Online Appendix A

This Appendix reports results of additional robustness tests that are briefly described in the text.

Table A1: Sample construction

Panel A: Annual survey of industries (ASI)	
Period	Fiscal year 2002 to fiscal year 2010
Number of observations (census)	1,26,586
Number of Factories (census)	31,655
Firm-year Observations in Phase 1	17,554
Firm-year Observations in Phase 2	16,725
Firm-year Observations in Phase 3	92,307
States covered	20
Union Territories covered	5
Districts covered	495
Phase 1 Districts	162
Phase 2 Districts	103
Phase 3 Districts	230
Average number of factories in a Phase 1 district	14
Average number of factories in a Phase 2 district	21
Average number of factories in a Phase 3 district	48
Average number of observations per factory in Phase 1	5.46
Average number of observations per factory in Phase 2	5.46
Average number of observations per factory in Phase 3	5.34
States/U.T.s Excluded	Andaman & Nicobar Islands, Manipur, Jammu & kashmir, Meghalaya,Tripura and Nagaland
States/U.T.s having no factory-year observation	Arunachal Pradesh, Mizoram, Lakshadweep, Sikkim
Panel B: MNREGA related variables for IV regression	
Period	Fiscal year 2007 to fiscal year 2010
States/U.T.s covered	20
U.T. Covered	4
U.T. not available	Delhi
Panel C: Election Commission of India	
Period	Fiscal year 2002 to fiscal year 2010
States/U.T.s covered	25 (20 States + 5 U.T.)
Number of observations	225
State ruling dummy == 1	101

AI Access to finance and mechanization

To the extent that labor expenditure can at least in part be met ex-post from operating cash flows, the capital investments need to be financed upfront (Fazzari, Hubbard, Petersen, Blinder and Poterba (1988)), therefore access to finance is a critical pre-condition for mechanization (Duchin, Ozbas and Sensoy (2010)). We exploit this idea to further sharpen the interpretation of our results on mechanization by firms post MNREGA.

Specifically, we use a natural experiment engendered by a policy experiment in India that randomized the access to finance among small firms and enabled us to analyze whether capital investments were particularly higher for firms that had better access to finance.[37] In

[37] Farre-Mensa and Ljungqvist (2015) show that widely used measures of financial constraints such as K-Z index (Kaplan and Zingales (2000)) or the measure developed by Hadlock and Pierce (2010) do not measure

India, banks are mandated to direct 40% of their total credit to priority sectors (Cole (2008)). The definition of priority sector includes key sectors such as agriculture, low-cost housing, and small and medium enterprises (SME). Until the year 2006, a firm was considered as an SME if the total investment in plant and machinery was less than or equal to INR 10 million. The limit was increased from 10 million to 50 million in the year 2006.

The redefinition of an SME led to a large exogenous increase in the number of firms that became eligible for priority sector credit. Prior literature highlights that such redefinition eased credit constraints for firms (Banerjee and Duflo (2014)). The 50 million cut-off lends itself to a sharp regression discontinuity design. This redefinition created a situation wherein firms just below a 50 million cut-off enjoyed better access to finance when compared to firms just above 50 million. It must be noted that the first phase of MNREGA was also implemented in the year 2006. Further, financial constraints are likely to be more severe, and hence priority sector lending program is likely to have a greater effect in regions with lower levels of financial development. We proxy for the level of financial development in a region using bank branch penetration defined as bank branch per 100,000 population.

To formally analyze whether mechanization investments were greater in less financially-constrained firms, we use the regression discontinuity method designed by Calonico, Cattaneo and Titiunik (2014). This method recognizes the fact that the routinely employed polynomial estimators are extremely sensitive to the specific bandwidths employed. Calonico, Cattaneo and Titiunik (2014) show that the conventional and regression discontinuity (RD) tests and the, recently developed, nonparametric local polynomial estimators make bandwidth choices that lead to a "bias in the distributional approximation of the estimator." Accordingly, based on the suggestion, we report both the biases-corrected as well robust RD estimators. Our bandwidth selection is based on Imbens and Kalyanaraman (2011).

In our RD test, we use gross investments in plant and machinery as the dependent variable. The level of investment in plant and machinery is the running variable, with 50 million being the cut-off. We report the results in Table (A2) in Appendix A. In column (1), our sample consists of factories located in districts with below-median bank penetration and where MNREGA was implemented in 2006. We find that factories that are to the left of the cut-off mechanize significantly more than factories that are placed to the right. It must be noted that the policy experiment exogenously reduced the financial constraints for factories on the left. In column (2), using the same sample as in column (1), we test the impact on wages. Consistent with our baseline results reported in section (VI.B), we do not find any significant discontinuity in wages at the cut-off.

In columns (3) and (4), we examine the impact on mechanization and wages, respectively, in phase-1 districts with high (above median) bank branch penetration. The policy experiment aimed at alleviating financial constraints for small firms is more likely to have a bite for firms with limited access to finance. Consequently, in areas with a high level of bank penetration, we do not expect much (or, at the very least, less) difference in the ability of firms on both sides of the RD cut-off to raise external finance. Consistent with the idea, we do not find any significant discontinuity in either mechanization or wages at the cut-off.

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financial constraints appropriately.

Finally, to rule out the thesis that our findings regarding the increase in mechanization by factories post-MNREGA implementation could potentially be driven by some unobservable time-varying factor that happens to coincide with MNREGA, in columns (5)-(8), we conduct a placebo RD experiment with the sample of factories located in phase-3 districts. MNREGA was not implemented in these districts, as of 2006. Thus, these districts were not experiencing a labor supply shock at the time the priority sector cut-offs for lending were redefined. However, factories located in these areas with less than INR 50 million investment in plant and machinery also exogenously became eligible for priority sector lending. An analysis of columns (5)-(6) provides some evidence of an increase in mechanization by factories to the left of the cut-off. However, the estimated treatment effect is about one-third of the magnitude observed for phase-1 factories in columns (1)-(2) and is statistically indistinguishable from zero using robust RD estimates. This effect is not surprising, given that these factories may be responding to an anticipated fall in labor supply. Again, we do not find any discontinuity for factories located in more financially developed areas.

Table A2: FACTORIES UNDER FINANCIAL CONSTRAINT VERSUS OTHERS

This table reports the regression discontinuity (RD) results for the impact of MNREGA on Log of Gross P&M additions (P&M) and change in Wages (WAGES). The RD specification estimates the significance of $E[Y_i(1) - Y_i(0)|X_i = \bar{x}]$. We use the procedure developed by Calonico et al. (2014) to estimate robust, and bias-corrected standard errors. Z-statistics are reported in parentheses. Total Gross P&M opening balance as of 1st April 2006 is the running variable. As we are using the exogenous change in the priority sector lending limit to manufacturing establishments, in October 2006, from INR 10 million to INR 50 million, we take INR 50 million as the cut-off. T-statistics are reported in parentheses. ***,** and * represent statistical significance at the 1%, 5% and 10% levels, respectively.

	Phase 1 districts				Phase 3 districts			
	Low financial development		High financial development		Low financial development		High financial development	
	P&M	WAGES	P&M	WAGES	P&M	WAGES	P&M	WAGES
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Bias-Corrected	6.586***	-0.1146	-0.0525	0.5916	2.1586*	-0.2411	0.0622	0.0351
	(3.5020)	(-0.6832)	(-0.0745)	(1.2494)	(1.7931)	(-1.3714)	(0.0661)	(0.3498)
Robust	6.586*	-0.115	-0.0525	0.5916	2.1586	-0.2411	0.0622	0.0351
	(1.7437)	(-0.5417)	(-0.0269)	(0.9840)	(1.2542)	(-0.9934)	(0.0558)	(0.2452)
Observations	841	842	52	52	2,438	2,438	3,506	3,506
Year	2007				2007			

Table A3: Existence of Pre-Trend (Placebo treatment)

The table reports OLS estimates based on equation (1) and using a placebo treatment assignment to test for pre-existing trends. A detailed description of variables is provided in Table 1. Note that MNREGA was implemented at the beginning of the fiscal year 2007 (2nd February 2006), 2008 (1st April 2007) and 2009 (1st April 2008) in three phases. In panel A, we use fiscal years 2003, 2004 and 2005 as placebo treatment years representing the three-phased implementation of MNREGA. In panel B, we use 2004, 2005 and 2006 as placebo years. The sample consists of all open "wholly private owned" factories in the ASI census survey from the fiscal year 2002 to the fiscal year 2010. The controls include firm size (factory size) and age of the factory. The standard errors are clustered at the district level. T-statistics are reported in parentheses. ***,**,* represent statistical significance at 1%, 5% and 10% respectively.

	(1)	(2)	(3)	(4)
	Log(1+PERM_WORKER)	Log(1+WAGE_PERM)	Log(1+FIXED_ASSET_ADD)	log(1+PNM_ADD)
Panel A : Years 2003-2005				
Post-MNREGA	0.0016	0.0021	-0.0160	-0.1384*
	(0.1347)	(0.2447)	(-0.4012)	(-1.6644)
Firm size	0.0500***	0.0382***	-0.0971***	-0.1476***
	(14.5782)	(19.0076)	(-8.4190)	(-7.6724)
Age	0.0021***	0.0007**	0.0032	-0.0024
	(3.8106)	(1.9867)	(1.3101)	(-0.4923)
Observations	120,774	120,774	120,774	118,778
R-squared	0.9300	0.8285	0.8062	0.7187
Panel B : Years 2004-2006				
Post-MNREGA	-0.0091	-0.0044	-0.0002	-0.0124
	(-0.9240)	(-0.7250)	(-0.0056)	(-0.1613)
Firm size	0.0500***	0.0382***	-0.0971***	-0.1476***
	(14.5834)	(19.0001)	(-8.4197)	(-7.6801)
Age	0.0022***	0.0007**	0.0032	-0.0024
	(3.8172)	(1.9919)	(1.3089)	(-0.4951)
Observations	120,774	120,774	120,774	118,778
R-squared	0.9300	0.8285	0.8062	0.7187
Year FEs	Yes	Yes	Yes	Yes
Factory FEs	Yes	Yes	Yes	Yes

AII Alternative identification strategy: instrument variable approach

In section (VI.A.1), we perform several other cross-sectional tests using different economic characteristics to analyze the heterogeneous impact of the program. These tests further strengthen the causal interpretation of our findings. The chances of there being an omitted variable that comoves with MNREGA in both time series and several cross-sectional dimensions are remote. Nevertheless, to address any residual concerns, we use an alternative identification strategy and employ an IV approach. We design our instrument by considering the political economy implications of the program. Prior literature highlights that governments in emerging economies resort to politically targeted fiscal measures to win voter support (Cole (2008); Alok and Ayyagari (2019)). Although MNREGA is funded by the central government, it is implemented by state governments. Therefore, a party ruling at the center is likely to get higher political mileage for allocations made to states that it rules when compared to other states (See Khemani (2007), Arulampalam, Dasgupta, Dhillon and Dutta (2009) and Dinç and Gupta (2011)). Thus, we expect that the expenditure allocated for MNREGA and, consequently, the intensity of MNREGA implementation is likely to be higher in states where the ruling party in the state is same as the party at the center when compared to the states that are under party in opposition at the center.

We exploit this idea to construct our instrument. Specifically, we use a dummy variable (DUMMY_STATE_CENTER) as our instrument that takes the value of one if the ruling party is a state S during a year t that is the same as the ruling party at the center. We restrict our sample to all the states where the ruling party in the state is same as the party at the center or the party in opposition at the center.[38] It must be noted that since the timing of state elections is exogenously specified and constitutionally mandated to be held every 5 years, it does not always coincide with the MNREGA implementation; the instrument is unlikely to be related to any plausible time-varying omitted variable that correlates with MNREGA. An example would better clarify our identification strategy. The Indian National Congress (INC) was the ruling party both at the center and in the states of Andhra Pradesh and Maharashtra. While the central government and Andhra Pradesh governments were elected in the year 2004, the Maharashtra government was elected in the year 2005. MNREGA was implemented in the year 2006 in both the states. The identifying assumption (exclusion restriction) is that the victory of the INC in these states is unlikely to directly have an adverse effect of employment in factories other than through its effect on the intensity of MNREGA implementation. Thus, while our DID tests rely on a staggered roll-out of MNREGA for identification, our estimates using the IV approach are identified through a randomized variation in the intensity of treatment.

In Table A4, we report the results of the first stage and formally verify whether our instrument satisfies the inclusion restriction. Specifically, we examine if our instrument

[38] We exclude states ruled by *regional* parties, which have formed a coalition with either the ruling party or the party in opposition at the center. This is because it is difficult to disentangle the effect in the states that are under allied parties as the alliances are often withdrawn. In essence, all regional parties are potential allies for the two main national parties in India, the Indian National Congress and the Bharatiya Janata Party.

correlates with the subsequent intensity of the MNREGA implementation. Each observation represents a factory-year. It must be noted that in these tests we focus only on the post-MNREGA period and restrict our sample to the states under either the ruling party or the party in opposition. We use the following three proxies to capture the intensity of the treatment: LABOR_EXP (columns (1), (4), (7), and (10)) is the total wage expense related to MNREGA workforce, NUMBER_WORKS (columns (2), (5), (8), and (11)) is the total number of public infrastructure projects undertaken through MNREGA, and the TOTAL_EMP_DEMAND refers to the *Number of Workers* (columns (3), (6), (9), and (12)) registered with MNREGA that demanded work. Focusing on Table A4, we find that our instrument is positively correlated with all the three measures and the correlation is statistically significant at the 1% level. Further, we follow Sanderson and Windmeijer (2016) to mitigate the concerns of under-identification and a weak instrument bias. Overall, these results show that MNREGA implementation is more intense in districts that belong to states ruled by the same political party that rules at the federal level.

In the second stage, we analyze whether the decrease in permanent workforce employed and an increase in mechanization is greater in factories located areas with greater MNREGA intensity. In Table A5, we report the estimates from these tests. Focusing on columns (1)-(3), we find that, consistent with our baseline results reported in Table 3, there is a statistically significant decline in the number of permanent workers for factories located in states with greater MNREGA intensity. Moreover, in line with our DID results, we find no significant impact on wages (columns (4)-(6)) and a statistically significant increase in mechanization (columns (7)-(12)).

Summarily, the results from IV estimates corroborate the baseline findings of our difference-in-differences empirical strategy. In subsequent analysis, we only report the results based on our baseline DID empirical strategy.

Table A4: First stage IV regression

This table reports the estimates from the first-stage of our IV regressions. We use three proxies to capture the intensity of treatment: MNREGA's labor expenditures (INR in millions), Number of works (in millions), both completed and ongoing, and total employment demanded (in millions). *State-Center* dummy is our instrumental variable that provides exogenous variation in the intensity of treatment. *State-Center* takes the value one if the ruling party in the state is the same as the party in power at the center and 0 otherwise. The sample consists of all open "wholly private owned" factories in the ASI census survey from the fiscal year 2002 to the fiscal year 2010. The controls include firm size (factory size) and age of the factory. We report Sanderson- Windmeijer (SW) first-stage chi-squared p-value and F-statistic tests for under-identification and weak instruments, respectively, of individual endogenous regressors in each column. The standard errors are clustered at the district level. T-statistics are reported in parentheses. ***,**,* represent statistical significance at 1%, 5% and 10% respectively.

	(1)	(2)	(3)
VARIABLES	LABOR_EXP	NUMBER_WORKS	TOTAL_EMP _DEMAND
DUMMY_STATE_CENTER	0.0042***	0.0202***	0.0628***
	(3.33)	(4.06)	(3.61)
Observations	28,897	28,897	28,897
SW Chi-sq p-value	0.001	0.000	0.000
SW F-statistic	11.10	16.49	13.05
Prob > F	0.005	0.001	0.0034
Year FEs	Yes	Yes	Yes
Factory FEs	Yes	Yes	Yes
Controls	Yes	Yes	Yes

Table A5: Second stage IV regression

This table reports the estimates from the second-stage of our IV regressions. We use three proxies to capture the intensity of treatment: MNREGA's labor expenditures (INR in millions), Number of works (in millions), both completed and ongoing, and total employment demanded (in millions). DUMMY_STATE_CENTER dummy is our instrumental variable that provides exogenous variation in the intensity of treatment. DUMMY_STATE_CENTER takes the value one if the ruling party in the state is the same as the party in power at the center and 0 otherwise. The sample consists of all open "wholly private owned" factories in the ASI census survey from the fiscal year 2002 to the fiscal year 2010. The controls include firm size (factory size) and age of the factory. The standard errors are clustered at the district level. T-statistics are reported in parentheses. ***,**,* represent statistical significance at 1%, 5% and 10% respectively.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
VARIABLES	Log(1+PERM_ WORKER)			Log(1+WAGES_ PERM)			Log(1+FIXED_ ASSET_ADD)			Log(1+PNM_ ADD)		
LABOR_EXP	-7.3069*			2.3536			32.0549			99.5593*		
	(-1.7719)			(0.4090)			(1.5351)			(1.9402)		
NUMBER_WORKS		-1.5238**			0.4908			6.6848*			20.5310**	
		(-2.0719)			(0.4206)			(1.9468)			(2.2169)	
TOTAL_EMP_ DEMAND			-0.4919*			0.1584			2.1579			6.7188**
			(-1.8196)			(0.4076)			(1.6047)			(2.0137)
Observations	28,897	28,897	28,897	28,897	28,897	28,897	28,897	28,897	28,897	28,570	28,570	28,570
R-squared	0.9686	0.9675	0.9685	0.8457	0.8455	0.8457	0.8853	0.8826	0.8851	0.8192	0.8102	0.8185
Year FEs	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
District FEs	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

AIII Impact on District Level Growth

We start with the impact of MNREGA on growth. If activity levels of firms, in general, are adversely affected due to MNREGA, and full-time workers leave those areas where the manufacturing firms are located, it is reasonable to expect a decline in economic growth. Manufacturing is likely to be directly affected by firm growth slowing down caused by a short-run drop in profitability. Unfortunately, reliable district-level GDP data are not available. As an alternative, we use the night lights data and examine the effect of MNREGA on the Night-time Light Intensity. [39] The measure of night-time Light Intensity, also called Luminosity Index is used in the economics literature as a measure of economic growth and output (Henderson, Storeygard and Weil (2011); Chen and Nordhaus (2011)). Thus, the availability of time-series of night lights data at the district level allows us to examine the effect of MNREGA on the local economic activity.

We employ our baseline staggered difference-in-differences regression in these tests, albeit with district-month as the unit of observation. The dependent variable is the monthly median value of the district level Night-time Light Intensity. Table A6 summarizes these results. We find a significant decline in visibility during the night. The results are economically significant; a one standard deviation movement leads to a decline of about 13% in the median visibility at night.

Table A6: District level outcome: night-time light visibility

In this table, we examine the effect of the MNREGA on the Night-time light visibility at the district level. We use the Night-time light data at the district level from 2002 and 2010 from the api.nightlights.io. The data is organized at district month level. The dependent variable is the monthly weighted median of night light visibility of a district. The parameter of interest is the coefficient on the interaction term Post-MNREGA, which is a dummy variable that takes the value 1 for all treated districts in all months after the implementation of MNREGA in the district. We include district and month fixed effects in all specifications. The errors are clustered at a district level. ***, **, * represents statistical significance at the 1%, 5%, and 10% levels.

VARIABLES	Night light visibility (1)
Post-MNREGA	-0.1729***
	(-5.7921)
Observations	52,911
R-squared	0.5641
Month FEs	Yes
District FEs	Yes

[39] Source: The India Lights project is a collaboration between Development Seed, The World Bank, and Dr. Brian Min at the University of Michigan. http://api.nightlights.io