Government Employment Guarantee, Labor Supply and Firms' Reaction: Evidence from the largest Public Workfare Program in the World *

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Abstract

Using establishment-level employment and operating data, we examine the impact of Indian government's employment guarantee program on labor and firm behavior. Using the staggered implementation of the program for identification, we find that the program leads to 10% reduction in permanent workforce in factories. Factories respond to the adverse labor supply shock by resorting to increased mechanization. As a result, firms' cost of production increases significantly leading to a reduction in net profits and productivity. These effects manifest primarily in firms paying low wages, having low labor productivity, greater sales volatility and firms located in states with pro-employer labor regulations.

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1 Introduction

Governments all over the world engage in activist fiscal policies (Auerbach et al. (2010)). Such fiscal interventions include tax cuts (House and Shapiro (2006); Mertens and Ravn (2014)), interventions in debt contracts (Agarwal et al. (2012), Agarwal et al. (2015), Bolton and Rosenthal (2002)), increased spending on infrastructure in order to boost employment (Munnell (1992)), minimum wage (Aaronson et al. (2012)) among others. These are typically employed to deal with economic distress.[1] Amongst such interventions, public workfare programs have become increasingly popular around the world (Subbarao et al. (2010)).[2] There has been a longstanding debate among economists on effects of such workfare programs. However, surprisingly the empirical evidence on the externalities of such programs on labor market frictions, capital expenditure and firm output in the corporate sector is scant. This paper attempts to fill this gap by examining the real effects of a large government employment guarantee program on firms.

The economic setting that we use is the implementation of a large rural employment guarantee program in India. The program named as "Mahathma Gandhi National Rural Employment Guarantee Act (MNREGA from now)" aimed to provide at least 100 days employment to the rural unemployed and the underemployed by engaging them in the building of rural infrastructure. To make the program labor intensive, it was stipulated that at least 70% of the expenditure should be on wages alone.

MNREGA fits the description of a typical workfare program analyzed in the literature (Besley and Coate (1992)). The program was launched in the year 2006. By 2008, 5.8 million families completed 100 days of work, with an initial outlay of INR 228.46 billion (USD 5.08 billion an exchange rate of INR 45 to a USD) (Imbert and Papp (2015)). In terms of man days provided and the proportion of government revenue allocated, this is the *largest ever* employment guarantee program in history. Currently, it provides employment to approximately 50 million households annually generating about 2300 million person-days of employment.

The biggest obstacle in evaluating the impact of workfare programs on outcomes such as corporate employment and investments is that such programs are typically launched as a remedial measure during economic downturns. For instance, Franklin Roosevelt launched the largest workfare program in history at that point to arrest the rising unemployment during the great depression. Thus, identifying the effect of such programs is confounded by macroeconomic conditions as well as other contemporaneous fiscal and monetary policy measures that governments may undertake in dealing with recessions.

[1] For example, the US governments Middle Class Tax Relief and Job Creation Act of 2012

[2] For instance, Franklin Roosevelt launched the largest workfare program in history at that point to arrest the rising unemployment during the great depression. In recent times, Public workfare has been launched in Korea (1997-1999), Ethiopia (2004), Rwanda(2008), Sri Lanka (2010) among a host of other countries (Subbarao et al. (2010)).

Further, since such programs are launched across the country, it becomes difficult to obtain an estimate of the counterfactual level of these outcomes in the absence of the program.

Many salient features of MNREGA help us to circumvent these issues and allows for a relatively clean experimental setting for causal identification. First, the program was implemented in a phase-wise manner starting from 200 districts in the first phase, extending up to 130 in the second phase and 285 districts in the third phase. This facilitates the use of the generalized version of difference-in-differences methodology for multiple time periods and treatment groups (Bertrand and Mullainathan (1998)). We include factory fixed effects and year fixed effects in all our specifications in order to control for time-invariant factory level characteristics as well as aggregate macroeconomic shocks and trends. Second, our setting overcomes the challenges posed by simultaneous changes in the fiscal as well as monetary policy, which is a major identification hurdle in many setting (Auerbach et al. (2010)). The fact that there were no major changes in the monetary policy during the implementation of the first and the second phases of the program allows us to disentangle the impact of the program. Third, unlike most activist fiscal programs in the west, MNREGA was not announced as a temporary measure. The plan did not mention any expiry date.[3] Therefore, MNREGA is likely to have caused a permanent change in behavior. Finally, retrenchment of permanent employees is a very long and arduous process in India, thanks to rigid labor laws (Besley et al. (2004)). Therefore, any quick change in permanent employment can be attributed to the labor supply rather than demand shocks driven by adverse regional or macroeconomic conditions.

Our paper has multiple objectives. First, we examine how the program impacts labor supply of both temporary and permanent workforce in private (non-government) sector.[4] To understand the underlying mechanism of MNREGA it is key that the shock is to labor supply and not to demand, because the effect on labor demand may be driven by macro and industry dynamics. Consequently, we conduct a series of tests to rule out the possibility that our results are confounded by labor demand. Second, we study how does the labor supply shock impact firm's capital expenditure. Further, we analyze whether the impact of MNREGA on firms is a function of firm-specific factors, such as access to finance, ex-ante wages, labor productivity, cash-flow volatility as well the labor law regime in the firm's state. Third, we study how the changes in labor supply and demand for capital impacts firm productivity. Additionally, in this paper, we examine the time-

[3]The Indian National Congress Party (INC) which launched the program lost power in 2014. The Bhartiya Janata Party (BJP), which came to power in 2014 decided to not only continue the program but also increased allocation of funds for the program

[4]We also examine the effect of this policy on the public (government) sector. However, that is not the main focus of the paper because such firms are not profit maximizing and so we do not expect them to be responding to such a program.

series and cross-sectional dynamics of MNREGA. We conduct a battery of robustness tests to rule out alternative explanations and highlight the underlying mechanism.

We start our analysis by examining the impact of MNREGA on the composition of factory production workers. Our baseline results show that the implementation of MNREGA leads to an approximately 10% reduction in the number of permanent workers.[5] At a first glance, it may seem that any plausible impact on factory employment should have been on contract workers particularly since MNREGA pays minimum wages. However, note that contract workers can simultaneously work for both MNREGA for 100 days and in factories during the rest of the year. Moreover, many workers in India migrate to other states away from their family for employment (Banerjee and Duflo (2007), Morten (2016)).[6] If work under MNREGA requires very little effort due to poor monitoring by the government (Niehaus and Sukhtankar (2013), Muralidharan et al. (2016a), Banerjee et al. (2016)) and has added benefits of working very close to home, lower living/incidental expenses, lower chance of accidents, among others, then even a permanent worker may consider the possibility of working for MNREGA for 100 days. In other words, for workers at the lower end of the wage distribution, the welfare gains from working under MNREGA net of leisure and other non-pecuniary benefits such as being close to family may exceed factory wages net of additional living expenses. Given their full-time commitment with the factories, the only way such workers can participate in MNREGA is by resigning from their permanent employment.[7] Our causal evidence is consistent with this thesis.

As we have noted before, due to the existence of rigid labor laws in India (Besley et al. (2004)), the reduction in the number of permanent workers that we document is unlikely to be demand driven. Nevertheless, we perform two additional tests to show that the reduction in permanent labor is indeed supply driven. We report the following main findings.

First, under MNREGA, the government pays minimum wages applicable as per law. We find that the average factory wage is higher than MNREGA wages. Now, if the fall in number of workers is supply driven, then workers working in factories that pay low wages are more likely to shift to MNREGA when compared to workers employed in factories located with high wages. We do find evidence consistent with this idea. Second,

[5] "We have been finding it hard not only to attract manpower but also to retain the existing ones, thanks to ... government schemes like MNREGA. We have made representations to the Ministry of Textiles in this regard which has already begun talks with the respective ministries to work out the same," said Sanjay Jain, president of Kolkata Association of Garment as well as joint managing director TT Limited, an apparel manufacturing company." - The Times of India, July 24, 2016

[6] See also Topalova (2010)

[7] "Admitting that NREGA had pushed Ludhiana's industry on the back foot, brand manager of Duke Gagan Jain said, "Acute labor shortage is a reality and we're trying to work things out... Not only unskilled, but even tasks requiring skilled workers have taken a beating, what with around 20% personnel taking off, Jain said... He claimed as it was getting tougher to find people with the required skill set, the future would see adoption of latest technology so that lesser people would have be hired." - "Traders blame NREGA for worsening labor crisis", Times of India, Oct 21, 2009

we examine the impact on wages of permanent workers. If the reduction in permanent workers is due to lack of demand by firms, then we expect the wages to go down. We find no change in the wages of permanent workers. The above two tests rule out demand based explanation.

Third, we examine the impact of MNREGA on the number of contract workers and managerial (supervisory) staff.[8] Here, we do not detect any impact. In particular, managerial staff acts as a placebo group. Given the nature of jobs being provided by MNREGA, we do not expect it to have any direct impact on the demand or supply of managerial staff.

One concern regarding our tests is that the phase wise implementation of MNREGA may be in response to an anticipated drop in employment. Alternatively, there could be unobservable time-varying factors that are correlated with both the timing of MNREGA roll out and the decline in permanent workforce. While there is no empirical or even anecdotal evidence in favor of these theses, nonetheless to further strengthen our causal claims, we also employ an alternate empirical strategy using the instrumental variable approach. MNREGA funds are allocated by the central (federal) government while the actual implementation is managed by the respective state governments. Our instrument is based on the idea that funds allocated to MNREGA program are likely to be higher if the state government is ruled by the same party as the central government (Khemani (2004)). Consequently, the intensity of treatment should be higher in such states. Using a dummy variable that identifies whether the state is ruled by the party that is also in power at the center as an instrument for the intensity of MNREGA, we again find a significant decrease in the number of permanent employees post-MNREGA. Consistent with our baseline DID estimates, we do not observe any impact of MNREGA on contract labor or managerial staff.

Our next objective is to examine the response of firms to the labor supply shock. Faced with a labor supply shock, it is possible that factories cut down the level of activity. It is also possible that mechanization, which was not optimal in pre-MNREGA labor market conditions, may become a preferred choice following the implementation of MNREGA (Acemoglu (2010), Acemoglu and Finkelstein (2008)). We find that additional investments in fixed assets (plant and machinery) increases by approximately 12% (24%) as a response to MNREGA. To the extent that such capital entails upfront investments and need to be financed (Fazzari et al. (1988), Benmelech et al. (2015)), we expect the move towards mechanization to be higher for firms with greater access to finance.

To test this idea we exploit a natural experiment engendered by a policy change in India that exogenously alleviated financial constraints for certain firms. Specifically, in 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 small and medium

[8]Throughout the paper, we use the terms "supervisory" and "managerial" workers interchangeably.

enterprises (SME) among others. 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 Rupees 10 million. The limit was increased from 10 million to 50 million in the year 2006. Thus, the firms below the 50 million cut-off enjoyed greater access to finance as compared to the firms above the 50 million cut-off. The 50 million cut-off allows for a sharp regression discontinuity identification strategy. Further such alleviation in financial constraints is likely to be more important for firms located in areas with low financial development (proxied for by bank branch penetration). Focusing on the sample of factories located in such areas for our RD tests, we find those factories that have higher access to finance tend to mechanize in response to the labor supply shortage. In contrast, factories with lesser access to finance increase wages possibly to attract workers.

As part of our third objective, we examine the operating performance of factories. By revealed preference, increasing mechanization was not optimal as compared to the use of labor under pre-MNREGA conditions. Consistent with this thesis, we find that cost of production increases by approximately 8% while the output (gross revenue) remains unchanged resulting in a significant fall in earnings. However, it is possible that this drop in earnings may be only temporary and driven by the fixed costs of associated with implementing and using new technology. Consistent with mechanization improving operational efficiency, we find a decrease in inventory days and current asset cycle.

Finally, we perform a number of additional time-series and cross-sectional tests that further strengthen the causal interpretation of our findings revealing substantial heterogeneity in the impact of MNREGA and the resulting labor shortage on firms. We find that the decline in permanent workforce and the corresponding increase in mechanization is especially greater in establishments associated with low wages, low labor productivity, high sales (output) volatility and located in states with pro-employer labor laws. We also examine the dynamic effects of the impact of MNREGA (See figures 2 and 3). We find that number of permanent workers employed in factories drops convexly over time. Consistent with the long-run nature of labor-capital substitution, we find that capital additions also increases gradually. Most importantly, we do not observe any pre-trends in the data, which is critical for identification in a difference-in-differences setting.

Our paper has the following macroeconomic implications. Since, the workers self-select to work for MNREGA and leave formal employment, by revealed preference it appears to have been beneficial to them in the short-term. However, given the lack of oversight, potential corruption (Banerjee et al. (2016), Muralidharan et al. (2016a)), and the nature of work provided by MNREGA, in the long run it could adversely impact both their incentives and opportunities for skill accumulation and consequently their wealth and welfare (Besley and Coate (1992)). With regards to firms, our analysis shows that labor supply shortage engendered by MNREGA encouraged capital investments in plants and machinery and hampered their productivity and profitability in the short

run. However, to the extent that mechanization is associated with greater operational efficiency, the labor-capital substitution may result in increased firm productivity over the long term (Romer (1990)).

Overall, we contribute to the literature in the following ways. To the best of our knowledge, this is the first paper to examine the impact of large public works program on the interaction between labor, capital, and finance. Second, we exploit the features of MNREGA implementation that allow for relatively clean identification to document its causal impact and show that it crowds out labor supply to the private sector, impacts capital expenditure and firm output. Third, the granularity of our data allows us to speak to the mechanisms through which MNREGA impacts labor and firm behavior.

Our study contributes to several strands of literature. First, it contributes to the literature about the real implications of activist fiscal policy in general and workfare programs in particular. Fiscal interventions usually take the form of either tax cuts or broad-based spending increases or some targeted public works policies (Auerbach et al. (2010)). The program we study comes under the third category. Auerbach et al. (2010) argue that although post financial crisis of 2008-09, the use of fiscal tools has become common, their efficacy remains controversial. The simultaneous implementation of both active monetary and fiscal policies, especially during the times of crisis, has been a challenge in delineating the impact of fiscal measures (Davig and Leeper (2011)). The program we study overcomes the above challenge for two reasons. First, monetary policy was stable during most of the program implementation phase (Das (2015), Das et al. (2015)). Second, the implementation of MNREGA across districts was staggered across time, allowing us to control for aggregate shocks and trends by employing year fixed-effects. To the extent that monetary policy coverage is national (Azam (2011)), it should not have a confounding effect on our difference-in-differences estimates. Overall, this literature argues that fiscal spending may have unintended adverse effects on the economy (Ramey and Shapiro (1998)) and may crowd out investments in the private sector (Cohen et al. (2011)). Our study adds to this literature by showing that workfare programs can potentially crowd out employment in the corporate sector.

Second, our study relates to the large literature that analyses the optimality of workfare as compared to welfare (Chambers (1989)). Historically, countries all over the world have used workfare programs as poverty alleviation tools (Drèze (1988); Katz (1987)). However, there are two opposing views in the literature with regards to the efficacy of such programs in poverty alleviation. On one hand, workfare may allow the unemployed to gain skills helping them eventually get a job in the private sector (Himmelfarb (1984)). On the other hand lack of effective monitoring in such programs may even attract productive labor who were already employed in firms making them forever dependent on the program effectively transforming workfare into welfare (Besley and Coate (1992), Nichols and Zeckhauser (1982)). Our results support the latter view.

Third, we add to the growing literature assessing the impact of MNREGA. Extant research on the program has looked at the impact of MNREGA on labor market outcomes (Azam (2011); Imbert and Papp (2015); Blattman and Ralston (2015)), incidence of poverty (Ravi and Engler (2015); Klonner and Oldiges (2014)), crime (Dasgupta et al. (2014); Banerjee and Saha (2010)), consumption (Kumar et al. (2013)) and other real outcomes.[9] The key findings are that MNREGA resulted in higher wages in agricultural and informal firms, increased expenditure on food and nonfood consumables, and facilitated consumption smoothing. However, remarkably the impact of the program on the nonagricultural economy in general, and manufacturing, in particular, has not received much attention. Such an impact assessment is important in order to assess the costs and benefits of the program comprehensively. If MNREGA impacts industrial activity adversely because of movement of productive labor from factories to MNREGA, then the benefits pointed out in the above papers may have to be qualified. This paper contributes to the above literature by examining the impact of the above workfare program on the industrial sector.

Muralidharan et al. (2016b) use the staggered roll-out of a technology reform across districts in the Indian state of Andhra Pradesh to examine the general equilibrium effects of improving MNREGA implementation on income gains for the poor and broader labor market impact on wages, employment and migration. They find a relative increase in income gains and private sector wages but no significant impact on employment in areas with more effective implementation. They also provide some evidence of labor supply getting crowded out in their control regions suggesting that crowding out may arise from spillovers across regions with varying degrees of MNREGA effectiveness. While related, there are important differences between our studies. In contrast to examining the impact of improving MNREGA implementation, our goal is to examine the overall impact of the roll out of MNREGA. Moreover, one unique aspect of our paper is that we study the behavior of firms in response to potential labor market distortions created by MNREGA and document substantial heterogeneity in both the impact of the program on labor supply to these firms and the consequent firm response. For instance, we find that while firms with greater access to finance choose to mechanize rather than pay higher wages, those with limited access choose to increase wages. Additionally, we are able to examine the labor markets effects of MNREGA on the different types of workers (Permanent, Contract, and Managerial). In these respects, our study complements their findings.

Finally, our paper contributes to the growing body of work in the area of "labor and finance". However much of this literature focuses on the impact of labor market frictions on firm's capital structure decisions. Agrawal and Matsa (2013) find that higher unemployment benefits are associated with an increase in firm leverage. Simintzi et al. (2014) find that increase in employment protection is associated with a decrease in lever-

[9] Sukhtankar (2016) provides a great summary of this literature.

age possibly because labor protection increases the costs of financial distress. Thus far, the literature has largely ignored the impact of labor market frictions on real investment decisions of firms. A recent exception is (Bena and Simintzi (2016)) who examine the impact of labor costs on firm-level innovation. Using the 1999 U.S.-China agreement as a shock that lowered effective labor cost, they find that U.S. firms operating in China decrease their share of process innovations. Our paper furthers the scholarship in this area by providing direct evidence that firms respond to labor scarcity by adopting technology (mechanization).[10]

2 The Program

2.1 Background

Even after 68 years of independence, more than half of Indian population, even to this day, is dependent on agriculture (Narayana et al. (2013)). Agricultural infrastructure is under developed, access to modern scientific developments in farming remains limited and, a large fraction of farmers do not have access to crop insurance (Cole et al. (2013)). Given the above background, fortunes of Indian farmers are significantly dependent on rainfall. Since, rainfall is seasonal, agricultural sector creates sizeable seasonal unemployment in India. As well, as pointed out by (Banerjee and Duflo (2012)), a large portion of rural poor are landless and hence significantly underemployed. In order to mitigate the problem of unemployment and under-employment in rural areas, the United Progressive Alliance Government introduced a employment guarantee program in 2006.

2.2 Implementation

Mahathma Gandhi Rural Employment Guarantee Act (MNREGA) was launched by the government of India on 2nd of February, 2006. The stated objective of the program was to provide "livelihood security in rural areas by providing at least 100 days of guaranteed wage employment in a financial year, to every household whose adult members volunteer to do unskilled manual work."[11] In order to achieve the stated purpose of providing maximum employment to the rural poor, the program stipulated that at least 70% of the total expenditure under the program should be incurred on wages.

The program is an Act of Parliament and not a result of any executive order. The Act did not mention any expiry date. Therefore, the program can be completely stopped only if the enabling Act of Parliament is repealed.[12] Indeed, the new government headed by the National Democratic Alliance (NDA) that came to power in 2014 not only continued the

[10]Theoretically the impact of labor scarcity on technology is ambiguous (Acemoglu (2007, 2010)).
[11]Source: National Rural Employment Guarantee Act 2005
[12]Any change in allocation of funds also requires approval of the Parliament.

program but also significantly increased the allocation of funds to MNREGA. The NDA was in opposition when the program was implemented in 2006. Therefore, it is reasonable to conclude that unlike other fiscal stimulus measures which were temporary in nature, MNREGA has a semblance of permanence. The expectation that MNREGA will continue in the long-run may encourage movement of workers from factories to MNREGA related work. The program only defines the type of work to be provided under the program but does not set any measurable output target. The task of monitoring the work is left entirely to the local bureaucracy.

The program was implemented in a staggered manner in three phases. On 2nd February 2006, the program was implemented in 200 districts. The program was extended further by including 130 districts on 1st April, 2007 and the remaining 285 districts were covered on 1st April, 2008. The stated policy of the government was to select most backward districts in the first phase and the relatively less backward in later phases ((Imbert and Papp (2015)).

In total, MNREGA involved an annual outlay of 230.73 billion Rupees in the year 2005-06 from the Federal budget. This amount increased to 340 billion Rupees in the year 2014-2015. The initial outlay under MNREGA represented approximately 6.3% of total tax revenue of the federal government. As proportion of government revenue allotted, MNREGA is by far the biggest employment guarantee program ever. Even in terms of the number of jobs created, MNREGA is unparalleled. In the first eight years of the program, MNREGA generated over 100 million man days of work.

3 Data and Summary Statistics

3.1 Data

The data used in this study are compiled from three main sources. Our first and primary data source is the Annual Survey of Industry (ASI), an annual survey of registered factories conducted by Ministry of Statistics and Program Implementation (MoSPI) since 1960. ASI performs census survey on all the registered factories, registered with 100 or more workers and, conducts a sample survey for the units having less than 100 workers. Our data coverage extends to 20 out of 28 states and 5 out of 7 Union territories of India spanning 495 districts.[13] The primary unit of enumeration is a factory in case of manufacturing industries, a workshop in case of repair services, an undertaking or a

[13]Following Chaurey (2015), Imbert and Papp (2015), and Bertrand et al. (2015), we leave out the state of Jammu and Kashmir, seven north eastern states of states - Mizoram, Meghalaya, Arunachal Pradesh, Sikkim, Nagaland Tripura and Manipur, and U.T. Andaman & Nicobars Islands and Lakshadweep. Most studies on India exclude these states as special laws are applicable to these states. They together constitute less than 13% of India's geographical area. In total, our data set covers 495 out of 546 districts of India as of 2002.

licensee in the case of electricity, gas and water supply undertakings and an establishment in the case of bidi and cigar industries. Going forward, we refer to all these establishments as "factories".

Our data spans the period, fiscal years 2002 to 2010. The factory identifiers are provided against each observation, which lends itself nicely to a panel structure.[14] For the purpose of our analysis, we restrict our sample to all those census factories which are wholly privately owned and exclude any establishment with a government stake.[15] Among other things, ASI provides detailed information regarding the number of workers segregated by the nature of employment (Contract, Permanent, Supervisory/Managerial), number of man-hours worked by each worker type, total wages and benefits per worker type. The other variables of our interest are the fixed assets (such as land, building, plant and machinery, and computers etc.), capital expenditure on investments, total output (sales) and total input costs. In table 1, we provide detailed definition of the main variables used in our study.[16]

In Table 2, we provide details regarding our sample construction. As mentioned above, we consider only those factories that are a part of the ASI census. These are the factories that are covered by ASI data every year allowing for a panel-structure This leaves us with 1,26,586 factory year observations. MNREGA was first implemented in less developed regions and later extended to relatively more developed regions. Therefore, it is reasonable to expect that industrial activity and consequently, the number of factories to be lower in phase 1 districts and keep increasing phase wise. Consistent with this idea, 17,554 factory years are from 162 phase 1 districts, 16,725 are from 103 phase 2 districts and 92,307 are from 230 phase 3 districts.

Second, we collect information regarding labor expenditure, number of ongoing and completed projects, and total employment demanded under the MNREGA from the Mahatama Gandhi National Rural Employment Guarantee Program Website.[17] The unit of observation for this data is a district-year and spans the period between fiscal years 2006 and 2010. This information is available from fiscal year 2006-07 because the first stage of MNREGA was implemented on 2nd Febraury, 2006. Third, we gather additional data on the the ruling party in each state from the collection commission of India. These datasets are used for our robustness test based on the Instrumental Variable (IV) strategy. We explain our IV methodology in greater detail in section 5.1.1.B.

In table 2, we provide a brief summary of the datasets used for easy reference.

[14]The panel structure is available till 31st March, 2008. Post 2008, we follow the approach as cited in Harrison et al. (2013)

[15]Census factory data comes under the purview of Industrial Disputes Act (IDA), 1947.

[16]ASI data does not report firm identifiers. Hence, we cannot match an establishment to a firm. Therefore, we use only factory related performance variables constructed using ASI's Tabulation scheme for each year.

[17]http://www.nrega.nic.in/ [Accessed in October, 2016]

3.2 Summary Statistics

Table 3 provides summary statistics for the key variables used is this study. The mean (median) number of permanent workers employed in a factory is 173 (72). While on average,a factory employs 67 contract workers, the median factory does not employ any contractual worker. The mean (median) number of supervisory workers employed turns out be 27 (7). The mean (median) wage per permanent worker per year works out to be nearly INR 54,237 (40,081), which translates to a daily wage of approximately INR 174 (128).[18] For contract workers, mean (median) annual wage is INR 13,519 (0). This translates to mean (median) daily wage of INR 43 (0). It is noteworthy that the minimum wage stipulated in India is INR 60-90.[19] Therefore, the typical permanent worker draws more than the minimum wage (the wage rate applicable to MNREGA). Not surprisingly, wage of supervisors (managerial worker) is much higher than that of a worker. The mean (median) annual wage of a supervisor is INR 202,803 (129,076). In daily terms, this works out to be INR 650 (414) per day.

There is a huge variation in the value of gross fixed assets and plant & machinery additions. The standard deviation is INR 939 millions and 775 millions respectively. The mean (median) value of fixed assets additions is INR 62.27 million (INR 2.015 million) and for plant and machinery additions is INR 35.7 million (INR 0.647 million). We observe similar variation exists in the ratio new capital investments per worker; with mean (median) of INR 1.501 million (INR 0.463 million) and standard deviation of INR 6.291 million. The mean (median) of total output produced in the factory, total input of a factory and profits in INR million is 350 (92.34), 229.8 (58.87) and 121.09 (16.67) respectively.

4 Empirical strategy

Our empirical tests proceed in three steps. First, we examine if indeed MNREGA crowds out labor supply to factories. Second, using MNREGA as an exogenous labor supply shock, we focus on analyzing the response of factories to this shock. Here , we also examine the cross sectional heterogeneity in response of factories. These tests not only help us in understanding the economic impact of the program better but also serve as robustness tests to rule out alternative explanations. Third, we study how the changes in labor supply and demand for capital impacts firm productivity.

As noted in Section 2.2, the program was implemented in a phase wise manner. It was implemented in 200 districts on 2nd February 2006, in 130 more districts on 1st April,

[18] We assume a 6 day working week, which is a norm in Indian factories and assume 52 weeks in a year

[19] http://nrega.nic.in/wages.pdf [accessed October, 2016]

2007 and finally in remaining 285 districts on 1st April, 2008. Our empirical design exploits this staggered implementation by estimating a generalized version of the difference-in-differences setup for multiple treatment groups and time periods (See Bertrand and Mullainathan (1998) and House and Shapiro (2006)). Here, a district remains in the "control" group until the program is implemented in that district and subsequently becomes a part of the treatment group. For example; all phase 1 districts belong to the control group during fiscal years 2002 to 2006 and serve as a part of the treatment group from the year 2007 onwards. As noted in Section 2.2, our data spans a period between fiscal years 2002 and 2010. Therefore, we have information for up to four years before the program implementation and two years after.

Formally, our baseline regression specification is as follows:

$$Y_{it} = \alpha + \nu_i + \delta_t + \gamma \times X_{it} + \beta \times \text{Post-MNREGA} + \epsilon_{it} \tag{1}$$

The unit of observation is a factory-year. *Post-MNREGA* is a dummy variable which takes value one for the factories located in the treated districts in the Post-MNREGA implementation period. For example; if MNREGA was implemented in the district where factory A is located in the year 2006 and the district where factory B is located in the year 2008, then *Post-MNREGA* takes the value of one for factory A (B) in the years after 2006 (2008). X_{it} refers to the factory level controls. ν_i is a vector of factory fixed effects that absorb all time-invariant differences across factories. Finally, δ_t refers to year fixed effects that control for aggregate macroeconomic shocks and trends. Standard errors are clustered at district level and adjusted for heteroscedasticity.

The coefficient of interest is β, which captures the change in outcomes in factories located in a treated district before and after the implementation of MNREGA relative to factories located in all other districts not implementing MNREGA at the same time.

4.1 Identifying assumptions

The identifying assumptions for the consistency of β are twofold. First, the usual caveat for identification in a difference-in-differences setting requires the presence of parallel trends in our outcome variables of interest (labor and capital investments) before the NREGA implementation across factories located in the treatment and control districts. We formally verify this assumption in section **5.1.1.A**.

Second, we require that other than the implementation of MNREGA, there were no other contemporaneous change in district level policies or local economic conditions that could differentially impact labor and capital investments across the control and treatment districts. In other words, the phase-wise MNREGA implementation itself is not endogenous. Admittedly, the districts were selected into various phases and not randomly assigned. Therefore, it is important to consider and address the possibility of

time varying unobservable factors which could have an impact on outcomes. For example; if MNREGA was implemented as a remedial response to an anticipated fall in private sector employment, then the drop in factory employment that we document would ensue even without implementation of the program. While the absence of differential pre-trends help us allay these concerns to some extent, to further strengthen the causal interpretation of our findings, we also use an Instrumental Variable (IV) strategy.

We discuss these identification issues in greater detail and our formal tests (including IV) to address such concerns in section **5.1.1**.

5 Results

5.1 MNREGA and Labor Supply

As noted in section 4, we start our analysis by first examining the possible impact of MNREGA on formal employment in the private sector. Specifically, we analyze the impact of MNREGA on both the number of permanent and contract labor employed in factories. On the face of it, it appears that MNREGA is likely to impact contract workers more. This is because such workers can work under MNREGA for 100 days and carry on their factory work during other days. Prima facie, it also appears that the permanent workers may not be impacted by MNREGA as participation in MNREGA activities would require them to leave their permanent job and all associated benefits. Moreover, MNREGA pays only minimum wages. Factories on the other hand not only pay more than the minimum wage on average but also provide opportunity for learning and hence, human capital development.[20] In such a case, a priori it would seem that MNREGA should attract only contract workers.

However, the reality may be more nuanced. First, while the average wages in factories is greater than MNREGA wages, there will be substantial variation in wages received by different workers within a firm (Mueller et al. (2015)). It is likely that workers leaving permanent employment for MNREGA are those at the lower end of the wage distribution. Second, if work under MNREGA requires very little effort due to poor monitoring by the government and has added benefits of working very close to home, lower incidental expenses, lower chance of accidents, among others, then even a permanent worker may consider the possibility of working for MNREGA for 100 days. In other words, factory wages net of additional benefits and expenses may be lower than MNREGA wages. Therefore, a permanent factory worker may find work under MNREGA more attractive per unit of effort. He may either work as a contract worker in factories or do odd local

[20] Our calculations show that the average wage of a factory worker is 80-100% higher than the minimum wage and also that an average worker works for about 295 days in a year. The pre-implementation average wage of productive worker is around INR 125-145. While as per the NREGA wage document http://nrega.nic.in/wages.pdf, the minimum wage varies around INR 60-75 per day.

jobs during other days of the year.[21] Note that in contrast to permanent workers, contract workers can simultaneously work for both factories as well as for MNREGA.

Thus, whether or not MNREGA crowds out employment in the private sector and what type of formally employed work force (permanent or contractual) it attracts is an empirical question.

In table 4, we examine the impact of MNREGA on total number of permanent and contract workers employed in factories. Panel A reports the estimates from our baseline regression 1 using the number of workers as the dependent variable whereas in panel B, we use the natural logarithm of the number of workers as the dependent variable.[22] In columns 1 and 2 of both the panels, we report the results for permanent workers whereas in columns 3 and 4 (5 and 6), we report the results for contract (managerial) workers.[23]

Focusing on columns 1 and 2, the negative and significant coefficient on *Post-MNREGA* indicates that MNREGA led to a decline in the nnumber of permanent workers employed in factories located in the treatment districts relative to factories located in the control districts. The number declines by 16.68 (17.4) in column 1 (2). Given that the mean (median) number of permanent workers in a factory is 173 (72), the above decline is economically significant as well. In percentage the estimates translate into an approximately 10% (23%) decline in permanent workers for the mean (median) factory.

Results presented in columns 3 and 4 show that the number of contract workers does not change materially. These results do not unequivocally imply that contract workers remain unaffected by MNREGA. Note that ASI data reports the average number of workers employed by a firm in a year based on the number man-days of work reported by the firm in a year and not the unique number of individuals employed. For instance, a contract worker A works for first 6 months and another contract worker B works for rest of the 6 months during a year, ASI data would count it as 1 contract worker on annual basis. As discussed above, it is possible that a portion of permanent workers who leave their factory jobs and work for MNREGA may work as contract workers during non MNREGA days. Therefore, a plausible outflow of contract workers to MNREGA may well be offset by a plausible inflow of former permanent workers.

Finally, focusing on columns 5 and 6, we don not find any impact of MNREGA on the number of managerial workers employed in factories. This results can also be interpreted as a placebo test and further strengthens the causal interpretation of our findings. Since

[21] Please note that Indian factories employ both "permanent" and "contract" workers (Bertrand et al. (2015)). Almost all labor laws are applicable mostly for permanent workers and hence factories have less flexibility with respect to such workers. It is not possible for a permanent factory worker to work under MNREGA as long as he retains that employment status. Such workers, if attracted towards MNREGA because of reasons mentioned above, may chose to quit the permanent factory job, perform MNREGA work for 100 days and do something else in the remaining working days.

[22] We take logs because the distribution of workers is log-normal.

[23] ASI data classifies permanent and contract workers as productive workers. The term productive is used in the sense that these workers are directly engaged in production. The term does not imply higher efficiency or productivity in the conventional sense.

MNREGA is targeted toward poorer low-skilled manual workforce, we do not expect it to impact managerial staff. The results reported in Panel B, where we use natural logarithms of number of workers is qualitatively similar to the results presented in Panel A.

As explained in Section 2.1, the above result is unlikely to have been driven by demand side response from factories as rigid labor laws make laying off workers extremely difficult. More importantly, given our difference-in-differences setting exploiting the phase wise implementation, any aggregate shock that affects all districts simultaneously should get differenced out. This limits the set of potentially confounding policy changes and other economic shocks. A shock can only confound our estimates if it either affects the districts sequentially in a staggered fashion or its adverse impact on employment is greatest on phase 1 districts followed by phase 2 and phase 3 districts. Nonetheless, in order to further strengthen our thesis that MNREGA resulted in a labor supply shock, we verify the absence of differential pre-trends and also verify these results using an Instrumental Variables approach. We discuss these in detail in the next section.

5.1.1 Identification Concerns and Alternative Interpretation

Our causal claims face three main identification challenges. First, there could be a pre-existing trend of declining permanent workers in these districts. Second, the implementation of the program may have followed a counter cyclical pattern. This concern relates to selection of districts in various phases. Suppose, selection of a district for MNREGA implementation coincides with an adverse economic shock, then decline in factory employment may just be an artifact of the economic situation at hand. Finally, it is possible that the decline in number of permanent workers is driven by demand and not by labor supply. We now proceed to address these concerns.

5.1.1.A Ruling out Pre Existing Trend

Any result from a difference-in-differences test is subject to the caveat that the result may be driven by pre existing trend differentials between the treatment and control group. We test the existence of pre-existing trend by estimating the following regression equation.

Specifically, we estimate the following distributed lag model:

$$ln[1 + y_{idt}] = \beta_0 + \sum_{-5}^{-1} \theta_k \times Pre[k]_{idt} + \sum_{1}^{3} \theta_k \times Post[k]_{idt} + \delta_i + \gamma_t \quad (2)$$

The dependent variable in these tests is the natural logarithm of permanent workers. $Post[k](Pre[k])$ is a dummy variable that identifies the year T+k, where T is the year of MNREGA implementation. For example, if MNREGA was implemented in the year

2008 in a district A, then dummy variable representing Pre_{-1} year takes the value of one for factories located in that particular district for year 2007. The coefficient θ_1 measures the immediate DID effect of MNREGA on the dependent variable. The *marginal* coefficients θ_2 (θ_3) measure the *additional* marginal responses one year (two years) after the implementation of the MNREGA. Similarly, coefficients θ_{-1},..., θ_{-5} capture the difference of trends for each of the dependent variable between the treatment group and the control group in each of the five pre-treatment years. In line with Agarwal and Qian (2014) and Agarwal et al. (2007), we then cumulate individual coefficients starting from -5 to 0 and 1 to 3 separately. For example, for year -3, we cumulate the coefficient for years -5, -4 and -3 and so on. Following Agarwal and Qian (2014) and Agarwal et al. (2007), the results can be interpreted as an event study. Figure 2a graphs the entire paths of cumulative coefficients and the dotted lines depict the corresponding 95 percent confidence intervals. In essence, this graph plots the coefficients on the DID regressions that show the difference between the firms in the treated group and the control group over time. All these coefficients are relative to the year of implementation of MNREGA in the respective factory's districts.

Notice that in the years upto the year of implementation of the program, we do not observe a statistically significant difference between the treated and the control firms. If anything, we observe a slight upward trend in the number of permanent workers in factories but the estimates are statistically indistinguishable from zero. This clearly rules out existence of any pre trend. Also notice that the trend changes direction after the implementation of MNREGA. We observe a statistically significant decrease in number of permanent employees post-MNREGA.

To further rule out existence of pre-trend, we perform a placebo test. Note that MNREGA was implemented in the beginning of fiscal year 2007 (2nd February, 2006), 2008 (1^{st} April, 2007) and 2009 (1^{st} April, 2008) in three phases. We use placebo implementation years and estimate regression equation 2. The results are reported in Table 5. In panel A, we use fiscal years 2003, 2004 and 2005 as placebo years representing three phase implementation. In panel B, we use 2004, 2005 and 2006 as placebo years. As shown the table, we do not detect a significant decline in the number of permanent workers when we use placebo treatment years. We only report the estimates from analysis with controls in Table 5 for brevity. However, our results are qualitatively similar without controls as well.[24]

Overall, these tests help us allay any concerns regarding the possibility of our estimates being confounded by pre-existing trend differences between factories located in treatment and control districts.

[24]These results are available upon request.

5.1.1.B Alternate Identification Strategy: Instrument Variable Approach

In sections **5.4**, we perform several other cross sectional tests using different economic characteristic to analyze the heterogeneous impact of the program. These tests further strengthen the causal interpretation of our findings chances of there being an omitted variable that comoves with MNREGA in both time series and a number of cross sectional dimensions is remote. Nevertheless, in order to address any residual concerns, we also use an alternate identification strategy and employ an instrumental variable (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 (2015)). MNREGA is funded by the central government but 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 et al. (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 those states where the ruling party in the state is same as the party at the Center.

We exploit this idea to construct our instrument. Specifically, we use a dummy variable as our instrument that takes the value of one if the ruling party is a state S during a year t is same as the ruling party at the center. Note that since 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. 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 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 staggered roll out of MNREGA for identification, our estimates using the instrumental variable approach are identified through randomized variation in the intensity of treatment.

In table A1 of appendix 6, we report the results of the first stage and formally verify whether our instrument satisfies the inclusion restriction. Specifically, we examine if indeed our instrument correlates with the subsequent intensity of MNREGA implementation. Each observation represents a factory-year. Note that in these tests we focus

only on the post-MNREGA period. We use three proxies to capture the intensity of treatment: *Labor Expenditure* (columns 1, 4, and 6) is the total wage expense related to MNREGA workforce, *Number of Works* (columns 2, 5, and 8) is total number of public infrastructure projects undertaken through MNREGA, and total employment demanded is the *number of workers* (columns 3, 6, and 9) registered with MNREGA that demanded work. Focusing on table A1, we find that our instrument is positively correlated with all three measures and the correlation is statistically significant at the 1% level. 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 in factories is higher in areas with greater MNREGA intensity. Formally, we use the predicted value from the first stage as explanatory variable to estimate the second stage regression. In table A2, we reports the estimates from these tests. Focusing on columns 1, 2 and 3, we find that consistent with our baseline results reported in table 4, 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 do not observe any significant effect on the number of either contract workers (columns 4, 5, and 6) or managerial staff (columns 7, 8, and 9).

Summarizing, 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.[25]

5.1.2 Impact On Wages

Here we attempt to rule out that the decline in permanent workers is driven by an adverse economic shock to firms resulting in a reduced demand for labor. It is important to note that India's labor laws are rigid and hence laying off permanent workers is very costly (Besley et al. (2004). Hence even if firms face economic shocks, laying off permanent workers is difficult. If anything firms would layoff contract workers. Moreover, it would have to be the case that any such adverse shock effects factories in the control group more than the treatment group. Nonetheless, if indeed our results are driven by a drop in demand for labor, then it is reasonable to expect a decrease in wages paid to the remaining permanent workers. We test the above proposition using the DID design, equation 1 and report the results in table 6.

The dependent variable in these tests is the natural logarithm of wages. In columns

[25]We also use these tests to examine the impact on capital investments. While we find a positive effect, the coefficient estimates are statistically indistinguishable from zero. This is not surprising as we are exploiting small variations in election cycle and centre-state alignment to identify the estimates here. Consequently, these tests suffer from low statistical power. Moreover, since the increase in MNREGA expense allocation by political parties is targeted towards rural labor, we expect that it will effect labor supply. However, it is not obvious that that capital investments of factories should respond immediately.

1 and 2, the dependent variable is the natural logarithm of average daily wage paid to permanent workers. Columns 3 and 4 (5 and 6) report the results pertaining to wages of contract (managerial) workers. We employ factory and year fixed effects in all specifications. In columns 2, 4 and 6, we employ additional factory level control as described in section 4.

The results indicate that the wages of all three category of workers do not change significantly as a result of implementation of MNREGA. Overall, these results provide further support for our claim that the decline in number of permanent workers is unlikely to have been driven by a drop in labor demand by factories. However, at the same time, it is also important to note that an adverse labor supply shock should potentially resulted in an increase wages, which is not what we observe. Alternatively, it is possible that rather than increasing wages, factories may prefer to move towards mechanized methods of production that requires less labor. Therefore, a close examination of how factories respond to MNREGA is warranted at this stage. We next proceed to examine the response of factories to MNREGA.

5.2 MNREGA and Capital Investments

We now move on to examine the response of factories to the labor supply shock pointed out above. When faced with a labor supply shock factories may respond by either increasing wages or by resorting to mechanization. In other words, factories may prefer to substitute labor with capital.

We begin by graphically examining the impact of MNREGA on capital expenditure by factories. The dependent variables in these tests is the natural log of gross value of additions to fixed capital (figure 3a) as well as just additions to plant and machinery (figure 3b). The estimates reported figures 3a and 3b are based on equation 5.1.1.A. Similar to our discussion in section 5.1.1.A, the reported point estimates correspond to cumulative effects of MNREGA with respect to the year of implementation over time. In contrast to our results on permanent employees, we find that a significant increase in capital investments following MNREGA. Further, these investments cumulatively increase over time. Importantly, critical for identification in our setting, we do not observe any differential pre-trends between the treatment and control group. If anything we observe a slightly downwards trend in capital investments in the pre-MNREGA period subject to the caveat that the point estimates are statistically indistinguishable from zero.

To investigate this further, we re-estimate the specification 1 in table 7. We use four measures as proxies for mechanization by factories and use them as dependent variables in each regression. In column 1 (and 2), 3 (and 4), 5 (and 6), and 7 (and 8), we use natural logarithm of gross additions to fixed assets, gross additions to plant and machinery, capital per worker and total expenditure on rent and lease on plant and machinery respectively as

dependent variables. We find that addition to fixed assets increases by 11.82%, addition to plant and machinery increases by 23.23%, capital per workers increases by 2.3% and finally, expenditure on rent and lease expenses on plant machinery increases by 24.87%. The results show that factories respond to labor shock by resorting to mechanization.

These findings also help explain our results pertaining to wages. Our results indicate that factories prefer to move towards mechanized modes of production rather than increasing wages. More importantly, these results provide robust evidence against the idea that the decline in permanent employees could be driven by a demand shock. If the factories in our control group were subject to an adverse economic shock, then we should expect to see a decline in both labor and capital.

Summarizing the results so far, we find that a public works program such as MNREGA crowds out employment in the private sector and firms respond to the consequent labor supply shortage by mechanizing.

5.2.1 Access to Finance and Mechanization

To the extent that labor expenditure can at least in part be met ex-post from operating cash flows, while capital investments need to be financed upfront (Fazzari et al. (1988)), access to finance is a critical pre-condition for mechanization (Duchin et al. (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 access to finance among small firms to analyze whether capital investments were particularly higher for firms with greater access to finance.[26] In 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, small and medium enterprises (SME) among others. 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 Rupees 10 million. The limit was increased from 10 million to 50 million in the year 2006.

The SME redefinition led to a large exogenous increase in the number of firms that became eligible for priority sector credit. Prior literature highlights that such a 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 where firms just below the 50 million cut-off enjoyed higher access to finance when compared to firms just above 50 million. Note that the first phase of MNREGA was also implemented in the year 2006. Further, financial constraints are likely to be more severe

[26] 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 financial constraints appropriately.

and hence priority sector lending program is likely to have 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 et al. (2014). This method recognizes the fact that the routinely employed polynomial estimators are extremely sensitive to the specific bandwidths employed. Calonico et al. (2014) show that both conventional and regression discontinuity(RD) tests as well as 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 bias 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 A3 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 to the right. Note 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. We expect that to the extent that financially constrained firms find it more difficult to substitute labor with capital, they will be forced to increase wages in response to the labor supply shock. Indeed, we find such a result. Firms on the right of the cut-off pay more wages to permanent workers when compared to factories on the left which are less constrained. This result pertaining to increase in wages is consistent with extant studies on the topic which show that MNREGA leads to an increase in wage level for the agricultural sector and informal ("mom and pop") businesses (Swain and Sharma (2015)) and Imbert and Papp (2015)). However, there are important differences in our study. First, our analysis pertains to larger firms in the formal sector. Second, our findings are more nuanced. We show that factories that have higher access to finance tend to mechanize whereas factories with less access to finance are likely to end up paying higher wages.

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 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 of

wages at the cut-off.

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 Rupees 50 million investment in plant and machinery also exogenously became eligible for priority sector lending. Focusing the columns 4-8, we do not find any significant discontinuity at the RD cut-offs either in terms of mechanization or in terms of wages for such firms.

Overall these tests help buttress our claim that firms choose to mechanize in response to the labor supply shortage created by MNREGA.

5.3 Impact of MNREGA on Factory Level Performance

We now examine the impact of MNREGA on operating performance of factories.

5.3.1 Impact on Factory Output

Generally, mechanization is expected to lead to an improvement in operational efficiency. However, in this case mechanization is caused by a labor supply shock. By revealed preference, factories were better off without the increased mechanization which ensued after MNREGA. Moreover, marginal productivity of factory labor is positive in India (House and Shapiro (2006)). Therefore, in this context, it is reasonable to expect that mechanization driven by a labor supply shock is likely to lead to deterioration in operating performance at least in the short-term. We use natural logarithm of total input (total cost of production), output, earning before interest taxes depreciation and amortization (Profit), output to input ratio as performance metrics. We use cash ratio as a metric for liquidity. Formally, we re-estimate our baseline regression 1 using these measures as dependent variables

The results are reported in table 8. The dependent variables in columns 1 to 10 are the natural logarithm of cost of production, gross output, earning before interest taxes depreciation and amortization (Profit), cash ratio and output to input ratio respectively. We find that cost of production increases by 7.5% and profitability declines by 50 basis points post MNREGA. Rupee value of output remains unchanged. Output to input ratio, which is measure of efficiency declines significantly.

In summary, these results show that MNREGA lead to a decline in operating performance of factories.

5.3.2 Impact on Working Capital

Impact of forced mechanization on working capital is not clear ex-ante. On the one hand, due to minimum batch size requirements and high set up costs, mechanization may lead to mismatch between quantity demanded and quantity produced and hence lead to increased inventory. On the other hand, mechanization may facilitate implementation of just in time and other efficiency improving methods due to quick turnaround time. We examine the above two conflicting hypotheses. We estimate equation 2, using the inventory cycle, defined in terms of number of days, as the dependent variable. The results are reported in columns 1 and 2 of Table 9. We find that the inventory cycle declines by about 25 days. We then examine the impact on the number days it takes to collect debt. Because the change is in production technology, prima-facie, one may not expect an improvement in the debtor cycle. However, it is possible to argue that standardized production system may reduce the time required for inspection and also return of goods by customers and hence lead to quick payment. We report the results pertaining to debtor cycle in columns 3 and 4 of Table 9. Here, we find an improvement of about 2 days in debt recovery cycle. The improvement, although statistically significant does not translate into an economically meaningful number.

Finally, we combine the two and calculate the impact of total working capital cycle. We report the results in column 5 and 6 of table 9. We find that total working capital cycle improves by about 27 days.

5.4 Cross Sectional Heterogeneity in the impact of MNREGA

We now perform several cross sectional tests to sharpen our understanding regarding the impact of the labor supply shock on different types of firms. These tests help us better identify the channels of influence.

5.4.1 Impact Based On Level Of Wages

As explained in section 2.1, workers are paid only minimum wages under MNREGA. Summary statistics presented in Table 3 show that average wage of factory workers is significantly higher than MNREGA wages. Therefore, a factory worker will have to settle for lower level of monetary earnings if he opts out of a factory work and chooses to work for MNREGA. However, there may be significant non-pecuniary and pecuniary benefits such as being close to home, greater leisure, lower cost of living etc. under MNREGA. Assuming these pecuniary benefits to be similar across wage levels, we expect that MNREGA would be relatively more attractive to workers earning low wages.

In order to empirically verify the above thesis, we first calculate the average daily wages of workers at the factory level and average wages per worker at the district-industry

level in the pre-MNREGA period. We then split our sample into two and classify factories where the average wage is less (more) than district median for the industry to which the factory under consideration belongs as low (high) wage factories. We then re-estimate our baseline difference-in-differences specification separately for low wage and high wage workers. The results are reported in table 10. In panel A (panel B), we report the results for the sub-sample of low (high) wage factories. We find that the drop in number of permanent workers is confined to factories with low wages. In such factories, the number of workers declines by 2.7%. Expectedly, we do not observe any significant change in the number of workers in factories where workers fall under high wage category.

Interestingly, we find MNREGA lead to an increase in both wages (column 2) and mechanization (columns 3 and 4) in factories that were paying low wages. Note that average wages in such factories may rise mechanically post-MNREGA as the workers that leave are likely to be the ones who were at the lower end of the wage distribution within the factory.

In contrast, focusing on high wage factories in panel B, we find that MNREGA lead to a decrease in wages (column 2) and an increase in mechanization. While we do not observe a statistically significant decline in permanent workforce for such firms, even these may prefer to mechanize post-MNREGA in anticipation of a labor supply shortage should they need to expand their production. To the extent, that increased mechanization should depress the demand for labor, these firms would also reduce wages for their workforce.

5.4.2 Impact Based On Labor Productivity

Given the nature of work performed under MNREGA, it is reasonable to expect that factories where output per worker (our proxy for labor productivity) is low are more likely to experience an outflow of workers when compared to factories with high output per worker. Note that MNREGA's mandate is to provide unskilled employment. Therefore, highly skilled workers who produce large per capita output are likely to receive higher wages and unlikely to opt out of factory work for MNREGA. In order to test this proposition, we split our sample of factories into two based on whether the labor productivity measure is above (high productivity) or below (low productivity) the median output per workers at the industry level in the pre-MNREGA period. We then re-estimate regression equation (2) separately on the two sub samples.

The results are reported in table 11. In line with our expectation, the decline in permanent workforce is confined to factories with low worker productivity as shown by Panel A of Table 11. Such factories experience a 3.85% decline in the number of permanent workers. We also find that additions to gross fixed assets increase by 16.8% and new investments in plant and machinery increase by 26%. Again, consistent with our results on low-wage factories (Table 10, panel A), we find an increase in average wage of permanent

workers in such factories. Note that this result is also likely to be mechanical. To the extent that wages are an increasing function of labor productivity, if low productivity workers leave to work for MNREGA, average wage of the remaining (high productivity) workers in the factory would increase mechanically.

In Panel B, we examine factories with high output per workers. In line with our thesis outlined above, we do not see any change in either the number of permanent workers or in any of the mechanization measures. While the increase in plant and machinery is economically meaningful (column 4), the estimate is statistically indistinguishable from zero.

Overall, the results presented in sections 5.4.1 and 5.4.2 shows that MNREGA crowded out employment in factories with low wages and low labor productivity.

5.4.3 Output Volatility and Impact of MNREGA

Workers are likely to experience greater job uncertainty in riskier industries with greater cash flow volatility. There could be long spells with little work or no work followed by short spells of heavy work. Workers working in such conditions may find 100 days of guaranteed employment under MNREGA attractive as there is little uncertainty involved. In order to test the above proposition, we classify the factories into high output volatility and low output volatility categories. Specifically, we follow Dougherty et al. (2011) and measure industry volatility by the standard deviation of the annual growth rate of factories' output. We then split our sample into above and below the median volatile industry.

We expect the impact of MNREGA to be higher in factories with high output volatility. using the measures developed by Dougherty et al. (2011) These results are reported in table 12. In Panel A (B), the sample covers factories with high (low) volatility. In accordance with our conjecture, the number of permanent workers declines by 3,2% and measures of mechanization increase by between 14.2% to 29.65% in factories with high output volatility. In panel B, we find that the factories with low output volatility are not affected by MNREGA. Given the lower level of uncertainty, permanent workers in such factories seem to find MNREGA less attractive.

5.4.4 Impact based on Labor Laws

In India, both federal and the state governments have a right to pass laws governing labor. The Industrial Disputes Act of 1947 (IDA henceforth) forms the basis of labor regulations in India. Although IDA is a federal law, the state governments have a right to amend certain provisions. This has led to heterogeneity between states regarding the exact form of the act applicable. Based on state level amendments made to the labor regulations, Besley et al. (2004), classify Indian states as pro-employer and pro-

employee. The above classification has been updated by Aghion et al. (2008) using an expanded time-period. We use this updated classification of states as pro-employer and pro-employee.

Workers working in pro-employee states enjoy higher level of job security and protection against actions taken by employers (Besley et al. (2004)). Therefore, all else equal, a-priori such workers are less likely to leave their job and join the MNREGA workforce. On the other hand, workers who work in pro-employer states, are likely to be relatively more inclined to join MNREGA as they face relatively low job security and stricter monitoring from their employers. We examine the above thesis by estimating regression equation 2 separately on sub-sample of factories located in pro-employer and pro-employee states.

The results are reported in Table 13. In panel A (B), the sample is restricted to factories from pro-employer (pro-employee) states. As shown in the table 13, the number of permanent workers declines by about 3% in factories that are located in states with pro-employer labor laws. Investment in fixed assets and investment in plant and machinery increase by 15.6% and 25.65% respectively, which show that these factories resort to mechanization. We do not see any significant impact on factories that are located in pro-employee states.

Overall our cross-sectional tests help us understand the heterogeneity in the impact of MNREGA on factories and further ameliorate any concerns about correlated economic shocks confounding the effects that we document in this paper.

5.4.5 Interaction between Productivity and Labor Laws

We now classify factories into four sub-samples based on the level of worker productivity and the level of labor regulations in the state in which the factory is located. Based on the above findings, factories with low worker productivity and located in states with pro-employer regulations are likely to be most impacted by MNREGA. A combination of low job security, high employer monitoring and lower level of skills may spur movement of workers towards MNREGA. Highly productive workers even in states that pro employer are unlikely to join MNREGA as they may find MNREGA work unsuitable. Similarly, workers working in states with pro-employee regulations may not feel the need to move to MNREGA irrespective of their level of productivity. The gains from moving to MNREGA is likely to be lower for such workers with regards to reduction in effort and they may lose job security.

We now examine the impact of MNREGA on the four sub samples separately and report the results in Panels A, B ,C and D of table 14. In Panel A, the sample is restricted to factories located in pro-employer states with low worker productivity. In line with our conjecture, the number of permanent workers reduces by 5.4% and mechanization

represented by additions to fixed assets and additions to plant and machinery increases significantly in such factories. In Panel B, we consider highly productive factories located in pro employer states. Expectedly, we do not find any significant impact on such factories. In Panel C and D our sample is restricted to factories that are located in states with pro-employee labor laws. In panel C (D), we focus on factories with low (high) productivity. Here again, we do not see any significant impact of MNREGA.

5.4.6 Interaction between Wage Levels and Labor Laws

Similarly, in Table 15, we classify factories into four groups based on pre-MNREGA wages and the level of labor regulations applicable. We find that permanent workers tend to move out of factories that pay low wages and are located in states with labor laws favoring employers. We do not see such movement in any of the other three groups.

These results further reduce the plausibility of there being any correlated economic shock at play. Such an unobservable shock should not only impact states with weaker labor regulations the most but also within such states, it should have a greater effect on factories with low labor productivity and those that pay low wages. These results, coupled with our instrument variables analysis, provide compelling evidence against our estimates being potentially confounded by time-varying shocks correlated with MNREGA.

5.4.7 Interaction between Output Volatility and Labor Laws

The level of job insecurity, work pressure and uncertainty is likely to be higher in factories in more volatile industries and are located in states that have labor laws favoring employers. In these states, the chances of a worker losing a factory job during lean period is higher. Therefore, we expect that permanent workers employed in more volatile factories that are located in states with pro-employer labor regulations would be more likely to leave factory work and join MNREGA. To test the above proposition, we divide our sample into four groups based on the level of output volatility and the level of labor regulations.

The results are reported in Table 16. In panel A, the sample covers highly volatile factories that are located in states with pro employer labor regulations. We find that, in such factories, the number of permanent workers falls by 4.4% and measures of mechanization increase by between 16.7% to 31.8%. We do not see any significant change in either employment or mechanization in other sub samples. These results further corroborate our claim that the movement of workers and consequent increase in wage or mechanization is indeed caused by MNREGA and raise the bar further against the possibility that our results may be driven by a confounding economic shock.

6 Conclusion

In this study, we analyze the impact of the largest ever workfare program on labor and firm behavior. Using India's Mahatma Gandhi National Rural Employment Guarantee Act (MNREGA), which compelled the state to provide at least 100 days of employment to all citizens as our experimental setting, we find that MNREGA crowds out labor supply to factories. The number of permanent workers engaged in factories declined by 10% due to MNREGA. Faced with labor scarcity, factories resort to mechanization. Operating profitability goes down, consistent with the idea that mechanization was not optimal ex-ante.

Overall, our paper shows that workfare programs may adversely impact the corporate sector by weening away productive workforce and thereby, creating a labor shortage. This has the unintended consequence of hastening technology adoption by firms. While our paper documents the short-term consequences of workfare programs on labor and firms, our analysis helps us conjecture on the long-run implications of such programs as well. By providing relatively less demanding alternative opportunity to work, workfare may reduce individuals' incentives to expend effort towards skill accumulation thereby making them forever dependent on state-sponsored employment. This may adversely impact their long-term term welfare by hampering their ability (skills) to avoid poverty. Moreover, firms respond to the labor supply shortage created by such programs by investing in mechanization which may further reduce the labor force's ability to garner formal employment. The sudden move towards mechanization results in a decline in firm productivity and earnings in the short run. To the extent that mechanization results in greater operational efficiency, in the long run, it may prove to be beneficial.

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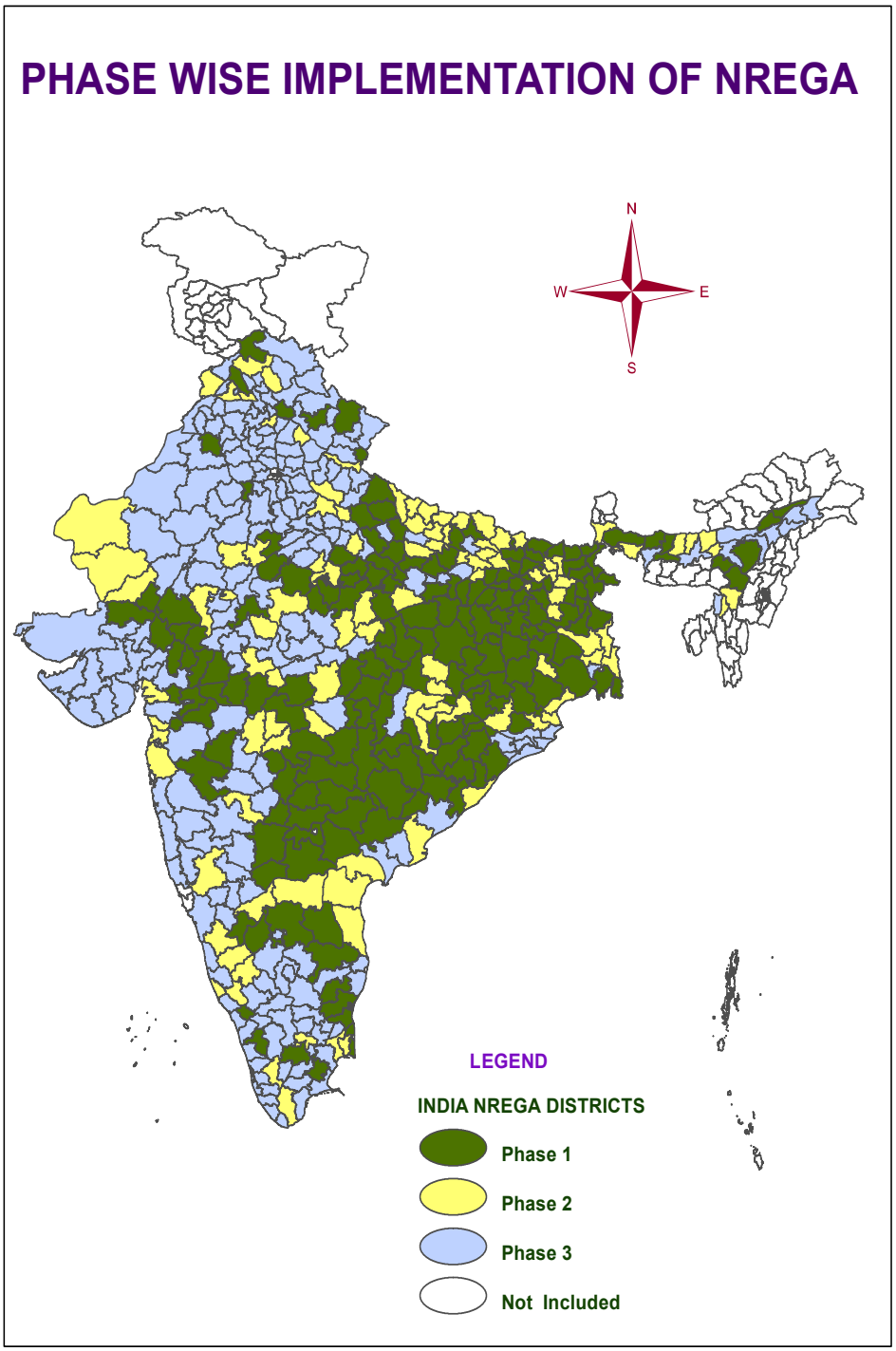
PHASE WISE IMPLEMENTATION OF NREGA
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LEGEND
INDIA NREGA DISTRICTS
Phase 1
Phase 2
Phase 3
Not Included

Figure 1

Table 1: Variable Description

The description of variables used in the study is presented below.

Variable	Description
	Panel A: Annual Survey of Industries[27]
Permanent workers	count; workers on the factory payroll.
Wages per Perm--anent worker	in INR; yearly wage paid to a permanent worker.
Contract workers	count; workers hired through contractors
Wages per cont--ract worker	in INR; yearly wage paid to a contract worker.
Fixed Assets (Gross Additions)	in INR; Gross additions to the total fixed assets, this includes assets equipment, transport and land.
P&M (Gross Additions)	in INR; Gross additions to plant and machinery.
Invested capital	in INR; Fixed capital and physical capital.
Capital per worker	in INR; Invested capital / (permanent and contractual worker).
Total Output	in INR; Ex-factory value of quantity manufactured + income from services + variation in stocks of semi finished goods + value of electricity generated and sold + value of own construction + net balance of goods sold in the same condition as purchased.
Total Input	in INR; Fuel and material consumption + Operating and non-operating expense + Repairs and maintenance of fixed assets + Insurance charges + Expense on other works.
Profit	in INR; (Total output-total input) - depreciation - rent & interest paid - wages, benefits and bonus to employees.
Cash Ratio	Cash & Cash Equivalents by Total Assets.
Output per unit Input	Total output per total input.
Post-MNREGA	A dummy variable that takes the value one for factories located in phase 1 districts for fiscal years after 2006 , phase 2 districts for fiscal years after 2007, and phase 3 districts for fiscal years after 2008;and zero, otherwise.[28]

continued ...

[27] Variables are constructed using the definition from ASI tabulation scheme.

[28] A fiscal year in India spans April 1st of one year to March 31st of the following year. For instance, the fiscal year 2006 runs from 1st April, 2005 to 31st March, 2006.

. . . continued

Variable	Description
Panel B: MNREGA variables for IV regression	
Labor expenditure	in millions INR; District-wise labor expenditure made each year under MNREGA.
Number of Works	count in millions; Total number of ongoing and completed projects every year in each district under MNREGA.
Total Employment Demanded	count in millions; Employment demanded by the MNREGA job card holders.[29]
Panel C: Instrument Variable	
State Election Dummy	Dummy Variable; 1 if state's ruling party is also the central ruling party, otherwise 0.

[29]The 100 days of paid MNREGA work per year can only be accessed if they have a MNREGA job card.

Table 2: Sample Construction

Panel A: Annual Survey of Industry (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

Table 3: Descriptive Statistics

In this table, we report descriptive statistics from the ASI Data.

	(1)	(2)	(3)	(4)	(5)	(6)
VARIABLES	N	Mean	p25	Median	p75	SD
Permanent Workers	126,586	173	19	72	176	453
Contract Workers	126,586	67	0	0	32	640
Managerial Staff	126,586	27	2	7	22	111
Total Employees	126,586	299	40	139	304	950
Wage per Permanent Worker (in INR per year)	126,586	54,237	26,276	40,081	63,942	51,361
Wage per Contract Workers (in INR per year)	126,586	13,519	0	0	26,474	25,038
Wage per Managerial Staff (in INR per year)	126,586	202,803	65,358	129,076	240,000	349,493
P&M Gross Additions during the year (in INR Millions)	122,847	35.72	0	0.65	6.26	774.70
Capital per Worker (in INR Millions)	126,574	1.50	0.15	0.46	1.28	6.29
Total Fixed Asset Gross Add (in INR Millions)	124,975	62	0.13	2.06	13.57	939.69
Total Fixed Asset Gross (in INR Millions)	124,975	419.76	0	21.39	160.11	4,205.98
Debtor Turnover Cycle (1)	1,15,519	112	16.76	46.98	91.21	704.82
Inventory Turnover Cycle (2)	1,26,586	195.64	33.89	74.85	141.21	781.40
Working Capital Cycle = (1+2)	1,26,586	195.16	73.58	134.57	237.34	215.36
Total Input (in INR Millions)	126,586	229.80	9.33	58.87	245.00	380.70
Profit (in INR Millions)	126,586	121.09	3.15	16.67	81.92	277.77
Total Output (in INR Millions)	126,586	350.90	16.77	92.34	371.60	578.30

Table 4: Number of workers

This table reports the OLS estimates based on the equation (1). The dependent variables in these tests is the number of workers (Panel A) and natural logarithm of number of workers (Panel B). Detailed description of variables are provided in Table 6. 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 factories in all fiscal years after the implementation of MNREGA in the district in which the factory is located. In columns (2), (4) and (6), we report the estimates including controls. The controls include firm size (factory size) and age of the factory. The sample consists of all open "wholly private owned"factories in the ASI census survey from fiscal year 2002 to fiscal year 2010. The standard errors are clustered at district level. T-statistics are reported in parentheses. ***,**,* represent statistical significance at 1%, 5% and 10% respectively.

	(1)	(2)	(3)	(4)	(5)	(6)
Panel A						
VARIABLES	Permanent Workers		Contract Workers		Managerial Staff	
Post-MNREGA	-16.68**	-17.40**	-1.81	-1.92	-0.70	-0.86
	(-2.5275)	(-2.5470)	(-0.2474)	(-0.2569)	(-0.9112)	(-1.0849)
Firm Size		9.75***		3.01***		1.27***
		(7.3127)		(5.0580)		(9.7579)
Age		0.78**		0.03		0.10***
		(2.3762)		(0.4119)		(3.0306)
Observations	126,586	120,774	126,586	120,774	126,586	120,774
R-squared	0.8928	0.8938	0.9608	0.9613	0.7489	0.7484
Panel B						
VARIABLES	Log(1+Permanent Workers)		Log(1+Contract Workers)		Log(1+Managerial) Staff	
Post-MNREGA	-0.0267*	-0.0271**	0.0275	0.0253	-0.0022	-0.0034
	(-1.8876)	(-2.0353)	(0.8792)	(0.8136)	(-0.1701)	(-0.2750)
Firm Size		0.0500***		0.0419***		0.0469***
		(14.5783)		(8.4442)		(17.2981)
Age		0.0021***		-0.0005		0.0026***
		(3.8004)		(-0.3515)		(3.8986)
Observations	126,586	120,774	126,586	120,774	126,586	120,774
R-squared	0.9269	0.9300	0.8056	0.8081	0.9082	0.9113
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Factory FE	Yes	Yes	Yes	Yes	Yes	Yes

Table 5: Existence of Pre-Trend (Placebo treatment)

The table reports OLS estimates based on the equation (1) to test for pre-existing trends. Detailed description of variables is provided in Table 6. The sample consists of all open "wholly private owned" factories in the ASI census survey from fiscal year 2002 to fiscal year 2010. The controls include firm size (factory size) and age of the factory. The standard errors are clustered at district level. T-statistics are reported in parentheses. ***,**,* represent statistical significance at 1%, 5% and 10% respectively.
In each panel, we maintain the year on year phase-wise MNREGA implementation scheme. For instance, in Panel A, we provide consider phase 1 districts having MNREGA implementation in the fiscal year 2002, phase 2 districts in year 2003 and phase 3 districts in year 2004.

	(1)	(2)	(3)	(4)	(5)	(6)
	Log(1+Permanent Workers)	Permanent Workers	Log(1+Contract Workers)	Contract Workers	Log(1+Managerial) Staff)	Managerial Staff
			Panel A : Years 2003-2005			
Post-NREGA	0.0016	14.59*	-0.0194	-2.52	0.0096	-0.23
	(0.1347)	(1.9223)	(-0.5793)	(-0.2994)	(0.7935)	(-0.3470)
Firm Size	0.0500***	9.76***	0.0419***	3.01***	0.0469***	1.27***
	(14.5782)	(7.3069)	(8.4387)	(5.0585)	(17.2938)	(9.7501)
Age	0.0021***	0.79**	-0.0005	0.04	0.0026***	0.10***
	(3.8106)	(2.3819)	(-0.3542)	(0.4211)	(3.8995)	(3.0383)
Observations	120,774	120,774	120,774	120,774	120,774	120,774
R-squared	0.9300	0.8938	0.8081	0.9613	0.9113	0.7484
			Panel B : Years 2004-2006			
Post-NREGA	-0.0091	0.25	0.0189	-1.56	0.0084	0.09
	(-0.9240)	(0.0702)	(0.7488)	(-0.4149)	(0.8728)	(0.1436)
Firm Size	0.0500***	9.76***	0.0419***	3.05***	0.0469***	1.27***
	(14.5834)	(7.3013)	(8.4379)	(5.0604)	(17.2866)	(9.7496)
Age	0.0022***	0.79**	-0.0005	0.04	0.0026***	0.10***
	(3.8172)	(2.3837)	(-0.3592)	(0.4238)	(3.9000)	(3.0383)
Observations	120,774	120,774	120,774	120,774	120,774	120,774
R-squared	0.9300	0.8938	0.8081	0.9613	0.9113	0.7484
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Factory FE	Yes	Yes	Yes	Yes	Yes	Yes

Table 6: Wages per workers

This table reports the OLS estimates based on the equation (1). The dependent variables in these tests is the wage per worker (Panel A) and natural logarithm of wage per worker (Panel B). Detailed description of variables are provided in Table 6. 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 factories in all fiscal years after the implementation of MNREGA in the district in which the factory is located. In columns (2), (4) and (6), we report the estimates including controls. The controls include firm size (factory size) and age of the factory. The sample consists of all open "wholly private owned" factories in the ASI census survey from fiscal year 2002 to fiscal year 2010. The standard errors are clustered at district level. T-statistics are reported in parentheses. ***,**,* represent statistical significance at 1%, 5% and 10% respectively.

	(1)	(2)	(3)	(4)	(5)	(6)
			Panel A			
VARIABLES	Permanent Workers		Contract Workers		Managerial Staff	
Post-MNREGA	273.07	168.38	220.76	177.26	-6,356.35	-6,508.77
	(0.2781)	(0.1849)	(0.5463)	(0.4510)	(-1.1435)	(-1.2390)
Firm Size		1,225.40***		702.11***		8,196.99***
		(15.0748)		(10.4869)		(11.5943)
Age		69.80***		-19.7		355.68
		(2.7516)		(-1.1848)		(1.5665)
Observations	126,586	120,774	126,586	120,774	126,586	120,774
R-squared	0.8466	0.8493	0.6752	0.6774	0.5473	0.5639
			Panel B			
VARIABLES	Log(1+Permanent Workers)		Log(1+Contract Workers)		Log(1+Managerial Staff)	
Post-MNREGA	0.0004	0.0008	0.0354	0.0289	-0.0070	-0.0121
	(0.0409)	(0.0888)	(0.5262)	(0.4354)	(-0.1922)	(-0.3403)
Firm Size		0.0382***		0.0897***		0.0729***
		(19.0036)		(8.7878)		(11.5129)
Age		0.0007**		-0.0019		0.0000
		(1.9880)		(-0.5848)		(0.0086)
Observations	126,586	120,774	126,586	120,774	126,586	120,774
R-squared	0.8260	0.8285	0.7704	0.7728	0.7625	0.7657
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Factory FE	Yes	Yes	Yes	Yes	Yes	Yes

Table 7: Mechanization of Factories

This table reports the OLS estimates based on the equation (1). The dependent variables in these tests are different measures of mechanization. Detailed description of variables are provided in Table 6. 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 factories in all fiscal years after the implementation of MNREGA in the district in which the factory is located. The controls include firm size (factory size) and age of the factory. The sample consists of all open "wholly private owned" factories in the ASI census survey from fiscal year 2002 to fiscal year 2010. The standard errors are clustered at 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)
VARIABLES	Log(1+Fixed Assets (Gross Additions))		Log(1+P&M (Gross Additions))		Log(1+Capital per worker)		Log(1+ Rent for P&M)	
Post-MNREGA	0.1135***	0.1182***	0.2363***	0.2323***	0.0411**	0.0230*	0.2201*	0.2487**
	(2.9276)	(3.1249)	(2.7793)	(2.7213)	(2.4773)	(1.8831)	(1.8633)	(2.0647)
Firm Size		-0.0971***		-0.1475***		0.0813***		0.0505***
		(-8.4035)		(-7.6571)		(8.5810)		(3.6610)
Age		0.0032		-0.0024		0.0005		0.0084**
		(1.3210)		(-0.4836)		(0.5287)		(1.9663)
Observations	124,975	120,774	122,847	118,778	126,569	120,757	126,558	120,752
R-squared	0.7987	0.8063	0.7116	0.7188	0.9072	0.9270	0.5782	0.5790
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Factory FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Table 8: Performance of Factories

This table reports the OLS estimates based on the equation (1). The dependent variables in these tests are different measures of performance. Detailed description of variables are provided in Table 6. 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 factories in all fiscal years after the implementation of MNREGA in the district in which the factory is located. The controls include firm size (factory size) and age of the factory. The sample consists of all open "wholly private owned" factories in the ASI census survey from fiscal year 2002 to fiscal year 2010. The standard errors are clustered at 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)
VARIABLES	Log(1+Total Input)		Log(1+Total Output)		Log(1+Profit)		Cash Ratio		Output per unit Input	
Post-MNREGA	0.0763***	0.0752***	0.0176	0.0163	-0.0048**	-0.0048**	-0.0033***	-0.0026**	-1.0166***	-1.0593***
	(3.3755)	(3.3680)	(1.1388)	(1.2897)	(-2.5245)	(-2.4552)	(-2.6156)	(-2.4705)	(-3.2824)	(-3.2646)
Firm Size		0.1013***		0.1053***		0.0050***		-0.0029***		0.0184
		(20.2568)		(22.8744)		(12.0877)		(-7.5685)		(0.7192)
Age		0.0037***		0.0028***		0.0001		0.0002***		-0.0090**
		(4.0244)		(3.3502)		(0.8787)		(3.3002)		(-2.1375)
Observations	126,586	120,774	126,586	120,774	126,583	120,771	124,701	119,248	126,586	120,774
R-squared	0.9234	0.9276	0.9420	0.9477	0.7468	0.7513	0.9925	0.9948	0.3648	0.3650
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Factory FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Table 9: Inventory, Debtor and Working Capital

This table reports the OLS estimates based on the equation (1). The dependent variables in these tests are Debtor turnover cycle, Inventory turnover cycle and Working capital cycle. Detailed description of variables are provided in Table 6. 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 factories in all fiscal years after the implementation of MNREGA in the district in which the factory is located. The controls include firm size (factory size) and age of the factory. The sample consists of all open "wholly private owned"factories in the ASI census survey from fiscal year 2002 to fiscal year 2010. We use year and factory fixed effects. The standard errors are clustered at district level. T-statistics are reported in parentheses. ***,**,* represent statistical significance at 1%, 5% and 10% respectively.

	(1)	(2)	(3)	(4)	(5)	(6)
VARIABLES	Inventory Cycle		Debtor cycle		Working Capital Cycle	
Post-NREGA	-25.09***	-25.24***	-2.09**	-2.26***	-26.61***	-26.92***
	(-4.1690)	(-4.1278)	(-2.4544)	(-2.7158)	(-4.4034)	(-4.3648)
Firm Size		1.34**		0.58***		2.24***
		(2.3936)		(3.4316)		(3.6285)
Age		0.09		0.02		0.13
		(0.8583)		(0.3626)		(1.0416)
Observations	126,586	120,774	115,519	110,389	126,586	120,774
R-squared	0.6561	0.6588	0.7715	0.7745	0.6672	0.6692
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Factory FE	Yes	Yes	Yes	Yes	Yes	Yes

Table 10: Factories with Low Wages Versus Others

This table reports the OLS estimates of our baseline equation (1), for our sub-samples based on the average permanent wage per worker at the district level within an industry. 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 factories in all fiscal years after the implementation of MNREGA in the district in which the factory is located. The controls include firm size (factory size) and age of the factory. The sample consists of all open "wholly private owned" factories in the ASI census survey from fiscal year 2002 to fiscal year 2010. The standard errors are clustered at district level. T-statistics are reported in parentheses. ***,**,* represent statistical significance at 1%, 5% and 10% respectively.
Panel A reports the OLS estimates of the factories which are below an Industry's median ex-ante permanent wage per worker, within a district.
Panel B reports the OLS estimates of the factories which are above an Industry's median ex-ante permanent wage per worker, within a district.

Panel A : Factories with below median Permanent Wage per worker				
	(1)	(2)	(3)	(4)
	Log(1+Perma--nent Workers)	Log(1+Wages per Permanent)	Log(1+Fixed Assets (Gross Additions))	Log(1+P&M (Gross Additions))
Post-MNREGA	-0.0267*	0.0579***	0.1045*	0.1946*
	(-1.9102)	(4.8250)	(1.9606)	(1.7656)
Observations	62,653	62,653	62,653	61,452
R-squared	0.9293	0.7971	0.7953	0.7113
Panel B : Factories with above median Permanent Wage per worker				
Post-MNREGA	-0.0161	-0.0535***	0.0853	0.2196*
	(-0.8537)	(-4.6099)	(1.5296)	(1.8865)
Observations	55,666	55,666	55,666	54,900
R-squared	0.9212	0.8219	0.7971	0.7028
Year FE	Yes	Yes	Yes	Yes
Factory FE	Yes	Yes	Yes	Yes

Table 11: Factories with low labor productivity versus others

This table reports the OLS estimates of our baseline equation (1), for our sub-samples based on industry's output per worker (permanent + contract workers). 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 factories in all fiscal years after the implementation of MNREGA in the district in which the factory is located. The controls include firm size (factory size) and age of the factory. The sample consists of all open "wholly private owned" factories in the ASI census survey from fiscal year 2002 to fiscal year 2010. The standard errors are clustered at district level. T-statistics are reported in parentheses. ***,**,* represent statistical significance at 1%, 5% and 10% respectively.
Panel A reports the OLS estimates of the factories which have low levels of productivity i.e. factory's output per worker is below industry's median level of productivity. Panel B reports the OLS estimates of the factories which have high productivity.

Panel A : Factories with low labor productivity				
	(1)	(2)	(3)	(4)
	Log(1+Perma--nent Workers)	Log(1+Wages per Permanent)	Log(1+Fixed Assets (Gross Additions))	Log(1+P&M (Gross Additions))
Post-MNREGA	-0.0385*	0.0358***	0.1686***	0.2600*
	(-1.7286)	(2.7540)	(3.0938)	(1.9410)
Observations	56,614	56,614	56,614	55,329
R-squared	0.9321	0.8162	0.7674	0.6886
Panel B : Factories with high labor productivity				
Post-MNREGA	-0.0048	-0.0156	0.0306	0.1586
	(-0.3582)	(-1.3421)	(0.5774)	(1.5486)
Observations	61,701	61,701	61,701	61,020
R-squared	0.9254	0.7946	0.7648	0.6658
Year FE	Yes	Yes	Yes	Yes
Factory FE	Yes	Yes	Yes	Yes

Table 12: Factories with ex-ante high output volatility versus others

This table reports the OLS estimates of our baseline equation (1), for our sub-samples based on the industry volatility measure (Dougherty et al. (2011)). We compute for each industry its ex-ante mean variation(standard deviation) of the annual growth rate in a factory total output. 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 factories in all fiscal years after the implementation of MNREGA in the district in which the factory is located. The controls include firm size (factory size) and age of the factory. The sample consists of all open "wholly private owned" factories in the ASI census survey from fiscal year 2002 to fiscal year 2010. The standard errors are clustered at district level. T-statistics are reported in parentheses. ***,**,* represent statistical significance at 1%, 5% and 10% respectively.
Panel A reports the OLS estimates for the factories in the high output volatility industry. Panel B reports the OLS estimates for the factories low output volatility industry.

Panel A : Factories with high output volatility				
	(1)	(2)	(3)	(4)
	Log(1+Perma--nent Workers)	Log(1+Wages per Permanent)	Log(1+Fixed Assets (Gross Additions))	Log(1+P&M (Gross Additions))
Post-MNREGA	-0.0320**	0.0004	0.1422***	0.2965***
	(-2.1885)	(0.0383)	(3.3380)	(3.1506)
Observations	86,953	86,953	86,953	85,193
R-squared	0.9237	0.8414	0.8072	0.7195
Panel B : Factories with low output volatility				
Post-MNREGA	-0.0113	0.0045	0.0425	0.0579
	(-0.4757)	(0.2762)	(0.6244)	(0.3524)
Observations	33,282	33,282	33,282	33,060
R-squared	0.9433	0.7806	0.8016	0.7144
Year FE	Yes	Yes	Yes	Yes
Factory FE	Yes	Yes	Yes	Yes

Table 13: Pro-Employer Regulations versus Pro-employee/Neutral States

This table reports the OLS estimates of our baseline regression equation (1), for our sub-samples based on the prevalent labor regulation regime in state of incorporation of the factories. We split the states into pro-employee and pro-employer/neutral labor regulation states based on the Besley et al. (2004) (updated till 1997 in Aghion et al. (2008)), will be referred to as BB measure. 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 factories in all fiscal years after the implementation of MNREGA in the district in which the factory is located. The controls include firm size(factory size) and age of the factory. The sample consists of all open "wholly private owned" factories in the ASI census survey from fiscal year 2002 to fiscal year 2010. The standard errors are clustered at district level. T-statistics are reported in parentheses. ***,**,* represent statistical significance at 1%, 5% and 10% respectively.
Panel A reports the OLS estimates for the factories which are located in pro-employer states. Panel B reports the OLS estimates for the factories which are located in pro-labor or neutral states.

Panel A : Factories in States with Pro-Employer/Neutral Labor Regulations				
	(1)	(3)	(5)	(6)
	Log(1+Perma--nent Workers)	Log(1+Wages per Permanent)	Log(1+Fixed Assets (Gross Additions))	Log(1+P&M (Gross Additions))
Post-MNREGA	-0.0304*	-0.0051	0.1558***	0.2565**
	(-1.8226)	(-0.4108)	(3.2882)	(2.3036)
Observations	77,024	77,024	77,024	75,535
R-squared	0.9279	0.8106	0.8082	0.7246
Panel B : Factories in States with Pro-Employee Labor Regulations				
Post-MNREGA	-0.0222	0.0129	-0.0538	-0.0239
	(-0.7665)	(0.9083)	(-0.7268)	(-0.1646)
Observations	29,995	29,995	29,995	29,576
R-squared	0.9272	0.8720	0.8055	0.7059
Year FE	Yes	Yes	Yes	Yes
Factory FE	Yes	Yes	Yes	Yes

Note: BB measure is not defined for five U.T. and two states namely, Goa and Himachal Pradesh. This reduces our sample by 13,755 (11%) factory-year observations, removing 3,765 (12%) of factories.

Table 14: Labor Productivity and Labor Laws

This table reports the OLS estimates of our regression equation (1), for our sub-samples based on the combination of labor productivity (table 11) amd labor regulations (table 13) measures. 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 factories in all fiscal years after the implementation of MNREGA in the district in which the factory is located. The controls include firm size (factory size) and age of the factory. The sample consists of all open "wholly private owned" factories in the ASI census survey from fiscal year 2002 to fiscal year 2010. The standard errors are clustered at district level. T-statistics are reported in parentheses. ***,**,* represent statistical significance at 1%, 5% and 10% respectively.
In panel A (B), we report results for factories with below median labor productivity and are located in states with pro-employer/neutral labor (pro-employee) regulations. In panel C (D), we report results for factories with above median labor productivity and are located in states with pro-employer/neutral labor (pro-employee) regulations.

	Panel A : Low Labor productivity and Pro-Employer/Neutral Regulations				Panel B : Low Labor Productivity and Pro-Employee Regulations			
	Log(1+Perma-nent Workers)	Log(1+Wages per Permanent)	Log(1+Fixed Assets (Gross Additions))	Log(1+P&M (Gross Additions))	Log(1+Perma-nent Workers)	Log(1+Wages per Permanent)	Log(1+Fixed Assets (Gross Additions))	Log(1+P&M (Gross Additions))
	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)
Post-MNREGA	-0.0541**	0.0339**	0.2302***	0.3169*	-0.0279	0.0396*	0.0301	0.0545
	(-2.3136)	(2.1147)	(3.3341)	(1.8264)	(-0.4149)	(1.8071)	(0.3769)	(0.2554)
Observations	39,362	39,362	39,362	38,353	12,083	12,083	12,083	11,867
R-squared	0.9291	0.8101	0.7641	0.6842	0.9302	0.8268	0.7784	0.6953
	Panel C : High Labor productivity and Pro-Employer/Neutral Regulations				Panel D : High Labor Productivity and Pro-Employee Regulations			
	Log(1+Perma-nent Workers)	Log(1+Wages per Permanent)	Log(1+Fixed Assets (Gross Additions))	Log(1+P&M (Gross Additions))	Log(1+Perma-nent Workers)	Log(1+Wages per Permanent)	Log(1+Fixed Assets (Gross Additions))	Log(1+P&M (Gross Additions))
Post-MNREGA	0.0036	-0.0276*	0.0050	0.1011	-0.0092	0.0059	-0.1219	-0.0789
	(0.2170)	(-1.7617)	(0.0771)	(0.7759)	(-0.4293)	(0.3604)	(-1.2413)	(-0.5006)
Observations	36,037	36,037	36,037	35,576	17,212	17,212	17,212	17,019
R-squared	0.9235	0.7592	0.7657	0.6693	0.9210	0.8726	0.7637	0.6554
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Factory FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Table 15: Wages and Labor Laws

This table reports the OLS estimates of our regression equation (1), for our sub-samples based on the combination of average permanent wage per worker (table 10) and labor regulations (table 13) measures. 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 factories in all fiscal years after the implementation of MNREGA in the district in which the factory is located. The controls include firm size (factory size) and age of the factory. The sample consists of all open "wholly private owned" factories in the ASI census survey from fiscal year 2002 to fiscal year 2010. The standard errors are clustered at district level. T-statistics are reported in parentheses. ***,**,* represent statistical significance at 1%, 5% and 10% respectively.
In panel A (B), we report results for factories which have permanent wages below an Industry's median ex-ante permanent wage per worker in a district and are located in states with pro-employer/neutral labor (pro-employee) regulations. In panel C (D), we report results for factories which have permanent wages above an Industry's median ex-ante permanent wage per worker in a district and are located in states with pro-employer/neutral labor (pro-employee) regulations.

	Panel A : Low Wage and Pro-Employer/Neutral Regulations				Panel B : Low Wage and Pro-Employee Regulations			
	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)
	Log(1+Perma-nent Workers)	Log(1+Wages per Permanent)	Log(1+Fixed Assets (Gross Additions))	Log(1+P&M (Gross Additions))	Log(1+Perma-nent Workers)	Log(1+Wages per Permanent)	Log(1+Fixed Assets (Gross Additions))	Log(1+P&M (Gross Additions))
Post-MNREGA	-0.0380**	0.0530***	0.1551**	0.2061	-0.0091	0.0689***	-0.0545	0.0117
	(-2.0723)	(3.4916)	(2.3823)	(1.4908)	(-0.3527)	(3.2637)	(-0.5486)	(0.0583)
Observations	40,347	40,347	40,347	39,466	15,237	15,237	15,237	14,976
R-squared	0.9282	0.7982	0.7964	0.7165	0.9238	0.8126	0.8012	0.7070
	Panel C : High Wage and Pro-Employer/Neutral Regulations				Panel D : High Wage and Pro-Employee Regulations			
	Log(1+Perma-nent Workers)	Log(1+Wages per Permanent)	Log(1+Fixed Assets (Gross Additions))	Log(1+P&M (Gross Additions))	Log(1+Perma-nent Workers)	Log(1+Wages per Permanent)	Log(1+Fixed Assets (Gross Additions))	Log(1+P&M (Gross Additions))
Post-MNREGA	-0.0131	-0.0588***	0.0797	0.2167	-0.0242	-0.0430***	-0.0620	-0.0651
	(-0.5635)	(-3.6718)	(1.1737)	(1.3953)	(-0.5871)	(-2.9650)	(-0.6044)	(-0.3611)
Observations	35,052	35,052	35,052	34,463	14,060	14,060	14,060	13,911
R-squared	0.9169	0.7890	0.8032	0.7129	0.9181	0.8889	0.7769	0.6663
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Factory FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Table 16: Output volatility and Labor Laws

This table reports the OLS estimates of our regression equation (1), for our sub-samples based on the combination of industry's output volatility (table 12) and labor regulations (table 13) measures. 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 factories in all fiscal years after the implementation of MNREGA in the district in which the factory is located. The controls include firm size (factory size) and age of the factory. The sample consists of all open "wholly private owned" factories in the ASI census survey from fiscal year 2002 to fiscal year 2010. The standard errors are clustered at district level. T-statistics are reported in parentheses. ***,**,* represent statistical significance at 1%, 5% and 10% respectively.
In panel A (B), we report results for factories having high output volatility and are located in states with pro-employer/neutral labor (pro-employee) regulations. In panel C (D), we report results for factories having low output volatility and are located in states with pro-employer/neutral labor (pro-employee) regulations.

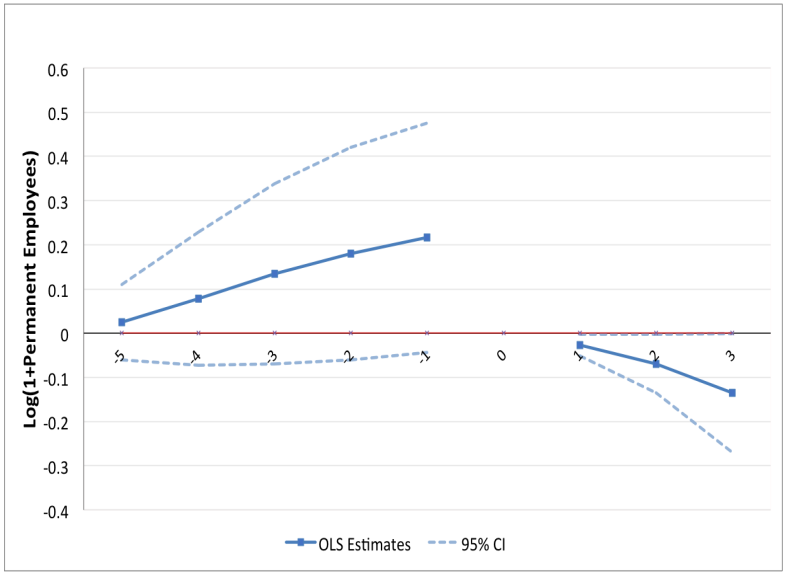
	Panel A : High output volatility and Pro-Employer/Neutral Regulations				Panel B : High output volatility and Pro-Employee Regulations			
	Log(1+Perma-nent Workers)	Log(1+Wages per Permanent)	Log(1+Fixed Assets (Gross Additions))	Log(1+P&M (Gross Additions))	Log(1+Perma-nent Workers)	Log(1+Wages per Permanent)	Log(1+Fixed Assets (Gross Additions))	Log(1+P&M (Gross Additions))
	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)
Post-MNREGA	-0.0440**	-0.0056	0.3189***	0.1675***	-0.0042	0.0131	-0.0392	-0.0137
	(-2.1932)	(-0.3944)	(2.5938)	(3.1604)	(-0.1962)	(0.7949)	(-0.4557)	(-0.0906)
Observations	56,037	56,037	54,707	56,037	21,016	21,016	21,016	20,652
R-squared	0.9197	0.8237	0.7235	0.8077	0.9234	0.8715	0.8110	0.7129
	Panel C : Low output volatility and Pro-Employer/Neutral Regulations				Panel D : Low output volatility and Pro-Employee Regulations			
	Log(1+Perma-nent Workers)	Log(1+Wages per Permanent)	Log(1+Fixed Assets (Gross Additions))	Log(1+P&M (Gross Additions))	Log(1+Perma-nent Workers)	Log(1+Wages per Permanent)	Log(1+Fixed Assets (Gross Additions))	Log(1+P&M (Gross Additions))
Post-MNREGA	0.0064	0.0005	0.0948	0.0612	-0.0581	0.0107	-0.1019	-0.0739
	(0.3022)	(0.0237)	(1.1215)	(0.2931)	(-0.8550)	(0.6198)	(-0.7701)	(-0.2522)
Observations	20,611	20,611	20,611	20,464	8,884	8,884	8,884	8,830
R-squared	0.9464	0.7583	0.8062	0.7242	0.9333	0.8727	0.7908	0.6873
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Factory FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Figure 2: **Estimated Employment and Wages Response Dynamics of the Impact of MNREGA**

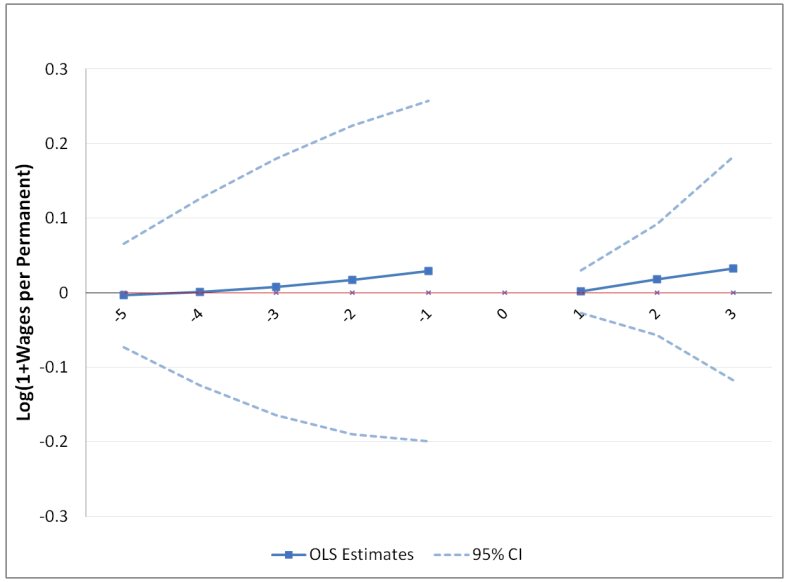
The graphs plots the cumulative coefficient estimates from the OLS estimation of the dynamic version of the difference-in-differences regression:

$$ln[1 + y_{idt}] = \beta_0 + \sum_{-5}^{-1} \theta_k \times Pre[k]_{idt} + \sum_{1}^{3} \theta_k \times Post[k]_{idt} + \delta_i + \gamma_t$$

where y_{cst} is the dependent variable The sample consists of all open "wholly private owned" factories in the ASI census survey from fiscal year 2002 to fiscal year 2010. The controls include firm size (factory size) and age of the factory. We use year and factory fixed effects. The standard errors are clustered at district level. *Pre[k]* (*Post[k]*) is a dummy variable that is set to one k years before (after) the implementation of MNREGA in the *treated district*. *Post[≥3]* (*Pre[≤ −6]*) is a dummy variable set to one for all years up to and including six years (three years) prior (after) the implementation of NREGA. The base category in these tests is the year 0 and denotes the year of implementation. The figure plots the entire paths of cumulative coefficients, along with their corresponding 95 percent confidence intervals (dashed lines), of natural logarithm of number and wages of permanent workers and contract workers.



(a)



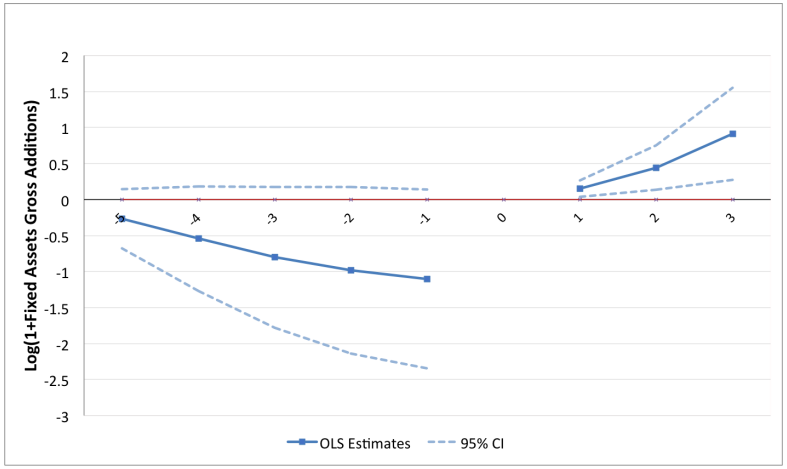
(b)

Figure 3: **Estimated Mechanization Response Dynamics of the Impact of MNREGA**

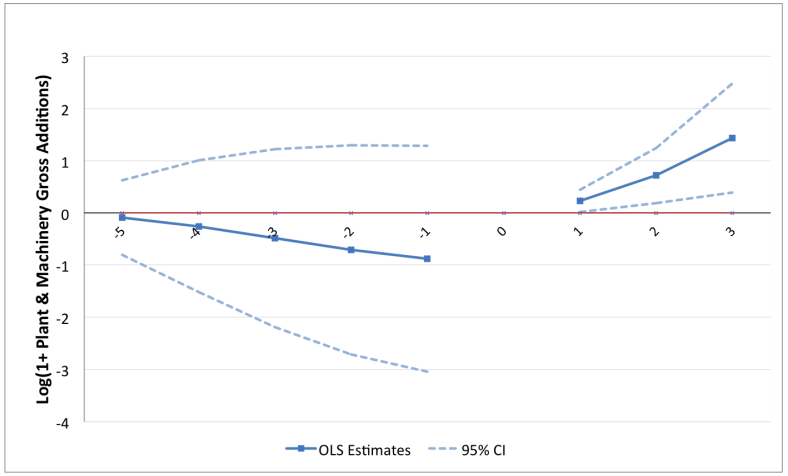
This graphs plots the cumulative coefficient estimates from the OLS estimation of the dynamic version of the difference-in-differences regression:

$$ln[1 + y_{idt}] = \beta_0 + \sum_{-5}^{-1} \theta_k \times Pre[k]_{idt} + \sum_{1}^{3} \theta_k \times Post[k]_{idt} + \delta_i + \gamma_t$$

where y_{cst} is the dependent variable. The sample consists of all open "wholly private owned" factories in the ASI census survey from fiscal year 2002 to fiscal year 2010. The controls include firm size (factory size) and age of the factory. We use year and factory fixed effects. The standard errors are clustered at district level. *Pre[k]* (*Post[k]*) is a dummy variable that is set to one k years before (after) the implementation of NREGA in the *treated district*. *Post[≥3]* (*Pre[≤ −6]*) is a dummy variable set to one for all years up to and including six years (three years) prior (after) the implementation of NREGA. The base category in these tests is the year 0 and denotes the year of implementation. This figure plots the entire paths of cumulative coefficients, along with their corresponding 95 percent confidence intervals (dashed lines), of fixed assets and plant & machinery's gross additions change response as estimated from the above equation.



(a)



(b)

Appendix A

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

Table A1: First stage IV Regression

This table reports first-stage **IV** estimates of MNREGA's labor expenditures (INR in millions), Number of works (in millions), both completed and ongoing, and total employment demanded (in millions) using State Election dummy variable as an instrument. We define state election dummy as 1 if the state's ruling party is also the central ruling party, otherwise 0. The sample consists of all open "wholly private owned" factories in the ASI census survey from fiscal year 2002 to 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 identification, respectively, of individual endogenous regressors in each column. The standard errors are clustered at district level. T-statistics are reported in parentheses. ***,**,* represent statistical significance at 1%, 5% and 10% respectively.

	(1)	(2)	(3)
VARIABLES	Labor Expenditure	Number of Works	Total Employment Demanded
State Election Dummy	0.0022***	0.0103***	0.0339***
	(2.6102)	(2.5713)	(2.7611)
Observations	49,715	49,715	49,715
P(SW Chi-sq)	0.0091	0.0100	0.0058
SW F	6.7900	6.6100	7.6100
Prob > F	0.0263	0.065	0.0321
Year FE	Yes	Yes	Yes
Factory FE	Yes	Yes	Yes

Table A2: Second stage IV Regression

This table reports second-stage **IV** estimates of MNREGA's labor expenditures (INR in millions), Number of works (in millions), both completed and ongoing, and total employment demanded (in millions) , using State Election dummy variable as an instrument. The sample consists of all open "wholly private owned"factories in the ASI census survey from fiscal year 2002 to fiscal year 2010. The controls include firm size (factory size) and age of the factory. The standard errors are clustered at 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)
VARIABLES	Log(1 + Permanent Workers)			Log(1 + Contract Workers)			Log(1 + Managerial Staff)		
Labor Expenditure	-10.1409*			5.3189			6.7811		
	(-1.7140)			(0.5116)			(1.0610)		
Number of Works		-2.1684*			1.1374			1.4500	
		(-1.8639)			(0.4784)			(1.2399)	
Total Employment Demanded			-0.6560*			0.3441			0.4387
			(-1.7750)			(0.5064)			(1.1049)
Firm Size	0.0381***	0.0383***	0.0382***	0.0450***	0.0449***	0.0450***	0.0318***	0.0317***	0.0318***
	(10.3170)	(10.3246)	(10.3798)	(5.6400)	(5.6150)	(5.6441)	(8.7509)	(8.6268)	(8.7202)
Age	0.0030**	0.0028*	0.0030**	-0.0020	-0.0019	-0.0020	0.0020	0.0022	0.0020
	(2.2684)	(1.9642)	(2.2705)	(-0.8077)	(-0.7538)	(-0.8037)	(1.3485)	(1.4666)	(1.3535)
Observations	49,715	49,715	49,715	49,715	49,715	49,715	49,715	49,715	49,715
R-squared	0.9680	0.9664	0.9679	0.9060	0.9058	0.9060	0.9551	0.9543	0.9550
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
District FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Table A3: 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 and change in 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, Cattaneo, and Titiunik (2014) to estimate robust and bias corrected standard errors. z-statistic 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 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	-6.5734***	1.3791***	0.05246	-21.544	-2.0995*	0.04426	-0.35145	0.82536
	(-3.4459)	(5.005)	(0.0745)	(-1.5137)	(-1.6935)	(0.2125)	(0.8536)	(0.126)
Robust	-6.5734*	1.3791**	0.05246	-21.544	-2.0995	0.04426	-0.35145	0.82536
	(-1.7524)	(2.4101)	(0.0269)	(-1.1452)	(-1.2329)	(0.1563)	(1.044)	(0.665)
Observations	836	624	52	46	2420	1830	3714	2765
Year	2007				2007			