α can be interpreted as the increase in the iceberg costs of trade per kilometer of distance, and θ as the elasticity of trade to total costs. Since the key commodity of interest here is labor, we set α as follows: suppose that workers can travel 20km / hour by bicyle and work for 10 hours per day; in this case commuting to a worksite an additional 1km away reduces the proportion of the workday available for labor by 1%.[62] Hence, we set $\alpha = 1/100$. We set $\theta = 8$ following Donaldson and Hornbeck (2016).

In Column 3 we examine an alternative treatment of same-mandal GPs. By default we exclude these GPs when calculating the intensity of treatment in the neighborhood of a given GP, as this lets us cleanly separate the two sources of experimental variation we use, and avoids the potential issue that neighborhood variables would by construction be differently related to proximity to borders in treatment and control mandals. To check sensitivity to this approach we also report estimates that include same-mandal villages in the calculation of neighborhood exposure measures.

Finally, in Column 4 we examine sensitivity to functional form. By default we model outcomes as linear in the share of treated neighbors, as we do not have strong priors that spillovers should exhibit either increasing or decreasing returns to scale at the margin. This specification is also comparable with other relevant examples in the literature such as Miguel and Kremer (2004) and Egger et al. (2020). Figure B.1 shows, consistent with this, that there is no obvious visual tendency towards non-linearity for key outcomes. To assess sensitivity to this approach we also report estimates based based on a quadratic specification.

Overall our results are reasonably robust to these variations, with a few exceptions. Using a smooth kernel, the effect on net earnings per acre and days worked in the private sector become insignificant while effects on SECC income variables all become significant. Including same-mandal villages in the regressor, effects on days worked in the private sector and on Economic Census outcomes become insignificant. Otherwise the patterns of statistical significance (and magnitude of the estimates) are reasonably consistent.

62. The time cost is $2 \times 1km/20km/hr = 1/10hr$, or 1/100 of the workday.

Table B.1: Adjusted treatment effects on key outcomes by buffer treatment assumption

	Main specification	Buffer is 10% treated	Buffer is 20% treated	Buffer is 30% treated	Buffer is 40% treated	Buffer is 50% treated
	(1)	(2)	(3)	(4)	(5)	(6)
Total income	9579**	9602*	9580*	9488	9297	8980
	(4539)	(4930)	(5421)	(6005)	(6658)	(7331)
Reservation wage	6.9**	7.3**	7.7**	8.3**	8.9*	9.5*
	(3.2)	(3.4)	(3.7)	(4.1)	(4.6)	(5)
Wage realization	13***	14***	15***	16***	17***	18***
	(4.3)	(4.6)	(5)	(5.6)	(6.2)	(6.8)
Days worked in private sector	1.4*	1.6*	1.8*	1.9*	2.1*	2.2*
	(.8)	(.88)	(.97)	(1.1)	(1.2)	(1.3)
Days worked in NREGS	1.3**	1.4**	1.5**	1.6**	1.7**	1.8**
	(.55)	(.59)	(.64)	(.7)	(.77)	(.85)
Days self-employed or not working	-2.4***	-2.6***	-2.8***	-3.1***	-3.2***	-3.4***
	(.79)	(.86)	(.94)	(1)	(1.1)	(1.2)
Log of Price Index (uniform goods)	-.055	-.069	-.085	-.1	-.13	-.15
	(.13)	(.14)	(.16)	(.19)	(.22)	(.25)
Log of Price Index (all goods)	.0059	.008	.012	.018	.028	.043
	(.045)	(.05)	(.055)	(.063)	(.071)	(.081)
Log of Individual Prices	-.0003	.0019	.0046	.0078	.012	.017
	(.016)	(.017)	(.018)	(.02)	(.023)	(.025)
Own-land profits	-.19**	-.21**	-.24***	-.27***	-.29**	-.32**
	(.08)	(.084)	(.091)	(.1)	(.11)	(.13)
Value per acre of land	-.06	-.062	-.065	-.07	-.077	-.086
	(.13)	(.14)	(.15)	(.17)	(.18)	(.2)
Lowest bracket (< Rs. 5,000)	-.028*	-.029	-.029	-.031	-.033	-.037
	(.017)	(.018)	(.02)	(.021)	(.023)	(.025)
Middle bracket (Rs. 5,000 - 10,000)	.025*	.026*	.027	.028	.029	.03
	(.014)	(.015)	(.016)	(.018)	(.019)	(.021)
Highest bracket (> Rs. 10,000)	.0034	.003	.003	.0036	.005	.0074
	(.0069)	(.0073)	(.0078)	(.0082)	(.0085)	(.0086)
Income bracket 3 levels	-.026	-.026	-.027	-.028	-.031	-.035
	(.017)	(.018)	(.019)	(.021)	(.023)	(.024)
All enterprises	1095*	1166*	1257*	1371**	1505**	1653**
	(575)	(610)	(649)	(690)	(729)	(764)
All employees	3307**	3562**	3867**	4221**	4609**	4999**
	(1554)	(1663)	(1787)	(1924)	(2069)	(2214)
Total savings (Rs.)	260	325	402	492	591	690
	(322)	(344)	(374)	(415)	(466)	(526)
Total loans (Rs.)	20400***	22638***	25135***	27797***	30419***	32643***
	(6403)	(7028)	(7838)	(8858)	(10080)	(11448)
Owns land (%)	.072**	.074**	.076*	.076*	.076	.072
	(.033)	(.036)	(.04)	(.044)	(.049)	(.054)
Survey: annualized expenditure (Rs. per year)	389	941	1646	2525	3577	4758
	(4676)	(5090)	(5636)	(6327)	(7165)	(8122)
NSS: annualized expenditure (Rs. per year)	18105	17024	15203	12316	7952	1664
	(13106)	(14592)	(16507)	(18920)	(21855)	(25220)

Refer to Tables 1, 2, 3, 4, 5, and 7 for the corresponding main specification tables. Standard errors in parentheses are clustered by mandal. Statistical significance is denoted: $^{*}p < .10, ^{**}p < .05, ^{***}p < .01$.

Table B.2: Adjusted treatment effects on key outcomes by spillover radius assumption

	R = 10	R = 15	R = 20 Main specification	R = 25	R = 30
	(1)	(2)	(3)	(4)	(5)
Total income	10377**	9789**	9579**	9732*	10027*
	(4280)	(4173)	(4539)	(5071)	(5551)
Reservation wage	6.5**	7.3**	6.9**	6.7*	6.3*
	(2.9)	(2.9)	(3.2)	(3.4)	(3.7)
Wage realization	13***	13***	13***	13***	14***
	(3.8)	(3.9)	(4.3)	(4.7)	(5.1)
Days worked in private sector	1.1	1.3*	1.4*	1.7**	2**
	(.69)	(.74)	(.8)	(.85)	(.91)
Days worked in NREGS	1.1**	1.3**	1.3**	1.4**	1.4**
	(.53)	(.56)	(.55)	(.56)	(.6)
Days self-employed or not working	-2***	-2.3***	-2.4***	-2.7***	-3***
	(.68)	(.71)	(.79)	(.84)	(.9)
Log of Price Index (uniform goods)	.024	-.03	-.055	-.11	-.082
	(.065)	(.11)	(.13)	(.14)	(.14)
Log of Price Index (all goods)	.0026	-.0011	.0059	.0099	-.00067
	(.029)	(.038)	(.045)	(.05)	(.054)
Log of Individual Prices	.0098	.0047	-.0003	-.0069	-.019
	(.015)	(.015)	(.016)	(.018)	(.021)
Own-land profits	-.13	-.16*	-.19**	-.19**	-.15
	(.083)	(.082)	(.08)	(.084)	(.09)
Value per acre of land	-.037	-.066	-.06	-.021	.042
	(.12)	(.12)	(.13)	(.13)	(.14)
Lowest bracket (< Rs. 5,000)	-.033**	-.032**	-.028*	-.033*	-.036**
	(.015)	(.015)	(.017)	(.017)	(.018)
Middle bracket (Rs. 5,000 - 10,000)	.027**	.025*	.025*	.028*	.031**
	(.012)	(.013)	(.014)	(.015)	(.015)
Highest bracket (> Rs. 10,000)	.0057	.0065	.0034	.0049	.0038
	(.0058)	(.006)	(.0069)	(.0066)	(.007)
Income bracket 3 levels	-.032**	-.031**	-.026	-.031*	-.034*
	(.015)	(.015)	(.017)	(.017)	(.018)
All enterprises	1160*	1009*	1095*	1079*	826
	(618)	(583)	(575)	(569)	(538)
All employees	3278**	3085**	3307**	3256**	2663*
	(1613)	(1534)	(1554)	(1528)	(1405)
Total savings (Rs.)	455	325	260	269	290
	(345)	(327)	(322)	(358)	(388)
Total loans (Rs.)	15668***	16246***	20400***	22578***	23030***
	(5975)	(6281)	(6403)	(6356)	(6391)
Owns land (%)	.031	.045	.072**	.072**	.054
	(.03)	(.031)	(.033)	(.036)	(.038)
Survey: annualized expenditure (Rs. per year)	725	-66	389	1924	3493
	(3783)	(4191)	(4676)	(5166)	(5525)
NSS: annualized expenditure (Rs. per year)	7905	13333	18105	18398	22492
	(8561)	(11863)	(13106)	(14498)	(16149)

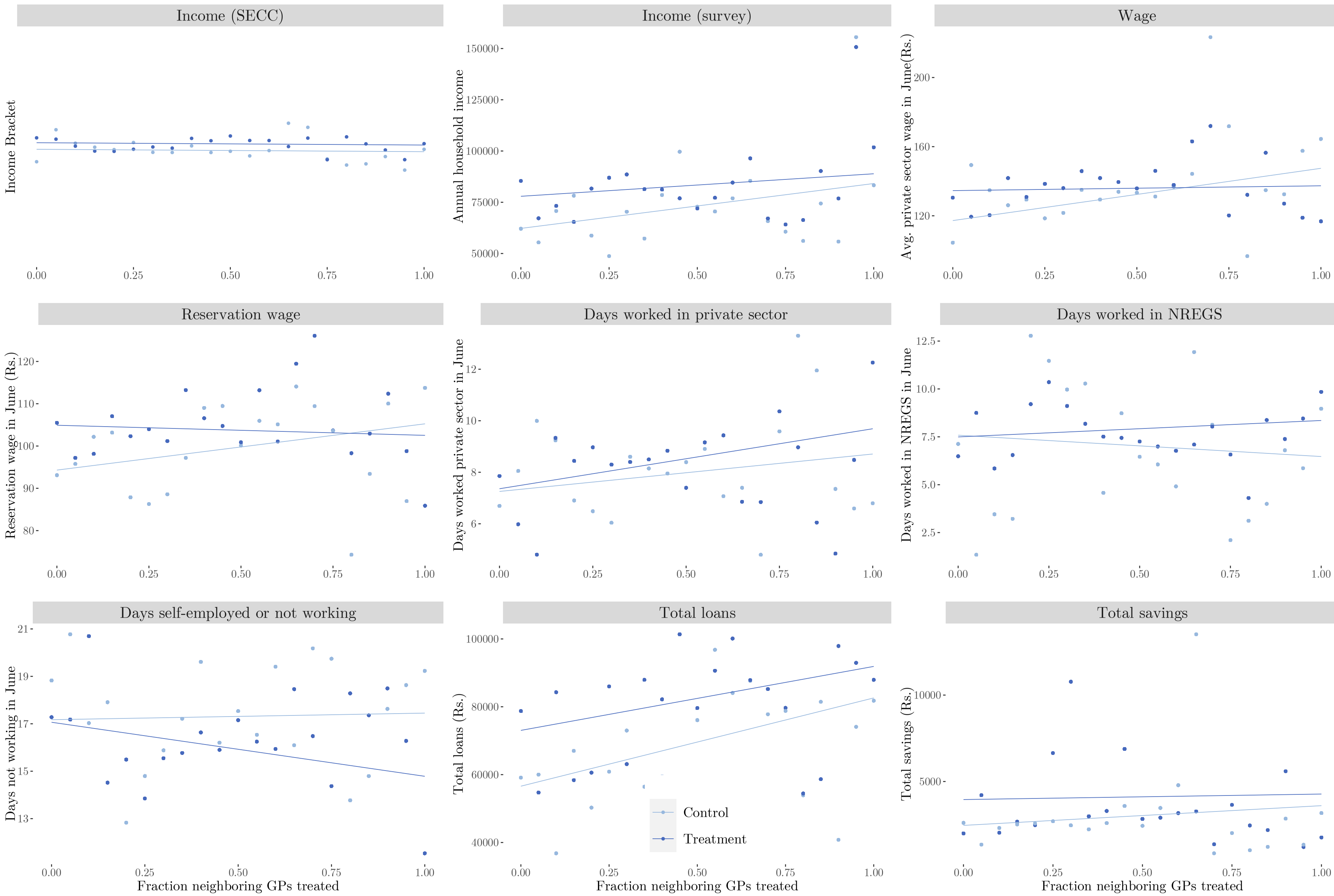
Refer to Tables 1, 2, 3, 4, 5, and 7 for the corresponding main specification tables. Standard errors in parentheses are clustered by mandal. Statistical significance is denoted: $^{*}p < .10,^{**} p < .05,^{***} p < .01$.

Table B.3: Adjusted treatment effects on key outcomes using alternative spatial approaches

	Main specification	Smooth kernel	Same-mandal villages included	Functional form
	(1)	(2)	(3)	(4)
Total income	9579**	9325**	9410**	8994*
	(4539)	(3920)	(4236)	(5378)
Reservation wage	6.9**	5.3**	7.9**	9.1***
	(3.2)	(2.7)	(3.1)	(3.5)
Wage realization	13***	8.4**	11**	16***
	(4.3)	(3.7)	(4.6)	(5)
Days worked in private sector	1.4*	.8	1.1	1.6**
	(.8)	(.55)	(.79)	(.81)
Days worked in NREGS	1.3**	.85*	1*	1.6***
	(.55)	(.49)	(.55)	(.59)
Days self-employed or not working	-2.4***	-1.5***	-2***	-2.7***
	(.79)	(.57)	(.79)	(.81)
Log of Price Index (uniform goods)	-.055	.0048	-.045	-.0071
	(.13)	(.069)	(.099)	(.15)
Log of Price Index (all goods)	.0059	.012	.014	.015
	(.045)	(.026)	(.033)	(.058)
Log of Individual Prices	-.0003	-.0065	.0022	-.02
	(.016)	(.011)	(.013)	(.028)
Own-land income	-.19**	-.079	-.2**	-.19**
	(.08)	(.078)	(.079)	(.092)
Value per acre of land	-.06	-.062	-.11	-.022
	(.13)	(.1)	(.13)	(.14)
Lowest bracket (< Rs. 5,000)	-.028*	-.034**	-.025	-.032*
	(.017)	(.014)	(.017)	(.018)
Middle bracket (Rs. 5,000 - 10,000)	.025*	.024**	.023	.027*
	(.014)	(.011)	(.014)	(.015)
Highest bracket (> Rs. 10,000)	.0034	.0095*	.0032	.0052
	(.0069)	(.0055)	(.0067)	(.0078)
Income bracket 3 levels	-.026	-.034**	-.023	-.031*
	(.017)	(.014)	(.017)	(.018)
All enterprises	1095*	853*	513	1405*
	(575)	(445)	(642)	(757)
All employees	3307**	2468**	1485	3307**
	(1554)	(1247)	(1791)	(1554)
Total savings (Rs.)	260	-12	1.0e+02	612*
	(322)	(284)	(316)	(352)
Total loans (Rs.)	20400***	10658**	20036***	26047***
	(6403)	(5076)	(6326)	(7744)
Owns land (%)	.072**	.048**	.059*	.097***
	(.033)	(.024)	(.032)	(.036)
Survey: annualized expenditure (Rs. per year)	389	-563	2687	2914
	(4676)	(835)	(5051)	(5167)
NSS: annualized expenditure (Rs. per year)	18105	14120	18110*	21655
	(13106)	(8862)	(9992)	(13464)

Refer to Tables 1, 2, 3, 4, 5, and 7 for the corresponding main specification tables. Standard errors in parentheses are clustered by mandal. Statistical significance is denoted: $^{*}p < .10, ^{**}p < .05, ^{***}p < .01$.

Figure B.1: Relationship between key outcomes and spatial exposure variable



C Labor market comparative statics

This appendix derives comparative statics for the effects of an improvement in the NREGS on private sector labor market outcomes, considering both the benchmark case of perfect competition and also the case of imperfect competition on the employer side of the market. The framework also allows us to quantitatively assess the extent to which an improved NREGS could affect labor productivity by contributing to an increase in the rural capital stock. Finally, we examine how an improved NREGS could affect returns to land under the same range of alternative assumptions.

C.1 Labor supply

We first examine properties of the labor supply curve; note that these hold irrespective of market structure on the employer side. Consider a unit mass of workers each of whom decides whether to work in the private sector, on the NREGS, or neither (e.g. to engage in self-employment or leisure). Private-sector jobs pay a wage w, while NREGS jobs are characterized by a parameter θ which captures various non-wage aspects of job quality, such as the likelihood of getting work, and the speed and reliability of getting paid. Viewed through the lens of this model, our empirical results are the reduced-form effects of a discrete increase in θ (which we do not directly observe) induced by the Smartcards reform. Here we interpret θ as continuous to facilitate the derivation of comparative statics.

Define worker i's *reservation wage* $r(i, \theta)$ as the lowest private sector wage such that he prefers to work in the private sector. This depends on characteristics of NREGS jobs—including those captured by θ and potentially others such as the location, NREGS wage, the intensity of effort required, etc.—and may vary by individual, as different workers have different self-employment options and different tastes for NREGS or private-sector work. Let individuals be ordered by their reservation wage, so that $i \geq i' \leftrightarrow r(i, \theta) \geq r(i', \theta)$. Let $i^*(w, \theta)$ denote the marginal worker who is just indifferent between working in the private sector or not for a given schedule (w, θ), defined implicitly by

$$r(i^*(w, \theta), \theta) = w \tag{5}$$

Then we can write the labor supply curve simply as

$$L(w, \theta) = i^*(w, \theta) \tag{6}$$

i.e. the share of the population who choose to work in the private sector is equal to the index value of the marginal worker. Assuming differentiability, and differentiating (5) and substituting for i^* using (6), we obtain the following expression for the total effect of improving the NREGS on private sector employment:

$$\frac{dL}{d\theta} = \frac{1}{\partial r(i^*, \theta)/\partial i} \left[\frac{dw}{d\theta} - \frac{\partial r(i^*, \theta)}{\partial \theta} \right] \tag{7}$$

From this we see the intuitive result that private sector employment (regardless of demand-side market structure) increases, decreases, or does not change depending on whether improving the NREGS has an impact on private sector wages that is greater than, less than, or equal to the impact on the reservation wage of the marginal worker. Note that in our data we do indeed see larger increases in mean wages (Rs. 13) than in mean reservation wages (Rs. 6.9), consistent with employment gains.

The same logic also implies that the changes in wages and employment we observe in our data do not on their own identify the elasticity of labor supply, precisely because reservation wages are simultaneously affected. To see this more explicitly, rewrite (7) as

$$\frac{w}{L}\frac{dL/d\theta}{dw/d\theta} = \epsilon \cdot \left[1 - \frac{\partial r(i^*, \theta)/\partial\theta}{dw/d\theta}\right] \tag{8}$$

where

$$\epsilon := \frac{w}{L}\frac{\partial L}{\partial w} \tag{9}$$

is the wage elasticity of aggregate labor supply. Equation (8) shows that the observed relationship between employment and wages is downwards-biased as an estimate of the supply elasticity with the magnitude of the bias depending on relatively magnitudes of the effects on reservation wages and actual wages. Since we observe treatment effects on reservation wages, however, we can estimate this term directly (using the adjusted treatment effects from Table 2) and thus recover an estimate of ϵ. Combining these with control-group mean values of w and L and the estimated treatment effects on L and w, we recover an estimated elasticity of $\epsilon = 3.07$, albeit with a wide confidence interval (with 95% confidence interval of $[-3.89, 10.03]$).[63] Note that this is the elasticity of overall labor supply to the private sector *conditional* on the presence of the NREGS as a potential alternative, and we should thus expect it to be higher than overall elasticity of labor supply to *any* form of employment, or the elasticity of labor supply to the private sector in the absence of the NREGS.

C.2 Labor demand

We next introduce a production function and examine the labor demand and market equilibrium conditions this produces under the alternative assumptions that wages equal the marginal product of labor, as under perfect competition, or that wages are as if set by a single, monopsonistic employer. In each case we examine what must hold quantitatively to fit these assumptions to our data, and what our data then imply about underlying elasticities.

Let the revenue product of labor be given by $f(L, \theta)$, so that private-sector profits are

$$\pi(w, L, \theta) := f(L, \theta) - wL \tag{10}$$

where f is increasing ($f_L > 0$) with decreasing returns ($f_{LL} < 0$) in L. We allow f to depend directly on θ in order to capture the possibility that improvements to the NREGS could have positive externalities on private-sector labor productivity, as for example through the creation of public assets (roads, irrigation).

C.2.1 Perfect competition

Consider first the benchmark case in which wages (and thus the reservation wage of the marginal worker) equal the marginal revenue product of labor:

$$f_L(L, \theta) = w = r(i^*(w, \theta), \theta) \tag{11}$$

In this case, higher wages must be associated with lower employment (which raises f_L) unless corresponding changes in θ directly increase f_L. In economic terms, employment can increase in response to NREGS improvements that raise wages only if those improvements also increase labor productivity

63. The variance of this estimate is driven by the fact that we cannot reject the hypothesis that $\partial r/\partial\theta = dw/d\theta$, and thus that the factor we divide by to solve (8) for ϵ is close to zero.

enough to more than offset the higher costs of labor. Mathematically,

$$\frac{dw}{d\theta} = \frac{f_{LL}L_\theta + f_{L\theta}}{1 - f_{LL}L_w} \qquad\qquad \frac{dL}{d\theta} = \frac{L_\theta + f_{L\theta}L_w}{1 - f_{LL}L_w} \tag{12}$$

The market wage effect here is positive (provided only that $f_{L\theta}$ is not too negative - note that we expect $f_{L\theta}$ to be positive), while the employment effect is negative unless the second term in the numerator is sufficiently positive to offset the first—in other words, if the increase in labor productivity $f_{L\theta}$ times the responsiveness of labor supply to market wages L_w is greater than its responsiveness to NREGS wages L_θ.

The net effect of θ on profits π is generally ambiguous, since θ may both raise the productivity and increase the opportunity cost of labor. If we interpret θ as a pure labor productivity shift, however, then it unambiguously increases profits. Specifically, letting $f(L,\theta) = f(\theta L)$ and $L_\theta = 0$, we have

$$\frac{d\pi}{d\theta} = L \cdot \left[f'(\theta L) - \frac{dw}{d\theta} \right] = -Lf''(\theta L) \cdot \left[\frac{\theta L + \theta^2 f'(\theta L) L_w}{1 - \theta^2 f''(\theta L) L_w} \right] \geq 0 \tag{13}$$

where the last inequality follows from $f'' \leq 0$

One consequence of the fact that labor productivity must increase to explain our results under perfect competition is that we cannot identify a labor demand elasticity in this case. To see this, note that the demand elasticity is $\epsilon^D = \frac{w}{L}\frac{1}{f_{LL}}$ and so is identified if and only if f_{LL} is identified. In our data we do not observe θ and so do not observe $dw/d\theta$ or $dL/d\theta$ individually, but do observe the ratio of these quantities, i.e.

$$\frac{dw/d\theta}{dL/d\theta} = \frac{f_{LL}L_\theta + f_{L\theta}}{L_\theta + f_{L\theta}L_w} \tag{14}$$

If $f_{L\theta} = 0$ then this identifies f_{LL}, but in this case employment is (counterfactually) predicted to fall with θ. We require $f_{L\theta} > 0$ to fit the data, and thus cannot separately identify f_{LL} and $f_{L\theta}$ even with full knowledge of the labor supply curve L. Graphically this is analogous to saying that a given increase in wages and employment could be explained by a small upward shift in a relatively flat labor demand curve, or by a large upward shift in a relatively steep labor demand curve.

To examine quantitatively to what extent our results could be explained by a labor productivity shock, we next consider a Cobb-Douglas specification for production:

$$f(L,\theta) = AK(\theta)^{\alpha_K} L^{\alpha_L} \tag{15}$$

Here production uses labor and capital (with land held constant, and thus suppressed for notational simplicity), and we suppose that improvements in NREGS implementation θ also serve to augment the capital stock. This captures for example the possibility that increased NREGS activity leads to the creation of additional public assets such as roads and irrigation facilities which then increase labor productivity in the private sector. Using this specification, equating the marginal product of labor with the wage, and taking percentage changes, we can express the change in the capital stock required to explain a given change in wages and employment as

$$\%\Delta K(\theta) = \frac{1}{\alpha_K} \left(\%\Delta w + (1 - \alpha_L)\%\Delta L \right) \tag{16}$$

Using factor share estimates of $\alpha_L = 0.35$ and $\alpha_K = 0.35$ from NSS 2012 cost of cultivation survey [64]

64. The NSS cost of cultivation survey for 2011-12 was accessed from https://eands.dacnet.nic.in/Cost_of_Cultivation.

(the remaining 0.3 is the factor share of land) and our observed AdjTE values for June of $\%\Delta L = 17.8\%$ and $\%\Delta w = 10.2\%$ (Table 2), the implication is that we would need an increase in the capital stock of $\%\Delta K = 59.9\%$ to fully explain our results.[65] [66]

To benchmark this figure, we consider what increase we might expect to see in the size of overall capital stock if the rate of NREGS asset creation increased in proportion to the increase in NREGS employment, or by 28.9% (Table 2). We estimate the size of the NREGS-generated capital stock as a proportion of the total stock of rural capital as follows. We obtain data on Gross Capital Formation in Agriculture and Allied sectors according to National Accounts data over the years 2002-03 through 2011-12, and apply a depreciation rate of 10% per year to the stock to obtain a total capital stock of Rs. 6.48 trillion (in 2004-05 prices).[67] In comparison, total NREGS expenditure in the years of the experiment (2010-11 and 2011-12) was Rs. 0.47 trillion (in 2004-05 prices).[68] Assuming generously that 60% of this expenditure went directly to gross capital formation, this would result in 2010-12 NREGS-driven capital formation being 4.4% of all capital stock. This in turn yields $\%\Delta K = 28.9\% \times 4.4\% \simeq 1.3\%$, or around 2.4% of the increase that would be required to explain the joint increase in wages and employment we observe. This suggests that the creation of public assets likely played at most a marginal role in generating the labor market effects we observe.

C.2.2 Imperfect competition

Now consider a setting in which wage-setting is centralized to some degree by profit-maximizing employers. For analytical simplicity and transparency we consider fully centralized wage-setting (i.e. a monopsonist who sets wages to maximize profit as given by (11)) and then discuss how the analysis relates to the case of oligopsony. We first show analytically that both wages and employment are increasing in the NREGS wage in the limit case where NREGS and private sector jobs are perfect substitutes, despite the fact that in this case equilibrium NREGS employment is zero. We then examine the case in which they are imperfect substitutes, showing numerically that we can obtain approximately the same result (i.e. substantial impacts on wages even when equilibrium NREGS employment is low). We also show that, as in the case of perfect competition, our data do not identify the marginal product of labor.

To build intuition, consider first the limit case in which NREGS jobs and private sector jobs are perfect substitutes. In this case there is an "effective" NREGS wage $e(\theta)$ such that for $w \geq e(\theta)$ no workers choose to work on the NREGS, while for $w < e(\theta)$ no workers choose to work in the private sector.[69] The reservation wage will thus equal $e(\theta)$ for workers with relatively unattractive self-employment options, and equal the value $\tilde{r}(i)$ of self-employment for the rest. Denoting by i^c the worker who is just indifferent between wage work and self-employment (i.e. $e(\theta) = \tilde{r}(i^c)$), we have

$$r(i,\theta) = \begin{cases} e(\theta) & i \leq i^c \\ \tilde{r}(i) & i > i^c \end{cases} \tag{17}$$

htm. The labor, capital and land factor shares for cultivating paddy in Andhra Pradesh were calculated using the item wise break up of cost of cultivation.

65. Factor share calculations may underestimate labor shares if they miss labor income of the self-employed; in that case our calculations here would under-estimate the required increase in the capital stock.

66. If instead we ignore spillovers and use the estimated main effects of treatment, we obtain a required increase in the capital stock of $\%\Delta K = 37.0\%$, smaller but still improbably large.

67. See http://planningcommission.nic.in/data/datatable/data_2312/DatabookDec2014%2043.pdf.

68. Data from Sukhtankar (2017). Note that we count only the experimental years, since anything before those years would be equal in treatment and control areas.

69. We assume ties are broken in favor of the private sector.

In this case the NREGS acts "as if" it set a binding minimum wage: employers cannot hire any positive quantity of labor at a wage below $e(\theta)$. If the wage that solves (11) is higher than $e(\theta)$ then this constraint does not bind and changes to the NREGS wage have no effect. If alternatively $e(\theta)$ is higher than the monopsonist's preferred wage then he sets $w = e(\theta)$; in this case increases in θ unambiguously increase both wages and employment until wages reach their competitive level.

Notably, improvements to the NREGS can have substantial impacts on private sector wages and employment in this case even when equilibrium levels of NREGS employment are zero. This result is of course too stark to map exactly to our data, where we observe positive employment levels in both the NREGS and the private sector. It illustrates the point, however, that the mechanism through which improving the NREGS affects the private sector can work through its role as an *outside option*, rather than through NREGS employment levels per se.

Now consider the less stark case in which NREGS jobs and private sector jobs are imperfect substitutes. Labor supply $L(w, \theta) = i^*(w, \theta)$ is a smooth, differentiable function, increasing in w and decreasing in θ. The monopsonist's profit-maximizing wage satisfies

$$\frac{w}{f_L} = \frac{\epsilon}{\epsilon + 1} \tag{18}$$

This relates the markdown (relative to marginal product) that the monopsonist is able to extract from workers, a measure of his labor market power, to the elasticity of supply.[70] As usual, effective market power on one side of the market is decreasing in the price elasticity of participation by actors on the other side of the market.

This metric likely represents an upper bound on the market power of employers in our setting, where wage-setting need not be fully centralized. With multiple employers the profit-maximizing wage for a given employer is still characterized by Equation (18) but with ϵ defined as the elasticity of labor supply facing that specific employer. Since employer-specific elasticities must be greater than the aggregate elasticity, the (inverse of the) aggregate elasticity provides an upper bound on the market power of any individual employer. Numerically, using our estimate of $\epsilon = 3.07$ above, this implies a lower bound of 75% on the share of marginal product that any *individual* employer pays its workers. By way of comparison, a review by Sokolova and Sorensen (2021) of studies across a wide range of labor markets finds an average elasticity among studies following "best practices" of 7.1, implying that workers receive 88% of their marginal product, with a 95% confidence interval from 64% to 93%. Our point estimate lies towards the lower end of this range, meaning that our results are consistent with a substantial degree of employer market power relative to what other studies have found.

Taking comparative statics with respect to NREGS quality θ yields

$$\frac{dw}{d\theta} = \frac{L_\theta - L_w f_{L\theta} - f_{LL} L_\theta L_w - L_{w\theta}(f_L - w)}{L_w^2 f_{LL} + L_{ww}(f_L - w) - 2L_w} \tag{19}$$

$$\frac{dL}{d\theta} = \frac{-f_{L\theta} L_w^2 + L_\theta (L_{ww}(f_L - w) - L_w) - L_{\theta w} L_w (f_L - w)}{L_w^2 f_{LL} + L_{ww}(f_L - w) - 2L_w} \tag{20}$$

The former expression implies that, under believable distributional assumptions, wages should increase. The (common) denominator in these expressions is the second-order condition for the monopsonist's problem and is thus negative at an optimum. The numerator in the wage expression is also negative

70. Note that the monopsonist does not choose to ration jobs. If more workers wanted to work for him at the offered wage than he wanted to hire, he could increase profits by (for example) lowering his wage offer while holding employment levels fixed. Rationing could emerge as a result of market power among *workers*, on the other hand, as for example in the case of a labor union that negotiates a wage above the market-clearing one.

provided that $f_{L\theta}$ and $L_{w\theta}$ are not too negative. The first condition holds assuming that any productivity spillovers from an improved NREGS are positive, while the second holds if the labor supply curve facing the firm does not become too much steeper (which is what one would expect if an improved NREGS has a larger effect on the reservation wages of lower-wage workers).

The sign of the effect on employment is ambiguous, as expected. The denominator is again negative (assuming $L_{ww} < 0$, consistent with the distribution of wages and reservation wages we observe in the data). The numerator then includes the following effects: (i) the direct effect of any improvements in the NREGS on the marginal productivity of labor, which tends to increase employment (represented by $f_{L\theta} > 0$ in the first term); (ii) the upward shift in the labor supply curve, which per se tends to reduce employment (represented by $L_\theta < 0$ in the second term); and (iii) the change in the elasticity of labor supply (due to $L_{w\theta}$ in the third term) which may increase or decrease the level of employment the firm chooses depending on its sign. Note in particular that if $L_{w\theta}$ is sufficiently large and the firm enjoys substantial market power ($f_L - w > 0$), then the overall effect will be positive even if $f_{L\theta} = 0$, i.e. we do not need to assume productivity spillovers from the NREGS in order to generate a pattern of rising wages and employment.

Given this ambiguity, we next demonstrate via numerical example that both wages and employment may increase with NREGS quality, and that these effects can be substantial even when equilibrium NREGS employment is low. Figure C.1 visualizes an example that illustrates these points. Panel (a) plots labor supply curves and equilibrium wage / employment pairs for an increasing series of values of θ, illustrating the concurrent increase in wages and employment. Panel (b) plots the share of the population employed in the two sectors at equilibrium for different θ. We see that the increase in employment in private sector is observed even when the proportion of the population employed in NREGS is very low.

The wage elasticity of labor demand, in the sense of the response of labor demand to exogenous change in wages, is not defined in this case since wages are chosen endogenously by the monopsonist. That said, we can still examine whether the quantity $\epsilon^D = \frac{w}{L}\frac{1}{f_{LL}}$ is identified. As above, our data allow us to estimate the ratio

$$\frac{dw/d\theta}{dL/d\theta} = \frac{L_\theta - L_w f_{L\theta} - f_{LL} L_\theta L_w - L_{w\theta}(f_L - w)}{-f_{L\theta} L_w^2 + (L_\theta L_{ww} - L_w L_{\theta w})(f_L - w) - L_\theta L_w} \tag{21}$$

Here we face the same issue as in the competitive case, as if $f_{L\theta} \neq 0$ we cannot separately identify $f_{L\theta}$ and f_{LL}. Even assuming $f_{L\theta} = 0$, however, we would face the deeper issue that without firm-level data we cannot separately identify f and the degree of imperfect competition among employers (which we have assumed here to be monopsonistic for illustrative purposes). Our data are thus consistent with a range of possibilities.

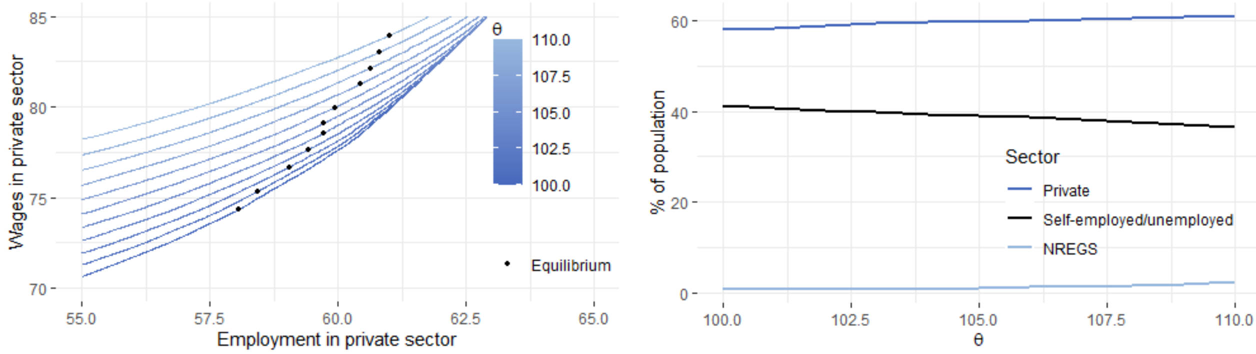
C.3 Returns to land

We now turn to examining how NREGS quality affects the returns to land. To do so we augment the production function in (15) to make explicit the roles of capital and land. The profit earned by the firm is then:

$$\Pi = AK(\theta)^{\alpha_K} L^{\alpha_L} T^{\alpha_M} - rK - wL - pM \tag{22}$$

where T represents land and p is the rental value of land.

In this section we derive the comparative statics of p, the rental value of land. We examine the effect on p of varying θ under the same two assumptions of wages equal marginal product of labor, as under perfect competition, and that wages are set as if set by a single, monopsonistic employer. In each



(a) (b)

Figure C.1: Labor market equilibria under imperfect competition

This figure presents a simulation to show how it is possible for both wages and employment to increase in response to an improvement in the quality of NREGS jobs (and the value of NREGS as an outside option). Figure (a) illustrates labor supply curves and equilibrium employment / wage pairs (L, w) under the assumption of monopsony wage-setting. Figure (b) shows the proportion of the population employed in the two sectors at equilibrium under monopsony wage setting for different values of θ. In this simulation, the reservation wage for 160,000 workers for NREGS work is uniformly distributed between 50 and 150 and for the private sector work is equal to $exp(\text{Reservation wage}_{\text{NREGS}} + 20)/30+$ a random Uniform[-20,20] noise. The firm's production function is $2500\sqrt{L}$.

case, we compute the treatment effect on returns to land under the model from the improvement in the NREGS work quality θ given the impact on wages and labor supply.

C.3.1 Perfect competition

In this case the firm demands labor, capital, and land to maximize profit given wage and prices. We assume the capital stock and land owned is not affected by the change in NREGS program quality $(K'(\theta) = 0)$ in the short run, implying that labor is easiest factor of production to adjust in the short run. This implies the following relationship between the short term returns to land (p) and the exogenous wage:

$$\frac{d \log p}{d\theta} = \frac{\alpha_L}{\alpha_L - 1} \frac{d \log w}{d\theta} \tag{23}$$

We calculate the labor share α_L to equal 0.35 from NSS 2012 cost of cultivation survey. The treatment effect on equilibrium wage is 10.2%. This implies a 5.5% decline in the returns to land due to the treatment.

C.3.2 Imperfect competition

We now consider a market where a single firm is a monopsonistic employer and decides equilibrium wage and labor demand endogenously given the workers' labor supply curve. We assume the firm has the same Cobb-Douglas production function. As before, we assume the capital stock and land owned are fixed in the short run. The firm hence choose wage and labor supplied given the capital stock, land, and the workers' labor supply curve.

By the envelope theorem, the change in the labor supply due to change in θ and the change in wage due to change in labor do not have a first order effect on the profit or the returns to land. The returns to land is impacted only by the direct change in wage due to the change in θ. We derive the following relationship for the impact on short term returns to land:

$$\frac{d\log p}{d\theta} = \frac{\alpha_L}{\alpha_L - \text{markdown}}\frac{\partial \log w(L,\theta)}{\partial\theta} \tag{24}$$

where markdown is the ratio of marginal product of labor and wage. We estimate labor elasticity of 3.07 which implies a wage markdown of 1.33. The last term in the expression is the treatment effect on the labor supply curve for a fixed labor supply. We estimate this using the treatment effect on the reservation wage as 7.1%. Assuming $\alpha_L = 0.35$, this yields a 2.5% decline in the returns to land due to the treatment.

D Distributional analysis

This appendix outlines the procedures used to arrive at the distributional analysis presented in Figure 2 and the supplementary visualization (Figure D.1) in this appendix. Using both our original survey data and model-based calculations, we are able to estimate the treatment effects on wage income and profits-per-acre across the distribution of landholdings for every household in the SECC roster. Our findings are robust to various treatment estimates and measurement techniques.

D.1 Discrete landholding intervals

Using the SECC household-level data, we first sort households by landholdings, then collapse them into discrete bins based on landoldings. Panels A-C of Figure 2 are all ordered in ascending order of household land holdings (with the width of the bars indicating the fraction of the population at that level of landholding). Panel A presents the estimated impacts on wage income, Panel B presents the estimated impacts on profits, and Panel C adds the two to present estimated net income gains.

To calculate effects on labor earnings (Panel A), we first calculate the labor endowment of each household in the SECC as the number of adults aged 18-65 in the household. We then construct the average of this number across households in each bin of landholdings, indicated by the black line (scale on the right-hand y-axis). We then multiply this by the adjusted treatment effect on earnings from wage labor per adult aged 18-65 in our survey (Table D.1) to obtain the estimated effect on labor earnings (blue bars, left-hand scale). The adjustment for number of working adults accounts for the variation in households' endowment of working-age adults. For instance, some very poor households by landholding may also not have working adults (e.g. in cases where household members are elderly), and may hence not be able to benefit from increased wages and labor income.

For profits (Panel B), we first calculate mean land-holdings in the SECC data in each bin (black line, right-hand scale). We then multiply these by two different estimates of effects on profits-per-acre, indicated by the two different colored bars in Panels B (and C). The first (blue bar) uses the treatment effects on land profits estimated in our survey data, indicating a 6.2% decrease in value-per-acre (Column 5 of Table 3). The second (grey bar), uses the estimated effect under a Cobb-Douglas Production Function and imperfectly competitive labor markets (see Appendix C.3.2), indicating a 2.5% decrease in profits. To convert this percentage reduction in land profits to a rupee value, we multiply by the estimated mean profits per acre of land in Andhra Pradesh of ∼Rs. 10,200 using the 2012 NSS Cost of Cultivation Survey.[71]

The third panel shows the sum of estimated treatment effects on wages (Panel A) and profits (Panel B) treatment effects. Our default estimate of profit reduction (based on the 6% decrease in land value estimated in our survey data), suggests that all households with landholdings below 7 acres were made better off.[72] The second model-based estimate under imperfect competition (which yields a profit reduction of 2.5%) suggests that households further up the landholding distribution also saw income gains. In the second case, net income is only negative for households holding more than 24 acres of land, who comprise only 0.77% of the population.

71. See http://mospi.nic.in/sites/default/files/publication_reports/KI_70_33_19dec14.pdf. The Cost of Cultivation survey provides estimates of net receipt from cultivation at the state level. We take this monthly estimate of Rs. 2,022 for Andhra Pradesh (from Table 7 on page A-11 of the report above), multiply it by 12 to get the yearly estimate, and then divide by the average landholding for agricultural households in AP recorded in the same survey (2.39 acres). This gives us an yearly profit-per-acre estimate of Rs. 10,164, which we round up to 10,200.

72. The net-impact is close to zero for the group holding between 5.1-10 acres of land as shown in 2. This is the average of modest positive net impacts below 7 acres and negative net impacts over 7 acres.

These results are robust to alternative rupee estimates of profits-per-acre. For instance, Foster and Rosenzweig (2011) estimate a considerably lower mean profit-per-acre of Rs. 1500 (after imputing for the cost of own labor) compared to the Rs. 10,200/acre we use from the NSS. In this case, the rupee value of the profit reduction would be significantly lower, and we would estimate positive net effects for nearly all households.

D.2 Continuous measure of socioeconomic status

As an alternative way to visualize distributional effects, we also run a similar procedure as above using a more comprehensive measure of socioeconomic status to order households and present the result in Figure D.1. The SECC does not have a continuous measure of income since it only categorizes households into 3 income categories based on whether the highest-earning member of the household has monthly earnings below Rs. 5,000, between Rs. 5,000 and 10,000, or above Rs. 10,000. To obtain a continuous measure of income in the SECC, we run a logistic regression of a binary measure of income (whether the household is in or out of the lowest category above, which accounts for 83% of households in the control group) on several predictors of socioeconomic status (SES) including landholdings but also home ownership, the number of rooms in the home, whether the home is a pucca (brick/stone) home, an indicator for whether the household is scheduled caste or schedule tribe, education level, whether there is a member who has a disability, and a variable that is the first principal component of several asset variables. We then use the fitted values from this regression as a measure of each household's affluence or socioeconomic status (SES).

Grouping these values into percentiles, ranked from low (1) to high (100), we then plot the mean number of adults aged 18-65 in a given household (Panel A), and total landholdings in acres (Panel B) for each percentile of the SES distribution. Performing a Loess regression on the two plotted distributions—that is, mean working-age adults and mean landholding by SES percentile—yields a smooth estimate of the distribution. We then apply our wage and profit treatment effects based on both our survey and model estimates (as described above) to these two smoothed distributions, and add the two values at each percentile of the distribution to arrive at the net treatment effect (Panel C).

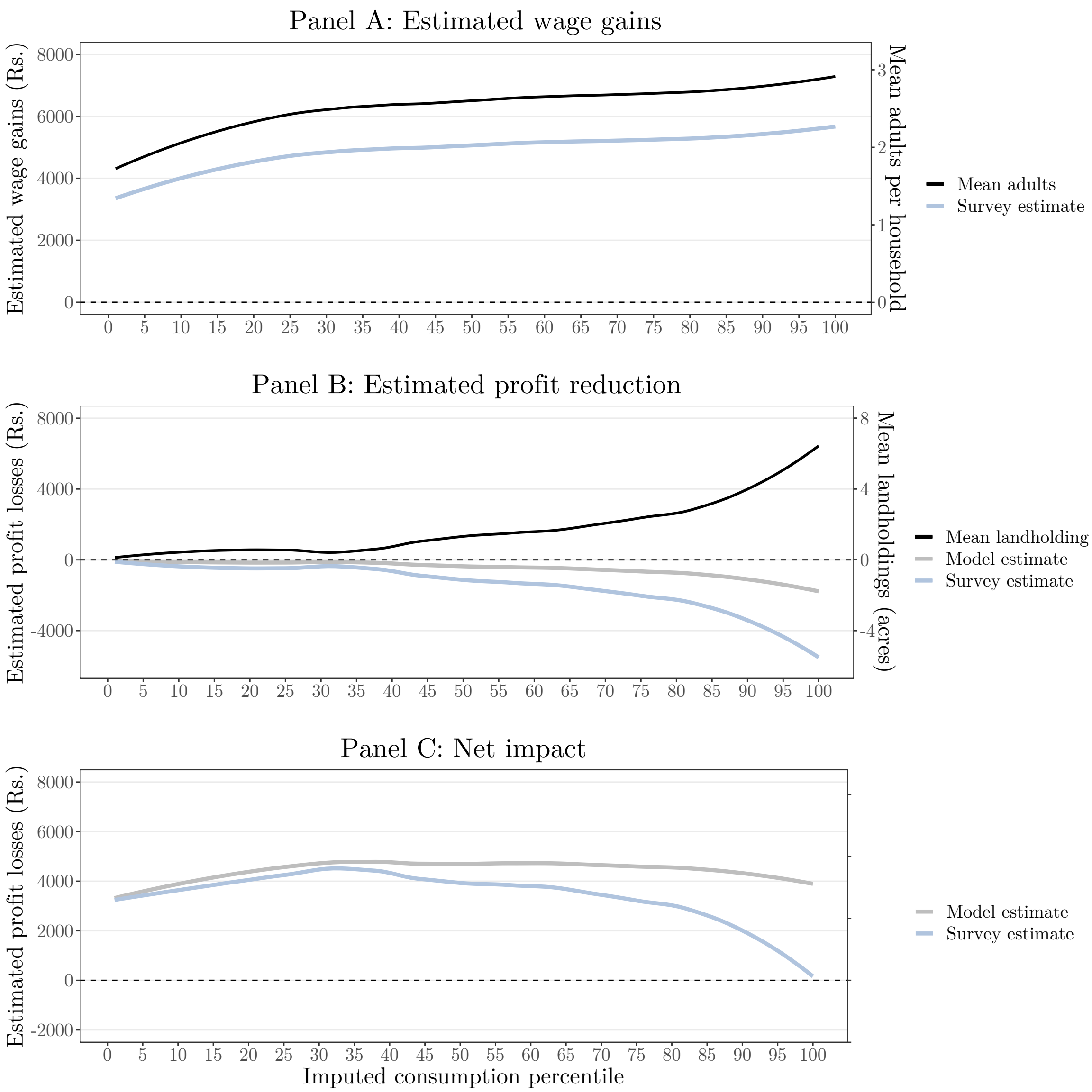
We see that the overall narrative is quite similar to that presented in Figure 2, with the main difference being that the net impact of the reform (in Figure D.1) now appears to be positive at all percentiles of the SES distribution - using both survey and model based estimates of profit reduction from land. The difference relative to Figure D.1 is that this measure of SES includes several other variables in addition to landholdings. Thus, while landholdings are strongly positively correlated with SES, the mean landholdings for the highest SES are (understably) lower than when we sort households *only* by landholdings as we do in Figure 2. The reductions in profits are correspondingly lower. Correspondingly, the net gains lower in the SES distribution are less positive, because even low SES households do own at least some land (on average), and would therefore experience a reduction in land returns, though this is much less than the gain in wages.

Table D.1: Earnings from wage labor per working-age adult

	Wage per worker	Working-age adults
	(1)	(2)
Adjusted TE	1946***	.23
($\beta_T + 0.36 * \beta_N$)	(729)	(.21)
	{797}	{.22}
Main effect	1630***	.13
(β_T)	(585)	(.16)
	{612}	{.17}
Nbhd effect	317	.098
($0.36 * \beta_N$)	(307)	(.1)
	{312}	{.099}
Control mean	7,525.0	4.1
Adjusted R^2	.053	.023
Observations	4,732	4,892

The unit of analysis is a household. In Column 1, we take working-age adults to be those aged between 18 and 65. We divide the household-level wage labor income (both physical labor income and income from NREGS) by the number of working-age adults per household. Column 2 presents a balance test of the mean number of working-age adults per household across treatment and control groups. Standard errors in parentheses are clustered by mandal; those in brackets are spatial as in Conley (2008). Significance based on the former is denoted: $^{*}p < .10, ^{**}p < .05, ^{***}p < .01$.

Figure D.1: Wage and profit estimates across imputed consumption percentiles



Panel A shows the fraction of working-age adults (aged 18-65) per household for each consumption percentile (black line, right-hand axis). The blue lines and left-hand axis show the estimated wage gains when we apply the treatment effect estimated in our survey data to the distribution of adults. Panel B shows both the mean landholding size in acres for each percentile plus two estimates of profit losses (derived from our survey estimates and model-based estimates). Panel 3 shows the net impact, calculated by summing the estimated wage gains with the two estimated profit losses. We describe our estimation strategy above.

E Comparison to Imbert and Papp (2015)

In this section, we show that the difference between our estimated average earnings gains (10.9% of mean PCE) and IP's is fully explained by the differences in our estimated employment effects. That is, we show that if we adjust our estimated earnings impacts to reflect (i) the all-India percentage increase in wages that IP find (4.7%), and (ii) the elasticity of demand they estimate (-0.38), we obtain an increase equal to 3.3% of mean PCE, within the range of the earnings gains they report by quintile. We do so by adjusting the impacts on earnings from the NREGS, from wage labor, and from other sources as reported in Table 1 as follows:

- **NREGS**. We (conservatively) leave these unchanged, at Rs. 1,295.
- **Wage labor**. We scale these down by the ratio

$$\frac{(1 + \%\Delta w^{IP}) \times (1 + \%\Delta e^{IP}) - 1}{(1 + \%\Delta w^{MNS}) \times (1 + \%\Delta e^{MNS}) - 1} \tag{25}$$

  i.e. the ratio of the percentage change in labor earnings we would expect to see given the wage increase in IP ($\%\Delta w^{IP} = 4.7\%$) and the corresponding employment change ($\%\Delta e^{IP} = 4.7\% \times -0.38$) and that we would expect to see given the corresponding estimates in our own data ($\%\Delta w^{MNS} = 9.4\%$, $\%\Delta e^{MNS} = 17.7\%$). This yields a counterfactual effect of Rs. $7,607 \times 10\% =$ Rs. 749.
- **Other sources**. We scale these down as above, but (conservatively) omit the employment terms, as this category primarily reflects self-employment. This yields a counterfactual effect of Rs. $1,733 \times (4.7\%/9.4\%) =$ Rs. 844.

This leaves us with a total counterfactual income gain of Rs. $1,295 +$ Rs. $749 +$ Rs. $844 =$ Rs. $2,887$. Mean annual per capita expenditure in the NSS is Rs. 20,250; multiplied by the average household size in our data (4.31 individuals per household) yields total annual household expenditure of Rs. $20,250 \times 4.31 =$ Rs. $87,277$. The income gain relative to PCE is thus $2,887/87,277 = 3.3\%$.

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