UNIVERSITY OF SUSSEX | BUSINESS SCHOOL

ECONOMICS

Working Paper Series

No. WPS-03-2026

Financial Inclusion and Wages in a Dual Economy: Theory and Evidence from India.

Chisomo Kuyenda
University of Sussex
c.kuyenda@sussex.ac.uk

Sambit Bhattacharyya
University of Sussex
s.bhattacharyya@sussex.ac.uk

Somdeep Chatterjee
IIM Calcutta somdeep@iimcal.ac.in

Gonul Colak
University of Sussex
g.colak@sussex.ac.uk

Amrita Saha
Institute of Development Studies
a.saha@ids.ac.uk

Jiao Wang
University of Sussex
jiao.wang@sussex.ac.uk

Abstract: Does expanding financial access at the extensive margin trigger wage growth and structural transformation? We investigate the general equilibrium effects of such shock on wages in a dual economy by formalising two distinct transmission channels. In the formal industrial sector, financial inclusion mobilises previously unbanked household savings and thereby

expanding aggregate credit, lowering user cost of capital, and inducing wage-increasing capital deepening. In the rural agricultural sector, financial access undermines monopolistic moneylending and extractive sharecropping thereby expanding labour demand and increasing agricultural wage. We empirically validate both mechanisms by estimating the wage effects of a large financial inclusion programme in India. Using difference-in-differences (DiD) and matching estimators on household and district panel data (1990-2020), we establish that financial inclusion increased agricultural and industrial wages. Factory- and firm-level microdata confirm that these effects are mediated by rural credit growth and formal-sector capital investment.

JEL codes: G21, G28, J3, O16

Key words: Financial Inclusion; Wages; Credit; Savings; India

Financial Inclusion and Wages in a Dual Economy: Theory and Evidence from India*

Chisomo Kuyenda, Sambit Bhattacharyya, Somdeep Chatterjee, Gonul Colak, Amrita Saha, and Jiao Wang†

3rd July 2026

Abstract

Does expanding financial access at the extensive margin trigger wage growth and structural transformation? We investigate the general equilibrium effects of such shock on wages in a dual economy by formalising two distinct transmission channels. In the formal industrial sector, financial inclusion mobilises previously unbanked household savings and thereby expanding aggregate credit, lowering user cost of capital, and inducing wage-increasing capital deepening. In the rural agricultural sector, financial access undermines monopolistic moneylending and extractive sharecropping thereby expanding labour demand and increasing agricultural wage. We empirically validate both mechanisms by estimating the wage effects of a large financial inclusion programme in India. Using difference-in-differences (DiD) and matching estimators on household and district panel data (1990-2020), we establish that financial inclusion increased agricultural and industrial wages. Factory- and firm-level microdata confirm that these effects are mediated by rural credit growth and formal-sector capital investment.

JEL classification: G21, G28, J3, O16
Keywords: Financial Inclusion; Wages; Credit; Savings; India

*We gratefully acknowledge comments by and discussions with Mostak Ahamed, Anindya Chakrabarti, Richards Dickens, Andy McKay, and Tom Potoms. We also acknowledge comments from seminar participants at Universities of Sussex, Bristol, and Bath. Chisomo Kuyenda acknowledges financial support from UK FCDO's Commonwealth Scholarship Council. The authors have no conflict of interest to declare.

†Kuyenda: Department of Economics, University of Sussex, email: C.Kuyenda@sussex.ac.uk. Bhattacharyya: Department of Economics, University of Sussex, email: S.Bhattacharyya@sussex.ac.uk. Chatterjee: IIM Calcutta & CDES Monash University, email: somdeep@iimcal.ac.in. Colak: Department of Accounting and Finance, University of Sussex, email: G.Colak@sussex.ac.uk. Saha: Institute of Development Studies, email: A.Saha@ids.ac.uk. Wang: Department of Economics, University of Sussex, email: Jiao.Wang@sussex.ac.uk.

1 Introduction

The relationship between financial development and economic growth is among the most thoroughly documented in macroeconomics (Schumpeter, 1911; McKinnon, 1973; King and Levine, 1993a,b; Levine, 1997, 2005, 2021). Yet for the large share of population in developing economies who remain outside the formal financial system, the practically urgent question is not how deep financial systems affect aggregate growth, but whether expanding access to those systems improves material living standards. In India alone, only 35 per cent of adults held a bank account in 2011; by 2021, following the world's largest financial inclusion programme, that share had risen to 78 per cent, meaning that roughly 700 million people were newly integrated into formal finance. If such a shift alters wages, the welfare consequences are large: agricultural field labour in our sample earns a baseline of approximately Rs 250 (US$2.50) per day, so even a moderate programme-induced wage gain lands squarely against the global extreme poverty line of one dollar a day.

Yet despite extensive evidence linking financial depth to economic growth, entrepreneurship, and productivity, whether expanding the extensive margin of financial access generates broad-based improvements in labour market outcomes remains largely underexplored. Standard growth theory predicts a close connection between finance, capital accumulation, and wages (Solow, 1956; Mankiw et al., 1992; King and Levine, 1993a; Levine, 2005): if financial development promotes capital accumulation and resolves resource misallocation, it should raise labour productivity and equilibrium wages through the standard marginal-product mechanism. This paper asks, and answers, whether that prediction survives contact with the data, and crucially, through what channels it does so in the context of a developing economy.

The channel through which this wage effect operates is shaped decisively by the structure of the economy. Many developing economies could be characterised by dualism, where a formal industrial sector coexists with a large rural agricultural sector (Lewis, 1954; Vollrath, 2009; Gollin, 2014). In these settings, financial frictions distort the allocation of capital and suppress labour productivity economy-wide (Greenwood and Jovanovic, 1990; Banerjee and Newman, 1993; Galor and Zeira, 1993; Aghion and Bolton, 1997; Buera et al., 2011; Midrigan and Xu, 2014), but they manifest differently across sectors. In rural areas these frictions are especially severe, and tied to informal moneylenders who link credit provision with tenancy and sharecropping contracts (Braverman and Stiglitz, 1982a; Basu, 1983a; Hoff and Stiglitz, 1998a; Guirkinger, 2008a). Consequently, when large populations simultaneously gain access to formal financial services, the influx of previously excluded savings and the subsequent expansion of the formal credit pool represent a macroeconomic shock. Understanding these

general equilibrium consequences requires a framework that accounts for these structurally distinctive frictions.

To this end, we develop a dual-economy general equilibrium model that links financial inclusion to wage growth through two complementary, empirically separable channels. In the formal industrial sector, financial inclusion mobilises previously unbanked household savings, expanding the aggregate supply of loanable funds and lowering the user cost of capital for firms. The resulting capital deepening raises the marginal product of labour and industrial wages. In the rural agricultural sector, access to formal finance enables households to bypass monopolistic moneylenders and extractive interlinked contracts. The elimination of the sharecropping friction expands agricultural capital, shifts the marginal demand for rural labour outward, and generates a discrete upward jump in market-clearing agricultural wages.

We bring these predictions to the data by exploiting the rollout of India's *Pradhan Mantri Jan-Dhan Yojana* (PMJDY), launched in August 2014. PMJDY is the world's largest financial inclusion programme: by August 2015, its first year, the original target of 75 million accounts had been surpassed more than twofold, and by end-2020 a cumulative 415 million accounts had been opened (Agarwal et al., 2017a). Crucially for identification, the programme was rolled out universally and nationally without strict stage-wise spatial targeting, so the rollout itself does not generate a clean binary treated-versus-control partition. Our identification strategy instead exploits pre-programme geographic variation in the intensity of financial exclusion. For agricultural wages, we classify districts with a rural-to-total population ratio above the sample median as high-intensity treated districts, reflecting the programme's stated focus on the financially excluded, who are disproportionately rural, and districts below the median as lower-intensity controls. For formal-sector wages, we define pre-PMJDY financial exclusion as below-median district-level bank account penetration. In both cases pre-treatment parallel trends hold, supporting the identifying assumptions. We further assess robustness to unobserved confounders using Rosenbaum (2002a) sensitivity bounds, confirming that the estimated effects survive moderate hidden-bias amplification, and we net out the concurrent NREGS workfare programme—the main competing labour-market intervention in rural India—throughout.

Using a suite of matching estimators on district-level Agricultural Wages in India (AWI) panel data spanning 1990–2020, we establish that PMJDY drove a 10 per cent increase in market wages for agricultural field labour, which is approximately Rs 27 (US$0.30) per day, or one-third of the global extreme poverty line of one dollar per day. Concurrently, DiD estimates on household panel data from the Consumer Pyramids Household Survey (CPHS) show a significantly larger increase in real wage income for industrial workers in

previously excluded districts. We then confirm both structural transmission mechanisms. Fixed Effects (FE) and System System Generalised Method of Moments (GMM) estimators on district-level panel data show that agricultural wage growth is mediated entirely by the expansion of *rural* credit and deposits, consistent with the rural friction-relaxation channel. For the formal sector, factory-level microdata from the Annual Survey of Industries (ASI) and firm-level data from Prowess confirm that financial inclusion is associated with credit expansion, capital investment, and capital deepening in formal manufacturing, validating the savings-mobilisation channel.

This paper makes four contributions. First, we develop a dynamic dual-economy model in which financial inclusion interacts with financial frictions in the rural sector and formal intermediation in the industrial sector. To the best of our knowledge, this is the first dynamic dual-economy framework to analyse the role of financial inclusion in structural transformation by jointly modelling the relaxation of rural credit monopolies and the mobilisation of industrial capital. The model shows that expanding the extensive margin of finance can facilitate the transition from low-productivity subsistence agriculture to high-productivity industry without relying solely on the relative-price mechanism of Lewis (1954) or the endogenous fertility mechanism of Vollrath (2009).

Second, we contribute to the macroeconomics of finance and growth by bridging the gap between aggregate financial depth and micro-level financial inclusion. Existing work has largely examined financial development through the depth, structure, or efficiency of financial systems (Levine, 2002; Beck et al., 2007). We instead focus on the extensive margin of finance. We show that this expansion functions as a structural macroeconomic shock that mobilises idle savings, enlarges the formal credit pool, and resolves resource misallocation, thereby altering labour market equilibrium at scale. Financial inclusion is not merely a household-level welfare intervention; it is a macroeconomic policy instrument that affects capital accumulation, productivity, and wages.

Third, we advance the literature on rural finance (Burgess and Pande, 2005a; Barboni et al., 2022) by providing a unified theoretical and empirical account of how modern financial intermediation weakens historical institutional frictions in agrarian economies. The empirical evidence demonstrates that rural credit and rural savings are a crucial mediating channel through which financial inclusion raises agricultural wages, providing direct evidence that formal financial access can disrupt local financial monopolies and improve labour market outcomes in rural economies.

Fourth, we contribute to the policy evaluation of PMJDY. While foundational studies have evaluated the programme through account uptake and household resilience (Chopra and Tantri, 2017a; Agarwal et al., 2017a), we demonstrate that it generated broader general equi-

librium effects on both agricultural and industrial labour markets. Our findings suggest that large-scale expansion of basic financial access can serve as a powerful, market-driven catalyst for wage growth, structural transformation, and poverty reduction with direct implications for the United Nation's Sustainable Development Goal 1.

The remainder of the paper is organised as follows. Section 2 situates our study in the related literature. Section 3 develops the theoretical framework. Section 4 describes the data and empirical strategy. Sections 5 and 6 present the empirical results. Section 7 concludes.

2 Literature Review

The theoretical foundations for this study lie in financial intermediation theory, which highlights the role of finance in stimulating economic growth through the facilitation of technological innovation and capital accumulation. Schumpeter (1911), further developed by McKinnon (1973), highlights the role of the financial system in facilitating the efficient allocation of resources, the mobilisation of savings, and the mitigation of borrowing constraints. King and Levine (1993a,b) provide early empirical and theoretical evidence linking finance to growth, entrepreneurship, and productivity, while Levine (1997, 2002, 2005, 2021) emphasise the role of financial systems in mobilising savings, allocating capital, managing risk, and easing financing constraints.

A central mechanism linking financial development to wages is the productivity channel. Solow (1956) demonstrates the significance of capital accumulation in driving labour productivity and economic growth, while Mankiw et al. (1992) show that capital accumulation remains central to explaining differences in income and productivity across economies. In the context of the agricultural sector, Falcon (1988) elaborates on the crucial role of capital investments in increasing farm productivity and generating higher wages. Improved access to financial services allows farmers to secure loans for productivity-enhancing machinery and inputs, thereby increasing total output and shifting the marginal demand for agricultural labour outward. Feder (1980) argues that access to financial services can connect farmers to larger markets and value chains, further increasing the overall profitability of farming. Beck et al. (2009) show that financial services can connect rural economies to larger markets and support long-term investments in human capital by providing savings options for previously excluded households.

Our paper is related to the classical literature on economic development with surplus labour in a dual economy (Lewis, 1954; Sen, 1966; Todaro, 1969; Stiglitz, 1974). More recent work has revisited the importance of dual-economy mechanisms and sectoral productivity gaps for aggregate productivity and structural transformation (Vollrath, 2009; Gollin, 2014).

The key innovation in our model is treating dualism and institutional imperfections in a dynamic general equilibrium framework with financial inclusion at the extensive margin, which represents a departure from the classical literature.

A related macroeconomic literature shows that financial frictions can distort occupational choice, capital accumulation, resource allocation, and productivity. Greenwood and Jovanovic (1990) link financial development to growth and inequality. Banerjee and Newman (1993), Galor and Zeira (1993), and Aghion and Bolton (1997) show how credit constraints and wealth distribution shape investment, occupational choice, and development dynamics. More recent quantitative work demonstrates that financial frictions can generate substantial misallocation across firms and sectors, thereby reducing aggregate productivity and slowing structural transformation (Buera et al., 2011; Midrigan and Xu, 2014). Our paper contributes to this literature by examining financial inclusion as an expansion in the extensive margin of formal finance that relaxes frictions in the rural economy, expands intermediated savings and credit, and affects equilibrium wages across sectors.

A distinct but related literature examines the specific institutional frictions present in developing rural economies, focusing on the role of informal moneylenders. Canonical models of interlinked agrarian contracts demonstrate that in the absence of formal credit, local moneylenders often link credit provision with tenancy or sharecropping agreements to extract maximum surplus from farmers (Braverman and Stiglitz, 1982a). Because informal lenders operate as local monopolies, they keep capital scarce and interest rates high, deliberately maintaining market isolation to preserve their pricing power (Basu, 1983a). Theoretical extensions indicate that introducing an outside option, such as a formal banking sector, disrupts this equilibrium: when formal credit becomes available, informal lenders facing capacity constraints often scale back rather than competing on price, allowing a growing segment of the population to bypass extractive contracts and increase productive investment (Hoff and Stiglitz, 1998a; Guirkinger, 2008a).

Evans and Jovanovic (1989), Beck and Demirgüç-Kunt (2006, 2008), and Beck et al. (2015) highlight the role of financial development in stimulating entrepreneurship, confirming that improved access to financial services among the poor can lead to increased investment in entrepreneurial activities. Barboni et al. (2022) note that although the benefits of financial access may initially accrue to wealthier households, there can be spillover effects on lower-income households who rely on agricultural labour, as wealthier households transition out of agriculture into micro-enterprises, raising demand for agricultural labour and potentially wages. Levine (2008), Beck et al. (2009), and Levine (2021) emphasise that access to financial services can act as a safety net during periods of economic shocks.

Empirically, a broad literature supports the positive impact of financial development

on poverty alleviation (Levine, 1998; Honohan, 2004; Beck et al., 2007; Demirgüç-Kunt and Levine, 2008; Huang and Lin, 2009; Beck et al., 2000). Burgess and Pande (2005a) assess the Reserve Bank of India's rural branch expansion policy (1977–1990), finding that the policy significantly reduced rural poverty and raised agricultural wages. Ayyagari et al. (2020a) find that financial depth reduces rural poverty in India by fostering entrepreneurship and geographic-sectoral migration. Parida and Roy Chowdhury (2021) find a positive and significant long-run effect of banking facilities on agricultural wages, while Kendall (2012) finds positive effects of banking-sector outreach on district-level economic growth in India. Young (2017) finds evidence that expansion of financial intermediation improves outcomes in agriculture and manufacturing.

Evaluations of PMJDY have documented significant increases in account ownership and usage. Chopra and Tantri (2017a) find significant evidence of uptake, active usage, and balance accumulation using individual-level bank account data. Agarwal et al. (2017a) find, using administrative data, that newly opened accounts eventually mirror the usage patterns of traditionally banked households, leading to increased overall lending.

While a substantial body of literature examines the determinants of agricultural wages in India (Saini et al., 2020; Kumar and Anwer, 2020; Saha and Roy, 2022; Berg et al., 2018a; Palmer-Jones and Parikh, 1998; Parida and Roy Chowdhury, 2021; Himanshu and Kundu, 2016), studies that directly link large-scale financial inclusion policies to general equilibrium wage effects remain scarce. Previous studies have generally focused on broader economic indicators without isolating the specific channels, i.e., capital deepening in manufacturing or the mitigation of interlinked contracts in agriculture, through which the extensive margin of financial access alters market-clearing wages. This paper fills these gaps by formalising these transmission channels and validating them empirically across both the formal and informal sectors.

3 Theoretical Framework: Financial Inclusion in a Dual Economy

To formalise the mechanisms through which financial inclusion affects wage dynamics, we construct a general equilibrium framework of a dual economy. This framework reflects the structural realities of developing economies, which are characterised by the coexistence of a formal industrial sector and an informal agricultural sector.

We define two states of the economy. State 1 is the financially excluded baseline, representing the economy prior to the financial inclusion programme, denoted by superscript

e. In this state, industrial workers are hand-to-mouth consumers without access to credit, and rural farmers rely on informal moneylenders. State 2 is the financially inclusive state, representing the integration of previously unbanked households into the formal financial system, denoted by superscript i. We first construct a benchmark two-period model to explicitly define the optimisation problems of the agents and derive comparative statics. We subsequently extend this structure to an N-period dynamic model to simulate the macroeconomic impulse responses to the gradual rollout of the programme.

3.1 The Benchmark Two-Period Model

The economy lasts for two periods, $t \in \{1, 2\}$, and consists of a formal industrial sector (f) and an informal agricultural sector (i). Each sector is populated by a representative household of mass $\bar{L}_f$ and $\bar{L}_i$, respectively. Households supply labour inelastically and own the productive firms in their respective sectors.

Production in both sectors follows a constant returns to scale (CRS) Cobb-Douglas technology, $Y_{j,t} = A_j K_{j,t-1}^{\alpha} L_{j,t}^{1-\alpha}$ for $j \in \{f, i\}$, where $K_{j,t-1}$ is the capital stock accumulated in the previous period. Capital depreciates at rate δ such that $K_{j,t} = (1-\delta)K_{j,t-1} + I_{j,t}$, where $I_{j,t}$ is new investment. Because the production function exhibits CRS, Euler's theorem ensures that if factors are paid their marginal products, total output is exactly exhausted. Consequently, residual economic profits are zero, and aggregate household income in each sector simplifies to the aggregate wage bill.

3.1.1 State 1: Financial Exclusion (The Baseline Economy)

In State 1, there is no formal banking sector available to intermediate funds. The formal and informal sectors operate in financial autarky.

In the formal sector, firms cannot borrow to finance new investment ($I_{f,1} = 0$). Consequently, the formal capital stock strictly depreciates over time, $K_{f,1} = (1-\delta)K_{f,0}$. Without a safe deposit vehicle, formal households cannot save and consume their wage income hand-to-mouth. Because the competitive formal wage is determined by the marginal product of labour:

$$w_{f,2}^{e} = (1-\alpha)A_f(K_{f,1}/\bar{L}_f)^{\alpha}. \tag{1}$$

The decay of the capital stock leads to a systematic decline in the industrial wage.

In the informal sector, the absence of a bank forces rural households to rely on an elite, monopolistic moneylender to finance agricultural investment. Following the canonical framework of interlinked agrarian contracts of Braverman and Stiglitz (1982b); Basu (1983b), the moneylender provides an informal loan $B_{i,1}^{M}$ but extracts maximum surplus by charging an

extortionate informal interest rate r_m and levying a sharecropping tax $\theta_s \in (0, 1]$ on total output. The unbanked farmer's optimality condition restricts capital accumulation such that the retained marginal product of capital equals the informal user cost:

$$(1 - \theta_s)\alpha A_i \left(\frac{K^e_{i,1}}{\bar{L}_i} \right)^{\alpha-1} = r_m + \delta. \tag{2}$$

Because the informal interest rate is high and the sharecropping tax reduces the marginal return on investment, the agricultural capital stock $K^e_{i,1}$ is severely constrained. The resulting suppressed agricultural market wage is:

$$w^e_{i,2} = (1 - \theta_s)(1 - \alpha)A_i \left(\frac{K^e_{i,1}}{\bar{L}_i} \right)^{\alpha}. \tag{3}$$

3.1.2 State 2: Financial Inclusion (The Integrated Economy)

In State 2, financial inclusion establishes a unified, competitive formal banking sector accessible to both formal and informal agents. The bank accepts deposits from households, holds a fraction $\rho \in (0, 1)$ in reserve, and lends the remainder to firms to finance capital investment.

With access to the formal bank, rural farmers bypass the monopolistic moneylender, eliminating the sharecropping friction ($\theta_s = 0$). Firms in both sectors now borrow at a unified formal lending rate r_l. The capital demand conditions for the formal and informal firms equalise the marginal product of capital to the formal user cost:

$$\alpha A_f \left(\frac{K^i_{f,1}}{\bar{L}_f} \right)^{\alpha-1} = \alpha A_i \left(\frac{K^i_{i,1}}{\bar{L}_i} \right)^{\alpha-1} = r_l + \delta. \tag{4}$$

Households in both sectors now optimise consumption intertemporally. Letting $c_{j,t}$ and $s_{j,1}$ denote per-capita consumption and savings, the standard Euler equation dictates the supply of savings:

$$\frac{U'(c_{j,1})}{U'(c_{j,2})} = \beta(1 + r_d). \tag{5}$$

The bank aggregates these per-capita savings into a national deposit pool, $D_1 = \bar{L}_f s_{f,1} + \bar{L}_i s_{i,1}$. The loanable funds market clears when bank lending equals total new investment across both sectors, $(1 - \rho)D_1 = I_{f,1} + I_{i,1}$. Finally, the zero-profit condition for the competitive banking sector dynamically links the lending and deposit rates, $(1 + r_l)(1 - \rho) = 1 + r_d$.

3.1.3 Comparative Statics and Transmission Mechanisms

Evaluating the shift from State 1 to State 2 analytically validates the two empirical transmission channels tested later in this paper.

First, in the formal sector, financial inclusion mobilises household deposits, establishing a formal credit pool ($D_1 > 0$) that enables positive industrial investment ($I_{f,1} > 0$). This capital deepening ($K^i_{f,1} > K^e_{f,1}$) raises the marginal product of labour, structurally increasing the formal industrial wage ($w^i_{f,2} > w^e_{f,2}$). We test this specific sequence from financial inclusion to credit access, capital deepening, and industrial wages in Section 6.

Second, in the informal sector, access to the formal bank allows rural households to bypass the moneylenders. Because the formal lending rate is lower than the informal rate ($r_l < r_m$) and the sharecropping tax is abolished ($\theta_s = 0$), agricultural capital strictly expands ($K^i_{i,1} > K^e_{i,1}$). This shifts the marginal demand for agricultural labour outward, resulting in a strictly higher market-clearing wage for agricultural workers ($w^i_{i,2} > w^e_{i,2}$). Furthermore, the Euler equation demonstrates that this rise in rural income mechanically increases rural savings ($s_{i,1}$). We evaluate this mechanism in Section 6, testing whether the expansion of rural credit and deposits mediates agricultural wage growth.

3.2 The N-Period Dynamic Model

To model the gradual, incremental rollout of the PMJDY financial inclusion programme, we extend the baseline framework to an infinite-horizon discrete-time setting ($t = 1, 2, \ldots, N$). Let $X_t \in [0, 1]$ denote the cumulative share of the population that has been financially included by period t. We assume the rollout is symmetric, meaning a mass of $X_t \bar{L}_f$ formal households and $X_t \bar{L}_i$ informal households operate in State 2 (banked), while the remaining $(1-X_t)$ fractions operate in State 1 (excluded). The policy shock is modelled as an exogenous, monotonic increase in X_t over time.

For the excluded population operating in State 1, financial intermediation remains absent. Unbanked formal firms cannot borrow to finance new investment and continue to experience capital decay over time. Because the competitive wage equals the marginal product of labour, this continuous capital decay forces the excluded formal wage to strictly decline over time. In the unbanked informal sector, farmers remain captive to the monopolistic moneylender. As financial inclusion programme rolls out and X_t increases, the pool of captive farmers shrinks. Following the theoretical literature on formal-informal credit coexistence (Hoff and Stiglitz, 1998b; Guirkinger, 2008b), we assume the monopolistic moneylender downsizes their aggregate loan portfolio rather than engaging in strategic price competition with the formal bank. Consequently, the remaining excluded farmers continue to face the historical, extract-

ive contract terms (r_m, θ_s), trapping their capital accumulation and agricultural wages at structurally suppressed, stagnant levels. Excluded households in both sectors continue to consume their incomes hand-to-mouth.

For the included population operating in State 2, firms and households interact with the formal banking sector to solve a dynamic intertemporal optimisation problem. Banked firms in both sectors maximize the present discounted value of all future dividends. This yields a dynamic capital demand condition which equates the marginal product of next period's capital to the contemporaneous formal user cost of capital, $\alpha A_j (K^i_{j,t+1}/\bar{L}_j)^{\alpha-1} = r_{l,t} + \delta$. Consequently, the market-clearing wages for included workers dynamically track the expanding capital stock. Concurrently, included households optimize consumption across their lifecycles. They supply per-capita savings $s^i_{j,t}$ to the formal bank, governed by the dynamic Euler equation, $c^i_{j,t+1}/c^i_{j,t} = \beta(1 + r_{d,t})$.

The general equilibrium wage effects of the programme are driven by the dynamic expansion of the formal banking sector's balance sheet. In each period t, the bank pools the savings of the included populations across both sectors, $D_t = X_t(\bar{L}_f s^i_{f,t} + \bar{L}_i s^i_{i,t})$. The bank retains a fraction ρ in reserve and clears the loanable funds market by financing the flow of new included investment, $(1-\rho)D_t = X_t(I^i_{f,t} + I^i_{i,t})$. A zero-profit condition for the competitive banking sector dynamically links the lending and deposit rates, $(1 + r_{l,t})(1-\rho) = 1 + r_{d,t}$.

Finally, to map the theoretical model to our empirical strategy, we define the observed district-level average wage. Because empirical datasets (such as AWI and CPHS) sample across the geographic population, the observed average wage in any district is the population-weighted aggregate of the excluded and included wages:

$$W^{Observed}_{j,t} = X_t w^i_{j,t} + (1 - X_t) w^e_{j,t} \tag{6}$$

As X_t rises, the observed aggregate wage shifts dynamically due to both the composition effect of individuals moving into the higher-wage banked sector, and the general equilibrium effect of sustained capital accumulation driving up the underlying market-clearing wage $w^i_{j,t}$. Details of the model are reported in Appendix C.

3.3 Model Dynamics and Impulse Responses

The general equilibrium wage effects of the financial inclusion programme are driven by the dynamic expansion of the formal banking sector's balance sheet. We parameterise the N-period dynamic model to reflect standard macroeconomic calibrations alongside the specific institutional frictions applicable to the financially excluded rural sector, as detailed in Table 1.

Standard real business cycle parameters are applied uniformly, setting the capital share at $\alpha = 0.30$, the depreciation rate at $\delta = 0.10$, the bank reserve requirement at $\rho = 0.10$, and the household discount factor at $\beta = 0.95$. To capture the severe institutional frictions of financial exclusion in State 1, the monopolistic moneylender's extractive interest rate is calibrated at $r_m = 0.25$ alongside a sharecropping tax of $\theta_s = 0.20$. Finally, the PMJDY rollout trajectory (X_t) is modelled as a steady exogenous expansion from 35 per cent to 78 per cent over 10 periods, closely mirroring the historical bank account penetration rates observed in India between 2011 and 2021.

We simulate the dynamic transition path under a perfect-foresight non-linear solver. The simulated impulse responses are presented in Figure 1. They demonstrate that as the included population share X_t increases, the aggregate deposit base D_t systematically expands. This continuous outward shift in the supply of loanable funds exerts downward pressure on the dynamic formal lending rate $r_{l,t}$, which systematically raises the optimal capital stock for all included firms.

The simulation yields three distinct observable dynamics. First, we observe severe divergence in capital accumulation: while excluded formal firms decay and excluded rural farms stagnate under the moneylender, banked firms in both sectors exhibit rapid capital deepening. Second, actual market-clearing wages for banked industrial and agricultural workers surge upward, driven entirely by the rising marginal product of labour. Finally, because the programme rolls out incrementally, the population-weighted aggregate average wages measured at the district level smoothly curve upward over time. This establishes the theoretical foundation for the difference-in-differences and fixed effects estimators employed in our empirical strategy, demonstrating that expanding the extensive margin of financial access operates as a powerful catalyst for economy-wide wage growth.

4 Data and Empirical Strategy

4.1 Data Sources

To empirically evaluate the effects of financial inclusion across the dual economy, we compile a comprehensive dataset combining district-level macroeconomic aggregates with firm- and household-level microdata.

4.1.1 Wage Data

To capture wage dynamics in the informal agricultural sector, we use unbalanced panel data from 391 Indian districts observed annually over the period 1990 to 2020.[1] Agricultural wages are sourced from various issues of the AWI, compiled at the village/centre level and aggregated to the district level. The data captures three categories of agricultural labour: field labour (e.g., ploughing, sowing, weeding, and reaping), skilled labour (e.g., carpenters, blacksmiths, and cobblers), and other agricultural labour (e.g., watering fields and digging wells). AWI reports nominal wages, which we convert to real wages following Berg et al. (2018b), aggregated to an annual series, and transformed to a logarithmic scale. Previous studies, including Kurosaki and Usami (2016), Usami et al. (2020), and Prakash (2023), confirm that despite some collection challenges, AWI data remains highly reliable for district-level comparative analysis.

To capture wage dynamics in the formal industrial sector, we utilise household longitudinal data from the CPHS compiled by the Centre for Monitoring Indian Economy (CMIE). This dataset provides high-frequency data on wage income for industrial workers from 2014 onwards.

4.1.2 Financial Access, Credit, and Firm-Level Data

District-level credit and deposits data are sourced from the Reserve Bank of India's (RBI) Basic Statistical Returns (BSR) of scheduled commercial banks. This dataset provides detailed distributions of credit and deposits across population groups. For our analysis, we aggregate rural and semi-urban credit to form a rural credit measure, and urban and metropolitan credit to form an urban credit measure. Total deposits are similarly aggregated.

To validate the formal productivity channel, we utilise factory-level microdata from the ASI, an annual census of registered manufacturing factories in India.[2] We extract three primary proxies: log short-term bank credit (covering overdraft and cash credit facilities), log actual additions to fixed assets (capturing gross capital expenditure), and the log capital-labour ratio (net closing fixed assets divided by average persons employed). We complement the ASI analysis with the CMIE Prowess database, covering a panel of large listed and unlisted Indian companies across multiple sectors from 2014 to 2024.[3] In Prowess, we proxy firm credit access with log total liabilities, and capital deepening with log total assets.

[1] The choice of districts is solely dependent on data availability.

[2] The ASI is conducted by the Ministry of Statistics and Programme Implementation (MOSPI). Our panel spans 14 survey years from 2010–11 to 2023–24, encompassing both pre- and post-PMJDY periods.

[3] Prowess predominantly covers large, formally registered firms whose credit access may heavily rely on capital markets rather than retail bank branches. Furthermore, it records registered office locations rather than factory locations. Results from Prowess are therefore treated as complementary associative evidence.

Finally, we construct a state-year Financial Inclusion (FI) index using CMIE-CPHS data, collapsing individual-level bank account ownership indicators into annual state-level penetration rates.

4.1.3 Control Variables

To isolate the effects of financial variables on wages, we control for several district-level characteristics. We include log real GDP per capita to control for the size of the local economy. We use the district literacy rate (the proportion of the population aged 7 and above capable of reading and writing) as a proxy for human capital. We control for agricultural intensity using cropping intensity (the number of times a crop is planted per year) and irrigation intensity (the ratio of net irrigated area to net sown area). Finally, following Berg et al. (2018b), we include a dummy variable for the Mahatma Gandhi National Rural Employment Guarantee Scheme (NREGS) to account for the phase-wise rollout of government workfare programmes, which guarantee 100 days of employment and act as a wage floor for rural households. Table 2 summarises the variables and their respective data sources. Table 3 presents the summary statistics for various categories of variables of labour, credit and deposits.

4.2 Empirical Specifications

4.2.1 Estimating the Direct Wage Effects

To test the core prediction that financial inclusion drives wage growth, we exploit the rollout of the PMJDY. Initiated in 2014, PMJDY is the world's largest financial inclusion initiative (Agarwal et al., 2017b). Because the programme was rolled out nationally without strict spatial targeting, we leverage geographic variation in programme intensity.

For agricultural wages, we define treatment based on pre-programme exposure to financial exclusion. As excluded populations predominantly reside in rural areas, we compute the ratio of rural to total population in each district. Districts above the sample median are classified as high-intensity treated districts ($Treatment = 1$), while those below the median serve as low-intensity controls ($Treatment = 0$). We estimate the Average Treatment Effect on the Treated (ATET) using a suite of matching estimators, including Nearest Neighbour Matching (NNM), Bias-Adjusted NNM, Propensity Score Matching (PSM), and Entropy Balancing (EB). The matching covariates include baseline deposits, credit, literacy rates, net sown area, GDP per capita, and NREGS status. To ensure robustness, we evaluate covariate balance using standardized mean differences, verify common support, and employ Rosenbaum (2002b)'s R-bounds test to assess sensitivity to unobserved confounders.

For industrial worker wages, we employ a difference-in-differences (DiD) design using the CPHS household panel. We define district-level financial exclusion as a binary variable taking the value of 1 if the district's pre-programme bank account penetration rate falls below the national median. We estimate the following equation:

$$\ln(wages)_{hm} = \beta_0 + \beta_1 Post_m + \beta_2 Excluded_h + \beta_3 (Post_m \times Excluded_h) + \Gamma Y_{hm} + \eta_h + \delta_m + u_{hm} \tag{7}$$

where $\ln(wages)_{hm}$ is the log of real wage income for household h in month m. $Post_m$ is an indicator for the post-PMJDY period (after August 2014). Y_{hm} is a vector of household controls (size, age, education, gender). η_h and δ_m represent household and month fixed effects, respectively. The coefficient of interest is β_3.

4.2.2 Validating the Transmission Mechanisms

To validate the specific transmission channels identified in our dual-economy framework, we estimate two supplementary models.

First, to test whether the expansion of rural credit and savings mediates agricultural wage growth, we estimate the following reduced-form dynamic panel model:

$$Y_{it} = \delta_t + \eta_i + \beta X_{it} + \varepsilon_{it} \tag{8}$$

where Y_{it} is the log of real agricultural wages in district i at time t. η_i and δ_t represent district and time fixed effects. X_{it} is a matrix containing our variables of interest (aggregate, rural, or urban credit and deposits) alongside the specified control variables. While FE estimators can be consistent with large N and T (Baltagi and Liu, 2016), they may suffer from dynamic panel bias (Caselli et al., 1996). To address potential endogeneity and lagged dependent variable bias, we supplement the FE models with System GMM estimators.

Second, to test the formal sector mechanism where financial inclusion expands firm credit and induces capital deepening we estimate the following specification using ASI and Prowess microdata:

$$\log(Y_{ist}) = \alpha + \beta FI_{st} + \gamma_s + \delta_t + \theta_k + \varepsilon_{ist} \tag{9}$$

where Y_{ist} represents the outcome (credit access, capital investment, or capital-labour ratio) for firm i in state s in year t. FI_{st} is the state-year financial inclusion index. γ_s and δ_t denote state and year fixed effects, and θ_k captures 2-digit National Industrial Classification (NIC) industry fixed effects. The coefficient β captures the effect of financial inclusion from within-state over-time variation, conditional on time-invariant cross-state differences and common macroeconomic shocks.

5 Empirical Results: The Effect of Financial Inclusion on Wages

Our theoretical framework predicts that transitioning from financial exclusion (State 1) to financial inclusion (State 2) systematically raises market-clearing wages across the dual economy. In the rural sector, this occurs as farmers bypass monopolistic moneylenders; in the industrial sector, it occurs via capital deepening. We first test these aggregate wage predictions using the rollout of the PMJDY programme.

5.1 Agricultural Wages

To test the rural wage channel, we estimate the causal impact of the PMJDY rollout on agricultural wages using district-level data from AWI spanning 1990 to 2020. Because PMJDY was rolled out universally without strict stage-wise spatial targeting, standard spatial treatment and control classifications are challenging. However, the programme's stated objective was to target the financially excluded, who are predominantly located in rural areas. Therefore, our identification strategy leverages the spatial intensity of programme implementation. We classify districts with a rural-to-total population ratio above the sample median as high-intensity treated districts, and those below the median as control districts.

Figure 2 plots the real field labour agricultural wages over time for the treatment and control groups before and after the PMJDY implementation in 2014. While wages in the financially included control group are structurally higher, the pre-2014 trends follow a reasonably parallel trajectory, supporting the identifying assumption. Following the implementation of PMJDY, the wage gap narrows as the treated districts experience accelerated wage growth.

We formally assess this impact using a suite of matching estimators to isolate the Average Treatment Effect on the Treated (ATET), which is the average effect of impact of PMJDY in districts with higher rural population compared to districts with lower rural population. Table 4 presents the results across three categories of agricultural labour (field, skilled, and other). Columns 1 and 2 present results using Nearest Neighbour Matching (NNM) with 1 neighbour and 4 neighbours respectively, whereas columns 3 and 4 are results using bias-adjusted NNM with 1 and 4 neighbours. Columns 5 and 6 reports Propensity Score Matching (PSM) results and column 7 reports Entropy Balancing (EB) results.

Overall, the matching estimates indicate a significant and positive average treatment effect of PMJDY across all wage categories. The magnitude of the effect ranges between 4.7 per cent and 10.7 per cent for field labour, 6.2 per cent and 9.9 per cent for skilled labour, and

5.3 per cent and 11.5 per cent for other agricultural labour. To put this into perspective, a 10.7 per cent increase in field labour wages translates to an increase of roughly Rs 27 (US$0.30) in daily wages, or, Rs 675 (USD 7.50) increase in monthly income, representing substantial poverty alleviation for rural households.

Note that, bias-adjusted NNM estimates are consistently smaller than NNM estimates likely due to bias correction in the NNM estimates. Finally, the PSM and EB estimates also reaffirm positive and robust impacts of PMJDY across all three categories of wages.

To validate these findings, we subject our matching estimators to a battery of diagnostic tests.

First, covariate balance tests confirm that the matching procedure successfully created comparable treated and control groups, with post-matching bias falling well within the standard 25 per cent threshold (Figure B.1).

Second, we observe sufficient common support (overlap) in propensity scores across groups (Figure B.2).

Third, we test for robustness against potential hidden bias using Rosenbaum's R-bounds test. This test assists in determining how strong an unobserved confounding factor would need to be to alter the conclusions of our findings. We report the critical γ values at which the treatment effect becomes insignificant. Higher gamma values indicate greater robustness to potential hidden bias. A common rule of thumb on robustness threshold is that the treatment effect remains significant up to γ =1.25 or γ= 1.5.

Table B.1 shows that the treatment effects for field labour wages (Panel A) and other agricultural labour wages (Panel C) remain robust to unobserved confounders up to a critical threshold of $\gamma = 1.5$. Panel B indicates that for skilled labour wages the effect remains significant up to $\gamma = 1.25$ but becomes insignificant at γ =1.5.

Finally, we confirm the stability of our estimates by applying entropy balancing to strictly match the first moments of the covariates (Table B.2) and by reconstructing the matching covariates using pre-treatment 2010-2013 averages to eliminate any potential post-treatment bias (Table B.3).

5.2 Industrial Worker Wages

The theoretical model suggests that the effects of financial inclusion are not confined to the agricultural sector; the unified pooling of deposits simultaneously lowers the cost of capital for formal firms, driving up industrial wages. We test this prediction using longitudinal household data from the CPHS from 2014 to 2020. The income from wages data are adjusted for inflation using CPI estimates from the RBI.

Because the CPHS dataset does not track the specific type of bank accounts held by households, we construct a measure of district-level pre-programme financial exclusion. We compute the pre-PMJDY bank account penetration rate in a district as the percentage of individuals with a bank account. We then compute the national median of pre-PMJDY bank account penetration and define a district as financially excluded (treated and takes the value 1) if its penetration rate falls below the median. Table 5 illustrates a clear surge in the mean proportion of bank account ownership immediately following the launch of PMJDY in August 2014, which is during the wave 2 survey. (The number of mean bank accounts per household increased by almost 6 per cent between wave 2 and wave 3). Furthermore, trend comparisons in Figure 3 show consistently parallel pre-treatment wage dynamics between the financially excluded and included districts.

We estimate the DiD model controlling for household-level covariates (size, age, education, and gender) alongside household and month fixed effects. The dependent variable is the log of real wage income for industrial workers. The results are presented in Table 6. The coefficient of interest on the interaction term is positive and statistically significant, indicating that financially excluded districts experienced a relatively greater increase in wage income for industrial workers following the implementation of PMJDY compared to previously banked districts.

6 Empirical Results: Validating the Transmission Mechanisms

Having established the positive general equilibrium effects of PMJDY on market wages, we now test the specific transmission mechanisms formalised in the theoretical framework: rural credit and savings mediation, and formal capital deepening.

6.1 Rural Mechanisms: Credit, Deposits, and Agricultural Wages

The rural sector model demonstrates that financial inclusion raises agricultural wages by allowing farmers to bypass moneylenders, leading to an expansion in formal rural credit (K_i) and an endogenous increase in rural savings (S_i) via the household Euler equation. We validate this specific mediation channel using FE and System GMM estimators on district-level panel data.

Table 3 presents summary statistics for district-level financial depth, highlighting a higher baseline concentration of credit and deposits in urban areas. However, the correlation matrix in Table 7 reveals that rural credit and deposits exhibit substantially higher positive

correlations with agricultural wages than their urban counterparts, hinting at the targeted mechanism of rural financial inclusion.

Table 8 reports the FE and System GMM results for the effect of aggregate credit on agricultural wages. Columns 1 and 2 present FE and System GMM estimates without control variables whereas columns 3 to 4 include control variables. We find from Panel A a consistent, robust positive relationship between total credit and field labour wages, robust to controls for regional GDP, literacy, cropping intensity, and government workfare programmes (NREGS). Under the FE models, a 1 per cent increase in credit is associated with a 5.6 to 6.7 per cent increase in field labour wages. Equivalently, a 5.6 per cent increase in the average daily wage from a base of Rs 250 (USD 2.5) in a particular district would translate into Rs 14 (USD 0.14) increase. The System GMM estimates, which correct for dynamic panel bias and endogeneity, broadly confirm this positive relationship.

Panels B and C of Table 8 confirms a generally positive relationship between total credit and the skilled labour and other agricultural labour wages, respectively, although it is not robustly significant across all specifications.

Table 9 examines the savings mechanism, demonstrating a similarly robust and positive relationship between total deposits and field labour wages, and a positive, albeit less robust, relationship between total deposits and skilled and other agricultural labour wages.

Crucially, our theoretical model posits that the wage-suppressing friction (the moneylender contract) is specifically a rural phenomenon. To test this structural assumption, Tables 10-12 decompose the financial variables into rural and urban classifications. Consistent with the theory, we find that the positive wage effects are driven entirely by rural credit and rural deposits. The effects of urban credit and deposits on agricultural wages are not statistically significant. A one standard deviation increase in rural credit translates into a 16.3 per cent increase in field labour wages under the System GMM estimates (Table 10). Similar, though slightly less robust, patterns are observed for skilled and other agricultural labour (Tables 11 and 12).

Taking these results together, we conclude that the dominant effect on field labour, which encompasses core agricultural tasks such as ploughing and reaping, mirrors our theoretical framework. It confirms that access to formal finance primarily raises rural wages by enabling farmers to bypass extractive moneylenders and increase savings and direct agricultural capital investment. Meanwhile, the positive, albeit weaker, effects on skilled rural labour likely reflect secondary spillovers into rural non-farm entrepreneurship, consistent with the channels emphasised by Ayyagari et al. (2020b).

Overall, these findings align with foundational literature demonstrating that historical banking sector outreach improved credit access and elevated agricultural wages (Burgess

and Pande, 2005b; Parida and Roy Chowdhury, 2021). However, our analysis advances this literature by moving beyond reduced-form geographic associations to formalise and validate a precise macroeconomic transmission channel. By evaluating the PMJDY rollout, we demonstrate that expanding the extensive margin of finance acts as a structural general equilibrium shock, where the mobilisation of unbanked savings and the dissolution of informal credit monopolies serve as the key drivers of market-clearing wage growth in the rural areas.

6.2 Formal Mechanisms: Credit and Capital Deepening

In the formal sector model, PMJDY-induced deposit mobilisation expands the aggregate supply of loanable funds. This reduces the formal user cost of capital, allowing firms to finance new investment. The resulting capital deepening (a higher capital-to-labour ratio) raises the marginal product of labour, leading to the industrial wage growth observed in Section 5. We empirically test this multi-step productivity mechanism using factory-level microdata from the ASI and firm-level data from Prowess.

Table 14 reports the mechanism tests using ASI data, evaluating outcomes across the productivity channel. Identification relies on state-year variation in the financial inclusion index. In Column 1, we find that financial inclusion significantly raises firm access to short-term bank credit, confirming the initial relaxation of liquidity constraints. In Column 3, we measure the accumulated capital stock constructed via the perpetual inventory method (PIM). We observe a positive and significant effect on the factory-level capital stock, confirming the investment and capital accumulation channel.[4]

While the estimated effect on the capital-labour ratio is positive, it lacks statistical significance (Columns 2 and 4). This micro-level attenuation is economically consistent with the structure of the Indian labour market. Because aggregate rural-to-urban labour migration in India is historically low and relatively inelastic, the aggregate formal labour supply remains broadly fixed, as specified in our theoretical framework. However, at the microeconomic level, newly credit-unconstrained factories can scale up production by absorbing local labour or reallocating workers from less productive competitors. Consequently, individual factories expand both their physical capital and employment simultaneously, keeping factory-level capital-labour ratios relatively stable.

Table 15 complements the mechanism testing above using Prowess data for firms across all registered sectors (manufacturing, services, construction, utilities, and mining). Consistent with the ASI findings, we observe significant positive associations between the financial

[4]Note that capital stock is constructed using PIM and the equation of motion $K(t) = I(t)+(1-0.06)K(t-1)$, initialising each factory's capital stock in its first observed year using $K(0) = I(1)/(0.05 + 0.06)$ where depreciation rate is 0.06 and growth is 0.05.

inclusion index and firm-level total liabilities (proxying credit access) as well as total assets (proxying capital stock).

Taken together, these microdata estimates validate the theoretical mechanism: by pooling previously unbanked deposits, financial inclusion systematically lowers capital constraints, inducing the capital deepening and the industrial expansion required to sustain industrial wage growth.

7 Conclusion

Finance is the vital artery that nourishes modern economies, allowing economic agents to hedge against risks, smooth consumption, and finance productive investments. Yet, a large number of economic agents in developing and emerging market economies remain excluded from the formal financial system due to structural frictions, geographic remoteness, policy bottlenecks, and weak contracting institutions. While a substantial literature has documented the positive effects of aggregate financial depth on economic growth, the general equilibrium effects of expanding the extensive margin of finance—financial inclusion—under dualism have received considerably less attention, despite their paramount significance for economic development.

In this paper, we investigate the general equilibrium effects of financial inclusion on productivity, wages, and welfare under dualism. We construct a dual-economy framework to trace the macroeconomic transmission channels of inclusion across both the formal industrial and informal agricultural sectors. In the formal sector, the model demonstrates that introducing banking to unbanked households mobilises deposits, which systematically lowers the user cost of capital for firms. This induces capital deepening, raising the marginal product of labour and industrial wages. In the rural sector, the financially excluded are historically captive to informal moneylenders who extract surplus via interlinked agrarian contracts. Our framework demonstrates that providing access to formal credit allows farmers to bypass these extractive monopolies. The resulting expansion in agricultural investment raises the marginal product of rural labour, generating a strictly positive jump in market-clearing agricultural wages.

We empirically validate both channels using the rollout of India's PMJDY, the world's largest financial inclusion programme. Consistent with our theoretical predictions, DiD estimates from household panel data (CPHS) show that PMJDY drove significant wage income growth for industrial workers. Concurrently, matching estimators on district-level data reveal a substantial 10 per cent increase in agricultural field labour wages (approximately US$0.30 per day). We confirm the structural transmission mechanisms underlying these wage gains,

using fixed effects and dynamic panel estimators to show that agricultural wage growth was entirely mediated by the expansion of rural credit and savings. Finally, using factory-level microdata (ASI), we find robust evidence that financial inclusion directly expands credit access and induces capital deepening among formal manufacturing firms.

The findings of this paper offer profound implications for development policy. First, they demonstrate that financial inclusion operates as a structural macroeconomic shock that resolves resource misallocation. It is a far more potent policy tool for modernisation and economic transformation than the microeconomic effects on household consumption smoothing. By integrating previously isolated savings into a unified national deposit pool, financial inclusion unambiguously extends economies of scale, generating aggregate investment demand even under dualism.

Second, our results highlight the critical role of the extensive margin of finance in dismantling institutional frictions in developing countries. Providing the rural poor with basic financial access diminishes the bargaining power of informal monopolies, translating directly into sustainable gains in agricultural productivity and wages. The magnitude of this wage effect—representing roughly one-third of the global extreme poverty line of a dollar a day—provides objective evidence that scaling basic financial access is a powerful catalyst for structural transformation. Consequently, implementing large-scale financial inclusion programmes such as PMJDY presents a highly effective, market-driven strategy for low-income countries aiming to address the United Nation's Sustainable Development Goal 1: No Poverty.

While our study focuses on the aggregate wage and productivity effects of deposit mobilisation, financial inclusion invariably has implications for other macroeconomic variables. Future research exploring the heterogeneous impacts of financial access across space, social identity, and local governance structures will also be vital for understanding the broader distributional consequences of financial inclusion policies and ensuring their ultimate success in addressing global development challenges.

References

Agarwal, S., S. Alok, P. Ghosh, S. Ghosh, T. Piskorski, and A. Seru (2017a). Banking the unbanked: What do 255 million new bank accounts reveal about financial access? *SSRN Electronic Journal*.

Agarwal, S., S. Alok, P. Ghosh, S. Ghosh, T. Piskorski, and A. Seru (2017b). Banking the Unbanked: What Do 255 Million New Bank Accounts Reveal about Financial Access? *SSRN Electronic Journal*.

Aghion, P. and P. Bolton (1997). A theory of trickle-down growth and development. *Review of Economic Studies 64*(2), 151–172.

Ayyagari, M., T. Beck, and M. Hoseini (2020a). Finance, law and poverty: Evidence from India. *Journal of Corporate Finance 60*, 101515.

Ayyagari, M., T. Beck, and M. Hoseini (2020b). Finance, Law and Poverty: Evidence from India. *Journal of Corporate Finance 60*, 101515.

Baltagi, B. H. and L. Liu (2016, April). Random Effects, Fixed Effects and Hausman's Test for the Generalized Mixed Regressive Spatial Autoregressive Panel Data Model. *Econometric Reviews 35*(4), 638–658. _eprint: https://doi.org/10.1080/07474938.2014.998148.

Banerjee, A. V. and A. F. Newman (1993). Occupational choice and the process of development. *Journal of Political Economy 101*(2), 274–298.

Barboni, G., E. Field, and R. Pande (2022). Rural banks can reduce poverty: Experimental evidence from 870 Indian villages. *Yale Economic Growth Working Paper*.

Basu, K. (1983a). The emergence of isolation and interlinkage in rural markets. *Oxford Economic Papers 35*(2), 262–280.

Basu, K. (1983b). The emergence of isolation and interlinkage in rural markets. *Oxford Economic Papers 35*(2), 262–280.

Beck, T. and A. Demirgüç-Kunt (2006). Small and medium-size enterprises: Access to finance as a growth constraint. *Journal of Banking & Finance 30*(11), 2931–2943.

Beck, T. and A. Demirgüç-Kunt (2008). Access to finance: An unfinished agenda. *World Bank Economic Review 22*(3), 383–396.

Beck, T., A. Demirgüç-Kunt, and P. Honohan (2009). Access to financial services: Measurement, impact, and policies. *World Bank Research Observer 24*(1), 119–145.

Beck, T., A. Demirgüç-Kunt, and R. Levine (2007). Finance, inequality and the poor. *Journal of Economic Growth 12*(1), 27–49.

Beck, T., R. Levine, and N. Loayza (2000). Finance and the sources of growth. *Journal of Financial Economics 58*(1), 261–300.

Beck, T., L. Lu, and R. Yang (2015). Finance and growth for microenterprises: Evidence from rural China. *World Development 67*, 38–56.

Berg, E., S. Bhattacharyya, D. Rajasekhar, and R. Manjula (2018a). Can public works increase equilibrium wages? Evidence from India's national rural employment guarantee. *World Development 103*, 239–254.

Berg, E., S. Bhattacharyya, D. Rajasekhar, and R. Manjula (2018b, March). Can Public Works Increase Equilibrium Wages? Evidence from India's National Rural Employment Guarantee. *World Development 103*, 239–254.

Braverman, A. and J. E. Stiglitz (1982a). Sharecropping and the interlinking of agrarian markets. *American Economic Review 72*(4), 695–715.

Braverman, A. and J. E. Stiglitz (1982b). Sharecropping and the interlinking of agrarian markets. *The American Economic Review 72*(4), 695–715.

Buera, F. J., J. P. Kaboski, and Y. Shin (2011). Finance and development: A tale of two sectors. *American Economic Review 101*(5), 1964–2002.

Burgess, R. and R. Pande (2005a). Do rural banks matter? Evidence from the Indian social banking experiment. *American Economic Review 95*(3), 780–795.

Burgess, R. and R. Pande (2005b). Do Rural Banks Matter? Evidence from the Indian Social Banking Experiment. *The American Economic Review 95*(3), 780–795. Num Pages: 16 Place: Nashville, United States.

Caselli, F., G. Esquivel, and F. Lefort (1996, September). Reopening the convergence debate: A new look at cross-country growth empirics. *Journal of Economic Growth 1*(3), 363–389.

Chopra, Y. and P. L. Tantri (2017a). Bank accounts for the unbanked: Evidence from a big bang experiment. *SSRN Electronic Journal*.

Chopra, Y. and P. L. Tantri (2017b). Bank Accounts for the Unbanked: Evidence from a Big Bang Experiment. *SSRN Electronic Journal*.

Demirguc-Kunt, A., L. Klapper, and D. Singer (2017, April). *Financial Inclusion and Inclusive Growth: A Review of Recent Empirical Evidence*. World Bank, Washington, DC.

Demirgüç-Kunt, A. and R. Levine (2008). Finance, financial sector policies, and long-run growth. *World Bank Policy Research Working Paper Series*.

Evans, D. S. and B. Jovanovic (1989). An estimated model of entrepreneurial choice under liquidity constraints. *Journal of Political Economy 97*(4), 808–827.

Falcon, W. P. (1988). Review of Schultz, T.W., transforming traditional agriculture. *American Journal of Agricultural Economics 70*(1), 198–200.

Feder, G. (1980). Farm size, risk aversion and the adoption of new technology under uncertainty. *Oxford Economic Papers 32*(2), 263–283.

Galor, O. and J. Zeira (1993). Income distribution and macroeconomics. *Review of Economic Studies 60*(1), 35–52.

Gollin, D. (2014). The Lewis model: A 60-year retrospective. *Journal of Economic Perspectives 28*(3), 71–88.

Greenwood, J. and B. Jovanovic (1990). Financial development, growth, and the distribution of income. *Journal of Political Economy 98*(5), 1076–1107.

Guirkinger, C. (2008a). Understanding the coexistence of formal and informal credit markets in Piura, Peru. *World Development 36*(8), 1436–1452.

Guirkinger, C. (2008b). Understanding the coexistence of formal and informal credit markets in piura, peru. *World Development 36*(8), 1436–1452.

Himanshu and S. Kundu (2016). Rural wages in India: Recent trends and determinants. *Indian Journal of Labour Economics 59*(2), 217–244.

Hoff, K. and J. E. Stiglitz (1998a). Moneylenders and bankers: Price-increasing subsidies in a monopolistically competitive market. *Journal of Development Economics 55*(2), 485–518.

Hoff, K. and J. E. Stiglitz (1998b). Moneylenders and bankers: Price-increasing subsidies in a monopolistically competitive market. *Journal of Development Economics 55*(2), 485–518.

Honohan, P. (2004). Financial development, growth, and poverty: How close are the links? *World Bank Policy Research Working Paper* (3203).

Huang, H.-C. and S.-C. Lin (2009). Non-linear finance–growth nexus: A threshold with instrumental variable approach. *Economics of Transition 17*(3), 439–466.

Kendall, J. (2012). Local financial development and growth. *Journal of Banking & Finance 36*(5), 1548–1562.

King, R. G. and R. Levine (1993a). Finance and growth: Schumpeter might be right. *Quarterly Journal of Economics 108*(3), 717–737.

King, R. G. and R. Levine (1993b). Finance, entrepreneurship, and growth: Theory and evidence. *Journal of Monetary Economics 32*(3), 513–542.

Kumar, S. and M. Anwer (2020). Agricultural wages in India: Trends and determinants. *Agricultural Economics Research Review 33*, 71–79.

Kurosaki, T. and Y. Usami (2016). A Note on the Reliability of Agricultural Wage Data in India: Reconciliation of Monthly AWI Data for District-Level Analysis. *Review of Agrarian Studies 06*(1).

Levine, R. (1997). Financial development and economic growth: Views and agenda. *Journal of Economic Literature 35*(2), 688–726.

Levine, R. (1998). The legal environment, banks, and long-run economic growth. *Journal of Money, Credit and Banking 30*(3), 596–613.

Levine, R. (2002). Bank-based or market-based financial systems: Which is better? *Journal of Financial Intermediation 11*(4), 398–428.

Levine, R. (2005). Finance and growth: Theory and evidence. In P. Aghion and S. N. Durlauf (Eds.), *Handbook of Economic Growth*, Volume 1A, pp. 865–934. Amsterdam: Elsevier.

Levine, R. (2008). Finance and the poor. *Manchester School 76*(S1), 1–13.

Levine, R. (2021). Finance, growth, and inequality. *IMF Working Paper* (2021/164).

Lewis, W. A. (1954). Economic development with unlimited supplies of labour. *Manchester School 22*(2), 139–191.

Mankiw, N. G., D. Romer, and D. N. Weil (1992). A contribution to the empirics of economic growth. *Quarterly Journal of Economics 107*(2), 407–437.

McKinnon, R. I. (1973). *Money and Capital in Economic Development*. Washington, DC: Brookings Institution Press.

Midrigan, V. and D. Y. Xu (2014). Finance and misallocation: Evidence from plant-level data. *American Economic Review 104*(2), 422–458.

Palmer-Jones, R. and A. Parikh (1998). The determination of agricultural wage rates in Bangladesh. *Journal of Agricultural Economics 49*(1), 111–133.

Parida, Y. and J. Roy Chowdhury (2021). An empirical analysis of the effect of floods on rural agricultural wages across Indian states. *World Development Perspectives 23*, 100272.

Parida, Y. and J. Roy Chowdhury (2021). An empirical analysis of the effect of floods on rural agricultural wages across Indian states. *World Development Perspectives 23*, 100272.

Prakash, P. (2023, September). Agricultural Wages in India: A Critical Review of Data Sources. *The Indian Journal of Labour Economics 66*(3), 933–940.

Rosenbaum, P. R. (2002a). *Observational Studies* (2nd ed.). New York: Springer.

Rosenbaum, P. R. (2002b). Sensitivity to Hidden Bias. In P. R. Rosenbaum (Ed.), *Observational Studies*, pp. 105–170. New York, NY: Springer.

Saha, S. and N. Roy (2022). Trends and determinants of agricultural wages in Assam. *Research Journal of Agricultural Sciences 13*(2), 460–465.

Saini, S., A. Gulati, J. Von Braun, and L. Kornher (2020). Indian farm wages: Trends, growth drivers and linkages with food prices. *SSRN Electronic Journal*.

Schumpeter, J. A. (1911). *The Theory of Economic Development*. Cambridge, MA: Harvard University Press. English edition published 1934.

Sen, A. K. (1966). Peasants and dualism with or without surplus labour. *Journal of Political Economy 74*(5), 425–450.

Shah, N. (2023, November). Impact of Pradhan Mantri Jan Dhan Yojana Program on Access to Credit. *Indian Journal of Finance and Banking 13*(2), 1–13.

Solow, R. M. (1956). A contribution to the theory of economic growth. *Quarterly Journal of Economics 70*(1), 65–94.

Stiglitz, J. E. (1974). Alternative theories of wage determination and unemployment in LDCs: The labour turnover model. *Quarterly Journal of Economics 88*(2), 194–227.

Todaro, M. P. (1969). A model of labour migration and urban unemployment in less developed countries. *American Economic Review 59*(1), 138–148.

Usami, Y., A. Das, and M. Swaminathan (2020). Methodology of Data Collection Unsuited to Changing Rural Reality: A Study of Agricultural Wage Data in India. *Review of Agrarian Studies 10*(2).

Vollrath, D. (2009). The dual economy in long-run development. *Journal of Economic Growth 14*(4), 287–312.

Young, N. (2017). Banking and growth: Evidence from a regression discontinuity analysis. *SSRN Electronic Journal*.

Table 1: Calibration of Model Parameters (N-Period Dynamic Model)

Parameter	**Description**	**Value**
α	Share of capital in production	0.30
δ	Capital depreciation rate	0.10
β	Subjective discount factor	0.95
ρ	Bank reserve requirement ratio	0.10
A_f	Total Factor Productivity (Formal Sector)	2.00
A_i	Total Factor Productivity (Informal/Rural Sector)	1.50
$\bar{L}_f$	Population mass (Formal Sector)	1.00
$\bar{L}_i$	Population mass (Informal/Rural Sector)	1.00
r_m	Extractive informal interest rate (Moneylender)	0.25
θ_s	Extractive sharecropping tax (Moneylender)	0.20
N	Periods of policy rollout plotted	10
X_t	Financial inclusion rate (PMJDY rollout trajectory)	0.35 to 0.78

Figure 1: Macroeconomic Effects of Financial Inclusion Programme Rollout, 35% to 78% Inclusion

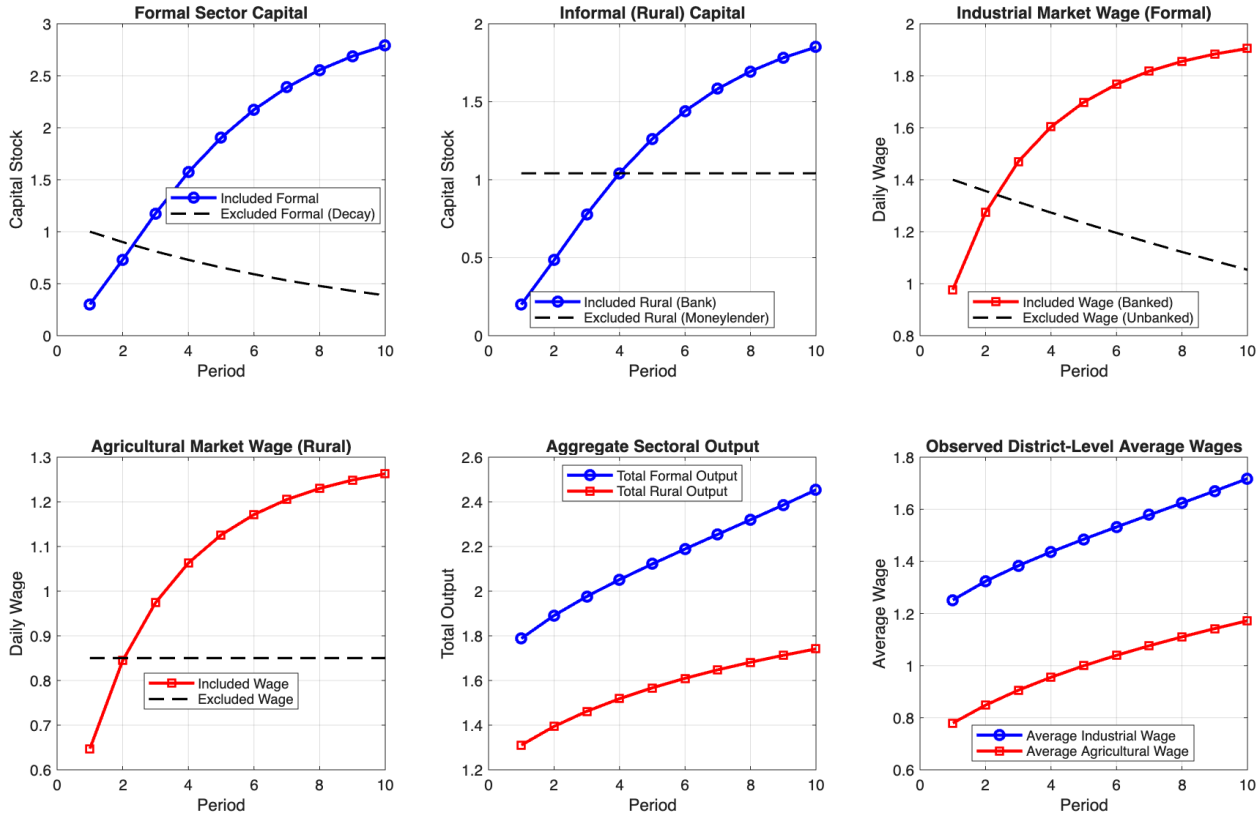
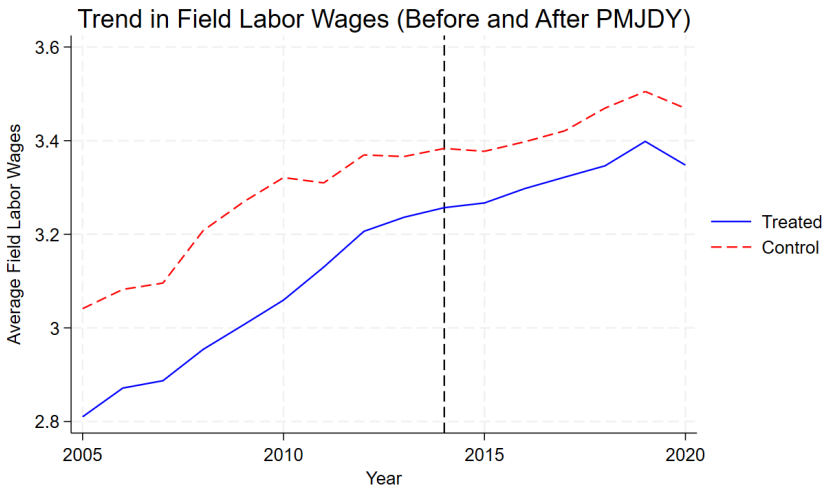
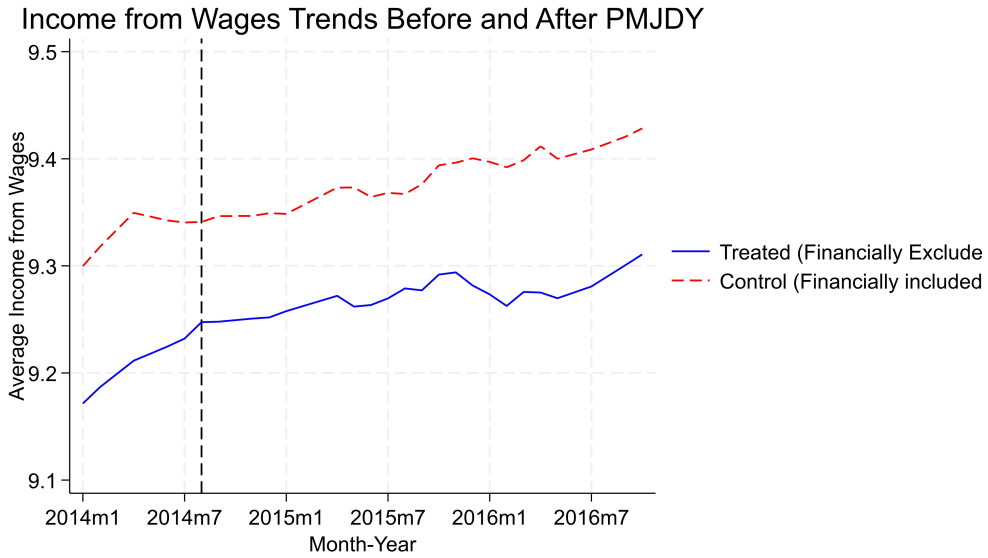


Figure 2: Trend in real field labour wages: Before and after PMJDY (AWI data)



Note: Field labour wages in logs. Treated districts are those with rural population share above the median (high PMJDY intensity). Control districts have rural population share below the median (low PMJDY intensity). The vertical dashed line indicates PMJDY implementation in August 2014. Pre-treatment trends are reasonably parallel, supporting the parallel trends assumption.

Figure 3: Trends in Income from Wages before and after PMJDY: CPHS Data



Note: Average income from wages in logs (CPHS household survey data, 2014-2020). Treated districts are those with proportion of bank account holders below the national median (financially excluded). Control districts have bank account penetration above the median (financially included). The vertical dashed line indicates PMJDY implementation in August 2014. Pre-treatment trends are broadly parallel, supporting the identifying assumption for the difference-in-differences analysis. Control districts consistently show higher wage income.

Table 2: List of variables

Variable notation	**Description**	**Source**
field labour	Log of real field labour wages in Indian Rupee (INR) per day (ploughing, sowing, weeding and reaping)	Agricultural Wages in India (AWI) data from Ministry of Agriculture and Farmers Welfare
Skilled labour	Log of real skilled labour wages in INR per day (carpenter, blacksmith and cobbler)	AWI data from Ministry of Agriculture and Farmers Welfare
other agricultural labour	Log real Other agricultural wages in INR/day (watering fields, digging wells and cleaning silt from waterways)	AWI data from Ministry of Agriculture and Farmers Welfare
Tota credit	Log of total credit (all types of credit facilities such as cash credit, overdrafts, demand loans, term loans & bills discounted/purchased and factored receivables)	Reserve Bank of India (RBI)'s Basic Statistical Returns (BSRs) of scheduled commercial banks
Total deposits	Log of total deposits (current deposits, savings bank deposits and term deposits)	BSRs from RBI
rural credit	Log of rural and semi-urban credit	BSRs from RBI
rural deposits	Log of rural and semi-urban deposits	BSRs from RBI
Urban credit	Log of urban and metropolitan credit	BSRs from RBI
Urban deposits	Log urban and metropolitan deposits	BSRs from RBI
Percapita gdp	Log of real GDP per capita	National Statistical Office, Ministry of Statistics and Programme Implementation
litrate	Literacy rate (%). proportion of persons who can both read & write with understanding in any language among population aged 7 years and above	Office of the Registrar General and Census Commissioner, Ministry of Home Affairs
MNREGA	National employment program implemented from 2007. Takes the value of 1 if MNREGA was active in a district, and 0 otherwise.	Ministry of Rural Development
Cropping intensity	Number of times a crop is planted per year in each agricultural area	Land Use Statistics- At a Glance, Ministry of Agriculture and Farmers' Welfare
Irrigation intensity	Ratio of net irrigated area to net sown area	Land Use Statistics- At a Glance, Ministry of Agriculture and Farmers' Welfare

Table 3: Summary statistics in logs for various categories of labour, credit, and deposits

	Mean	SDev	Min	Max	Obs
Field labour	3.02	0.55	-2	7	8117
Skilled labour	3.53	0.41	1	7	8375
Other agric labour	3.10	1.04	-4	23	7692
Total Credit	5.18	1.42	0	10	7891
Rural credit	4.66	1.19	-1	8	8165
Urban credit	4.82	2.97	-11	61	5849
Total Deposits	5.88	1.27	2	10	7896
Rural deposits	5.35	1.03	2	9	8165
Urban deposits	5.51	1.57	-8	20	5914

Note: Total Credit is the sum of rural, semi-urban, urban and metropolitan credit. The same applies for Total Deposits. Rural credit/deposits is the summation of rural & semi-urban credit/deposits while urban comprise of Urban and Metropolitan credit/deposits.
Field labour include activities such as ploughing, sowing, weeding, and reaping while carpenter, blacksmith, and cobbler fall under skilled labour category and other agric labour includes such activities as digging.

Table 4: Average Treatment Effects on the Treated: Impact of PMJDY Intervention on Agricultural Labour Wages

	(1) NNM (nn=1)	(2) NNM (nn=4)	(3) Bias-adj NNM (nn=1)	(4) Bias-adjNNM (nn=4)	(5) PSM (nn=1)	(6) PSM (nn=4)	(7) EB
Field labour	0.085***	0.124***	0.076***	0.094***	0.188***	0.173***	0.065*
	(0.018)	(0.014)	(0.018)	(0.014)	(0.028)	(0.020)	(0.038)
Observations	5381	5381	5381	5381	5381	5381	5381
Skilled labour	0.099***	0.130***	0.106***	0.115***	0.136***	0.131***	0.099***
	(0.016)	(0.013)	(0.016)	(0.013)	(0.024)	(0.018)	(0.099)
Observations	5520	5520	5520	5520	5520	5520	5520
Other agric labour	0.088***	0.147***	0.122***	0.127***	0.151***	0.123***	0.115***
	(0.027)	(0.023)	(0.027)	(0.023)	(0.043)	(0.037)	(0.036)
Observations	5062	5062	5062	5062	5062	5062	5062

Note: Standard errors, in parentheses, are robust.
NNM is nearest neighbour matching; Bias-adj NNM is Bias-adjusted nearest neighbour matching; PSM is Propensity score matching while EB is Entropy balancing methodology.
* p<0.10, ** p<0.05, *** p<0.01

Table 5: Proportion of Bank Accounts per Household by Wave

Wave	Mean of proportion of bank accounts per household
1	0.460
2	0.484
3	0.543
4	0.582
5	0.630
6	0.645
7	0.656
8	0.701
9	0.748

We observe an almost 6 percentage point jump in number of mean bank accounts per household from wave 2 to wave 3.
This could imply that most of these accounts were as a result of the implementation of PMJDY.

Table 6: Impact of PMJDY on Income from Wages for Industrial Workers

	(1) Income from Wages	(2) Income from Wages
Post-PMJDY	-0.045**	-0.045**
	(0.020)	(0.019)
Post-PMJDY X Financially-excluded	0.079**	0.081**
	(0.036)	(0.035)
Observations	140,644	140,644
Number of Households	13,361	13,361
Household Controls	No	Yes
Years	2014-2020	2014-2020
Household & Time FE	Yes	Yes

The dependent variable is log of wage income of industrial workers.
The total sample is from January 2014 to December 2020 with 211,228 households and about 3 million observations.
For this analysis, sample has been restricted to only one occupation group (income from industrial workers),
comprising about 13,631 households.
Post-PMJDY indicates time periods after PMJDY implementation in Aug 2014
Financially excluded: Binary valuable that captures a district's financial exclusion
(1 for districts with the average bank account ownership below the national median or 0 otherwise.
Standard errors clustered at district level in parentheses.
Household controls include average household size, age group, education, and gender
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 7: Correlation Matrix

	Field	Skilled	Other Agric	Total Credit	Rural Credit	Urban Credit	Total Deposits	Rural Deposits	Urban Deposits
Field Labour	1.00								
Skilled Labour	0.72***	1.00							
Other Agric Labour	0.53***	0.43***	1.00						
Total Credit	0.52***	0.44***	0.25***	1.00					
Rural Credit	0.54***	0.44***	0.26***	0.84***	1.00				
Urban Credit	0.41***	0.37***	0.19***	0.80***	0.57***	1.00			
Total Deposits	0.51***	0.43***	0.26***	0.91***	0.72***	0.74***	1.00		
Rural Deposits	0.53***	0.43***	0.28***	0.72***	0.85***	0.50***	0.81***	1.00	
Urban Deposits	0.38***	0.32***	0.20***	0.77***	0.51***	0.72***	0.83***	0.54***	1.00

Note: *** indicates statistical significance at the 1% level.

Table 8: Fixed Effects and System GMM Estimations: Impact of credit on wages

Panel A: Impact of credit on field labour wages

	Without controls		With controls	
	FE	GMM	FE	GMM
Total Credit	0.067***	0.011**	0.056**	0.006*
	(0.021)	(0.004)	(0.022)	(0.004)
L.field labour		0.883***		0.856***
		(0.041)		(0.045)
NREGS			0.137***	0.002
			(0.020)	(0.011)
Literacy rate			0.214*	0.089***
			(0.119)	(0.029)
Cropping intensity			-0.663***	0.017
			(0.166)	(0.027)
Irrigation intensity			0.372	0.030
			(0.248)	(0.023)
GDP per capita			0.039**	0.005
			(0.019)	(0.005)
Obs	7633	6920	5381	4859
Districts	373		288	
Adjusted R-squared	0.539		0.613	
Hansen test (p-value)		0.104		0.151
AR(2) p-value		0.266		0.476
Number of instruments		61		66
District and year fixed effects	Yes	Yes	Yes	Yes

Panel B: Impact of credit on skilled labour wages

	Without controls		with controls	
	FE	GMM	FE	GMM
Total Credit	0.067***	0.008**	0.052***	-0.002
	(0.016)	(0.003)	(0.007)	(0.003)
L.skilled labour		0.855***		0.871***
		(0.043)		(0.042)
NREGS			0.078***	-0.016
			(0.012)	(0.014)
Literacy rate			0.223***	0.087***
			(0.029)	(0.029)
Cropping intensity			-0.383***	0.002
			(0.049)	(0.024)
Irrigation intensity			0.197***	0.035*
			(0.046)	(0.019)
GDP per capita			0.070***	0.011**
			(0.006)	(0.005)
Obs	7891	7172	5520	4994
Districts	379		285	
Adjusted R-squared	0.368			
Hansen test (p-value)		0.421		0.350
AR(2) p-value		0.271		0.806
Number of instruments		61.000		66.000
District, year fixed effects	Yes	Yes	Yes	Yes

Panel C: Impact of credit on other agric labour wages

	Without controls		(With controls	
	(1) FE	(2) GMM	(3) FE	(4) GMM
Total Credit	0.109	0.007*	0.100	0.007*
	(0.067)	(0.004)	(0.094)	(0.004)
L.Other agric labour		0.926***		0.928***
		(0.017)		(0.014)
NREGS			0.059	-0.011
			(0.044)	(0.019)
Literacy rate			-0.291	0.024
			(0.571)	(0.021)
Cropping intensity			-1.426***	-0.023
			(0.280)	(0.021)
Irrigation intensity			1.243***	0.002
			(0.333)	(0.018)
GDP per capita			0.068	0.002
			(0.101)	(0.007)
Obs	7211	6538	5062	4570
Districts	359		277	
Adjusted R-squared	0.111		0.143	
Hansen test (p-value)		0.002		0.050
AR(2) p-value		0.720		0.987
Number of instruments		61		66
District, year fixed effects	Yes	Yes	Yes	Yes

Note: Standard errors, in parentheses, are robust and clustered at the district level. * p<0.10, ** p<0.05, *** p<0.01
Dependent variables include field labour wages in Panel A; skilled labour wages in Panel B;
& other agricultural wages in Panel C.
All variables in logs except NREGS. NREGS stands for National Rural Employment Guarantee Scheme.

Table 9: Fixed Effects and System GMM Estimations: Impact of deposits on wages

Panel A: Impact of deposits on field labour wages

	Without controls		With controls	
	FE	GMM	FE	GMM
Total Deposits	0.058	0.013**	0.063***	0.007*
	(0.038)	(0.005)	(0.025)	(0.004)
L.field labour		0.881***		0.855***
		(0.040)		(0.046)
NREGS			0.152***	0.003
			(0.022)	(0.012)
Literacy rate			0.177	0.087***
			(0.114)	(0.029)
Cropping intensity			-0.570***	0.013
			(0.161)	(0.026)
Irrigation intensity			0.310	0.032
			(0.244)	(0.022)
GDP per capita			0.041**	0.006
			(0.019)	(0.005)
Obs	7638	6924	5387	4864
Districts	373		288	
Adjusted R-squared	0.539		0.613	
Hansen test (p-value)		0.111		0.131
AR(2) p-value		0.259		0.477
Number of instruments		61		66
District, year fixed effects	Yes	Yes	Yes	Yes

Panel B: Impact of deposits on skilled labour wages

	Without controls		With controls	
	FE	GMM	FE	GMM
Total Deposits	0.070***	0.010***	0.061**	-0.001
	(0.021)	(0.004)	(0.026)	(0.004)
L.skilled labour		0.857***		0.870***
		(0.041)		(0.043)
NREGS			0.071***	-0.016
			(0.020)	(0.014)
Literacy rate			0.101	0.087***
			(0.087)	(0.030)
Cropping intensity			-0.356***	0.004
			(0.105)	(0.023)
Irrigation intensity			-0.065	0.033*
			(0.152)	(0.019)
GDP per capita			0.057***	0.010**
			(0.015)	(0.005)
Obs	7896	7176	5526	4999
Districts	379		295	
Adjusted R-squared	0.367		0.434	
Hansen test (p-value)		0.433		0.354
AR(2) p-value		0.268		0.797
Number of instruments		61		66
District, year fixed effects	Yes	Yes	Yes	Yes

Panel C: Impact of deposits on other agric labour wages

	Without controls		With controls	
	FE	GMM	FE	GMM
Total Deposits	0.095	0.007*	0.045	0.009**
	(0.062)	(0.004)	(0.091)	(0.004)
L.Other agric labour		0.926***		0.929***
		(0.017)		(0.014)
NREGS			0.090**	-0.011
			(0.039)	(0.019)
Literacy rate			-0.315	0.017
			(0.575)	(0.021)
Cropping intensity			-1.316***	-0.028
			(0.297)	(0.018)
Irrigation intensity			1.174***	0.003
			(0.319)	(0.016)
GDP per capita			0.076	0.003
			(0.102)	(0.007)
Obs	7216	6542	5068	4575
Districts	359		277	
Adjusted R-squared	0.110		0.142	
Hansen test (p-value)		0.002		0.046
AR(2) p-value		0.733		0.993
Number of instruments		61		66
District, year fixed effects	Yes	Yes	Yes	Yes

Note: Standard errors, in parentheses, are robust and clustered at the district level. * p<0.10, ** p<0.05, *** p<0.01
Dependent variables include field labour wages in Panel A; skilled labour wages in Panel B;
& other agricultural wages in Panel C.
All variables in logs except NREGS. NREGS stands for National Rural Employment Guarantee Scheme.

Table 10: Differential Impact of credit and deposits on field labour wages

Panel A: Impact of rural credit on field labour wages				
	Without controls		With controls	
	FE	GMM	FE	GMM
Rural credit	0.167***	0.163***	0.040***	0.033**
	(0.0188)	(0.020)	(0.0068)	(0.0060)
Obs	7907	5519	7142	4962
Districts	373	373	288	288
Adjusted R-squared	0.555		0.624	
Hansen test (p-value)	0.088		0.100	
AR(2) p-value		0.139		0.216
Number of instruments		61		66
District, year fixed effects	Yes	Yes	Yes	Yes
Panel B: Impact of Urban credit on field labour wages				
	Without controls		With controls	
	FE	GMM	FE	GMM
Urban credit	-0.005	0.008	0.075	0.014
	(0.00527)	(0.00162)	(0.0153)	(0.00334)
Obs	5665	5133	3920	3552
Districts	270		203	
Adjusted R-squared	0.511		0.583	
Hansen test (p-value)		0.084		0.090
AR(2) p-value		0.252		0.263
Number of instruments		61.000		66.000
District, year fixed effects	Yes	Yes	Yes	Yes
State fixed effects	Yes	No	Yes	No
Panel C: Impact of Rural deposits on field labour wages				
	Without controls		With controls	
	FE	GMM	FE	GMM
Rural deposits	0.123**	0.040***	0.159***	0.040**
	(0.0311)	(0.00794)	(0.0241)	(0.00761)
Observations	7907	7142	5519	4962
Districts	373	373	288	288
Adjusted R-squared	0.552		0.623	
Hansen test (p-value)		0.082		0.101
AR(2) p-value		0.135		0.218
Number of instruments		61		66
District, year fixed effects	Yes	Yes	Yes	Yes
State fixed effects	Yes	No	Yes	No
Panel D: Impact of Urban deposits on field labour wages				
	Without controls		With controls	
	FE	GMM	FE	GMM
Urban deposits	0.037	0.012	0.041	-0.010
	(0.0128)	(0.00397)	(0.0172)	(0.00549)
Obs	5730	5196	3932	3564
Districts	283	283	215	215
Adjusted R-squared	0.512		0.582	
Hansen test (p-value)		0.086		0.093
AR(2) p-value		0.249		0.266
Number of instruments		61		66
District, year fixed effects	Yes	Yes	Yes	Yes
State fixed effects	Yes	No	Yes	No

Note: Standardized betas are reported. Standard errors, in parentheses, are robust and clustered at the district level.
Control variables include: National Rural Employment Guarantees Scheme (NREGS), GDP per Capita,
Literacy rates, Irrigation intensity & Cropping intensity.
All variables in logs except NREGS.
* p<0.10, ** p<0.05, *** p<0.01

Table 11: Differential Impact of credit and deposita on skilled labour wages

Panel A: Impact of rural credit on skilled labour wages				
	Without controls		With controls	
	FE	GMM	FE	GMM
Rural Credit	0.159***	0.041**	0.203**	0.012*
	(0.015)	(0.0046)	(0.019)	(0.0048)
Obs	8165	7394	5658	5097
Districts	379	379	295	295
Adjusted R-squared	0.375		0.442	
Hansen test (p-value)		0.416		0.294
AR(2) p-value		0.251		0.890
Number of instruments		61		66
District, year fixed effects	Yes	Yes	Yes	Yes
Panel B: Impact of Urban credit on skilled labour wages				
	Without controls		With controls	
	FE	GMM	FE	GMM
Urban credit	0.022	0.018	0.008	0.069
	(0.0046)	(0.0018)	(0.013)	(0.012)
Obs	5849	5314	3985	3985
Districts	274		208	
Adjusted R-squared	0.356		0.416	
Hansen test (p-value)		0.168		0.000
AR(2) p-value		0.322		0.008
Number of instruments		61.000		67.000
District, year fixed effects	Yes	Yes	Yes	Yes
State fixed effects	Yes	No	Yes	No
Panel C: Impact of Rural deposits on skilled labour wages				
	Without controls		With controls	
	FE	GMM	FE	GMM
Rural deposits	0.143***	0.131*	0.047***	-0.014
	(0.020)	(0.030)	(0.0054)	(0.016)
Observations	7907	7142	5519	4962
Districts	373		288	
Adjusted R-squared	0.552		0.623	
Hansen test (p-value)		0.082		0.101
AR(2) p-value		0.135		0.218
Number of instruments		61		66
District, year fixed effects	Yes	Yes	Yes	Yes
State fixed effects	Yes	No	Yes	No
Panel D: Impact of Urban deposits on skilled labour wages				
	Without controls		With controls	
	FE	GMM	FE	GMM
Urban deposits	0.053*	0.025**	0.040	-0.048
	(0.0075)	(0.0028)	(0.018)	(0.015)
Obs	5914	5377	3997	3628
Districts	287		220	
Adjusted R-squared	0.355		0.416	
Hansen test (p-value)		0.360		0.244
AR(2) p-value		0.320		0.960
Number of instruments		61		65
District, year fixed effects	Yes	Yes	Yes	Yes
State fixed effects	Yes	No	Yes	No

Note: Standardized betas are reported. Standard errors, in parentheses, are robust and clustered at the district level.
Control variables include: National Rural Employment Guarantees Scheme (NREGS), GDP per Capita,
Literacy rates, Irrigation intensity & Cropping intensity.
All variables in logs except NREGS.
* p<0.10, ** p<0.05, *** p<0.01

Table 12: Differential Impact of credit and deposits on other agric labour wages

Panel A: Impact of rural credit on other agric labour wages				
	Without controls		With controls	
	FE	GMM	FE	GMM
Rural credit	0.203***	0.014***	0.211*	0.015**
	(0.0622)	(0.00373)	(0.0803)	(0.00434)
Observations	7482	6757	5198	4671
Districts	359		277	
Adjusted R-squared	0.126		0.157	
Hansen test (p-value)		0.001		0.034
AR(2) p-value		0.870		0.883
Number of instruments		61		66
District, year fixed effects	Yes	Yes	Yes	Yes
State fixed effects	Yes	No	Yes	No
Panel B: Impact of Urban credit on other agric labour wages				
	Without controls		With controls	
	FE	GMM	FE	GMM
Urban credit	-0.004	0.001	-0.039	0.010*
	(0.00616)	(0.00114)	(0.0409)	(0.00259)
Observations	5315	4819	3674	3332
Districts	258		194	
Adjusted R-squared	0.098		0.145	
Hansen test (p-value)		0.056		0.086
AR(2) p-value		0.504		0.563
Number of instruments		61		66
District, year fixed effects	Yes	Yes	Yes	Yes
State fixed effects	Yes	No	Yes	No
Panel C: Impact of Rural deposits on other agric labour wages				
	Without controls		With controls	
	FE	GMM	FE	GMM
Rural deposits	0.075	0.014***	0.071	0.019***
	(0.0525)	(0.00442)	(0.0627)	(0.00485)
Observations	7482	6757	5198	4671
Districts	359		277	
Adjusted R-squared	0.117		0.150	
Hansen test (p-value)		0.002		0.037
AR(2) p-value		0.885		0.877
No. of instruments		61		66
District, year fixed effects	Yes	Yes	Yes	Yes
State fixed effects	Yes	No	Yes	No
Panel D: Impact of Urban deposits on other agric labour wages				
	Without controls		With controls	
	FE	GMM	FE	GMM
Urban deposits	0.032	0.002	0.195**	-0.003
	(0.0283)	(0.00276)	(0.0576)	(0.00409)
Obs	5379	4881	3685	3343
Districts	270		205	
Adjusted R-squared	0.099		0.154	
Hansen test (p-value)		0.053		0.085
AR(2) p-value		0.513		0.566
Number of instruments		61		66
District, year fixed effects	Yes	Yes	Yes	Yes
State fixed effects	Yes	No	Yes	No

*Note:*Standardized betas are reported. Standard errors, in parentheses, are robust and clustered at the district level.
Control variables include: National Rural Employment Guarantees Scheme (NREGS), GDP per Capita,
Literacy rates, Irrigation intensity & Cropping intensity.
All variables in logs except NREGS.
* p<0.10, ** p<0.05, *** p<0.01

Table 13: Productivity Channel: Proxy Variables and Justification

Channel	**Outcome**	**ASI Proxy (2011-2024)**	**Prowess Proxy (2014-2024)**	**Justification**
Credit access	log(bank credit)	Bank overdraft and cash credit	(total liabilities)	Bank overdraft and cash credit is the primary formal working capital instrument for Indian manufacturing firms and provides a direct measure of access to formal finance in the ASI. In Prowess, total liabilities serve as the closest available proxy for overall firm borrowing, though they include both financial and non-financial liabilities.
Capital investment	(capital investment)	Additions to fixed assets during the year	(total assets)	Additions to fixed assets capture gross investment flows and reflect firms' decisions to expand productive capacity. This corresponds to the second step in the mechanism, where improved access to credit enables investment. In Prowess, total assets reflect the accumulated capital stock rather than contemporaneous investment, making this an imperfect but informative proxy.
Capital deepening	(K/L)	Net closing assets / average persons worked	(total assets)/employees	The capital–labour ratio captures capital deepening, the final step in the productivity channel through which higher investment raises the marginal product of labour and wages. A perpetual inventory method (PIM) capital stock (assuming 6% depreciation and 5% growth) is constructed as a robustness check. Employment data in Prowess is available for only a small subset of firms (approximately 5%), so K/L estimates are not reported for that dataset.

Table 14: Financial Inclusion and the Productivity Channel: ASI Data and Perpetual Inventory Method

	(1) log(Credit)	(2) log(K/L)	(3) log(K-PIM)	(4) log(KL-PIM)
FI_index	1.695*	0.077	0.217*	0.258
	(0.928)	(0.264)	(0.122)	(0.200)
Observations	502,912	495,976	318,157	290,817

Note: Standard errors, in parentheses, are robust and clustered at the state level. * p<0.10, ** p<0.05, *** p<0.01.
FI index varies at the state-year level. Identification validated using a 2011–2014 parallel trends event study.
Perpetual Inventory Method (PIM): $K_t = I_t + (1 - 0.06)K_{t-1}$ with growth rate $g = 0.05$.
Sample includes ASI manufacturing firms (columns 1–2) and the PIM subsample (columns 3–4).
ASI is an annual census of registered manufacturing factories under the Factories Act (1948).

Table 15: Financial Inclusion and Firm Outcomes: Prowess (All Sectors)

	(1) log(Sales)	(2) log(PAT)	(3) log(Assets)	(4) log(Liab)
FI_index	0.108***	0.071***	0.064*	0.066*
	(0.041)	(0.022)	(0.038)	(0.039)
Observations	81,520	90,357	109,630	110,916

Note: Standard errors, in parentheses, are robust and clustered at the district level. * p<0.10, ** p<0.05, *** p<0.01
Firm and year fixed effects included
log(Liab) denotes total liabilities (proxy for credit). log(Assets) proxies capital stock. log(PAT) is profit after tax.
Sample includes firms in manufacturing, services, construction, utilities, and mining sectors (2014-2024).
Prowess dataset covers a panel of large listed and unlisted Indian companies that file audited accounts.

Appendices

A Institutional Context of PMJDY

The *Pradhan Mantri Jan Dhan Yojana* (PMJDY) which was launched in 2014, is one of the biggest financial inclusion initiatives in the world (Agarwal et al., 2017b). The program aims at achieving universal access to basic and affordable financial services to every household, especially to financially excluded poorer households in India. The program's extensive implementation has thus broadened the scope of formal banking services to previously underserved regions in India. Before this initiative, over half of the population in India did not have access to a bank account. Specifically, in 2011, only 35 per cent of the population aged 15 years and above had a bank account. By 2021, this percentage improved to 78 per cent, largely attributed to PMJDY initiative. Initially, PMJDY had two phases: Phase I (Aug 2014 to Aug 2015); and phase II run from Aug 2015 to Aug 2018. Thereafter, the Program was extended indefinitely. The target for number of accounts to be opened during phase 1 was 75 million accounts. Meanwhile, by the end of August 2015, this target was surpassed by more than a twofold as a total of 179 million PMJDY accounts were opened. By the end of the second phase (August 2018), a cumulative of 325.4 million accounts were opened and further increased to 415.8 million accounts by end 2020. Table 1 highlights trends in PMJDY accounts over the years.

Financial services offered under the PMJDY initiative include access to a free basic zero-balance savings bank account that comes with a "RuPay" debit card; access to a need-based credit; remittances; insurance; and pension facilities. Several distinct features of PMDJY initiative have been instrumental in the uptake of the program. Firstly, the free and zero-balance account has been one of the crucial pillars of PMJDY as this has been one of the obstacles for people living below the poverty line to access formal banking services (Shah, 2023). Similarly, Know Your Customer (KYC) documentation requirements are relaxed under PMJDY, enabling temporary account opening through biometric authentication without ID. Another important feature of PMJDY is the overdraft facility, which enables account holders to access credit amounting to Rs.5,000 (US$59.45), thereby providing them with a safety net and a means to savings options. The overdraft facility is only offered to account holders who maintain the bank account and transact actively. Further, life insurance facilities under the initiative, such as the Rs.100,000 (US$1,190.13) accidental coverage and the Rs.30,000 (US$357.04) life insurance for accounts opened before 2015, have also assisted the uptake of the program as it provides beneficiaries with a safety net in times of need.

In terms of implementation, the PMJDY followed a multi-faceted approach. Firstly,

the districts, India's regional administrative units, were sub-divided into around 153,488 sub-service areas (SSA), each covering 1000-1600 villages. Based on the existing presence in a region, different state-owned banks were assigned different SSAs to ensure accountability. Under this arrangement, each designated bank was responsible for setting up a fixed-point banking outlet within a 5km radius of every village in their allotted SSAs. This was done either through a physical branch or a business correspondents (BCs) who act as representatives of the banks [5]. To expand access and ensure smooth implementation of the PMJDY program, the government of India established 50,000 additional BCs, 7,000 new bank branches, and 20,000 ATMs state-owned banks (Agarwal et al. (2017b)). Further, the government ensured that all BCs were equipped with micro-ATMs, enabling them to function like mini-branches. As such, BCs were able to receive deposits, withdrawals, fund transfers, and balance inquiries. Another important aspect of the PMJDY program was the introduction of basic mobile banking services via SMS which enabled account holders to check balances and initiate funds transfers without visiting a physical bank branch. The provision of banking services at people's doorsteps, and the introduction of mobile banking services necessitate the removal of significant barriers such as travel costs and time, that prevent poor people's access to financial services Demirguc-Kunt et al. (2017). Additionally, banks set up account opening camps in villages to ensure large account number openings in the early stages of the program. To ensure the banks' sustainability, the government of India provided various financial subsidies to support their operations.

The PMJDY program also incorporates financial literacy programs [6], and this has improved understanding and effective use of financial services. Similarly, the adoption of technology such as micro-ATMs through business correspondents who offer doorstep services in hard-to-reach areas and mobile SMS-based banking has helped lower transaction costs and simplified access to banking services. Various studies including Chopra and Tantri (2017b), and Agarwal et al. (2017b) have demonstrated that PMJDY has positively improved access

[5]BCs are employed by the banks and operate as intermediaries between banks and customers in areas where there are no physical branches and thus play an important role in reaching out to the rural and underserved areas. BScs offer basic banking services including deposits, withdrawals, account opening, and funds transfer. BCs receive a commission for each transactions done.

[6]There is a dedicated Financial Literacy program under the PMJDY where the RBI developed operational guidelines which mandates the banks to operate Financial Literacy centres (FLCs) and provide financial literacy services in rural branches. FLCs and rural branches of banks conduct special camps for the newly included people under PMJDY where they are encouraged to make meaningful transactions and start using the associated benefits of having a bank account. The target is to have a minimum of one outdoor camp per month by each FLC and rural branch of banks. The financial literacy campaigns are mandated to adopt and provide a segmented approach to financial literacy programs specific to different categories of borrowers, rather than generalized ones. For instance, for centres in rural and semi-urban areas, banks are encouraged to concentrate on financial literacy and counselling for farming communities and those engaged in allied activities. Whereas the focus in metro/urban areas is on personal loans.

to financial services, mostly to those who were financially excluded.

Details of progress in terms of the number of accounts opened and deposits in PMJDY accounts is illustrated in Table A.1. Overall, we observe an upward trend in both the number of beneficiaries and deposits in accounts since the inception of the initiative in 2014, reflecting the program's effectiveness in providing banking services to the financially excluded. During the first year of the initiative, 179 million PMJDY accounts were opened and have continually increased to 415.8 million as of end 2020. Likewise, the increase in the number of accounts has also led to an increase in deposits under this initiative. Deposits have increased from Rs.157 million (US$1.9 million) as of end March 2015 to Rs. 1,350.8 billion (US$15.42 billion) as of end December 2020. The data further reveals that rural and semi-urban areas have benefitted more from this initiative than urban and metropolitan areas, as 66.6 per cent of total accounts under PMJDY were opened in rural and semi-urban areas.

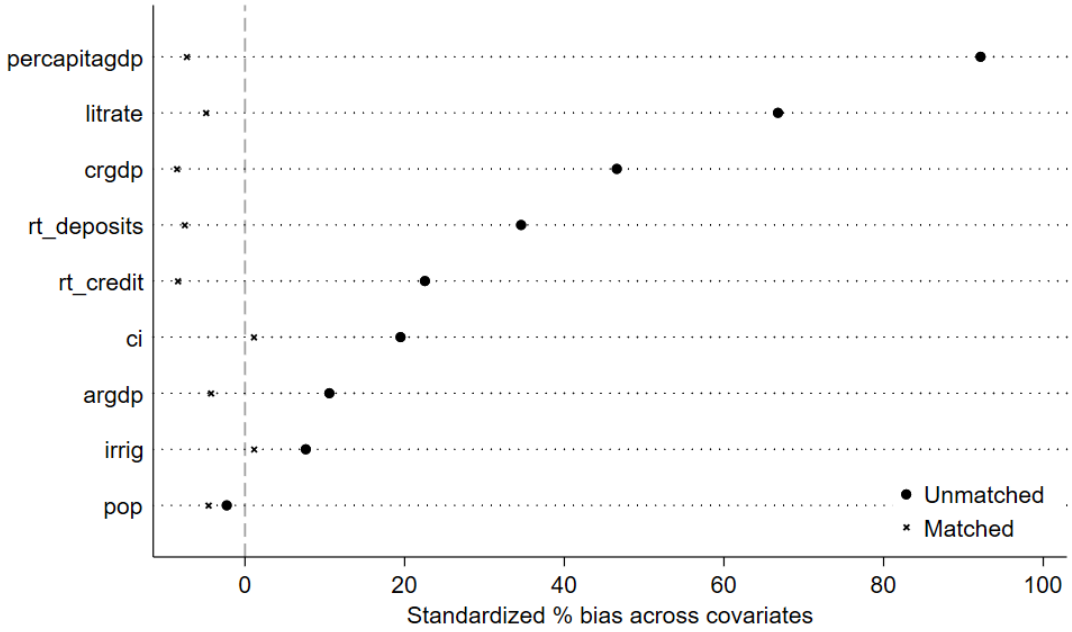
Table A.1: PMJDY Bank Category-wise Report as at end 30/12/2020 (Figures in Millions)

Bank Name / Type	**Rural/Semi-Urban Beneficiaries**	**Urban/Metro Beneficiaries**	**Total Beneficiaries**	**Deposits in Accounts (Million Rupees)**	**Rupay Debit Cards Issued (Millions)**
Public Sector Banks	201.56	127.50	329.06	1,049,217.37	260.98
Regional Rural Banks	64.85	9.19	74.04	260,092.48	33.72
Private Sector Banks	7.02	5.71	12.73	415,547.74	11.51
Grand Total	**273.43**	**142.40**	**415.83**	**1,350,848.59**	**306.21**

Further, an analysis of PMJDY accounts per bank type as presented in Table A.1 indicates that the majority of PMJDY accounts, at 79 per cent, are held by Public Sector Banks (PSBs), highlighting a critical role of state-owned banks in financial inclusion efforts in India. This is followed by Rural Regional Banks (RRBs) which opened 17.8 per cent of the total PMJDY accounts by end 2020 while private banks only accounted for 3 per cent of total accounts opened. We also observe that PSBs and RRBs dominate in rural areas with 74 per cent and 24 per cent of PMJDY accounts, respectively, while private banks play a negligible role in rural areas. This distribution highlights that rural areas registered more PMJDY accounts which reinforces the PMJDY's focus on financial inclusion in financially excluded areas. In rural and semi-urban areas, 62.7 per cent, 85.7 per cent, 45.4 per cent, and 100.0 per cent of PMJDY accounts were opened in public sector banks, regional rural banks, private banks, and rural cooperative banks, respectively. Meanwhile, in urban areas, 37.3 per cent, 14.3 per cent, and 54.6 per cent of the accounts were opened in public sector banks, regional rural banks, and private banks, respectively.

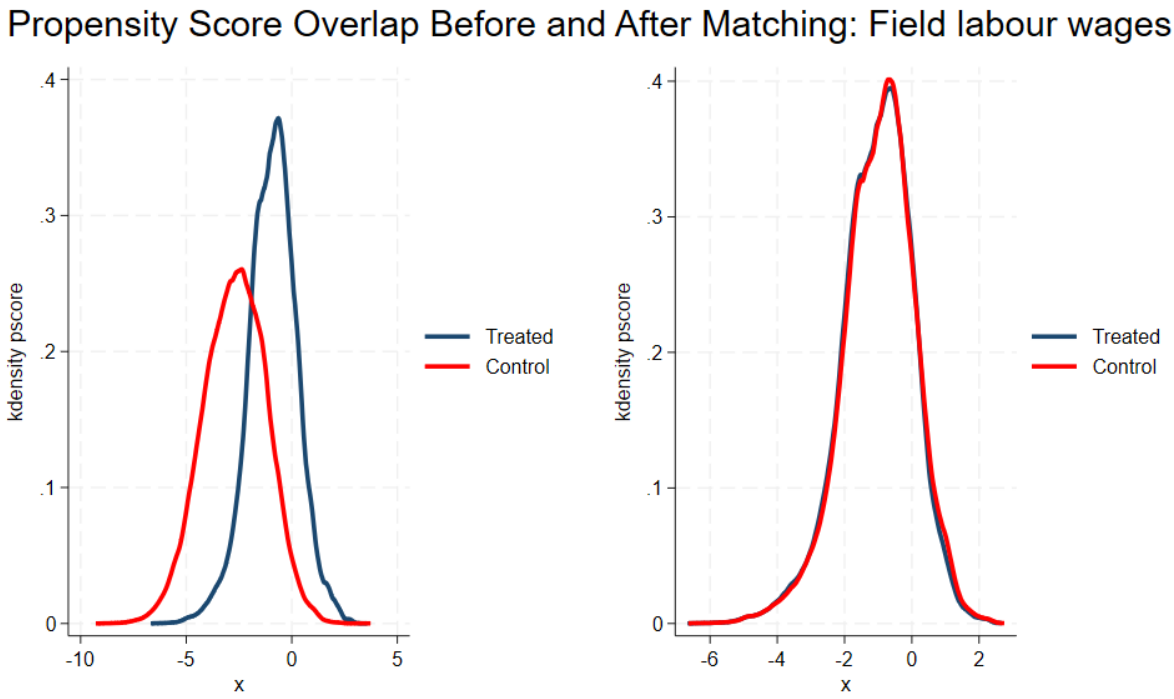
B Robustness Checks: Matching Estimators

Figure B.1: Covariate Balance Before and After Matching: Propensity Score Matching



Note: Covariates are well balanced after matching (bias within the recommended 25 percent This ensures a valid comparison between treated and control districts.

Figure B.2: Covariate Overlap Before and After Matching: Propensity Score Matching



Note: Enough overlap is achieved after matching

Table B.1: Rosenbaum Sensitivity Test for Agricultural Wages (Propensity Score Matching)

Panel A: Field labour wages						
Gamma	**sig+**	**sig-**	**t-hat+**	**t-hat-**	**CI+**	**CI-**
1	0	0	0.109576	0.109576	0.102554	0.116592
1.25	0	0	0.054393	0.164777	0.047382	0.171820
1.5	0.003656	0	0.009704	0.209769	0.002617	0.216928
1.75	1	0	-0.027914	0.247537	-0.035064	0.254676
2	1	0	-0.060118	0.279804	-0.067316	0.287042
Panel B: Skilled labour wages						
Gamma	**sig+**	**sig-**	**t-hat+**	**t-hat-**	**CI+**	**CI-**
1	0	0	0.070914	0.070914	0.064802	0.076972
1.25	0	0	0.022844	0.119065	0.016868	0.125116
1.5	1	0	-0.013614	0.158095	-0.022044	0.164298
1.75	1	0	-0.047073	0.195626	-0.055260	0.197164
2	1	0	-0.077162	0.219266	-0.083554	0.225661
Panel C: Other agricultural labour wages						
Gamma	**sig+**	**sig-**	**t-hat+**	**t-hat-**	**CI+**	**CI-**
1	0	0	0.121030	0.121030	0.113698	0.128325
1.25	0	0	0.063485	0.178614	0.056155	0.185984
1.5	0	0	0.016831	0.225547	-0.049630	0.239243
1.75	1	0	-0.022270	0.264892	-0.096990	0.272400
2	1	0	-0.055791	0.298785	-0.146350	0.366370

Note: Gamma: log odds of differential assignment due to unobserved factors.
sig+: upper bound significance level; sig−: lower bound significance level.
t-hat+: upper bound Hodges-Lehmann point estimate; t-hat−: lower bound estimate.
CI+: upper bound 95% confidence interval; CI−: lower bound 95% confidence interval.
The positive treatment effect on agricultural wages is robust to moderate unobserved confounding. At $\Gamma = 1.25$, the upper bound p-value remains below 0.05 across all three wage categories, meaning the positive effect holds even allowing for a 25% increase in the odds of selection on unobservables. At $\Gamma = 1.5$, skilled labour wages show greater sensitivity to hidden bias.

Table B.2: Covariate Balance Before and After Weighting using Entropy balancing

	Treat			Control		
Variable	Mean	Variance	Skewness	Mean	Variance	Skewness
Panel A: Before (without weighting)						
credit	5.362	1.090	-0.359	5.115	2.149	0.002
Deposits	6.192	0.752	0.221	5.788	1.719	0.007
Cropping intensity	4.992	0.022	-0.067	4.955	0.024	0.459
Irrigation intensity	0.479	0.044	0.053	0.453	0.054	0.749
Literacy rate	0.302	0.015	-0.241	0.434	0.065	-1.165
Population	14.310	0.750	-1.215	14.290	0.500	-1.152
GDP per capita	0.243	0.355	0.292	1.370	1.483	-0.516
Agric GDP	7.048	0.953	-0.436	7.053	1.419	-0.018
Construction GDP	6.316	0.691	-0.695	5.800	1.341	-0.493
NREGS	1.000	0.000	–	0.403	0.241	0.396
Panel B: After (*using Entropy balancing as the weighting variable)						
Credit	5.362	1.090	-0.359	5.358	1.547	-0.410
Deposits	6.192	0.752	0.221	6.188	1.120	-0.189
Cropping intensity	4.992	0.022	-0.067	4.992	0.025	-0.047
Irrigation Intensity	0.479	0.044	0.053	0.479	0.050	0.343
Literacy	0.302	0.015	-0.241	0.303	0.023	-0.692
Population	14.310	0.750	-1.215	14.310	0.664	-1.720
GDP per Capita	0.243	0.355	0.292	0.243	0.568	-0.118
Agric GDP	7.048	0.953	-0.436	7.050	1.025	-0.300
Construction GDP	6.316	0.691	-0.695	6.312	0.848	-0.765
NREGS	1.000	0.000	–	0.999	0.001	-26.830

Note: Using entropy balancing as weighting variable to adjust the control group to match the treatment group on the first moment (mean).
Panel B indicates balance on means achieved at two decimal places.
NREGS is National Rural Employment Guarantee Scheme

Table B.3: Average Treatment Effects on the Treated: Impact of PMJDY on Agricultural Wages using Pre-treatment Covariates

	(1) NNM (nn=1)	(2) NNM (nn=4)	(3) Bias-adj NNM (nn=1)	(4) Bias-adj NNM (nn=4)	(5) PSM (nn=1)	(6) PSM (nn=4)	(7) EB
Field labour	0.481***	0.528***	0.483***	0.532***	0.511***	0.550***	0.065*
	(0.016)	(0.014)	(0.016)	(0.014)	(0.016)	(0.015)	(0.038)
Observations	5,266	5,266	5,266	5,266	5,266	5,266	5,266
Skilled labour	0.337***	0.368***	0.341***	0.372***	0.365***	0.394***	0.099***
	(0.015)	(0.015)	(0.015)	(0.015)	(0.015)	(0.017)	(0.099)
Observations	5,405	5,405	5,405	5,405	5,405	5,405	5,405
Other agric labour	0.374***	0.365***	0.379***	0.374***	0.344***	0.355***	0.115***
	(0.063)	(0.059)	(0.063)	(0.059)	(0.045)	(0.046)	(0.036)
Observations	4,958	4,958	4,958	4,958	4,958	4,958	4,958

Note: Dependent variables are log of real agricultural wages. Standard errors in parentheses. All estimators use pre-treatment covariates (2010-2013 averages) to address post-treatment bias concerns. NNM is Nearest Neighbor Matching; Bias-adj NNM is Bias-adjusted Nearest Neighbor Matching; PSM is Propensity Score Matching; EB is Entropy Balancing methodology. Treatment defined as districts with rural population share above median (high PMJDY intensity). * p<0.10, ** p<0.05, *** p<0.01

C The N-Period Dynamic Model

This section details the formal setup, optimality conditions, and market-clearing identities for the infinite-horizon discrete-time dual-economy model ($t = 1, 2, \ldots, N$).

Population Dynamics

Let $X_t \in [0, 1]$ denote the cumulative share of the population financially included by period t. The economy consists of a formal sector (f) and an informal sector (i), populated by representative households of mass $\bar{L}_f$ and $\bar{L}_i$. Production follows a Constant Returns to Scale technology: $Y_{j,t} = A_j K_{j,t-1}^{\alpha} L_{j,t}^{1-\alpha}$.

- A mass of $X_t \bar{L}_f$ formal households and $X_t \bar{L}_i$ informal households operate in **State 2** (banked).
- A mass of $(1 - X_t)\bar{L}_f$ and $(1 - X_t)\bar{L}_i$ operate in **State 1** (excluded).

State 1: Financial Exclusion

Excluded Formal Sector: Unbanked formal firms face strict liquidity constraints ($B_{f,t}^e = 0$, $I_{f,t}^e = 0$). Capital strictly depreciates:

$$K_{f,t+1}^e = (1 - \delta) K_{f,t}^e \tag{10}$$

Wages equal the marginal product of labour (MPL):

$$w_{f,t}^e = (1 - \alpha) A_f \left(\frac{K_{f,t}^e}{\bar{L}_f} \right)^{\alpha} \tag{11}$$

Households consume hand-to-mouth ($c_{f,t}^e = w_{f,t}^e + \pi_{f,t}^e$), and the local goods market clears: $Y_{f,t}^e = \bar{L}_f c_{f,t}^e$.

Excluded Informal Sector: Unbanked farmers borrow $B_{i,t}^M$ from an informal moneylender at rate r_m and face a sharecropping tax $\theta_s \in (0, 1]$. The firm's optimality condition restricts capital accumulation:

$$(1 - \theta_s) \alpha A_i \left(\frac{K_{i,t+1}^e}{\bar{L}_i} \right)^{\alpha - 1} = r_m + \delta \tag{12}$$

The suppressed agricultural market wage is:

$$w_{i,t}^e = (1 - \theta_s)(1 - \alpha) A_i \left(\frac{K_{i,t}^e}{\bar{L}_i} \right)^{\alpha} \tag{13}$$

The moneylender downsizes their aggregate portfolio as X_t increases, holding (r_m, θ_s) constant. Excluded rural households consume hand-to-mouth ($c^e_{i,t} = w^e_{i,t} + \pi^e_{i,t}$). The local rural goods market clears:

$$Y^e_{i,t} + (1-\delta)K^e_{i,t} = \bar{L}_i c^e_{i,t} + C_{M,t} + (1+r^*)B^M_{i,t-1} \tag{14}$$

where $C_{M,t} = \theta_s Y^e_{i,t} + (r_m - r^*)B^M_{i,t-1}$, and r^* is the moneylender's baseline cost of funds.

State 2: Financial Inclusion

Firms' Optimality: Banked firms in both sectors ($j \in \{f, i\}$) borrow $B_{j,t}$ from the formal bank to finance investment. The dynamic marginal product of capital (MPK) equates to the formal user cost:

$$\alpha A_j \left(\frac{K^i_{j,t+1}}{\bar{L}_j}\right)^{\alpha-1} = r_{l,t} + \delta \tag{15}$$

Wages perfectly track the expanding capital stock:

$$w^i_{j,t} = (1-\alpha)A_j \left(\frac{K^i_{j,t}}{\bar{L}_j}\right)^{\alpha} \tag{16}$$

Households' Optimality: Included households save $s^i_{j,t}$ via bank deposits, yielding the dynamic Euler equation:

$$\frac{c^i_{j,t+1}}{c^i_{j,t}} = \beta(1 + r_{d,t}) \tag{17}$$

Aggregate Market Clearing

Money Market: The banking sector pools savings from the included populations and clears the loanable funds market:

$$D_t = X_t\Big(\bar{L}_f s^i_{f,t} + \bar{L}_i s^i_{i,t}\Big) \tag{18}$$

$$(1-\rho)D_t = X_t\Big(I^i_{f,t} + I^i_{i,t}\Big) \tag{19}$$

$$(1 + r_{l,t})(1-\rho) = 1 + r_{d,t} \tag{20}$$

Goods Market: The aggregate goods market for the financially included economy perfectly clears in every period t:

$$X_t\Big(Y^i_{f,t} + Y^i_{i,t}\Big) = X_t\Big(\bar{L}_f c^i_{f,t} + \bar{L}_i c^i_{i,t} + I^i_{f,t} + I^i_{i,t}\Big) + \rho D_t \tag{21}$$

Observed District-Level Wages: The average observable wages, measured in the empirical regressions, reflect the population-weighted aggregate of the excluded and included fractions:

$$W_{f,t}^{Observed} = X_t w_{f,t}^{i} + (1 - X_t) w_{f,t}^{e} \tag{22}$$

$$W_{i,t}^{Observed} = X_t w_{i,t}^{i} + (1 - X_t) w_{i,t}^{e} \tag{23}$$