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Household Savings in the Indian Economy: What has caused the changes in the savings ratio over time?

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Abstract

In this paper, we examine the changes in the savings ratio over time in India, from FY 1950-51 to 2022-23. We observe four major structural breaks in the household savings rate data, reflecting important changes in its behaviour over time. We focus on understanding the primary drivers of the household savings rate, as it accounts for more than 70% of total savings, and attempt to identify the factors behind its decline after 2008. We have also investigated the key determinants of household savings, including income levels, income growth, per capita income, and wealth inequality, to understand how these variables shape savings behaviour over time. Our findings indicate that while household savings rose steadily for several decades, they declined significantly in the most recent period. The current decline in savings rate in the Indian economy is a matter of concern. The reduction in household savings rate has been only partially offset by an increase in private corporate savings rate. The future borrowing program of public sector will have to be modified in this context of changing size and pattern of savings. This has implication for the level of fiscal deficit.

Keywords: Gross Domestic Savings Rate, Household Savings Rate, Private Corporate Savings Rate, Government Savings Rate, Gross National Disposable Income, Inequality, Structural Breaks

JEL Codes: E21, D31, C22

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1. Introduction

As India is a savings-investment-led growth economy, it is important to investigate changes in the savings ratio over time. Investment activities in India rely heavily on domestic savings, highlighting the crucial role of savings in India's growth process. Stressing the importance of savings and investment, Arthur Lewis (1954) wrote '*The central problem in the theory of economic development is to understand the process by which a community which was previously saving and investing 4 or 5 per cent of is national income or less, converts itself into an economy where voluntary saving is running at about 12 to 15 per cent of national income or more.*'

Savings represent the excess of income over consumption expenditure, meaning the portion of income that is not consumed immediately but set aside for future use. Total savings can be broken into household savings, corporate savings, and public sector savings, each playing a distinct role in the growth process. Household savings constitute the major source of savings, and involve the portion of disposable income that households do not spend on consumption. Household savings comprise of financial savings (net financial savings being gross financial savings minus financial liabilities) and savings in physical assets. Financial savings can be held in various forms such as bank deposits, stocks and bonds; physical savings are held in the form of real estate and gold.

Corporate savings refer to retained earnings, which are the profits of corporate entities that are not distributed as dividends to shareholders. These savings are crucial for funding future corporate investments. Public sector savings include the savings from the administrative departments of government and the retained earnings of public sector enterprises. Savings from the administrative departments means the revenue surplus (savings) or deficit (dissaving).

The household sector is the only surplus sector in the economy, and the government and corporate sectors are the net borrowers. When household financial savings decline, it means that the transferable savings in the economy come down, affecting the borrowing program of government and corporate sectors. This paper analyses savings data from FY 1950–51 to 2022–23 to get a clear understanding of savings behaviour in the Indian economy.

Post-independence in FY 1951, India's Gross Domestic Savings (GDS) as a percentage of Gross Domestic Product (GDP) was 9.4%, and it went up to the peak of 37.8% in FY 2008. Thereafter, it steadily declined to 30.2% in FY 2023. In this paper, we are trying to find (1) What has been pushing the savings rate in India up over time, and what caused the decline in savings after 2008? (2) Which sector is responsible for this decline in savings, and was it compensated by any other sectors? (3) Does this decline in savings has positive or negative implications for the economy.

Figure 1: Gross savings rate and its components (savings rate is calculated as a percentage of GDP at current market price).

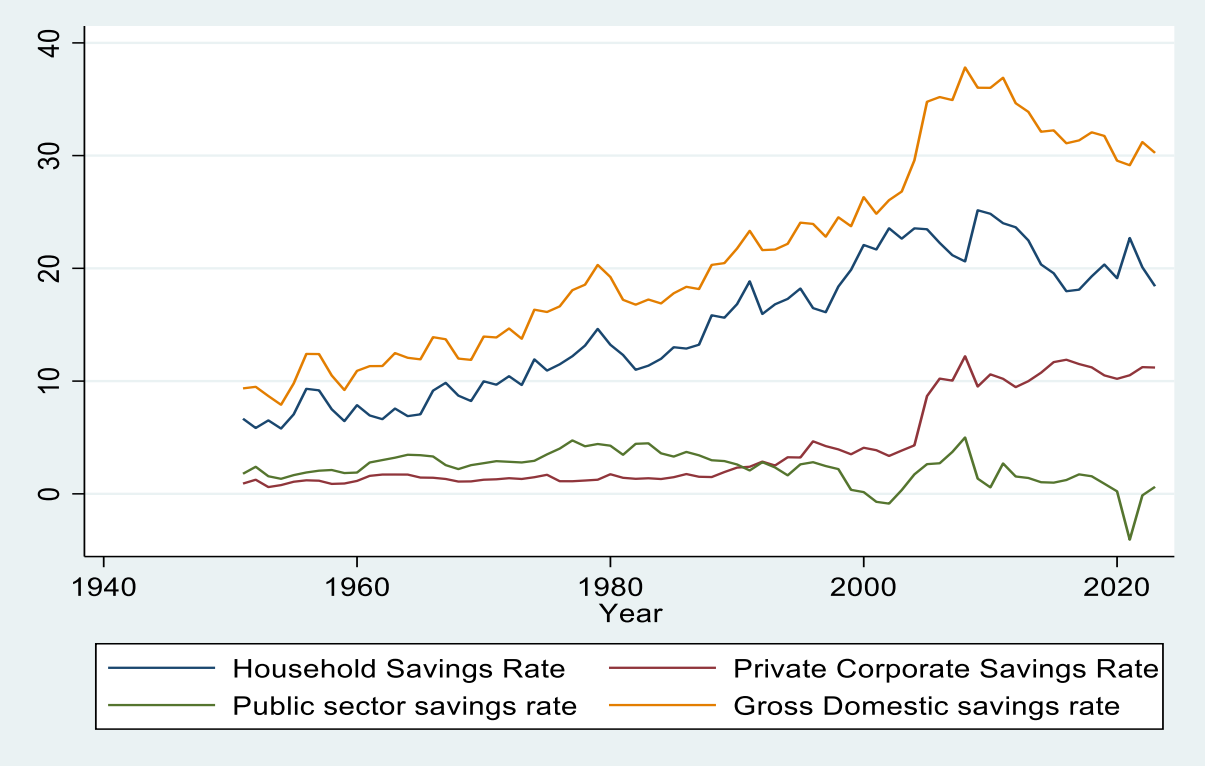


Figure 1 shows that household savings rate (HHSR) has steadily increased from FY 1951. Till the late 1980s, the private corporate savings rate was very low and stayed below 2%. It was the first time in FY 1991 that private corporate savings rate increased more than the public savings rate. That is when the Indian economy witnessed significant economic reforms and liberalization, which further influenced savings patterns. Since then, it increased and peaked at 12.2 % in 2008, and was at 11.2% in FY 2023.

This increase in corporate savings rate was driven by higher profitability of the firms, contributing to the overall rise in the national savings rate. But the pattern of public sector savings rate is different, as it reached its peak of 5% in FY 2008, and fell to its lowest rate of negative 4.1% during the pandemic year FY 2021; in FY 2023, it was at 0.6%.

Household sector savings rate stayed below 10% till FY 1970, then increased and peaked at 25.1% in FY 2009, and declined to 18.4% in FY 2023. From Figure 1, we can see that household savings rate highly influences the trend in aggregate domestic savings rate. Household savings rate accounted for around 70% of the total savings before the 1990s, reaching its peak in FY 2002 at 93.2%, and was at 61.2% in FY 2023. So, in this paper we focus on the behaviour of household savings.

To investigate this observed trend in household savings rate we begin by examining possible structural breaks in the data. We used the Chow test, introduced by Gregory Chow in 1960, to identify structural breaks in time series analysis. It determines whether one or two separate regression

lines best fit a split dataset. That is, if the regression coefficients are found to be different through the Chow test, then it indicates the presence of a structural break in the data. Identifying the structural breakpoints will help us determine when there are significant changes in the data.

We applied the Chow test to our household savings rate data, and the test results showed that there was a structural break in the following years:

- Period-1: 1950-51 to 1973-74,
- Period-2: 1974-75 to 1998-99,
- Period-3: 1999-00 to 2010-11, and
- Period-4: 2011-12 to 2021-23.

For gross domestic savings, the Chow test reveals a different break year for the last two periods, while Periods 1 and 2 remain unchanged. Period 3 is extended by two years (till 2012-13) compared to HHSR (Table 1).

Average household savings rate increased during the first three periods from 8.1% to 22.9%, but declined to 20.2% in period 4. In contrast, average private corporate savings rate showed consistent growth, rising from 1.2% in period 1 to 7.6% in period 3 and further increased to 10.8% in period 4. Overall, the average total savings rate slightly declined, from 32.4 % in period 3 to 31.1% in period 4, indicating that the decline in household savings rate in final period was partially offset by the rise in private corporate savings.

A closer look at household savings over the past three years shows that it was 22.7% in 2021 and declined to 18.4% in 2023. The decline in total household savings in FY 2023 was largely driven by a reduction in financial household savings, which fell from 7.4% in 2012 to 5% in 2023 and as per the latest available data, it stood at 5.3% in 2024.

Table 1: Period average of savings as a per cent of GDP

	1951-1974	**1975-1999**	**2000-2011**	**2012-2023**
HHSR	8.1	14.7	22.9	20.2
FIN_HSSR	2.5	7.3	10.9	7.7
PHY_HSSR	5.6	7.4	12.5	12.4
	1951-1974	**1975-1999**	**2000-2013**	**2014-2023**
GDSR	11.8	20.1	32.4	31.1

Note: HHSR= Household savings rate GDSR= Gross domestic savings rate, FIN_HHSR= Household savings in financial assets, PHY_HHSR= Household savings in physical assets.

This decline in savings rate raises concerns as reduction in savings can constrain the availability of resource for investment. This situation creates a conflict between the need to boost consumption to drive economic growth and the necessity to maintain adequate savings to support investment. The conflict between investment-led and consumption-led growth is particularly relevant in the context

of declining savings. Investment-led growth relies on high savings rates to fund capital investment, which is crucial for long-term economic development. On the other hand, consumption-led growth focuses on boosting demand through increased consumption, which can provide short-term economic stimulus (Rangarajan and Srivastava 2025).

2. Literature Review

The importance of savings in an economy cannot be overstated, as it plays a crucial role in fostering economic stability and growth. Savings, particularly household savings, serve as a buffer against economic uncertainties, and provide the necessary resources for investment in various sectors. Previous studies on Indian savings rates have provided a comprehensive understanding of the dynamics and determinants of savings behaviour in the country.

Various theories have stressed the importance of savings in enhancing economic growth. The relationship between income and savings is well-documented, with higher income levels generally leading to higher savings (Ezekiel, 1942). In both developed and developing countries high income growth rate leads to increase in savings (Arıç and Sek, 2021). Disposable income is a primary factor, as it directly influences the ability of households to save. Higher disposable income generally leads to higher savings, while lower disposable income can result in reduced savings. In the early years post-independence, India's savings rate was low, reflecting the early stage of its economic development. As the economy began to grow, the savings rate started to increase. This period saw a rise in disposable income, which positively influenced the propensity to save.

K. Krishnamurthy and P. Saibaba (1981) estimated that the savings would increase with income, and they also stated that a negative intercept in a saving function implies that positive savings would emerge only after a certain level of income. B. L. Pandit (1985) empirically showed that the marginal propensity to save of households varied directly with the level of their real disposable income. He also points out that households with larger incomes have a larger marginal propensity to save than those with smaller incomes, and the impact of income growth on household savings rate is positive and significant.

Arthur Lewis (1954) also points out that the group that saves more is the top 10% with the largest income, and the remaining 90% of the population never manages to save a significant fraction of their income. He then puts forward the question of why the top 10% save more, and gives a plausible explanation that the people save more because they have more income to save. Similarly, Carroll and Weil (1994), by analysing household data, established that households with predictably higher income growth tend to save more than households with predictably low growth in income.

The growth rate of the economy also impacts savings, as higher economic growth typically leads to increased savings because of confidence, whereas slower growth can have the opposite effect. The Granger causality tests conducted by Caroll and Weil (1994) indicated that growth rate was a significant driver of savings rate. Marty (1961) pointed out that economic development is linked to

the emergence of new financial institutions and assets. These developments not only impact the allocation of household savings between financial and non-financial assets, but also encourage an increase in overall savings. B.L Pandit (1985) stated that economic growth rate is an important variable for an underdeveloped country like India in influencing household savings behaviour.

The life-cycle hypothesis, proposed by Modigliani (1963), provides a theoretical framework for understanding savings behaviour. According to this hypothesis, individuals plan their consumption and savings over their lifetime to smooth out their consumption levels. This means that people save during their working years and dissave during retirement. This theory has been supported by various empirical studies, although the specific patterns of savings can vary based on cultural and economic factors (Carroll & Weil, 1994; Ghosh & Nath, 2023).

According to Dobrescu (2012) savings rate differs across developed countries, but there was a common trend of declining savings over time. The study also found that a shift in societal preferences have placed greater weights on immediate gratification are the reasons for lower savings by those selected developed countries. Dobrescu concluded that developed countries are placing more weights on the welfare of the current populations specially the older generation.

In the case of India, several studies have highlighted the importance of demographic factors, access to credit, and macroeconomic conditions in shaping savings patterns. For instance, a higher age dependency ratio, where a larger proportion of the population is either too young or too old to work, tends to reduce the savings rate, as more resources are allocated towards consumption rather than savings. Additionally, greater access to credit can also lead to a decrease in savings as individuals and businesses are more likely to borrow and spend rather than save (Ghosh & Nath, 2023).

Higher deposit rates can incentivize savings by offering better returns on saved funds, while lower rates may discourage savings. Interest rates influence the cost of borrowing and the return on savings. Higher interest rates can encourage savings by providing higher returns, while lower rates can have the opposite effect. Ogaki, Ostry, and Reinhart (1996) show that savings respond more strongly to interest rate changes in high-income countries than in low-income ones, but the overall effects remain small. Other studies have shown mixed results about the relationship between interest rate and savings. Giovannini (1985) concludes that in most cases the real interest elasticity is zero for developing countries, and a few other studies find that interest rate has no clear effect on savings (Schmidt-Hebbel et.al., 1992).

Inflation is another critical factor, as it erodes the purchasing power of money, reducing the real value of savings. High inflation over an extended period of time can discourage savings, as individuals may prefer to spend rather than save in an environment where the value of money is declining. Ghate and Pavan (2024) stated that inflation is an important factor in explaining the post-2009 decline in savings in India. Masson, Bayoumi, and Samiei noted that the development process typically involves an initial period of low savings rates, followed by high growth and high savings rates, and eventually lower savings rates in mature economies (Masson et.al., 1995).

3.Methodology And Results

Since household savings constitute the major share of total savings, we have focused our analysis on household savings. We have attempted several equations to find the factors influencing household savings. In the light of existing literature, we have formulated a model which incorporates variables that have been widely acknowledged in savings-related studies, while also accounting for India's unique socio-economic dynamics.

This study employs annual time series data from FY 1951 to FY 2023, sourced from the Reserve Bank of India's Database on Indian Economy (DBIE) and National Statistical Office. The model incorporates real household savings as the dependent variable, with real Gross National Disposable Income (GNDI real) and Disposable income growth rate (5-year average growth rate) as the primary explanatory variables. We use GNDI because household disposable income data is available only for a short period. All data are denominated in Indian currency.

To capture the distributional aspects influencing saving behaviour, an additional variable measuring wealth inequality has been included. Data for this variable have been obtained from the World Inequality Database. The inequality variable takes into account the average wealth of the top 10% of people, divided by the total for the whole population (aged 20 and above).

The empirical framework employs linear regression analysis, with household savings (hhs_real, in absolute terms) and household savings rate (hhsr) as the dependent variables. The explanatory variables include gross national disposable income (gndi_real), five-year average growth rate of gross national disposable income (avg5_gndi_gr), per capita income (pcgndi), per capita income square (pcgndi_squ), and inequality variable (inequality_p90). Both household savings and disposable income are in real terms.

Equations:

$$hhs\_real = \beta_0 + \beta_1\ gndi + \ \beta_2\ Avg5\_gndi\_gr + \beta_3\ Inequality\_p90\ + \ \varepsilon \quad (1)$$

$$hhsr = \beta_0 + \beta_1\ pcgndi + \ \beta_2\ pcgndi_{squ} + \ \varepsilon \quad (2)$$

The results of the regression are presented below in table 2:

Table 2: Regression results of OLS and Newey West (NW)

VARIABLES	OLS (1) Household savings	OLS (2) Household savings rate	NW (1) Household savings	NW (2) Household savings rate
Income	0.167***		0.167***	
	(0.00889)		(0.0106)	
Growth rate	0.310**		0.310*	
	(0.125)		(0.174)	
Inequality	19.58***		19.58***	
	(4.862)		(5.470)	
Per capita income		7.674***		7.674***
		(0.397)		(0.531)
Per capita income squ		-0.553***		-0.553***
		(0.0356)		(0.0506)
Constant	-8.784***	-2.199***	-8.784***	-2.199**
	(1.607)	(0.799)	(1.992)	(0.973)
Observations	69	72	69	72
Adj R-squared	0.984	0.896	0.984	0.896

Note: Standard error in parentheses. *** p<0.01, ** p<0.05, * p<0.1. Household savings and disposable income are expressed in trillions and per capita income in thousands. Both household savings and disposable income are in real terms. Durbin–Watson d-statistic (4,69) = 0.8916836 for equation 1 and Durbin–Watson d-statistic (3,72) = 0.5343969 for equation 2.

Durbin-Watson test revealed significant positive autocorrelation in our OLS regression results. Some studies argue that the autocorrelation test results can be misleading when there is a structural break in the data (Granger & Hyung, 2004). We have used the Newey-West procedure to address autocorrelation. This method was adopted because it gave reliable estimates of the covariance matrix when we have problems of heteroskedasticity and autocorrelation. It is a Heteroskedasticity and Autocorrelation Consistent (HAC) estimator. Newey-West improves the trustworthiness of our results by giving reliable standard errors. We get similar results from both OLS and Newey-West estimations. All variables remain statistically significant. While the growth rate's significance level changes from 5% (OLS) to 10% (Newey-West), all other coefficients retain their original significance level. Therefore, the Newey-West procedure confirms the robustness of our results.

The empirical analysis yields several important insights into the determinants of household savings in India. The results from both OLS and Newey-West highlight the importance of income variables in shaping savings patterns.

First, the coefficient of gross national disposable income (0.17) establishes a robust positive relationship with household savings. This indicates that for every ₹1 trillion increase in disposable income, household savings grow by ₹170 billion. The highly significant result confirms that income level is the most important factor determining how much households save. This supports the principle that people's ability to save depends primarily on their income.

The income growth rate emerges as another critical determinant. When structural breaks were identified in the data, we did not introduce dummy variables in the model because our concern was not capturing the shifts in the marginal propensity to save, but understanding what has caused the change in the savings ratio over time. To capture this change, we have used the income growth rate as an explanatory variable in the model. The positive income growth rate coefficient (0.31) reveals that faster growth in household income directly boosts savings behaviour. This indicates that besides the absolute level of income, the pace of income growth significantly affects savings behaviour. The positive relationship suggests that when income growth rate is high, households tend to save more, likely because of greater confidence in future income and overall economic conditions. The significance of this coefficient in the Newey-West specification reinforces the robustness of the relationship between income growth rate and household savings. This explains why the savings rate increased in the first three periods.

A closer examination of the income growth rate reveals distinct trends across different periods. Income growth increased steadily through the first three periods, starting at 3.9%, then rising to 4.8%, and reaching 6.6%. But in the fourth period, it declined to 6.1%. Notably, the household savings rate moved exactly in the same pattern as income growth rate. That is, when income growth rate went up, savings rate went up, and when income growth slowed down, savings rate declined. This variable thus explains the shift in marginal propensity to save.

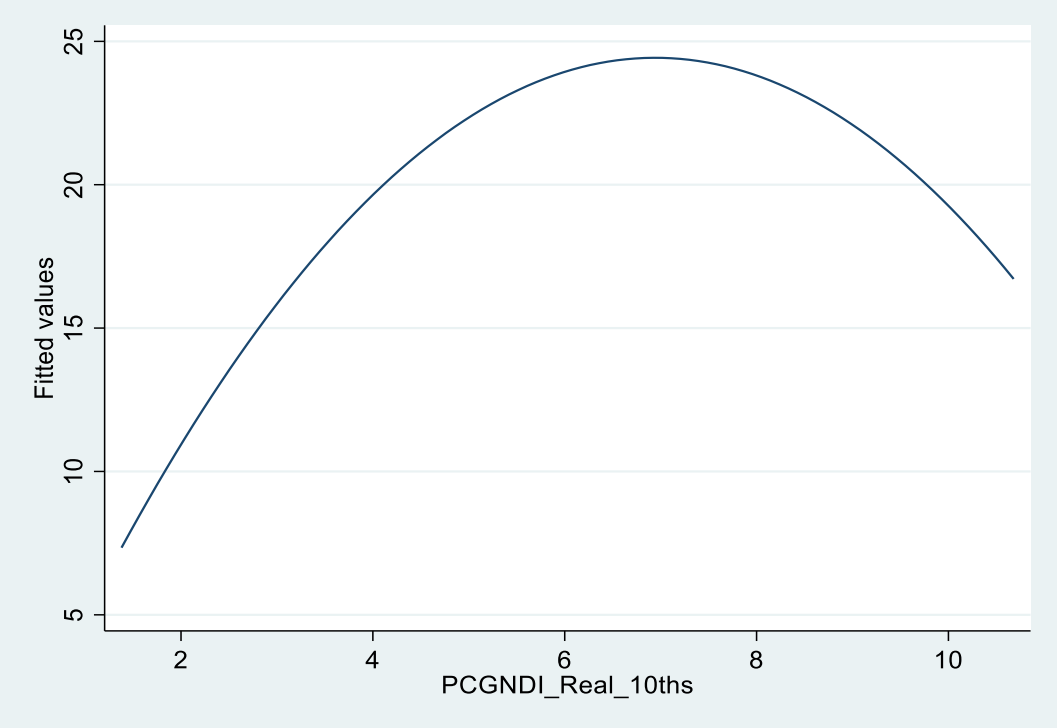
The inequality variable (ranging from 0 to 1) has a large positive coefficient (19.58). This outcome validates the hypothesis that greater income concentration among top earners elevates the overall savings, since wealthier households tend to have higher marginal propensity to save compared to lower-income groups.

We also estimated an equation including inflation as an additional variable in equation 2 ($hhsr = \beta_0 + \beta_1\ pcgndi + \beta_2\ pcgndi_{squ} + WPI + \varepsilon$), although the coefficient was negative (-0.08), it was not statistically significant. We have used a three-year average of WPI, since inflation is likely to have an impact only when it is continuous for a period of time. In other words, if inflation is expected to remain high for several years, the value of current savings diminishes in the future, and people save less.

Another important variable is the growth of the financial system. If the financial system widens, it provides greater opportunities to save and invest. In our model, the income variable largely captures this effect, as it is very strong, and the growth of the financial sector tends to coincide with growth in income of the economy.

To assess potential non-linear effects of income on savings behaviour, we have estimated values of equation 2, that is household savings rate as a function of per capita income and per capita income square. The results confirm a non-linear relationship between income and savings, as depicted in Figure 2.

Figure 2: Graph showing the quadratic relationship between savings rate and per capita income.



The coefficients of per capita income and per capita income squared are positive and negative, respectively, resulting in a concave downward curve (inverted U-shape) as in figure 2. The positive coefficient of per capita income (7.67) indicates that initially at lower levels of income, a rise in per capita income leads to higher savings rate. That is initially, as per capita income rises, households save more. The negative coefficient of per capita income squared (-0.55) indicates a diminishing marginal effect of per capita income on savings rate. Beyond a certain level, the rate of increase in per capita income slows down the rate of savings. As per capita income continues to rise further, the negative quadratic term dominates, leading to a decline in savings rate.

Figure 2 shows that the peak household savings rate occurred at 25.2% (FY 2009), when real per capita income was 60.2 thousand rupees. However, as per capita income further increased to 70.8 thousand rupees (FY 2012), the household savings rate declined to 23.6 %. After reaching the peak, the graph clearly illustrates a declining trend, which coincides with the period 4 (2012 to 2023) from our earlier analysis.

Is this decline in household savings good or bad for the economy? What are the other factors that led to a decline in savings in the last period?

Analysing the savings rates of various economies, China and Singapore have historically exhibited high savings ratios. Both countries recorded their peak savings rates at 52%, with China reaching this level in 2008 and Singapore in 1997, indicating that these economies allocated more than half of their income to savings. However, since 2010, a declining trend has been evident. Both countries maintained savings rates of 51% in 2010, but by 2023, these figures had fallen to 44% for China and

41% for Singapore. This downward trajectory in savings is not limited to China and Singapore but reflects a broader global trend.

Other developing economies, such as Vietnam, Bangladesh, and the Philippines, also experienced a decline in savings after reaching their respective peaks between 2010 and 2012. Specifically, Vietnam recorded its highest savings rate at 36% in 2011, Bangladesh at 41% in 2012, and the Philippines at 40% in 2010. Since then, their savings rates have declined to 34%, 35%, and 27% in 2023, respectively.

The data suggest a persistent global decline in savings rates post-2010, even in economies that previously exhibited strong savings growth. The Indian economy follows a similar trajectory, exhibiting a decline in savings since 2012 in line with the broader global trend. However, in the Indian case, the peak is much lower than China or Singapore. Indian per capita income at the peak savings rate is also much lower.

Period 4 was the time in which the Indian economy experienced notable challenges due to demonetisation of the currency and the Covid-19 pandemic. Despite these significant crises experienced during period 4, aggregate savings have remained relatively stable compared to the high-growth phase of period 3.

Over the past few years, the aggregate savings rate has declined by 1.5 percentage points, from 31.7% of GDP in FY 2019 to 30.2% in FY 2023. During the same period, the household savings rate experienced a sharper drop, falling from 20.3% in FY 2019 to 18.4% in FY 2023, which is a decline of 1.9 percentage points. The public sector savings rate also declined in the same period by 0.3 percentage points, from 0.9% in FY 2019 to 0.6% in FY 2023. However, this decline was partially offset by an increase in the corporate savings rate by 0.7 percentage points, from 10.5% in FY 2019 to 11.2% in FY 2023. Although the corporate savings rate did increase during this period, it was insufficient to compensate for the reduction in the household savings rate and public sector savings rate.

Savings in general are crucial for financial stability. They provide a buffer against economic shocks and uncertainties, enabling households and businesses to weather adverse conditions without resorting to excessive borrowing. The decline in savings rate raises concerns, as reduction in savings can constrain the availability of capital for investment.

Within household savings, net financial savings fell from 7.3% in FY 2022 to 5% in FY 2023, while gross financial savings remained at 11.1% in FY 2022 and 10.9% in FY 2023. It is the increase in the financial liabilities of households from 3.8% in FY 2022 to 5.9% in FY 2023 that resulted in a fall in net financial savings. As per the latest data available for FY 2024, net financial savings stood at 5.3%, while gross financial savings increased to 11.7%, and the liabilities have also increased to 6.4%. Net financial savings has implications for the borrowing programme particularly of public sector. Corporate sector may not be affected that much because of increase in corporate savings.

The current decline in savings rate in the Indian economy is a matter of concern. The reduction in household savings rate has been only partially offset by an increase in private corporate savings rate. The future borrowing program of public sector will have to be modified in this context of changing size and pattern of savings. This has implication for the level of fiscal deficit.

References

Ando, A., & Modigliani, F. (1963). The" life cycle" hypothesis of saving: Aggregate implications and tests. *The American economic review*, *53*(1), 55-84.

Arıç, K. H., & Sek, S. K. (2021). Saving Tendency of Developed and Developing European Countries. *Ekonomika*, *100*(1), 139-155.

Carroll, C. D., & Weil, D. N. (1994, June). Saving and growth: a reinterpretation. In *Carnegie-Rochester conference series on public policy* (Vol. 40, pp. 133-192). North-Holland.

Chow, G. C. (1960). Tests of equality between sets of coefficients in two linear regressions. *Econometrica: Journal of the Econometric Society*, 591-605.

Dobrescu, L. I., Kotlikoff, L. J., & Motta, A. (2012). Why aren't developed countries saving?. *European Economic Review*, *56*(6), 1261-1275.

Ezekiel, M. (1942). Statistical Investigations of Saving, Consumption, and Investment. *The American Economic Review*, *32*(2), 272-307.

Ghate, C., Gopalakrishnan, P., & Saha, A. (2025). The Great Indian Savings Puzzle. *Economic Modelling*, 107096.

Ghosh, S. K., & Nath, H. K. (2023). What determines private and household savings in India?. *International Review of Economics & Finance*, *86*, 639-651.

Giovannini, A. (1985). Saving and the real interest rate in LDCs. *Journal of Development Economics*, *18*(2-3), 197-217.

Granger, C. W., & Hyung, N. (2004). Occasional structural breaks and long memory with an application to the S&P 500 absolute stock returns. *Journal of empirical finance*, *11*(3), 399-421.

Krishnamurthy, K., & Saibaba, P. (1981). Determinants of saving rate in India. *Indian Economic Review*, *14*.

Lewis, W. A. (1954). Economic development with unlimited supplies of labour.

Marty, A. L. (1961). Gurley and Shaw on Money in a Theory of Finance. *Journal of Political Economy*, *69*(1), 56-62.

Masson, P. R., Bayoumi, T., & Samiei, H. (1995). I Saving Behavior in Induatrial and Developing Countries. In *Staff studies for the world economic outlook*. International Monetary Fund.

Ogaki, M., Ostry, J. D., & Reinhart, C. M. (1996). Saving behavior in low-and middle-income developing countries: A comparison. *Staff Papers*, *43*(1), 38-71.

Pandit, B. L. (1985). Saving behaviour and choice of assets of Indian households. *Indian Economic Review*, *20*(1), 85-116.

Rangarajan, C., & Srivastava, D. K. (2025). Role of consumption and investment expenditures in India's growth. *Economic & Political Weekly*, 60(23).

Schmidt-Hebbel, K., Webb, S. B., & Corsetti, G. (1992). Household saving in developing countries: first cross-country evidence. *The world bank economic review*, *6*(3), 529-547.

Appendix

Table: 3 - Components of Savings and Disposable income growth rate
(as a percentage of GDP cons)

	Total savings	Private corporate	Public sector	Household sector	Financial Household savings	Savings in physical assets	Income growth rate(avg5)
Year	GDSR	PCSR	PUSR	HHSR	FIN_HSSR	PHY_HSSR	GNDI_gr
1951	9.35	0.91	1.78	6.66	0.61	6.06	
1952	9.49	1.25	2.40	5.84	0.13	5.71	
1953	8.68	0.60	1.56	6.52	0.68	5.84	
1954	7.90	0.78	1.34	5.79	1.22	4.57	
1955	9.79	1.07	1.66	7.05	2.57	4.48	4.21
1956	12.41	1.20	1.90	9.32	3.84	5.48	4.11
1957	12.40	1.16	2.05	9.18	2.50	6.68	4.56
1958	10.50	0.88	2.12	7.50	2.12	5.38	3.90
1959	9.21	0.92	1.84	6.45	2.37	4.08	4.10
1960	10.91	1.15	1.89	7.87	2.69	5.18	3.66
1961	11.33	1.59	2.78	6.95	2.59	4.37	3.93
1962	11.33	1.71	3.00	6.62	2.62	4.00	3.59
1963	12.49	1.71	3.21	7.57	2.49	5.08	4.27
1964	12.07	1.71	3.47	6.89	3.22	3.67	4.03
1965	11.93	1.45	3.43	7.05	2.65	4.40	5.01
1966	13.90	1.43	3.32	9.15	3.78	5.37	3.48
1967	13.71	1.32	2.55	9.85	2.69	7.15	2.72
1968	12.00	1.09	2.20	8.71	2.30	6.41	3.71
1969	11.88	1.10	2.55	8.23	2.00	6.23	3.19
1970	13.95	1.25	2.72	9.98	2.10	7.88	3.03
1971	13.87	1.29	2.90	9.68	2.93	6.75	4.56
1972	14.67	1.39	2.84	10.44	3.10	7.33	4.95
1973	13.76	1.32	2.79	9.65	3.85	5.80	3.27
1974	16.33	1.47	2.93	11.93	5.37	6.56	3.24
1975	16.13	1.69	3.50	10.93	2.99	7.94	2.21
1976	16.63	1.12	4.02	11.49	4.60	6.89	3.08
1977	18.06	1.12	4.74	12.21	5.28	6.92	3.12
1978	18.55	1.18	4.22	13.15	5.63	7.52	4.73
1979	20.31	1.25	4.42	14.63	5.91	8.72	5.20
1980	19.24	1.74	4.27	13.23	4.92	8.30	4.00
1981	17.21	1.42	3.46	12.32	5.85	6.46	3.51
1982	16.78	1.33	4.44	11.01	5.56	5.44	4.24
1983	17.24	1.39	4.48	11.37	6.59	4.78	3.37
1984	16.89	1.32	3.59	11.98	5.91	6.07	3.65
1985	17.79	1.48	3.31	13.01	7.09	5.92	5.31

1986	18.36	1.76	3.72	12.89	6.52	6.37	4.90
1987	18.16	1.52	3.42	13.23	7.33	5.90	4.73
1988	20.31	1.49	2.98	15.84	7.41	8.42	4.87
1989	20.46	1.93	2.91	15.62	6.33	9.29	5.28
1990	21.76	2.33	2.61	16.83	7.70	9.12	5.69
1991	23.33	2.40	2.07	18.85	8.62	10.23	5.72
1992	21.62	2.86	2.81	15.95	9.38	6.57	5.12
1993	21.67	2.52	2.34	16.81	8.59	8.22	5.46
1994	22.18	3.25	1.64	17.29	10.81	6.47	4.69
1995	24.05	3.22	2.62	18.21	11.75	6.46	5.03
1996	23.94	4.66	2.81	16.47	8.77	7.70	5.39
1997	22.81	4.23	2.47	16.11	10.16	5.95	6.90
1998	24.53	3.94	2.20	18.39	9.50	8.89	6.55
1999	23.73	3.51	0.35	19.87	10.18	9.69	6.64
2000	26.32	4.09	0.15	22.08	10.39	11.68	6.99
2001	24.84	3.87	-0.71	21.68	10.06	11.61	6.31
2002	26.05	3.36	-0.87	23.56	10.69	12.86	5.57
2003	26.81	3.84	0.34	22.64	10.16	12.47	5.61
2004	29.58	4.30	1.73	23.55	11.22	12.33	6.09
2005	34.78	8.67	2.64	23.47	10.29	13.67	5.71
2006	35.20	10.23	2.72	22.26	12.07	11.86	6.59
2007	34.93	10.04	3.72	21.17	11.38	11.99	7.13
2008	37.82	12.21	5.00	20.61	11.84	10.99	7.99
2009	36.02	9.52	1.35	25.15	10.36	13.78	6.99
2010	36.01	10.60	0.57	24.84	12.17	13.45	7.15
2011	36.91	10.20	2.70	24.01	10.14	13.44	7.00
2012	34.65	9.46	1.54	23.64	7.36	16.29	6.51
2013	33.88	10.00	1.41	22.48	7.38	15.10	5.89
2014	32.12	10.75	1.03	20.34	7.41	12.94	6.52
2015	32.24	11.69	0.99	19.56	7.06	12.50	6.34
2016	31.09	11.90	1.23	17.97	8.07	9.90	6.44
2017	31.35	11.51	1.73	18.11	7.45	10.66	6.83
2018	32.07	11.22	1.56	19.29	7.64	11.65	7.15
2019	31.75	10.51	0.90	20.34	7.90	12.45	7.23
2020	29.55	10.20	0.22	19.13	7.71	11.20	6.60
2021	29.15	10.52	-4.07	22.69	11.73	10.76	3.83
2022	31.20	11.24	-0.13	20.10	7.26	12.58	4.09
2023	30.24	11.20	0.62	18.42	5.26	12.93	3.73

Table: 4 - Gross savings (% of GDP) (World Bank Data)

Year	Bangladesh	China	Philippines	Singapore	Viet Nam	India
1971						
1972				26.30		
1973				25.36		
1974				25.84		
1975				29.66		13.10
1976	-0.84			30.08		15.97
1977	10.04			30.20		15.40
1978	5.70			32.46		15.06
1979	7.08			35.45		15.77
1980	8.33			33.83		14.53
1981	21.14		30.49	35.86		15.81
1982	23.53	33.80	28.09	37.22		15.81
1983	23.10	33.15	30.62	41.58		15.35
1984	16.29	34.90	23.77	44.09		15.80
1985	21.52	35.28	18.21	41.57		16.80
1986	22.78	35.25	18.49	39.79		15.79
1987	22.63	37.23	21.81	37.85		16.98
1988	22.20	37.98	22.63	41.36		18.16
1989	22.35	35.88	22.17	42.76		20.14
1990	23.02	36.69	22.44	43.73		21.21
1991	22.56	38.50	20.99	44.97		21.76
1992	21.99	40.61	20.71	46.99		23.25
1993	20.90	41.71	20.35	44.37		24.08
1994	22.42	41.70	22.42	48.09		25.95
1995	22.15	39.53	21.94	50.59		26.97
1996	23.14	38.76	22.41	48.88	21.20	27.05
1997	24.40	39.74	23.91	52.30	21.80	27.55
1998	25.83	38.35	29.62	51.35	23.34	25.89
1999	26.66	36.56	35.97	48.91	26.87	25.64
2000	27.80	35.74	33.39	46.37	31.25	26.12
2001	28.42	37.27	34.62	40.08	31.30	26.26
2002	30.75	38.88	35.27	38.43	32.53	28.11
2003	30.16	42.41	35.61	39.40	31.49	30.47
2004	31.58	45.67	36.23	40.61	33.47	33.33
2005	32.36	45.95	37.77	43.63	33.08	34.42
2006	35.34	48.26	37.23	48.17	33.33	36.36
2007	36.32	50.28	36.75	49.97	31.84	37.01
2008	37.38	51.79	36.02	44.36	27.90	36.25
2009	38.98	50.37	37.95	43.86	27.50	35.62
2010	38.78	51.33	39.75	50.59	33.44	36.31

Year	Bangladesh	China	Philippines	Singapore	Viet Nam	India
2011	38.06	49.23	36.88	48.81	35.77	35.13
2012	40.60	48.67	35.13	47.25	34.87	35.26
2013	39.75	47.38	36.35	45.52	33.20	34.30
2014	37.78	47.62	37.35	47.30	32.99	33.47
2015	36.73	45.42	35.63	44.05	28.07	32.45
2016	37.28	44.38	35.05	44.89	28.47	31.73
2017	35.29	44.91	35.49	46.12	28.86	31.71
2018	35.46	44.49	33.81	41.72	30.93	31.41
2019	36.35	43.77	31.76	40.90	31.33	29.70
2020	37.19	43.93	24.82	40.97	33.01	28.68
2021	36.05	45.47	20.20	44.01	32.60	29.87
2022	33.95	45.81	22.47	41.75	32.80	29.89
2023	34.90	43.61	27.29	40.87	34.37	30.66

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Bottom-Up Meets Top-Down: How NGO–State Coordination Shapes Energy Access in India

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Abstract

This paper examines how state and non-state actors coordinate to deliver energy services in rural India. Using Bindi International's community solar program in Jharkhand, it asks: to what extent can NGO–state coordination advance equitable access to electricity? Drawing on policy mapping (national and state energy policies), program documents, and interviews with local officials and Self-Help Group members, the study analyses vertical coordination between the central government and state government and horizontal coordination between the state nodal agency for renewable energy and other state agencies responsible for rural development, tribal welfare. Findings show partial alignment at the state level around off-grid and last-mile electricity connectivity objectives but lack of institutionalized roles of NGOs in policy documents, and fragmentation of governance as one of the main causes of coordination failure. The paper argues that formalizing NGO roles, resourcing cross-departmental collaboration, and embedding Panchayats in program design can turn NGOs from "implementers" into co-producers of policy feedback and more just outcomes.

Keywords: energy equity, policy coordination, multi-level governance, energy access non-governmental organizations, coordination failure

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1. Introduction

This study looks at the extent of policy coordination between state and non-state actors in India's policy landscape. The study undertakes a coordination analysis of India's national energy policy landscape and brings out the role of non-state actors in implementing the government policy objectives.

The research question guiding this study is, "to what extent can state and non-state actors coordinate effectively to meet the energy services needs of the rural communities?". The assessment is based on the study of coordination between Bindi International (an NGO) and the state, reflected in the central government, state government, and local administration. The objective of this study is to show how lack of coordination (misalignment) can impede equitable access to energy services in rural communities.

The concept of off-grid energy systems to fulfil the energy access needs of rural consumers originated in the 1990s (Palit, D., & Chaurey, A. 2013 ; Palit, D., & Sarangi, G. K. 2014). One of the first solar programs was implemented in the Sunderbans delta region of West Bengal, where remote rural villages which were not linked to the grid were supported through a solar mini-grid, funded and implemented by the renewable energy nodal agency of the state (Palit, D., & Sarangi, G. K. 2014). Since then, renewable energy projects based on off-grid technology have proliferated in the states of Chattisgarh, Madhya Pradesh, Odisha, Jharkhand, and Uttar Pradesh. The remote location of some villages in these states creates opportunities for NGOs to participate in meeting energy access objectives, given technical, administrative, and resource capacity constraints of the government (Palit, D., & Chaurey, A. 2013).

NGOs in India work in the capacity of mediator, facilitator, and implementor to bridge the gap in government service delivery for marginalized communties. However, NGOs also face challenges regarding the accountability of their resources, their perceived interference with government service delivery mechanisms, excessive reliance on external funds to meet program objectives, etc. (Sinyosi, M. (2024; Stauffer, N. W. 2021).

Such debates around the role of non-state actors in state policy implementation can be analyzed through the scholarship on policy coordination. This body of scholarship has application in analysis of public-private coordination in various development programs. In India, studies have focussed on public health, education, and agriculture; the proliferation of NGOs as providers of energy services through off-grid technology has not been examined through the lens of policy coordination. Examination of Bindi International's community solar program, implemented in the government policy landscape, shows how lack of coordination affects the intended outcome of access to clean fuel for lighting in rural communities.

This study contributes to the under-researched area of the role of non-state actors in policy design and agenda development regarding public service delivery. In particular, the study contributes to overlooked policy problems in the Global South, by showing the scope of effective coordination

between state and non-state actors in meeting the objective of access to clean energy. The empirical evidence of this analysis is based on subnational coordination between Bindi International, national and state level policy objectives, as well as the rural local administration.

The study challenges the narrative of "NGO as implementer" by showing the opportunities available to Bindi International to utilize its institutional capacity to influence policy feedback in multi-level governance ecosystem.

I chose Bindi International for this study because of its unique position as a non-state actor. Its objectives of education, livelihoods, solar, women empowerment, and community development involves both the government and the community as stakeholders, making it a classic case for policy coordination analysis. The existing scholarship on policy coordination largely focuses on public administration problems of Western democracies, emphasizing government efforts in service delivery, and inter-agency collaboration (Sager. F., 2006; Trein. P., 2017). There is a growing need to understand how private actors, such as NGOs, can effectively coordinate with public institutions in developing countries (Dhiman, S., & Dyal, S. 2018; Gautam. A., 2020; Patnaik, S., & Shambu Prasad, C., 2021).

In the following sections, I first provide a theoretical review of the policy coordination scholarship, its sub-section on the study of coordination among public and private actors, and an overview of to what extent the scholarship has focused on India. I then provide an overview of equity in energy services and describe how community solar programs are positioned to deliver that outcome and why non-government organizations (NGOs) provide the resources to meet the energy needs of remote rural communities. This is followed by a discussion on methodology, wherein I discuss the policy ecosystem using a summative evaluation framework and use of equity as a metric of evaluation of the cost of policy implementation. This is followed by a discussion of results, and finally, a rationale of how this study informs the limited knowledge in the current scholarship using concepts of interdependence of actors and institutional capacity.

2. Literature review

Coordination in public policy is vital, and its analysis has been an important aspect of study for public policy scholarship. According to Charles Lindblom (Lindblom, C.E., 1965), policy coordination is a process by which different actors work together to achieve a shared policy goal by aligning their respective strategies or by avoiding conflicts of interest. According to this definition, policy coordination can be observed and analyzed in two ways: by observing how actors avoid conflict while maintaining their respective interests, or by observing how actors shift from their respective original interests to align strategies to arrive at mutually agreed policy goals.

Fritz Scharpf (Scharpf, F.W., 1994) in his work on analysis of factors of coordination showed that alignment is facilitated by cooperation networks among actors, while conflicts can arise if there's unequal distribution of power among the actors negotiating the terms of coordination. Antonio

Buainain and Arruda Leite (de Arruda Leite, J.P., & Buainain, A.M., 2013) in their work on identifying dimensions of coordination developed a conceptual framework for analyzing coordination. The authors develop two concepts - q. These two concepts encapsulate a wide range of factors that can vary given the geopolitical context. Interdependence arises when actors such as government agencies, organizations, or sectors depend on each other's resources, expertise, or actions to achieve shared goals. Institutional capacity refers to the rules (formal and informal) structure, norms, and resources that enable organizations to coordinate effectively (de Arruda Leite, J.P., & Buainain, A.M., 2013).

For example, in the study of international coordination regarding integration of climate change policies, G.R. Biesbroek and other authors (Beisbroek, G.R., et, al., 2010) show that policy coordination across nations requires monitoring, reporting, and distribution of responsibilities among national actors. Unclear division of power and responsibilities leads to conflict between the national governments. In a study of the public health sector of Australia, the United States, and Germany, Philipp Trein 9 Trein. P., 2017) reveals that coordination works when institutions share their resource capacity to mobilize resources to deliver public services such as healthcare. On the other hand, lack of coherence among institutions on goals and strategies can undermine effectiveness of a public policy due to misalignment (Champion, C., & Bonoli, G., 2011; Chinseu E, et, al., 2018). In another study of international coordination, Andrew Jordan and Andrea Lenschow (Jordan, A., & Lenschow, A., 2010) analyzed environmental policies across European Union member states to show that conflicts can arise due to lack of established procedures on how coordination should work, and inertia of organizations The authors also note that even though the literature provides many conceptual frameworks, there's not much work to show how coordination can be measured.

The review of the selected studies provides two insights. First, effective policy coordination is a result of multiple factors, which can be grouped under two broad concepts: interdependence of actors, and institutional capacity. Interdependence of actors is visible in social networks, knowledge diffusion, and bargaining power. It can range from low to high coordination, depending on the level of autonomy of actors in the policymaking process. Actors across different organizations who are at the same level of administration and functional capacity in a multi-level governance framework can coordinate easier due to ease of interdependence based on diffusion of knowledge, social capital compared to a situation where one actor has power to enforce their objectives over other actors (Gregorio, Di. et, al., 2019).

The second concept, institutional capacity, depends on availability of resources to implement the goals and strategies. Effective coordination results from sharing resources across institutions. Scholarship is predominantly focused on the public administration problems of western democracies (Sager. F., 2006; Trein. P., 2017; Champion, C., & Bonoli, G., 2011; Bolleyer, N., & Borzel, T.A., 2010). Authors have studied overlaps or total separation of government departments/entities that leads to misutilization and/or underutilization of institutional capacities, resulting in negative coordination. This is also understood as policy fragmentation, which is the condition of disjointed

and overlapping public policies leading to conflict, inefficiency across different government levels and sectors (Kissinger, G., et, al., 2021).

Fragmentation is one of the causes of incoordination and is a common feature of a top-heavy bureaucratic framework characterized by diversity of objectives, with resources spread across actors who are disconnected from each other in the policy cycle. Fragmentation is a prominent feature of the government administration of developing countries which have adopted the frameworks and planning process of Western democracies while ignoring the diversity of voices on the ground. The presence of fragmentation and resulting negative coordination is also observed in public private coordination scenarios.

The policy coordination scholarship is not confined to study of governmental actors. Trein and Tosun (Trein, P., & Tosun, P., 2019) investigate the different varieties of public-private policy coordination in EU member states regarding implementation of a youth employment guarantee program. Their findings show that private actors can support the delivery of public goods, if public institutions design the policy strategy to include the scope of involvement of private actors. Their other finding is that countries with higher share of government spending on public goods limits the scope of mobilization of resources from private sector actors, since the role of private finance is limited.

Similarly, Aurisch Beerheide and other authors (Aurich-Beerhide, P., et. al., 2015) in their study of public-private policy coordination in the labour market show that coordination of private sector actors can occur at the policy implementation stage. The scope of this coordination is a factor of the extent of centralization of policy planning. A decentralized planning process provides private sector actors with a higher degree of autonomy. Nigel Caldwell and other authors (Caldwell, N.D., et, al., 2017) have contributed to the findings by showing that coordination can occur through relationship building among actors, despite differences in the economic capacity and scale of operations of public and private institutions. The authors show that parameters like leadership and networking capabilities of individuals in the organizations contribute to alignment of organization's interests.

Coordination studies on public-private actors also encompasses factors like scope of privatization of public services (Moschetti, M., et, al., 2020); involvement of private actors at the local level of governance (Asland, A., et, al., 2020); and citizen involvement in community-led organizations (Hardina, D., 2006). The review of public-private coordination in policy scholarship shows that coordination of a private actor with a public sector actor is a function of capacity constraints. If the national government has a high expenditure on public services, there's lesser resource constraints for delivery of services as it is undertaken in a planned resource allocation manner. Hence there's low incentive for private sector actors to get involved in policy/program implementation stage as providers of government services.

Secondly, fragmentation within the public sector creates conditions for private sector actors to act as implementors of public services, as they are able to utilize the government resources that are locked in the fragmented policy loops. This study contributes to policy coordination scholarship by bringing

out the important role of NGOs as non-state actors for effective agenda setting at the local level. NGOs should be viewed not only as implementors, but also as actors who can set the policy agenda prior to implementation if coordination can be achieved at the subnational levels of government.

2.1. Policy coordination scholarship in India

Policy coordination scholarship in India is built on empirical evidence of how public services to citizens are delivered, particularly employment, rural development, and social wellbeing (Dhiman, S., & Dyal, S. 2018; Gautam. A., 2020; Patnaik, S., & Shambu Prasad, C., 2021). I utilize the concepts of interdependence of actors and institutional capacity given by Buainain and Leite (2013) to review the scholarship pertaining to India.

Coordination problems are visible in the study of the national government's efforts on poverty eradication, which have been tackled through different social welfare programs and schemes. In early work on policy coordination in India, Chanchal Sharma (Sharma, C.K., 2011) looked at internal government relations (interdependence of actors). The author's findings show that higher centre-state coordination through higher participation of states in planning and policy diffusion leads to efficient use of resources to achieve the collective goals of development.

Patnaik and Shambu Prasad (2021) explore the various factors that influence coordination among state governments and non-state actors like NGOs. Their work showed that the institutional capacity of NGOs and traits of the NGO leadership help in positive coordination with state governments in implementing poverty alleviation programs. Ajay Gautam (2020) analyzed coordination from the perspective of inefficiency in public administration. His work looks at the negative factors – excessive bureaucracy, lack of transparency, absence of monitoring in government departments in current process of public service delivery – which create conditions for policy coordination. According to the author, institutional capacity of government departments and the fragmentation necessitates coordination. Even though the focus of scholarship is on analysis of institutional capacity, Bhalotra et al (2023) have analyzed coordination using actor characteristics as well. Their study examines policy coordination because of leadership identity in both government and NGOs. Their work shows how social identities of leadership influences citizens' reactions and responsiveness to social welfare programs.

A review of the scholarship on India shows that NGO-government coordination in India has focused on service delivery in the health and education sectors (Bali, A.S., & Ramesh, M., 2021; Upadhyaya, P., et, al., 2020). Studies highlight how NGOs operate as a "filler" in delivery of public services in a resource-constrained environment (Jörgensen, K., et, al., 2015). There is limited empirical study of energy access as a public service.

2.2 Research Contribution

The review of the literature, and findings from the examination of existing empirical studies reveals three gaps in scholarship. The first gap is lack of empirical evidence on public-private sector

coordination in developing countries, which limits our understanding of how non-state actors use their institutional capacity to work in resource-constrained environments. The majority of the work is concentrated on coordination problems in the United States or Europe (Sager. F., 2006; Trein. P., 2017; Bolleyer, N., & Borzel, T.A., 2010; Trein, P., & Tosun, P., 2019; Aurich-Beerhide, P., et. al., 2015). However, given the increasing role of NGOs in developing countries, there is a need for research exploring how these actors navigate coordination with the public sector institutions in resource-constrained environments (Dhiman, S., & Dyal, S. 2018; Gautam. A., 2020; Patnaik, S., & Shambu Prasad, C., 2021). This study fills the gap through examination of how a top-down approach to policymaking conflicts with the bottom-up approach of NGOs when implementing public welfare programs.

Second, policy coordination scholarship has analyzed the cost of coordination (or the lack of it) using administrative, technical, logistical, jurisdictional parameters that hinder or incentivize coordination but there is no discussion on the social cost of achieving coordination. This normative element in measurement of coordination can be identified and analyzed using equity as a metric of measurement, by identifying whether an equitable outcome was achieved through the coordination between the state and non-state actor.

Finally, the study challenges the narrative in policy coordination scholarship regarding NGOs solely as implementors of public services, by showing how Bindi's institutional capacity is poised to influence policy feedback at local level through coordination with the local level administration.

3. Access to Energy Services in Rural India

People don't desire energy, they demand access to energy services such as access to electricity, fuel for cooking, uninterrupted lighting, heating, cooling, etc. that in turn creates a choice of activities for attaining a decent standard of living for a user (Alkire, S., & Deneulin. , S., 2009; Fell, M.J., 2017; Stewart, F., 2017). These 'choices' are to consume nourishing food, ability to read, access to clean water, harmonious relations with members of the household, and community relations (bartiauz, F., et, al., 2021; Day, R., et, al., 2016; Middlemiss, L., et, al., 2019).

Access to energy services is another way of looking at energy poverty. Since energy poverty is multidimensional and reduction of energy poverty creates choices for individuals, equity is invariably a part of this process (Sadath, A.C., & Acharya, R.H.,2017). Deprivation of access to essential energy services is the cause of, and is caused by energy poverty, which also includes income poverty, social inequality, and gender inequality, which show up in the extent of inequitable access to affordable, reliable and essential energy services (Manasi, B., & Mukhopadhay, J.P. 2024).

The incidence and extent of energy poverty is different in rural areas compared to urban areas because of the difference in forms of inequality across gendered division of labour in a household. For example, in rural areas women have the responsibility to collect fuel for the household and manage energy supply of the household (Kaygusuz, K., 2011).

Rural energy access in India emerged as a policy agenda during the 2000s as prime factor to improve rural development (Palit, D., & Bandopadhyay, K.R., 2017). The Electricity Act (2003) built the national architecture of electricity access including choice of access to consumers, involvement of states, and separate objectives and targets for rural electrification (Palit, D., & Bandopadhyay, K.R., 2017). The Act created obligations for the national and state governments to supply electricity to rural areas. The National Electricity Policy (NEP) 2005 in turn obligated the states to create their respective state-level electricity policy document for universal household electrification including rural electrification.

The policy landscape focuses on utility-scale grid-based solar power plants, competitive electricity markets, incentives for private companies to participate in solar manufacturing, etc. Financial incentives like tax rebates/exemptions, special financial packages to set up solar manufacturing facilities, relaxation of duties on raw materials, land allocation, ease of regulatory clearances, etc., are oriented towards large-scale power plants.

On the other hand, rural electrification is challenged by lack of financial resources, since it is seen to be inefficient for transmission and distribution companies. The quality of grid electricity supplied is also questionable, and the cost of installing a metered connection remains high. There is a lack of rural finance to operate and manage grid connections, and absence of coordination with other rural development objectives (Palit, D., & Bandopadhyay, K.R., 2017).

3.1 The context of study

India's energy landscape is dominated by coal. Out of the total installed power capacity of 476 GW in 2025, 50% was accounted for by coal (MNRE., 2024). Similarly, out of the total electricity generated from all sources, coal represented 72.75% (MNRE., 2024). Within the nominal share of renewable energy sources in the total installed capacity, solar energy has experienced the most substantial growth accounting for 24%, followed by wind power at a distant second (10.3 %). Nuclear (2%) and hydro power (4.6%) also play significant roles [40]. Although the share of clean energy sources both in installed capacity (Gigawatt) and electricity generation (Terawatt hour) has increased over the years, coal continues to dominate (EMBER., 2025).

India's transition toward solar energy gained pace as installed capacity reached 105.65 GW in April 2025, which included 81 GW of ground-mounted and 17 GW of rooftop installations (MNRE., 2024). Around 24 GW of capacity was added during FY 2024–25—its largest annual increase to date (MNRE., 2024). Despite this momentum, coal-fired generation still accounts for over half of the total share in electricity generation. The discrepancy between growing solar capacity and persistent generation from coal reflects deeper structural and policy trade-offs.

Jharkhand, located in eastern India, presents a unique context for study of decentralized renewable energy technologies and its policy implications. As one of India's youngest states formed in 2000, Jharkhand is rich in mineral resources yet faces persistent developmental challenges, especially in rural and tribal regions [(Balakrishnan, R., 2003). Over 26% of its population belongs to Scheduled Tribes

(Census of India, 2011[1]). The Scheduled Tribes face chronic poverty characterized by poor access to basic services including housing, food, water, and electricity (Sharma, K., 2012).

Jharkhand's energy landscape has been characterized by low electrification rates, infrastructural bottlenecks, and unreliable grid connectivity in rural areas. As of 2020, while 87% of rural households in Jharkhand had electricity access, 49% did not have a metered connection (Kottadiel, D., 2020). Despite the central government's efforts under national schemes like the Deendayal Upadhyaya Gram Jyoti Yojana (DDUGJY[2]), many remote villages remain underserved due to terrain, economic constraints, and logistical limitations (Palit, D., & Chaurey, A. 2013). In this context, decentralized renewable energy systems such as solar microgrids have emerged as viable alternatives to enhance energy access.

We must also recognize that Jharkhand is home to indigenous population of which ninety percent reside in rural areas. The indigenous (tribal) communities have their own cultural practices, traditional knowledge systems, and socio-economic profile which has undergone changes due to the coal-based economy of the state (Shilee, S., & Shailee, S., 2002). Over time, the tribal communities have faced marginalization due to displacement from their traditional habitats due to coal mining, leading them to reside in further remote areas, which exacerbated their challenge to access electricity, education and healthcare services, that are paid for through coal-based revenue (Haldar, T., &Abraham, V., 2015).

This study also points to the exclusionary pattern of renewable energy transition: a focus on utility-scale, grid-connected projects often overshadows the decentralized solutions needed to address regional inequalities. Jharkhand serves as a critical site to interrogate the implications of this exclusionary policy on marginalized communities. The state's unique socio-economic status marked by tribal identity, rural poverty, and dependence on fossil fuel makes it an essential case for understanding policy coordination in the context of access to essential energy services for the energy poor.

3.2 The policy context

At the national level, the Ministry of New and Renewable Energy (MNRE) is the pivotal body driving India's renewable energy agenda. In Jharkhand, Jharkhand Renewable Energy Development Agency (JREDA) operates under the directives of MNRE as the formal nodal agency in the state responsible for implementing both MNRE-backed and state-funded programs.

As of 2022, JREDA was tasked with executing over 280 MW of off-grid solar including solar pumps and mini-/micro-grid systems[3]. However, the state institutional capacity remains constrained by limited staffing, financial bottlenecks, and a focus on profitable large-scale infrastructure to implement and execute this mandate. Implementation of decentralized models lags, even as policy documents set quantitative targets e.g., ambition to install 110 MW of solar mini-grids by 2027 in Jharkhand (Gupta, L.C.D.K., 2022). The solar policy aims to expand solar parks and agricultural pump solutions but offers less guidance on micro-level community solar participation.

At the grassroots, Panchayati Raj Institutions (PRIs) and Self-Help Group (SHG) federations such as Mahila Vikas Mandal (MVM) play frontline roles in mobilizing local energy demand and managing distribution systems. However, their participation in formal planning and decision-making is limited or absent. District bodies such as village energy committees frequently serve as informal implementation partners but lack formal recognition in state level planning (Alsop, R., et, al., 2001). The local energy landscape thus depends heavily on NGO-led programs to fill institutional gaps. Their ability to coordinate vertically with JREDA and horizontally with PRIs and civil society becomes a key determinant of how national decentralization ambitions translate into equitable outcomes.

3.3 Why decentralized energy projects

The total installed capacity of off-grid solar in India is 5.01 GW (2025) out of which less than two percent (88 MW) is in Jharkhand (MNRE., 2024). Off-grid solar installations were spearheaded by NGOs, to improve rural energy access to address energy poverty in remote areas where grid infrastructure is economically and/or technically unfeasible.

In 2019, the central government launched the Prime Minister's Kisan Urja Suraksha evam Utthaan Mahabhiyan (PM-KUSUM) program to ensure energy security for farmers through decentralized solar plants and stand-alone solar agriculture pumps dedicated for improving livelihood through agriculture activities [40]. These initiatives have largely been driven in coordination with state renewable energy agencies, grassroots organizations, and local governing bodies such as Gram Panchayats.

Decentralized off-grid electricity programs have been implemented in the states of West Bengal, Bihar, Chhattisgarh, Lakshadweep, Madhya Pradesh, Odisha, Uttar Pradesh, and West Bengal either as stand-alone solar PV systems, biomass, or hydro systems (Palit, D., & Chaurey, A. 2013; Palit, D., & Sarangi, G. K. 2014). Such technologies have proliferated in these states, especially to remote villages where grid connection was neither cost-effective nor technologically feasible mode. As a result, the energy supply was inadequate to meet the demand (Palit, D., & Chaurey, A. 2013; Manasi, B., & Mukhopadhyay, J., 2024; Palit, D., & Bandopadhyay, K.R., 2017).

3.4 About Bindi International

Bindi International Association was established on July 20, 2015, with the aim of empowering rural women across India and contribute to the achievement of the United Nations' sustainable development goals (UNSDGs). The organization is headquartered in Harmara village, Ajmer District in Rajasthan state and operates with the fundamental belief that women should be at the forefront of all initiatives focused on fostering economic and social development.

The organization's focus on sustainable development through women's empowerment is evident in their approach to provide financial independence to women in rural areas. Women's entrepreneurship development has been instrumental in achieving women's empowerment and economic independence. Bindi International also trains on digital literacy, marketing skills, banking skills to women in remote areas to enable them to participate and access all the opportunities presented in the rapidly evolving digital world around them.

3.5 Bindi's community solar program

Bindi International's model is a multi-dimensional approach: distributing solar home systems, empowering local women through training as "solar mamas," and fostering village energy enterprises. This strategy intentionally bridges energy provision, livelihood generation, and gender equity, diverging from the dominant policy focus on grid-centric solutions and large-scale renewable infrastructure.

The objectives of the community solar program are 1) to provide access to electricity for the non-electrified and under electrified households, 2) provide skill training of solar technology to rural women, and 3) establish women as key resource of delivering renewable energy solutions in rural, remote communities. The intended outcome for Bindi International is economic development of the community and women empowerment through a secondary livelihood that is created through technical training, providing access to finance, marketing training, and administrative support through the social capital of the local SHG federation MVM.

In the case study region, I found that the existing social capital of Self-Help Groups (SHGs) helped Bindi International to implement the community solar program. SHGs are the network of actors that were designed to support rural income of women through micro finance (Gugerty, M.K., et, al., 2019). An SHG comprises of 10-20 local women who come together to form the organization and create a bank account associated with the organization (Shastry, G.V.R.R.S, 2022). Women members make monthly contributions to the group to build capital and utilize the credit for livelihood and entrepreneurial activities, improving financial health and use the social capital of the group to empower each other through development activities (Gugerty, M.K., et, al., 2019; Shastry, G.V.R.R.S, 2022; Parwez, S., 2013).

Bindi International utilized the social capital of Mahila Vikas Mandala (MVM), a grassroot women's federation that has formed several SHGs in villages of Gumla District of Jharkhand. MVM works on education, health and sanitation, livelihood end employment, create local autonomy in rural communities and improve administration of government programs (Gupta, A.K., 2012).

3.6 Solar technology in rural setting

Bindi International, along with MVM, conducted community meetings with the Gram Panchayat to understand the electrification status of households in the village, the energy needs, and the fund required to install the systems in the identified households in the village. Based on the inputs from

the community meetings prior to implementation, the NGO chose a Solar Home System (SHS) design that includes a 100-Watt capacity, four LED lamps, one direct current (DC) fan, and a mobile charging point. The system provides lighting for a duration of 6 – 12 hours and takes up to 8 hours to fully charge the battery.

4. Methodology of the study

The methodology of this study is the based on policy mapping of India's energy policy landscape, the summative evaluation of Bindi International's community solar program, and evaluation of the outcomes at the site of program intervention. Summative program evaluation is an ex-post evaluation conducted after the implementation of a program and focuses on measuring the outcomes against the program goals/objectives (Janus, M., & Brinkman, S., 2010).

This practice is common and is used by all levels of government, from local municipalities to central government (Kaczmarek, K, & Romaniuk, P., 2020). Usually, summative evaluation is used in evaluating effectiveness of learning process or education programs (Bhat, B.A., & Bhat, G.J., 2019; Bin Mubayrik, H.F., 2020; Murray, H.G., 1984) and public health programs (Kaczmarek, K, & Romaniuk, P., 2020; McGrath. J.C., 1991; Scanlon, D.P., et, al., 2016). However, none of the established evaluation techniques could be directly applied to this study. I've combined policy mapping, qualitative data analysis, and document analysis to create the summative evaluation methodology for this study. I used an inductive approach to ascribe meanings to the data and associate it with the scholarship of this study (Bingham, A.J., 2023).

4.1 Analytical Framework

The objective of this analysis is to determine the extent coordination between state and non-state actors through the study of this community solar program. The framework is informed by scholarship on multi-level governance (Jordan, A., & Lenschow, A., 2010; Jörgensen, K., et, al., 2015), and policy coordination in complex policy systems (Gautam. A., 2020; Patnaik, S., & Shambu Prasad, C., 2021).

The core of this framework is based on two dimensions: policy coordination mechanisms and energy equity. Policy coordination in this study is defined as the extent of alignment between central, state, and non-governmental actors in the design and implementation of energy access policies (Bolleyer, N., & Borzel, T.A., 2010). Coordination is enabled by resource capacity, technical knowledge, and adequate resource flows (Jordan, A., & Lenschow, A., 2010), and is constrained by bureaucratic fragmentation, entrenched power hierarchies, and uneven access to policy networks (van Bueren, E.M., et, al., 2003).

Energy equity is multidimensional. It includes distributional justice in the allocation of benefits from implementation of policy/program and procedural justice which evaluates inclusive participation in decision-making processes (Jenkins, K., McCauley, et, al, 2016). This approach recognizes that energy poverty is not merely a technical deficit but an outcome of structural

inequality, political exclusion, and market-oriented transitions that bypass marginalized groups (Yenneti, K., & Day, R., 2015).

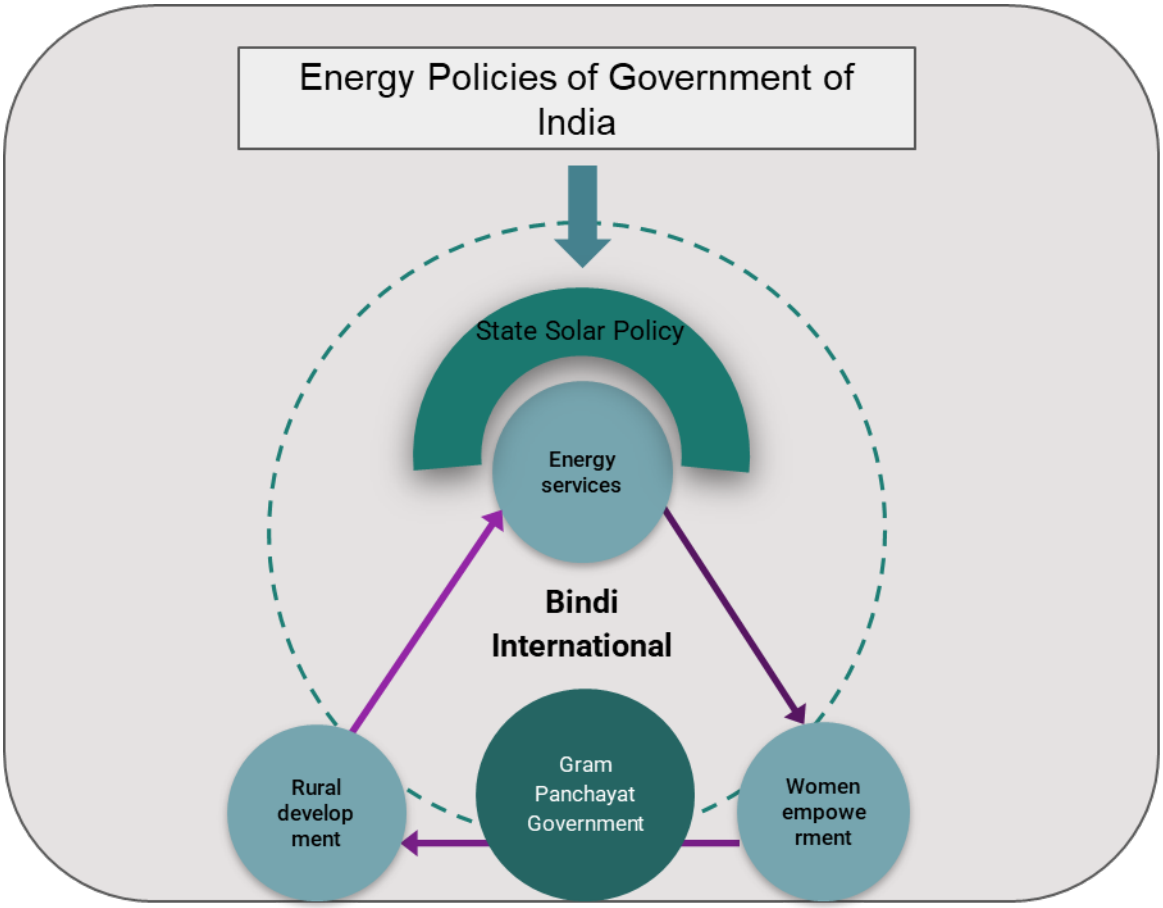
The analytical framework is visualized in Figure 1, which illustrates the policy ecosystem of the state, the non-state actor Bindi International within that ecosystem, and the resulting outcomes as a result of coordination or incoordination. The national-level energy policies determine the boundaries of implementation of state energy policies. Each state creates a state specific solar policy under the statutory requirements of the National Electricity Act (2003). The primary goal of state solar policy is to meet the energy services needs of the state through combination of fiscal, monetary, legal incentives. In the case of Jharkhand, JREDA is responsible for implementation of state specific solar programs, schemes, etc. as described in the State Solar Policy of Jharkhand.

At the other end of the circle is the lowest unit of government administration, the Gram Panchayat. The Gram Panchayat is the lowest level of government in the Indian administration, constituted of members who are elected by the village population (Alsop, R., et, al., 2001). Gram Panchayat oversees the administration of one to more than one village. It is responsible for implementing rural development programs which include central and state government schemes such as PM-KUSUM, DDUGJY, etc.

Bindi International is a nonstate actor external to this policy ecosystem. It has its own set of objectives – provide rural last mile electricity solutions (energy services); provide training and capacity building to rural women (women empowerment); improve village economy through solar entrepreneurship among women (rural development) that determines the boundary of operation, represented as the triangle.

I visualize the operational boundaries of Bindi International defined by the objectives as a triangle overlayed on the policy ecosystem of central, state policies. This framework represents the extent to which the state and Bindi International can coordinate as well as the possible extent of misalignment. The energy services objectives fit well within the state level solar policy directives. On the other hand, rural development, women empowerment are at the periphery of the ecosystem, representing areas of conflict between the state and Bindi International. The framework centers the coordination between state, nonstate actors, using equity in energy access as the theme, and speaks to the growing literature on policy coordination in the Global South (Zhang, P., & Gu, H., 2023).

Figure 1 Framework of coordination



4.2 Data and Analysis

The data for this study consists of policy documents (four national level and one document of Jharkhand) regarding electricity access (The Electricity Act and National Electricity Policy), energy efficiency (The Energy Conservation Act), solar policy (National Solar Mission and Jharkhand State Solar Policy). The policy mapping forms the first part of coordination analysis.

The second part of summative evaluation is based on document analysis of data obtained from Bindi International's program documents and analysis of qualitative data from interviews conducted with Bindi International's management team, Chairman of the Gram Panchayat, and group discussion with the SHG women members who are beneficiaries of the community solar program. The objective of each type of data analysis and key findings have been summarized in Table 1 below.

Table 1 Summary of data analysis

Data Source	Count	Objective	Key Findings
Policy documents of government of India and Jharkhand state	Five documents (four national documents, one state document)	The presence/absence of energy equity in India's energy policy landscape	Vertical alignment between national and state solar policies asymmetric; administrative bottlenecks. Limited horizontal coordination between energy and rural development departments; implementation silos.
Program documents of Bindi International	Two documents	Whether program outcomes align with the intended objectives	Coordination between Bindi and Gram Panchayat is not operationalized, which is a missed opportunity to utilize the Gram Panchayat's administration to create equitable distribution of benefits.
Interview with Chairman of Dumardih Gram Panchayat	One interviewee, recruited in coordination with MVM	Determine the participation of the local government in implementation of the program	Village electrification is not equal to household electrification. Benefits of government schemes and/or NGO programs are influenced by income poverty, social hierarchy, ethnicity.
Group discussion with household beneficiaries	One discussion with ten SHG members who are beneficiaries of the program	Determine the distributive and procedural justice in the implementation of off-grid solar programs	Local voices are largely excluded from planning and monitoring; engagement is top-down and one dimensional.
Group discussion with Bindi International's management team	One discussion with five persons. The team was recruited through email communication.	Determine the challenges and opportunities for Bindi to operate in the policy environment	Subsidies primarily benefit large-scale developers; limited support for community-led solar.

The group discussion was conducted online with the management team of Bindi International comprising of five persons. The discussion lasted two hours, and the recording of the discussion was later used to transcribe the data. The transcription was then converted to codes and themes. The

interview with the Chairman of the Gram Panchayat was conducted on site for a duration of two hours. The group discussion with the SHG members was also conducted on site where the community solar program was implemented. Recordings of the interview and discussion were converted and formatted into textual data after removing participant identifiers.

Top-level coordination is analysed using policy mapping of the National and State policies, document analysis of the program document, and analysis of discussion with Bindi International's management team. Analysis of bottom-level coordination is based on document analysis of Bindi International's program documents, in-person interview with the Chairman of the Gram Panchayat, and group discussion with household beneficiaries.

4.3 Vertical and Horizontal Coordination Challenges

Analysis of national and state policy documents revealed asymmetrical relationship between MNRE at the centre and JREDA. While national renewable energy policies promote both grid connected and off-grid solar applications through large-scale programs such as the National Solar Mission (NSM)[4], state-level implementation is constrained by lack of fiscal autonomy and technical capacity [63]. As stated earlier, the energy needs at the state level are specific to the socio-economic conditions, which in the case of Jharkhand are linked to a coal-based economy.

Transition to a renewable-energy-based economy requires human resources trained in renewable energy technology, fiscal independence, ease of access, and an energy culture that is currently missing at the state level. Secondly, at the state level, horizontal integration across departments such as JREDA, Department of Rural Development, and Jharkhand State Tribal Cooperative Development Corporation is missing from the State Solar Policy document. Interviews with Bindi Management team show that solar technology deployment is implemented in silos, without coordinated planning with other actors to align strategies. This adds another layer of challenge in policy coordination between the state and the NGO.

4.4 Assessing Energy Equity Outcomes

Analysis of the state solar policy document shows that while grid-based solar plants expanded the state's installed capacity from 36.4 MW in 2017 to 73.6 MW in 2022, the benefits accrued primarily to urban consumers and businesses. Interview data revealed that subsidies and incentives disproportionately supported large-scale developers, with minimal attention to decentralized community-led models. Participants from the group discussion with Bindi team noted that "there isn't too much focus on rural electrification in energy policy, neither are guidelines present in the policy document on how NGOs can operate to implement off-grid technology applications."

Community group discussions revealed how rural households – especially indigenous community households – continue to experience energy poverty despite being counted as electrified. In the hamlet of Dumardih Gram Panchayat, women respondents from households who were beneficiaries of the community solar program shared that although the SHS is useful, they consider grid electricity

connection as the beneficial outcome. However, grid electricity connection is limited to street lighting, and household connection requires metering, which is cost prohibitive. The absence of women in decision making regarding the scale of the technology has made them indifferent to the benefits derived from the program.

The differences between how a household is considered electrified and the lived experience of the beneficiaries highlight the procedural and distributive inequities. The heavy focus on solar applications in agriculture (PM KUSUM) has limited access to only certain section of rural households, who have the capacity to buy these higher-scale systems. Households with income vulnerability, limited land holding, and low purchasing power are left out of the transition process.

5. Results and Discussion

The key findings from the analysis are that the goals of Bindi International are more coordinated with state energy policies as compared to national energy policies. Secondly, within the given scope of coordination at subnational level, Jharkhand's policy on rural community energy access is best aligned with Bindi's energy services objective, and less with women empowerment and rural development objective (Figure 1).

The cause of misalignment between the state and Bindi International results from fragmented interdependence of government departments, which fail to coordinate with the NGO. Finally, Bindi International can be an actor in agenda setting of public policy at the local level, given its institutional capacity, if it could coordinate with the Gram Panchayat's capacity and resources to implement the program with more equitable outcomes.

Table 2 summarizes the findings from the evaluation of the goals of Bindi International with the policy objectives of government (both National and State level). The coordination is analyzed on a scale ranging from nil (no alignment) to high (maximum alignment). The state policies have been summarized into eight policy goals and have been examined for alignment with Bindi's four program goals.

The alignment matrix shows that goals focused on access to energy services along with women empowerment are more aligned with state policies that are specific on community solar, training in solar, employment in solar, last-mile connectivity, and promotion of off-grid solar. The alignment matrix shows that a policy which speaks to the community's energy needs will be best aligned with the NGO's objectives. In the following sub section, I discuss how policy coordination differs at the top and at the bottom using the findings from this alignment matrix.

Table 2 Policy alignment matrix

		Program goals			
		Fulfil energy needs of rural communities	Gendered training in solar	Community ownership	Creating rural livelihood
Policy Goals	Electricity generation	Nil	Nil	Nil	Nil
	Universal Access	Low	Nil	Low	Medium
	Increased participation of private sector	Nil	Nil	Low	Medium
	Energy efficiency	Nil	Nil	Nil	Nil
	Increase in % of grid solar in electricity generation	Nil	Low	Nil	Medium
	Promote the solar manufacturing industry	Low	Nil	Nil	Nil
	Last-mile connectivity	Medium	Nil	Nil	Low
	Promote off-grid solar	Medium	Medium	High	Low
	Skill training in solar	Nil	High	Low	Medium
	Employment in solar	Medium	Medium	Nil	Medium
	Community solar	High	Medium	High	High

5.1 Policy coordination at the top

The policy landscape for rural electrification in India presents significant challenges for NGOs like Bindi International, whose operational boundaries are defined by the small scale of technology and financial resources. Government policies prioritize large-scale grid expansion, requiring substantial public and private investment, while offering little institutional or financial support for small-scale,

community-based initiatives. As a result, there is a misalignment between the state and the nonstate actors working in rural electrification.

The primary challenge is the absence of specific guidelines in the policy documents on how NGOs can improve access to energy services using decentralized technologies. Unlike large-scale grid projects that receive government subsidies and investment incentives, small-scale solar home systems lack recognition in policy documents. Without targeted financial incentives, NGOs must independently raise funds through donors or develop monetized models where beneficiaries contribute financially to sustain program operations. This lack of institutional support limits the scalability and sustainability of decentralized energy initiatives in rural communities.

The second challenge is the lack of acknowledgment by the state government of the role of NGOs as key stakeholders in addressing rural electrification. Although state-level policies are more specific, they treat rural electrification, skill training, and women's empowerment as independent, mutually exclusive policies. Each policy in turn depends on separate government departments to be coordinated. This creates additional barriers for NGOs who synergize access to energy services with women empowerment, limiting their scope of coordination with any government department. Thus, NGOs and their contributions remain unacknowledged from policy objectives, because they can't coordinate with any particular department, which in turn is a result of the disjointed polices.

For example, JREDA has the potential to coordinate with other state departments, such as the Department of Scheduled Tribe, Minority, and Backward Class Welfare, and the Rural Development Department, to design skill training programs and livelihoods programs centered around community solar. However, such coordination needs to happen at two levels – first across government departments through inter-governmental collaboration, and then engagement with the NGO, a process that is not established in the existing policy. Bindi International could benefit from sharing its institutional resources with JREDA, while JREDA could assist with financing the implementation of the program.

5.2 Policy coordination at the bottom

"Our Panchayat was not involved with the program design or selection of beneficiary households. I'm supportive of the solar program but it would benefit the community to have a bigger scale technology such as a micro grid with a recharge system that connects a group of households on a pay-as-you-go basis model. If there's government support or if the company can help subsidize the cost of installation, that would ease the financial burden on the households."

The above quote is from the Sarpanch of the Gram Panchayat during the interview at Dumardih. This quote reveals the missed opportunity of Bindi International to influence policy making at the local level with the Sarpanch.

While coordination with the centre or the state is fraught with challenges of financial unviability, conflict of objectives, coordination at the bottom is also currently missing. In a multi-level governance

system, coordination is easier at the grassroots level where the two actors are horizontally at the same resource capacity to influence each other (Bolleyer, N., & Börzel, T. A., 2010) . In this case, the level of interdependence could have been much higher, leading to better outcomes for the beneficiary households if both the actors had utilized their respective capacities in a coordinated manner.

The village level government has sufficient resources to conduct community meetings regarding demand assessment, widen the reach of the technology to more beneficiary households, and provide financial support for the project success. It can map the demography of the village(s), identify specific energy needs of tribal and non-tribal groups across income disparities, and provide manpower support to operate and maintain the program. On the other hand, Bindi International has the capacity to use its knowledge and expertise to impart skill training to create 'choice' of new livelihoods for rural women and 'capability' of users to determine how they access energy services, and to raise capital to scale up the program. In this way, the NGO could coordinate with the local administration to create a policy that is context specific, coherent with the socio-economic inequalities, and hence produces more equitable outcomes for larger number of beneficiaries. The bottom-level coordination would be better if Bindi shared resources with the administration and utilized the Sarpanch's authority and his experience of working with the village to design the program, such that it was embedded in the socio-economic diversity of the community.

Bindi as an actor has a higher degree of autonomy at the local level, and it can leverage its knowledge capacity, resources, and infrastructure to influence the policy implementation of rural electrification. Higher degree of interdependency among these two actors will lead to effective coordination and ultimately higher success in program outcomes compared to the limited success. The current skills obtained are too limited to create any employment opportunity for women. Thus, there's a missed opportunity to align the program goals with the goals of the Gram Panchayat to address equity in access to energy services within the community.

6. Conclusion

This study approaches policy coordination between public and private actors from two ends – coordination at the top, and coordination at the bottom. The findings of this study emphasize the importance of policy coordination in addressing equity in energy services in rural India, particularly through the collaboration between NGOs and state level government. Based on the findings, the study has identified three contributions.

First, national and state-level energy policies should institutionalize the role of NGOs as key stakeholders in policy agenda setting. In the case of energy access, the government can integrate NGOs into the policy framework, leverage their institutional capacity, grassroots networks, and expertise in implementing small-scale renewable energy projects. This should be accompanied by incentives and enablers on how NGOs can implement decentralized energy programs.

Such an approach addresses the gap in public-private sector coordination in developing countries, as highlighted by Dhiman and Dyal (2018) and Ajay Gautam (2020). This study contributes to this scholarship by demonstrating how NGOs can influence policy feedback and improve program delivery when given the space to coordinate with government institutions. Furthermore, this study challenges the traditional narrative of NGOs as mere implementers and instead positions them as active participants in shaping policy outcomes (Kissinger, G., et, al., 2021; Trein, P., & Tosun, J., 2019).

The study reveals that coordination at the bottom, between NGOs and village government administration, is currently underutilized. The Gram Panchayats possess significant institutional capacity and social capital that can be utilized to enhance the reach and legitimacy of community-based energy programs. NGOs like Bindi International should actively engage with the Panchayat to design and implement programs that are attuned to the specific socio-economic and gender roles in such communities. By promoting coordination between NGOs and local governments, the study builds on the conceptual framework developed by Buainain and Leite (2013), which emphasizes the importance of interdependence among actors and institutional capacity in achieving effective policy coordination.

This study also brings out fragmentation as one of the major causes of negative coordination. The current policy landscape in India is characterized by overlap of policy objectives; each has a respective target outcome, and governmental actors respond uniquely to policy objectives that align with their exclusive capacity. Interdependence and capacity utilization is absent. This fragmentation creates barriers for NGOs to identify a state actor to coordinate.

To address this at the state level, government agencies and NGOs should be able to speak with each other in a manner that is institutionalized in the state-level policy document. Through these efforts, NGOs can move beyond their traditional role as implementers and become active participants in shaping policy feedback and decision-making processes. This shift will not only improve the effectiveness of rural energy programs but also contribute to the broader goals of sustainable development and gender equity.

The study contributes to the existing literature on policy coordination by demonstrating the importance of interdependence among actors and institutional capacity in achieving effective policy implementation, particularly in resource-constrained environments. It also highlights the need for future research to explore the long-term impact of policy coordination on rural energy access and community development, using methodologies such as summative evaluation to assess program outcomes.

6.1 Limitations of the study

This study has several limitations that should be acknowledged. First, while the policy mapping framework enabled a systematic analysis of national and state-level energy policies, it does not include

a systematic analysis of budgetary flows or state-wise energy access demand and supply, which could strengthen the analysis. Secondly, some potentially relevant documents particularly those implemented at sub-state (district) levels were not available publicly in digital format, and moreover, there was no access to physical documents.

Second, the empirical data collected through interviews and focus group discussions was limited in scope due to logistical and time constraints. Many JREDA officials declined telephonic or in-person interviews which would have made the qualitative data more robust. Since this study is based in Jharkhand, it does not capture policy variations in implementation or outcomes across other states in India. While the study integrates key concepts such as multi-level governance and fragmentation, it does not utilize a comparative framework for policy types. A cross-state comparative analysis could have offered broader generalizability and insights into diverse coordination dynamics and equity outcomes.

Finally, the study largely adopts a qualitative and post evaluation methodology. While this approach is useful for understanding program outcomes through lived experiences and institutional processes, using quantitative metrics of energy access and socio-economic indicators could complement the analysis and strengthen its analytical rigour. Future research could build on these limitations by incorporating mixed-methods and longitudinal tracking of policy impacts.

References

Palit, D., & Chaurey, A. (2013). Off-Grid Rural Electrification Experiences from South Asia. In (Vol. 116, pp. 75-104). https://doi.org/10.1007/978-1-4471-4673-5_4

Palit, D., & Sarangi, G. K. (2014). Renewable energy based mini grids for enhancing electricity access: Experiences and lessons from India.

Sinyosi, M. (2024). Renewable Energy in Rural Areas: Challenges, Opportunities, and Successful Rural Projects. Climate Change Writers. Retrieved March 15 from https://climatechangewriters.com/stories/renewable-energy-in-rural-areas-challenges-opportunities-and-successful-rural-projects

Stauffer, N. W. (2021). Encouraging solar energy adoption in rural India. MIT News. Retrieved March 15 from https://news.mit.edu/2021/encouraging-solar-energy-adoption-rural-india-0401

Sager, F. (2006). Policy coordination in the European metropolis: A meta-analysis. West European Politics, 29(3), 433-460.

Trein, P. (2017). Coevolution of policy sectors: A comparative analysis of healthcare and public health. Public Administration, 95(3), 744-758.

Bhalotra, S., Clots-Figueras, I., Iyer, L., & Vecci, J. (2023). Leader Identity and Coordination. The Review of Economics and Statistics, 105(1), 175-189. https://doi.org/10.1162/rest_a_01040

Di Gregorio, M, Fatorelli, L., Paavola, J., Locatelli, B., Pramova, E., Ridho Nurrochmat, D., May Peter, H., Brockhaus, M., Sari, I.M., & Kusumadewi. S.D. 2019. Multi-Level Governance and Power in Climate Change Policy Networks. Global Environmental Change 54 (1): 64–77. https://doi.org/10.1016/j.gloenvcha.2018.10.003.

Dhiman, S., & Dyal, S. (2018). The challenge of Governmental policy coordination in India. challenge, 3(1), 113-117.

Gautam, A. (2020). Role of Coordination in Effective Public Service Delivery System. Journal of Public Administration and Governance, 10(3), 158-201.

Patnaik, S., & Shambu Prasad, C. (2021). Coordination in multi-actor policy implementation: case study of a livelihood enhancement programme in India. Development in Practice, 31(4), 523-532. https://doi.org/10.1080/09614524.2020.1861220

Lindblom, C. E. (1965). The intelligence of democracy: Decision making through mutual adjustment. Free pr.

Scharpf, F. W. (1994). Games real actors could play: Positive and negative coordination in embedded negotiations. Journal of theoretical politics, 6(1), 27-53.

de Arruda Leite, J. P., & Buainain, A. M. (2013). Organizational coordination in public policy implementation: Practical dimensions and conceptual elements. Central European Journal of Public Policy, 7(2), 136-159.

Biesbroek, G. R., Swart, R. J., Carter, T. R., Cowan, C., Henrichs, T., Mela, H., Morecroft, M. D., & Rey, D. (2010). Europe adapts to climate change: comparing national adaptation strategies. Global Environmental Change, 20(3), 440-450.

Jordan, A., & Lenschow, A. (2010). Environmental policy integration: a state of the art review. Environmental Policy and Governance, 20(3), 147-158.

Champion, C., & Bonoli, G. (2011). Institutional fragmentation and coordination initiatives in western European welfare states. Journal of European Social Policy, 21(4), 323-334.

Chinseu, E., Stringer, L., & Dougill, A. (2018). Policy integration and coherence for conservation agriculture initiatives in Malawi. Sustainable Agriculture Research, 7(4), 51-62.

Bolleyer, N., & Börzel, T. A. (2010). Non-hierarchical policy coordination in multilevel systems. European political science review, 2(2), 157-185.

Kissinger, G., Brockhaus, M., & Bush, S. R. (2021). Policy integration as a means to address policy fragmentation: Assessing the role of Vietnam's national REDD+ action plan in the central highlands. Environmental Science & Policy, 119, 85-92.

Trein, P., & Tosun, J. (2019). Varieties of public–private policy coordination: How the political economy affects multi-actor implementation. Public Policy and Administration, 36(3), 379-400. https://doi.org/10.1177/0952076719889099

Aurich-Beerheide, P., Catalano, S. L., Graziano, P. R., & Zimmermann, K. (2015). Stakeholder participation and policy integration in local social and employment policies: Germany and Italy compared. Journal of European Social Policy, 25(4), 379-392.

Caldwell, N. D., Roehrich, J. K., & George, G. (2017). Social Value Creation and Relational Coordination in Public-Private Collaborations. Journal of Management Studies, 54(6), 906-928. https://doi.org/https://doi.org/10.1111/joms.12268

Moschetti, M., Martínez Pons, M., Bordoli, E., & Martinis, P. (2020). The increasing role of non-State actors in education policy making. Evidence from Uruguay. Journal of Education Policy, 35(3), 367-393. https://doi.org/10.1080/02680939.2018.1562569

Aasland, A., Kropp, S., & Meylakhs, A. Y. (2020). Between Collaboration and Subordination: State and Non-state Actors in Russian Anti-drug Policy. VOLUNTAS: International Journal of Voluntary and Nonprofit Organizations, 31(2), 422-436. https://doi.org/10.1007/s11266-019-00158-9

Hardina, D. (2006). Strategies for citizen participation and empowerment in non-profit, community-based organizations. Community Development, 37(4), 4-17.

Sharma, C. K. (2011). Intergovernmental Coordination Mechanisms in India.

Bali, A. S., & Ramesh, M. (2021). Governing healthcare in India: a policy capacity perspective. International Review of Administrative Sciences, 87(2), 275-293. https://doi.org/10.1177/00208523211001499

Upadhyaya, P., Shrivastava, M. K., Gorti, G., & Fakir, S. (2020). Capacity building for proportionate climate policy: Lessons from India and South Africa. International Political Science Review, 42(1), 130-145. https://doi.org/10.1177/0192512120963883

Jörgensen, K., Mishra, A., & Sarangi, G. K. (2015). Multi-level climate governance in India: the role of the states in climate action planning and renewable energies. Journal of Integrative Environmental Sciences, 12(4), 267-283. https://doi.org/10.1080/1943815X.2015.1093507

Alkire, S., & Deneulin, S. (2009). The human development and capability approach. In An introduction to the human development and capability approach (pp. 22-48). Routledge.

Fell, M. J. (2017). Energy services: A conceptual review. Energy Research & Social Science, 27, 129-140. https://doi.org/https://doi.org/10.1016/j.erss.2017.02.010

Stewart, F. (2013). Capabilities and Human Development: Beyond the individual-the critical role of social institutions and social competencies. UNDP-HDRO occasional papers(2013/03).

Bartiaux, F., Day, R., & Lahaye, W. (2021). Energy Poverty as a Restriction of Multiple Capabilities: A Systemic Approach for Belgium. Journal of Human Development and Capabilities, 22(2), 270-291. https://doi.org/10.1080/19452829.2021.1887107

Day, R., Walker, G., & Simcock, N. (2016). Conceptualising energy use and energy poverty using a capabilities framework. Energy Policy, 93, 255-264.

Middlemiss, L., Ambrosio-Albalá, P., Emmel, N., Gillard, R., Gilbertson, J., Hargreaves, T., Mullen, C., Ryan, T., Snell, C., & Tod, A. (2019). Energy poverty and social relations: A capabilities approach. Energy Research & Social Science, 55, 227-235. https://doi.org/https://doi.org/10.1016/j.erss.2019.05.002

Sadath, A. C., & Acharya, R. H. (2017). Assessing the extent and intensity of energy poverty using Multidimensional Energy Poverty Index: Empirical evidence from households in India. Energy Policy, 102, 540-550.

Manasi, B., & Mukhopadhyay, J. P. (2024). Definition, measurement and determinants of energy poverty: Empirical evidence from Indian households. Energy for Sustainable Development, 79, 101383. https://doi.org/https://doi.org/10.1016/j.esd.2024.101383

Kaygusuz, K. (2011). Energy services and energy poverty for sustainable rural development. Renewable and Sustainable Energy Reviews, 15(2), 936-947. https://doi.org/https://doi.org/10.1016/j.rser.2010.11.003

Palit, D., & Bandyopadhyay, K. R. (2017). Rural electricity access in India in retrospect: A critical rumination. Energy Policy, 109, 109-120. https://doi.org/https://doi.org/10.1016/j.enpol.2017.06.025

Ministry of New and Renewable Energy, I. (2024). Renewable Energy Statistics 2023-24 [Annual Report]. I. Ministry of New and Renewable Energy.

https://cdnbbsr.s3waas.gov.in/s3716e1b8c6cd17b771da77391355749f3/uploads/2024/10/20241029512325464.pdf

EMBER. (2025). India electricity generation highlights. EMBER. Retrieved 07/01/2025 from https://ember-energy.org/countries-and-regions/india/

Balakrishnan, R. (2003). Jharkhand - Past, Present & Future (CSD Working Paper Series, Issue. I. Council for Social Development. https://csdindia.org/wp-content/uploads/2017/04/Jharkhand-Past-Present-and-Future.pdf

Sharma, K. (2012). Poverty and Tribal Development in Jharkhand: Issues and Challenges. The Tribal Issues, 5(1). https://www.etribaltribune.com/index.php/volume-5/mv5i1/poverty-and-tribal-development-in-jharkhand-issues-and-challenges

Kottadiel, D. (2020). Energy in Rural Jharkhand. Power For All. Retrieved 07/01/2025 from https://www.powerforall.org/insights/asia/more-one-third-households-rural-jharkhand-dissatisfied-grid-supply-report

Shilee, S., & Shailee, S. (2002). Indigenous Identity of Tribals in Jharkhand. Indian Anthropologist, 32(1/2), 75-86. http://www.jstor.org/stable/41919910

Haldar, T., & Abraham, V. (2015). Development, Displacement and Labour Market Marginalisation: The Case of Jharkhand Tribal Population. Social Change, 45(1), 45-66. https://doi.org/10.1177/0049085714561839

Mishra, A., Sarangi, G. K., & Wadehra, S. (2016). Off-grid energy development in India: an approach towards sustainability. Economic and Political Weekly, 105-114.

Gugerty, M. K., Biscaye, P., & Leigh Anderson, C. (2019). Delivering development? Evidence on self-help groups as development intermediaries in South Asia and Africa. Development Policy Review, 37(1), 129-151.

Shastry, G. V. R. R. S. (2022). Financial inclusion challenges faced by self-help groups in Jharkhand: a case study of east Singhbhum district. International Journal of Advanced Research in Commerce, Management & Social Science, 5(1), 148-153.

Parwez, S. (2013). Impact assessment of self-help group towards rural development: a case study of Jharkhand, India.

Gupta, A. K. (2012). Women's group promises to help develop Gumla villages. Times News Network (TNN). Retrieved 03/01/2024 from https://timesofindia.indiatimes.com/city/ranchi/womens-group-promises-to-help-develop-gumla-villages/articleshow/16199985.cms

Janus, M., & Brinkman, S. (2010). Evaluating Early Childhood Education and Care Programs. International Encyclopedia of Education, 25-31. https://doi.org/10.1016/B978-0-08-044894-7.01197-0

Bhat, B. A., & Bhat, G. J. (2019). Formative and summative evaluation techniques for improvement of learning process. European Journal of Business & Social Sciences, 7(5), 776-785.

Bin Mubayrik, H. F. (2020). New trends in formative-summative evaluations for adult education. Sage Open, 10(3), 2158244020941006.

Murray, H. G. (1984). The impact of formative and summative evaluation of teaching in North American universities. Assessment and evaluation in Higher Education, 9(2), 117-132.

Kaczmarek, K., & Romaniuk, P. (2020). The use of evaluation methods for the overall assessment of health policy: potential and limitations. Cost Effectiveness and Resource Allocation, 18(1), 43. https://doi.org/10.1186/s12962-020-00238-4

McGrath, J. C. (1991). Evaluating national health communication campaigns: Formative and summative research issues. American Behavioral Scientist, 34(6), 652-665.

Scanlon, D. P., Wolf, L. J., Alexander, J. A., Christianson, J. B., Greene, J., Jean-Jacques, M., McHugh, M., Shi, Y., Leitzell, B., & Vanderbrink, J. M. (2016). Evaluating a complex, multi-site, community-based program to improve healthcare quality: the summative research design for the Aligning Forces for Quality initiative. Am J Manag Care, 22.

van Bueren, E. M., Klijn, E. H., & Koppenjan, J. F. M. (2003). Dealing with Wicked Problems in Networks: Analyzing an Environmental Debate from a Network Perspective. Journal of Public Administration Research and Theory, 13(2), 193-212. https://doi.org/10.1093/jpart/mug017

Jenkins, K., McCauley, D., Heffron, R., Stephan, H., & Rehner, R. (2016). Energy justice: A conceptual review. Energy Research & Social Science, 11, 174-182.

Yenneti, K., & Day, R. (2015). Procedural (in) justice in the implementation of solar energy: The case of Charanaka solar park, Gujarat, India. Energy Policy, 86, 664-673.

Zhang, P., & Gu, H. (2023). Potential policy coordination: Can energy intensity targets affect energy poverty? Energy Economics, 126, 106932. https://doi.org/https://doi.org/10.1016/j.eneco.2023.106932

Dubash, N. K., & Rao, D. N. (2008). Regulatory practice and politics: Lessons from independent regulation in Indian electricity. Utilities Policy, 16(4), 321-331.

Alsop, R., Anirudh K., & Sjoblom, D. (2001). Inclusion and local elected governments: The Panchayat Raj system in India. Social Development Paper 37, World Bank.

Gupta, L. C. D. K. (2022). The Status of Mini grids in Rural India. Transform Rural India,

(BEE), B. o. E. E. (2025). State Energy Efficiency Action Plan - Jharkhand (State Energy Efficiency Plans (SEEP), Issue. I. Bureau of Energy Efficiency (BEE), MNRE. https://beeindia.gov.in/sites/default/files/SEEAP_Jharkhand-Final.pdf

Bingham, A. J. (2023). From Data Management to Actionable Findings: A Five-Phase Process of Qualitative Data Analysis. International Journal of Qualitative Methods, 22. https://doi.org/10.1177/16094069231183620

Notes

[1] https://censusindia.gov.in/census.website/data/population-finder
[2] DDUGJY overview: https://www.india.gov.in/spotlight/deen-dayal-upadhyaya-gram-jyoti-yojana
[3] State Solar Policy 2022 (https://api.jreda.com/all-uploaded-img/img/6360e972de5e0.pdf)
[4] NSM overview: https://mnre.gov.in/en/solar-overview/

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IPPR

Regulation and the Performance of Microfinance Institutions in India

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Abstract

This study examines the regulatory status and the performance of 183 Microfinance Institutions (MFIs) in India from 2004-05 to 2019-20, using the latest available unbalanced panel data set, compiled from the Mix market database published by World bank. MFIs are vital in providing financial services to underserved populations. In response to concerns over aggressive lending practices and borrower exploitation, the Reserve Bank of India (RBI) has implemented stringent guidelines on interest rates, loan sizes, and borrower eligibility. While these regulations are intended to promote financial inclusion and maintain the ethical and financial stability of the sector, their effects on MFIs' operational efficiency, financial sustainability, and outreach capabilities remain ambiguous. Using the Generalized Method of Moments (GMM) technique, this empirical study examines the relationship between regulatory interventions and MFI performance across three key models: operational self-sufficiency (OSS), the number of active borrowers (NAB), and average loan size per borrower. The findings indicate that RBI-regulated MFIs have higher OSS and breadth of outreach, as regulated MFIs demonstrating improved operational sustainability and a greater capacity to attract and retain borrowers. However, the study also highlights challenges, such as high loan default rates and reduced loan sizes, particularly in response to macroeconomic factors like inflation and economic growth.

Keywords: Microfinance institutions (MFIs). Operational Self-Sufficiency (OSS). Breadth and Depth of Outreach. RBI Regulation. Generalized Methods of Moments (GMM)

JEL Codes: C33, C80, F62, G18, G21

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1. Introduction

Microfinance institutions (MFIs) have been playing a crucial role in developing countries like India, as they provide financial services to people who are often isolated from the mainstream banking system. These institutions have characteristics of both formal banking and non-banking financial intermediations, with diverse array of organizations such as Cooperatives, Credit Unions (CU), Non-Banking Financial Companies (NBFCs), Nongovernment Organizations (NGOs), Small Banks, etc. These MFIs provide banking services to the poor people. Initially, MFIs started as an institutional innovation in the credit market aimed at alleviation of poverty (Armendariz and Morduch, 2004; 2010; Olsen, 2017). However, later due to popularity and commercialisation of MFIs, the industry began to grow tremendously, which often led to crises in the industry (Rozas et al., 2015).

The microfinance industry in India has grown tremendously, both in gross loan portfolio and in the numbers of borrowers with higher total loan size, which indicates multiple loans per borrower. The microfinance industry in some regions in India reported higher default rates during 2005 and 2010, including high loan defaults in the Andhra Pradesh region (Mader, 2013; Sa-Dhan, 2016). This shed light into the need for a regulatory framework for the Indian microfinance industry. Thereafter, the regulation of MFIs in India has been evolved significantly, particularly following the Andhra Pradesh crisis of 2010, which highlighted issues of aggressive lending and borrower exploitation (Mader, 2013; De Quidt et al., 2012). These measures aimed to enhance institutional transparency and borrower protection by regulating loan size limits, capping interest rates, and setting eligibility criteria for borrowers based on household income (RBI, 2012).

Recent regulatory developments have focused on harmonizing guidelines across different types of lenders to ensure fair opportunities to various types of MFIs, and also helps to reduce regulatory arbitrage in the industry. Additionally, the RBI has emphasized the importance of financial inclusion, responsible lending practices, and the integration of digital lending platforms into the regulatory framework to address the sector's dynamic challenges (PwC, 2019).

These measures aim to balance the dual objectives of promoting financial access for the underserved and maintaining the sector's ethical and financial stability. Scholars and practitioners alike argue that without proper regulation, the sector's commercialization could undermine its mission to support the poor (Hudon & Sandberg, 2013). The need for enhanced regulation is underscored by the recurring ethical challenges faced by MFIs, which often arise from a conflict between profit motives and social objectives (Lauer & Staschen, 2013).

In this context, it is imperative to examine the evolving landscape of microfinance, the impacts of commercialization, and the necessity for regulatory reforms that can safeguard the sector's integrity and ensure that it continues to serve its targeted section of the underbanked people. The evolution and commercialization of MFIs in India, although aimed to enhance financial inclusion of underserved populations, have led to significant operational challenges, including high loan default rates and ethical concerns regarding aggressive lending practices.

The regulatory measures introduced by the RBI, particularly post-2010 Andhra Pradesh crisis, aimed to mitigate these issues by enforcing stringent guidelines on ceiling of interest rates, loan sizes, and borrower eligibility. However, the effect of these regulations on the overall performance and operational sustainability of MFIs remains ambiguous. There is a pressing need to empirically investigate whether these regulatory frameworks have effectively improved the operational efficiency, financial stability, and outreach capabilities of MFIs, or if they have constrained their growth and innovation.

This study aims to fill this gap by examining the relationship between regulatory interventions and the performance metrics of MFIs in India, thereby providing insights into the effectiveness of the current regulatory environment in balancing financial inclusion (as measured by breadth and depth of outreach to borrowers by MFIs) with ethical and sustainable lending operations of MFIs in India.

2. Evolution, Structure and Regulatory framework of the Indian Microfinance Sector

The foundation of microfinance in India lie in Self-Help Groups (SHGs), promoted by NGOs and development agencies in the 1970s and 1980s. Self Employed Women's Association (SEWA) in Gujarat is one of the first such organisations. During this period, various NGOs began to engage in microcredit lending, following the modern microfinance lending practices such as group lending and joint liability, enforcing peer and social pressures.

In India, the microfinance sector has evolved widely since the early 1990s, with the launching of NABARD's SHG-Bank linkage programme in 1992. This programme connected informal SHGs with formal banks in India, and banks began to lend SHGs under NABARD's refinance scheme, without regulatory supervision of the RBI (Muneer Babu, 2013). During the late 1990s, a diverse array of organizations such as Cooperatives, Credit Unions (CU), and Non-Banking Financial Companies (NBFC)-MFIs began to operate and scale up in the microfinance sector, meeting the large unmet demand.

The early 2000s witnessed the rise of MFIs as specialized entities providing individual and group-based microcredit. Among these, MFIs registered as NBFC-MFIs had access to commercial funds. Similarly, private investments and donor funding increased tremendously, leading to high growth in outreach, but also issues of over-lending and coercive recovery, culminating in the Andhra Pradesh crisis (2010). Over the years, the RBI has progressively refined its regulatory framework to ensure sectoral stability, customer protection, and sustainable growth, especially after the 2010 crisis. Before 2010, microfinance institutions (MFIs) largely operated under the legal status of NBFCs or Societies, Trusts, and Cooperatives. RBI had limited direct oversight except for NBFC-MFIs. There was absence of uniform standards, leading to over-lending.

In response to the 2010 crisis, the RBI's Malegam Committee Report (2011) introduced a clear regulatory framework for NBFC-MFIs as a distinct category, defining qualifying loans, borrower

income limits, interest caps and margin, and fair practices, and mandating transparency in loan pricing and loan recovery. RBI also took steps to prohibit coercive recovery and directed requirement of grievance redressal systems. These steps created prudential and consumer protection architecture.

This formalized supervision brought stability and accountability. Simultaneously, large MFIs transformed into Small Finance Banks (SFBs) (e.g., Bandan, Ujjivan, Equitas, ESAF), further integrating microfinance with mainstream banking. However, these steps also have cost implications on MFIs, as many steps also involve additional cost outlay to comply with the above regulatory and supervisory measures (RBI, 2022).

The RBI's 2022 Regulatory Framework for Microfinance Loans harmonized rules across all lenders such as banks, NBFCs, SFBs, and cooperatives. This removed interest rate caps, defined microfinance loans by household income (less than or equal to ₹3 lakhs annually), and emphasized transparency, household indebtedness limits, and responsible lending. The sector now integrates digital platforms, credit bureaus, and fintech-based micro-lending models for efficiency and scale. However, Mix Market data on the performance measures and MFI specific variables used in our current analysis have not been available since 2020 for inclusion in the empirical analysis (NABARD, 2023; RBI, 2022).

3. Review of Literature

Regulation, as defined by Baldwin and Cave (1999) and Chavez and Gonzalez (1992), refers to the binding rules governing the behaviour of organizations, which influence the actions of executives, managers, and stakeholders. The rules are set by government or RBI, other agencies such as NABARD, and self-imposed by the industry, which limit their activities and operations of financial institutions (Llewellyn, 1986). Regulation encompasses legal and judicial processes that aim to ensure secure transactions, enforce contracts, manage bankruptcy procedures, address tax and accounting standards, and grant permission to undertake financial operations (Armendariz & Labie, 2011).

The RBI enforces prudential regulation on public deposit-accepting NBFC-MFIs, which include reserve and other requirements to ensure the soundness and stability of financial institutions (Christen et al., 2003; Ledgerwood & White, 2006). These measures aim to ensure liquidity and solvency, thus protecting the financial system. NBFC-MFIs and Sec-25 NBFC-MFIs have to follow non-prudential norms of the RBI, whereas cooperative bank-MFIs and rural bank-MFIs have to follow the banking regulatory requirements. However, NGO-MFIs and Credit Union (CU)-MFIs are still unregulated.

Non-prudential regulation includes consumer protection measures such as promoting transparency, ensuring accountability, disclosing interest rates, preventing financial crimes, establishing credit information services, securing transactions, setting interest rate limits, and addressing accounting matters (Christen et al., 2003; Rosengard, 2011). These measures aim to create

an accountable and transparent industry with fair market practices, ensuring client protection and safeguarding against abusive practices of financial institutions.

Financial organizations face various risks, including operational, managerial, governance, political, credit, industry, and deposit risks (Berenbach & Churchill, 1997). Credit risk arises from non-repayment of loans, but MFIs can mitigate this by assessing the creditworthiness of borrowers. Industry risks due to high growth and competition in the industry, and macroeconomic and microeconomic failures, are also significant concerns (Rosengard, 2011). Identifying and managing these risks are crucial for financial organizations (Davis & Harper, 1991).

Deposit risk occurs when depositors massively withdraw funds due to panic or loss of confidence, affecting the liquidity and solvency of financial organisations, and potentially collapsing the financial system (Diamond & Dybvig, 1983; Heffernan, 1996). However, this risk is low in Indian MFIs, as most are non-deposit-taking NBFCs.

Harlow and Rawlings (1997) argue that regulation restricts behaviour and prevents undesirable activities. This is evident in Indian MFIs, where regulatory status influences financial behaviour, operational freedom, and decision-making. The regulation of MFIs impacts their financial behaviour, freedom of operation, and decision-making power, which often hinders innovation to reduce risks. A robust regulatory framework is vital for protecting and promoting stakeholders' interests in the Indian microfinance industry. Regulation ensures the safety and soundness of financial institutions, essential for financial system stability. Disclosure norms, information dissemination, and ensuring product quality and quantity are crucial for customer protection, though the cost and design of mandatory disclosure are debated (Moloney, 2010).

To assess the impact of regulation on Microfinance Institutions (MFIs), it is essential to clarify the key performance indicators frequently used in the microfinance literature. Return on Assets (ROA) measures an institution's profitability by evaluating how efficiently its assets are used to generate income. Operational Self-Sufficiency (OSS) reflects the ability of an MFI to cover its operational costs including administrative expenses, loan-loss provisions, and financial costs through its operating revenues. Financial Self-Sufficiency (FSS) extends this concept further by assessing whether an institution can cover operational and financial costs after adjusting for subsidies, inflation, and the cost of capital. These indicators form the basis for evaluating the financial sustainability and outreach of MFIs. An operative regulatory framework is crucial to ensure effective financial operations (Armendariz & Morduch, 2004). Woller and Woodworth (2001) highlight the importance of stable growth, low inflation, and fiscal discipline for effective financial intermediation. Hartarska (2005) found that regulated MFIs tend to have lower ROA and do not necessarily achieve broader outreach.

Cull et al. (2009a; 2011) identified a negative relationship between supervisory (regulatory) variables and the Financial Self-Sufficiency (FSS) ratio. Their findings show that regular supervision is positively associated with average loan size but negatively associated with lending to women. In the microfinance context, this implies that supervised MFIs may emphasize "depth of outreach" serving

fewer but relatively better-off or larger-loan clients rather than "breadth of outreach," which refers to reaching a larger number of poorer or more marginalized borrowers. Cull et al. (2011) further note that profit-oriented MFIs tend to comply with supervisory requirements by reducing services to costlier-to-serve populations, potentially limiting their inclusiveness.

Furthermore, Cull et al. (2009b) found that onsite supervision is positively associated with the average loan size per borrower, while higher capital–asset and labour–asset ratios tend to reduce MFI profitability. In this context, these ratios refer to MFI-level indicators, not borrower-level characteristics. The **capital–asset ratio** measures the proportion of an institution's assets financed through equity rather than debt, while the **labour–asset ratio** reflects the intensity of staffing requirements relative to total assets. These ratios are relevant because they capture aspects of institutional structure and cost-efficiency. A higher capital–asset ratio may indicate conservative financing and lower leverage, which can limit an MFI's ability to scale its loan portfolio. Similarly, a higher labour–asset ratio usually reflects higher operational and administrative costs, important in microfinance, which is inherently labour-intensive due to small loan sizes and frequent interactions with clients. The negative association with profitability suggests that MFIs with more costly organizational structures face tighter margins and reduced financial performance. Cull et al. (2011) extended this analysis and reported that regulated and non-regulated MFIs exhibit broadly similar levels of profitability, despite the higher regulatory compliance costs borne by regulated MFIs. They also observed that regulation can have a positive effect on MFI outreach, indicating that regulatory frameworks may strengthen institutional performance in terms of client coverage.

Mersland and Strøm (2009) report comparable performance outcomes between non-profit and shareholder-owned MFIs, suggesting that ownership type alone does not determine institutional efficiency. Crabb (2008) finds that heavy government intervention tends to reduce the Operational Self-Sufficiency (OSS) of MFIs, and that well-developed institutional environments characterized by robust legal systems, strict regulatory procedures, and formal administrative requirements, can increase operational expenses, thereby negatively affecting MFI performance. The Centre for the Study of Financial Innovation (CSFI, 2009) emphasizes that regulation, management quality, and good governance are key drivers of MFI growth, while investors often view inappropriate or poorly designed regulatory frameworks as major risk factors. Vanroose and D'Espallier (2009) show that MFIs tend to perform better, and serve more active borrowers with larger loan portfolios, in countries with less developed formal financial sectors. Their findings further indicate that inflation undermines both profitability and outreach, whereas lower interest rates have a positive effect on both dimensions.

Studies in the Indian context discuss the regulatory framework of microfinance industries in India (M-CRIL, 2005; Sa-Dhan, 2006; Sane and Thomas, 2012; 2013; Shankar and Asher, 2010; Tripathi and Radcliffe, 2006). RBI's Malegam committee recommended a regulatory framework for Indian microfinance sector, with an interest rate ceiling with a margin cap of 10% to make interest reasonable and affordable for the borrowers, and emphasized the need for transparency and disclosure norms (RBI, 2011; 2022).

The above studies and reports have proposed various regulatory frameworks but have not provided rigorous empirical evidence on the relationship between regulatory status and the performance of MFIs in the Indian context. However, Muneer Babu (2013) offers important insights by demonstrating that regulatory status enhances the number of active borrowers in India. His findings also show that regulation reduces the average loan size, which is consistent with our current results. At the same time, he reports that regulatory status lowers the OSS of MFIs. This decline in OSS was largely due to the relatively **small operational scale of Indian MFIs**, which made the **per-unit cost of regulatory compliance disproportionately high.**

Our research overlaps with studies of Cull et al. (2009a; 2011), Hartarska and Nadolnyak (2007), and Mersland and Strom (2009). This study adds to the existing literature by empirically examining how RBI regulatory frameworks impact the performance of MFIs in India. While previous research has extensively explored the theoretical aspects and implications of regulation, there is a notable lack of empirical evidence on how these regulations affect the outreach capabilities, operational efficiency, and financial stability of MFIs.

This empirical study aims to reveal whether the current regulatory practices have effectively improved the sector's stability and inclusivity, or inadvertently hindered growth and innovation. It will also provide a deeper understanding of the regulatory environment's role in balancing financial inclusion with ethical and sustainable lending practices in the Indian microfinance sector.

4. Methodology

4.1 Data Source

This study utilizes an unbalanced panel data set comprising 183 Microfinance Institutions (MFIs) from 2004-05 to 2019-20. The data was obtained from MIX Market (2024), along with reports from credit rating agencies such as CRISIL and M-CRIL, as well as the websites of various Indian MFIs. These MFIs operate across various states in India and hold a substantial share of the Indian microfinance industry. Although the primary criticism against MIX Market data is that it is self-reported and may be biased, it remains a major source of MFI data globally and has been widely used in previous research (Ahlin and Lin, 2006; Ahlin et al., 2011; Crabb, 2008; Cull et al., 2007; Cull et al., 2009a; 2009b;2011; Hartarska and Nadolnyak, 2007; Mersland and Strom, 2009).

4.2 Models

Given the limitations of static panel data models, this study employs the Generalized Method of Moments (GMM) technique for several reasons. Firstly, the model includes lagged dependent variables, making the GMM technique suitable for handling such dynamics. Secondly, unobserved factors such as a manager’s ability and willingness to work for an MFI are likely to be correlated with explanatory variables like regulatory status, indicating the presence of endogeneity. Thirdly, the panel dataset has a short time dimension and a large cross-section dimension. Fourthly, the model accounts

for fixed individual effects. Lastly, the detection of heteroscedasticity and auto-correlation necessitates a robust estimation method.

The GMM method overcomes the methodological difficulties associated with static panel data models by providing consistent, unbiased, and efficient estimators under these conditions. This approach enables a more accurate analysis of the impact of regulation on the performance of MFIs in India. We also did a robustness check by estimating static panel data methods, such as Fixed Effect Model (FEM) and Random Effect Model (REM). Our results confirm that these models are not appropriate, as they provide biased and inconsistent results (see Appendix A3).

4.3 The GMM Estimation Procedure

We find GMM estimator $\hat{\beta}$ by using a weighting matrix (W_N) to find efficient estimators by minimizing the objective function.

$$Q_N(\beta) = [\frac{1}{N}\sum_{i=1}^{N} Z_i(y_i - X_i'\beta)]' W_N [\frac{1}{N}\sum_{i=1}^{N} Z_i(y_i - X_i'\beta)]. \qquad (3)$$

where, Z_i is the matrix of instruments, X_i is the explanatory variables, and y_i is the response variable.

4.4 Variables Used in the Study

The primary aim of our paper is to empirically verify the impact of regulation on the performance of MFIs in India. Additionally, we incorporate firm and macro-level variables that influence MFI performance. The variable of interest is the regulatory status, represented by a categorical variable. Table 1 provides the details of variables used in this study, and Table 2 shows the summary statistics pertaining to the explanatory variables.

Table 1: Variables Employed in the Study

Variable	Definition
	Dependent variable
OSS	$OSS = \frac{\text{Operational Revenue}}{(\text{Financial Expense} + \text{Loan Loss Provision Expense} + \text{Operational Expense})}$
Log Number of Active Borrowers (NAB)	This measures logarithm of breadth of outreach (total number of borrowers who have currently drawn loans).
Log Average Loan Size	This measures depth of outreach (logarithm of loan amount per borrower)
	Variable of interest
Regulatory Status	Measured by a dummy variable, taking a value of 1 if the MFI is regulated by the RBI or by any cooperative banking act, and otherwise 0.
	Firm level Covariates
Log Assets	This includes logarithm of all financial assets and non-financial assets of the MFI.

Log Capital	This includes logarithm of funds provided by owners, retained earnings and reserves of the MFI.
Log Labor	This is the logarithm of the number of staff in the MFI.
PAR	This measures the amount of loan on default for at least 30 days.
Log Age	This is logarithm of total number of years of operation of the MFI.
Macroeconomic variables	
Growth Rate of GDP	Rate of growth of GDP in India
Inflation	This measures level of Inflation in the economy, measured by WPI.
Log PCI	This is measured by the logarithm of per capita GDP(at 2004-05 price level).

Table 2: Summary Descriptive Statistics of Explanatory Variables

Variable	Observations	Mean/Percent	Std. Dev.	Min	Max
Variable of interest					
Regulation	1327	60.28%	0.489	0	1
Firm level Covariates					
Log Assets	1328	15.79	2.26	4.77	22.81
Log Capital	1288	13.98	2.51	1.38	21.20
Log Labour	1227	5.34	1.67	0.69	10.03
PAR	1089	5.34%	28.23	0	71.14
Log Age	1330	2.38	0.658	1	3.78
Macroeconomic variables					
Growth Rate of GDP	N.A*	6.76	1.53	3.08	8.49
Inflation	N.A	6.97	2.76	3.32	11.98
Log PCI	N.A	1415+	397.41	624.10	2050.16

Source: Our calculation from Mix Market data (2024)

* N.A- Not Applicable. + Calculated in US dollar.

5. Results and Discussion

The analysis was conducted using three empirical models.

- In OSS Model I (see Table 3), we examine the ability of MFI to cover its expenses from its revenue, which is a measure of financial performance of an MFI.
- In NAB Model II (see Table 4) and Loan Size Model III (see Table 5), we assess the ability of MFI to reach number of borrowers and depth of reaching them, which are the social performance of an MFI.

The instruments used in this study are valid (as shown by the Sargan Test, in Table A1) and we also confirmed the first-order autocorrelation in the first differenced errors, which follows our theoretical expectations.

5.1 The OSS (Model I)

Table 3 shows the regulatory status positively impacts the OSS of the Indian MFIs. This finding contrasts with earlier studies of Hartarska (2005), Hartarska and Nadolnyak (2007), and Cull et al. (2009a; 2011). While regulated MFIs bear compliance costs, such as hiring skilled labour for maintaining accounts, audits, and reports, the regulation provides benefits, which exceed the compliance costs, as regulation helps MFIs to mobilize funds from markets, gain investor's confidence, and enhance their scale of operation and revenue. Regulation provides consumer protection and fraud prevention, which can enhance operational sustainability. This contrasts with arguments that the cost of compliance may outweigh regulatory benefits (Cull et al., 2009a; 2011). Indirect benefits of regulation include ensuring the safety, financial liquidity, and soundness of MFIs (Hartarska and Nadolnyak, 2007).

We found a positive relationship between assets of an MFI and OSS, as large firms explore economies of scale, reducing average operational costs and increase OSS. Additionally, larger MFIs have market power, competitive advantages, higher number of borrowers, and they can mobilize capital at lower costs, all of which positively influence their OSS. Sufficient capital to support assets also improves operational sustainability by enhancing investor confidence. However, a high portfolio at risk (PAR) adversely affects OSS by reducing operational revenue.

We found older MFIs have lower OSS, indicating that as MFIs mature, operational costs likely increase, reducing OSS. We also found that economic growth positively influences OSS, as found by Ahlin and Lin (2006), Henley (2005), and Cull et al. (2009a). There is no reverse causality, as MFIs are too small to influence economic growth in Indian economy. However, finance does affect economic growth, a prominent argument for mainstream financial institutions (Levine, 2005).

Higher rate of inflation reduces the sustainability of Indian MFIs, our result is similar to Ahlin and Lin (2006), Hartarska (2005), and Cull et al. (2009a). Inflation increases the cost of funds to MFIs, since banks are likely to charge higher interest rates during inflationary periods, and thereby negatively affecting the OSS of MFIs in India. Indian MFIs are heavily depend on loans from Indian commercial banks. During inflationary periods, poor borrowers face tighter budget constraints, leading to higher default risks for MFIs, which may reduce the scale of their operations and generate lower revenues.

Higher per capita income can lower the OSS of Indian MFIs, as increased economic activity of people can reduce OSS, since higher incomes may lead poor borrowers to borrow less. Our finding indicates that the negative influence of rising incomes on borrowing outweighs the positive effect of increased economic activity on OSS in the Indian context.

Our robustness check of the result by estimating static panel data methods, such as FEM and REM have been provided in Appendix Table A3, that shows the FE model could not be used in the study, as regulatory status is time-invariant, thus REM estimators provide biased and inconsistent results, due to the correlation between explanatory variables like regulatory status and unobserved factors such as a managerial skills and willingness to work in the regulated MFI indicating the presence of endogeneity, which is also confirmed by Cull et al. (2009a; 2011).

Table 3: OSS Model of Indian MFIs

	Two-Step Difference GMM		Two-Step System GMM	
Variables	Coefficient and Std. Error	Coefficient with WC Robust Std. Error	Coefficient and Std. Error	Coefficient with WC Robust Std. Error
Regulation	5.58*** (1.042)	5.58(6.609)	5.947***(0.739)	5.95 (9.840)
Lagged OSS	0.22*** (0.005)	0.22***(0.063)	0.263***(0.004)	0.26***(0.093)
Log Assets	5.97***(0.213)	5.97 (3.870)	3.385***(0.212)	3.39 (3.932)
Log Capital	6.42***(0.184)	6.42***(2.290)	6.489***(0.140)	6.49***(2.568)
Log Labour	3.03***(0.248)	3.03 (4.613)	-2.70***(0.292)	-2.70 (4.963)
Portfolio at Risk	-0.02***(0.003)	-0.02(0.020)	-0.04***(0.003)	-0.04 (0.034)
Log Age	-14.32***(0.964)	-14.32**(7.286)	8.26***(0.530)	8.68 (12.362)
Growth Rate (GDP)	0.49***(0.052)	0.49 (0.580)	0.87***(0.028)	0.66 (0.547)
Inflation	-1.03***(0.037)	-1.03*(0.570)	-0.89***(0.015)	-0.89 (0.570)
Log PCI	-0.03***(0.001)	-0.03**(0.014)	-0.03***(0.001)	-0.03 (0.020)
Constant	-30.59***(2.736)	-30.59 (36.356)	-3.08*** (2.842)	-23.08 (33.711)
Observation = 693 and 917. Number of Groups = 152 and 167.				
Wald chi^2 (10)= 286631.4*** and 57.02***			Wald chi^2 (10)=1210000*** and 50.47***	
No. of Instruments =115 and 129				

Source: Our estimation, using Mix market Data (2024).

*,**, and*** shows significance level at 10%, 5% and 1% level.

Note: Standard error (SE) has been provided in parenthesis.

5.2 The NAB (Model II)

Table 4 shows that previous year active borrowers support the MFI to raise the number of clients in the present year, as they inform the potential borrowers in their neighbourhood regarding provision of loan from the MFI. An important finding of our study is the regulation of an MFI raise number of active borrowers in the MFI, as non-prudential norms ensure protection of consumer's interests and thereby helps to gain customers' 'trust', which enhances the number of active borrowers in MFIs in India.

We obtained sign of coefficient similar to the result of Hartarska and Nadolnyak (2007), whose result is however statistically insignificant. The study found a negative effect of the age of an MFI on its breadth of outreach. Our result shows that higher amount of assets, capital, and higher number of staff of MFIs helps them to reach more borrowers. This supports the fact that more staff are essential for mobilizing lending groups and reaching borrowers.

The growth rate of GDP in the Indian economy positively influences the breadth of outreach of MFIs. An increase in per capita income can also increase the number of active borrowers, indicating higher credit requirements among borrowers. Conversely, a higher inflation reduces the number of active borrowers of Indian MFIs.

Table 4: Number of Active Borrowers Model of Indian MFIs

	Two-Step Difference GMM		Two-Step System GMM	
Variable	Coefficient and Std. Error	Coefficient with WC Robust Std. Error	Coefficient and Std. Error	Coefficient with WC Robust Std. Error
Lagged NAB	0.08***(0.002)	0.08 (0.063)	0.09***(0.002)	0.09 (0.063)
Regulation	0.07***(0.028)	0.07 (0.087)	0.20***(0.025)	0.20 (0.137)
Log Age	-0.07**(0.029)	-0.06 (0.131)	-0.01 (0.013)	-0.01 (0.129)
Log Assets	0.47***(0.006)	0.47***(0.082)	0.45***(0.003)	0.45***(0.083)
Log Capital	0.01***(0.002)	0.01 (0.029)	-0.02***(0.002)	-0.02 (0.030)
Log Labour	0.58***(0.009)	0.58***(0.172)	0.59***0.004	0.59***(0.150)
Portfolio at Risk	0.001 (0.0003)	0.001(0.0002)	0.001***(0.000)	0.001(0.000)
Growth Rate(GDP)	0.02***(0.001)	0.02***(0.007)	0.03***(0.001)	0.03***(0.007)
Inflation	-0.01***(0.001)	-0.01(0.008)	-0.01***(0.001)	-0.01 (0.009)
Log PCI	0.001*** (0.0002)	0.001***(0.000)	0.001***(0.000)	0.001***(0.000)
Constant	-0.15 (0.101)	-0.15 (0.788)	0.03 (0.056)	0.03 (0.755)
	Wald chi^2 (10) 268990*** and 1218.46***		Wald chi^2 (10) 1080000***and 1305.71***	

Source: Our estimation, using Mix market Data (2024).

*,**, and*** shows significance level at 10%, 5% and 1% level.
Note: Standard error (SE) has been provided in the parenthesis.

5.3 The Loan Size (Model III)

Table 5 provides the results of the loan size model, indicating that borrowers with a higher loan amount in the previous year tend to borrow a higher amount of loan in the present year. The average loan size per borrower is higher in the regulated MFIs compared to unregulated MFIs. This suggests that despite the constraints imposed by regulators to reduce credit risk, regulated MFIs still manage to offer larger loans.

This finding aligns with Cull et al. (2009a), who found a positive association between regulation and average loan size per borrower, although Cull's study found this relationship to be statistically insignificant. Similarly, Mersland and Strom (2009) found a statistically insignificant positive relationship between regulation and average loan size per borrower.

The positive impact of regulation on the performance of MFIs is further underscored by the influence of MFI assets on providing higher amounts of average loans per borrower. Our findings are consistent with Mersland and Strom (2009), showing a positive correlation between assets and average loan size per borrower. However, the study also reveals that higher MFI labour and capital are associated with lower average loan sizes per borrower. This suggests that while larger and better-capitalized MFIs can offer more significant loans, the efficiency of loan disbursement may decrease with increased labour and capital costs.

Moreover, our study indicates a negative relationship between economic growth and average loan size per borrower, as well as between inflation rates and average loan sizes. An increase in per capita

income also appears to reduce the average loan size per borrower. These findings highlight the complex interplay between macroeconomic factors and MFI performance, suggesting that while economic growth and rising incomes can lead to increased borrowing capacity, they may also reduce the average loan sizes as borrowers transition to more substantial, formal financial services.

Table 5 : Loan Size Model of Indian MFIs

	Two-Step Difference GMM		Two-Step System GMM	
Variables	Coefficient and Std. Error	Coefficient with WC Robust Std. Error	Coefficient and Std. Error	Coefficient with WC Robust Std. Error
Lagged Loan Size	0.42***(0.002)	0.42***(0.103)	0.85***(0.004)	0.85***(0.052)
Regulation	12.36***(2.136)	12.36(14.011)	20.52***(1.217)	20.52 (29.127)
Log Assets	42.83***(0.437)	42.83***(6.654)	34.23***(0.509)	34.23***(8.769)
Log Capital	-4.52***(0.683)	-4.52(4.259)	-5.61***(0.641)	-5.61(5.309)
Log Labour	-47.01***(0.883)	-47.01***(17.742)	-41.89***(0.751)	-41.89***(16.111)
Log Age	3.32 (4.215)	3.32(20.365)	36.65***(2.095)	36.65 (27.856)
Portfolio at Risk	-0.01 (0.003)	-0.01(0.050)	0.05***(0.002)	0.05 (0.041)
Growth Rate(GDP)	-0.62***(0.136)	-0.62(1.614)	2.13***(0.087)	2.13 (1.552)
Inflation	-3.09***(0.101)	-3.09***(1.129)	-0.65***(0.087)	-0.65 (1.831)
Log PCI	0.06***(0.003)	0.06***(0.026)	0.01***(0.002)	0.01 (0.019)
Constant	-339.49***(7.393)	-339.48***(63.908)	-319.95***(5.988)	-319.95***(79.767)
	Wald chi^2 (10)= 753228.03*** and 214.33***		Wald chi^2 (10)=1900000*** and 790.32***	
	No. of Instruments= 115 and 129			

Source: Our estimation, using Mix market Data (2024).

*,**, and*** shows significance level at 10%, 5% and 1% level.

Note: Standard error (SE) has been provided in the parenthesis.

6. Conclusion

This study investigates the impact of Reserve Bank of India (RBI) regulations on the performance of Microfinance Institutions (MFIs) in India. The establishment of the Non-Banking Financial Company-Microfinance Institution (NBFC-MFI) category in 2011 marked a pivotal shift aimed at mitigating issues such as aggressive lending and borrower exploitation. These regulations were designed to ensure affordable rate of interest, prevent multiple lending, enhance borrower protection, and ensure institutional transparency.

Our analysis addresses the dynamic panel data characteristics and endogeneity issues. Findings from three empirical models—Operational Self-Sufficiency (OSS), Number of Active Borrowers (NAB), and Average Loan Size per Borrower—reveal the multifaceted effects of RBI regulations on MFI performance. The results show that regulatory status positively impacts OSS, with larger MFIs benefiting from economies of scale and market power, although high portfolio at risk (PAR) and

inflation negatively affect OSS. Additionally, regulations enhance the breadth of outreach by increasing the NAB, demonstrating the trust gained through enhanced consumer protection.

The study underscores the dual objectives of RBI regulations: promoting financial access for the underserved while maintaining ethical and financial stability within the microfinance sector. The positive impact of regulations on OSS and NAB highlights the crucial role of regulatory frameworks in improving MFI performance, as it helps them to increase their revenue, to gain customer trust and thereby increase number of active borrowers. Furthermore, regulation reduced average loan size of the MFI, which ensure reduction of PAR and also reduces multiple lending, which was the main reasons of the microfinance crisis in 2010.

Our study recommends a balanced regulatory approach for Indian MFIs that ensures consumer protection and ethical business practices without imposing excessive compliance costs detrimental to operational sustainability. Essential non-prudential norms, such as transparent disclosure of product features and financial service terms, are critical to empower financially literate choices among predominantly financially illiterate MFI customers.

Concurrently, regulatory frameworks like minimum capital requirements and capital adequacy ratios are pivotal to safeguard investor interests amid inherent MFI risks, though they should not stifle innovation or operational flexibility. Delegating risk assessment to experienced funders like major commercial banks, given their substantial role in MFI funding, could enhance risk management and operational efficiency. Facilitating asset mobilization, aligned with MFIs' social mission of financial inclusion, remains imperative, particularly in light of recent RBI restrictions on savings mobilization by MFIs. Ensuring stable macroeconomic conditions further supports MFI performance, underscoring the regulator's role in fostering an enabling environment while balancing the regulatory burden to sustain the industry's growth and integrity.

References

Ahlin, C., & Lin, J. (2006). Luck or skill? MFI performance in macroeconomic context. *BREAD [Bureau for Research and Economic Analysis of Development]* working paper, 132.

Ahlin, C., & Jiang, N. (2008). Can micro-credit bring development? *Journal of Development Economics, 86*(1), 1-21.

Ahlin, C., Lin, J., & Maio, M. (2011). Where does microfinance flourish? Microfinance institution performance in macroeconomic context. *Journal of Development Economics*, *95*(2), pp.105-120.

Anderson, T. W., & Hsiao, C. (1981). Estimation of dynamic models with error components. *Journal of the American Statistical Association*, *76*(375), pp. 598-606.

Arellano, M., & Bond, S. (1991). Some tests of specification for panel data: Monte Carlo evidence and an application to employment equations. *The Review of Economic Studies*, *58*(2), pp. 277-297.

Arellano, M., & Bover, O. (1995). Another look at the instrumental variable estimation of error-components models. *Journal of Econometrics*, *68*(1), pp. 29-51.

Armendariz, B., & Morduch, J. (2004). Microfinance: Where do we stand? In Goodhart, C. (Ed.), Financial development and economic growth: Explaining the links. Basingstoke, Hampshire, UK: Palgrave Macmillan.

Armendariz, B., & Morduch, J. (2010). *The economics of microfinance.* Cambridge, MA: MIT Press.

Armendariz, B., & Labie., M. (2011). *The handbook of microfinance.* Chennai: World Scientific.

Baldwin, R., & Cave. M. (1999). *Understanding regulation: theory, strategy and practice*. Oxford: Oxford University Press.

Baum, C. F. (2006). *An introduction to modern econometrics using Stata*. Texas: Stata Corp.

Berenbach, S., & Churchill, C. (1997). *Regulation and supervision of microfinance institutions: Experiences from Latin America Asia and Africa.* Occasional paper 1. The microfinance network. Washington D.C: USAID.

Blundell, R., & Bond, S. (1998). Initial conditions and moment restrictions in dynamic panel data models. *Journal of Econometrics, 87*(1), pp. 115-143.

Chaves, R. A., & Gonzalez-Vega, C. (1992). Principles of Regulation and Prudential Supervision: Should They Be Different for Microenterprise Finance Organizations. *Economics and sociology occasional paper*, (1979). Ohio: Ohio State University.

Christen, R. P., Lyman, T. R., & Rosenberg, R. (2003). *Guiding principles for regulation and supervision of Microfinance*. Washington D.C: CGAP/ World Bank Group.

Cull, R., Demirgu¨c¸-Kunt, A., & Morduch, J. (2007). Financial performance and outreach: a global analysis of leading microbanks. *Economic Journal*, vol. 117, pp. F107-F133.

Cull, R., Demirgüç-Kunt, A., & Morduch, J. (2009a). Does regulatory supervision curtail microfinance profitability and outreach? *World Bank Policy Research* working paper series 4948. Washington, D.C: World Bank.

Cull, R., Demirgüç-Kunt, A., & Morduch, J. (2009b). Microfinance meets the market. *The Journal of Economic Perspectives*, *23*(1), pp. 167-192.

Cull, R., Demirgüç-Kunt, A., & Morduch, J. (2011). Does regulatory supervision curtail microfinance profitability and outreach?. *World development*, *39*(6), 949-965.

Crabb, P. (2008). Economic freedom and the success of microfinance institutions. *Journal of Developmental Entrepreneurship*, *13*(02), pp. 205-219.

CSFI. (2009). *Microfinance banana skins 2009 confronting crisis and challenges*. New York: Centre for Studies of Financial Innovation.

Davis, K., & Harper, I., (Eds.). (1991). *Risk management in financial institutions*. Melbourne: Allen and Unwin.

Diamond, D. W., & Dybvig, P. H. (1983). Bank runs, deposit insurance, and liquidity. *The Journal of Political Economy*, *91*(3), pp. 401-419.

Green, W.H. (2003). *Econometric analysis*. 5th ed. New Jersey: Prentice Hall.

Hardy D., Holden P., & Prokopenko, V. (2003). Microfinance institutions and public policy. *Policy Reform 6*(3), pp. 47-158.

Harlow, C., & Rawlings, R. (1997). *Law and administration*. UK: Cambridge University Press.

Hartarska, V. (2005). Governance and performance of microfinance institutions in central and eastern Europe and the newly independent states. *World Development, 33*(10), pp. 1627-1643.

Hartarska, V., & Nadolnyak, D. (2007). Do regulated microfinance institutions achieve better sustainability and outreach? Cross-country evidence. *Applied Economics*, *39*(10), pp. 1207-1222.

Heffernan, S. (1996). *Modern banking in theory and practice*. England: John Wiley.

Henley, D. (2005). *Learning from the future: Lessons from contemporary microfinance for the interpretation of Indonesian past*. Conference paper, National University of Singapore.

Hudon, M., & Sandberg, J. (2013). The ethical crisis in microfinance: Issues, findings, and implications. *Business Ethics Quarterly*, *23*(4), 561-589.

Lauer K., and Staschen, S.(2013). Regulation in Ledgerwood, J., Earne, J., & Nelson, C. (Eds.). (2013). *The new microfinance handbook: A financial market system perspective*. World Bank Publications.

Ledgerwood J., & White, V. (2006). *Transforming microfinance institutions: Providing full financial services to the poor*. Washington. D.C: World Bank.

Levine, R. (2005). Finance and growth: theory and evidence (pp. 865-934). In Aghion, P., & Durlauf, S. N. (Eds.). (2005). *Handbook of Economic Growth, Volume 1B*. Elsevier.

Llewellyn, D. (1986). *Regulation and supervision of financial institutions*. London. The Institute of Bankers.

Mader, P. (2013). Rise and fall of microfinance in India: The Andhra Pradesh crisis in perspective. *Strategic Change*, *22*(1–2), 47–66.

Malegam, Y. H. (2011). *Report of the sub-committee of the central board of directors of Reserve Bank of India to study issues and concerns in the MFI sector.* Reserve Bank of India.

M-CRIL. (2005). *A study of the regulatory environment and its implications for choice of legal form by microfinance institutions in India*. New Delhi: Micro-Credit Ratings International Ltd.

Mersland, R., & Strøm, R. Ø. (2009). Performance and governance in microfinance institutions. *Journal of Banking and Finance* (33), pp. 662-669.

Mix Market. (2024). *Data accessed from microfinance information exchange for microfinance industry.* Data accessed on 20 March 2011 & 14 March 2024.www.mixmarket.org/mfi/country/india.

Moloney, N. (2010). Financial Services and Markets. In Baldwin, R, Cave Martin and Lodge Martin (Ed.), *The Oxford Handbook of Regulation* (pp. 437-461). New York: Oxford University Press.

Muneer Babu M. (2013). *An empirical study of regulation and performance of microfinance institutions in India.* Unpublished Ph.D. *thesis* submitted at Indian Institute of Technology (IIT) Kanpur.

Nickel, S. (1981). Biases in dynamic models with fixed effects. *Econometrica*, 49, pp. 1417–26.

Olsen, T. D. (2017). Political stakeholder theory: The state, legitimacy, and the ethics of microfinance in emerging economies. *Business Ethics Quarterly*, *27*(1), 71-98.

NABARD. (2023). *Status of Microfinance in India 2022–23.* National Bank for Agriculture and Rural Development.

PwC, (2019). Vision of microfinance in India. PWC and SIDBI, New Delhi, India.

De Quidt, J., Fetzer, T., & Ghatak, M. (2012). Microfinance, market structure, and borrower welfare: Regulatory lessons from the Indian crisis. *LSE Paper*.

RBI. (2011). Report of the sub-committee of the central board of directors of Reserve Bank of India to study issues and concerns in the MFI sector, Mumbai.

RBI. (2022). Regulatory framework for microfinance loans (RBI/2021-22/112). Master Directions, Mumbai.

Rosengard, J.K. (2011). Oversight is a many splendored thing: choice and proportionality in regulating and supervising microfinance institutions. In Armendariz, B., & Marc Labie (Ed.), *The Handbook of Microfinance* (pp. 159-171). Chennai: World Scientific.

Rozas, D., Mourji, F., Morvant-Roux, S., D'espallier, B., Moisseron, J. Y., Roesch, M., ... & Javoy, E. (2015). *The Crises of Microcredit*. Zed Books Ltd..

Sa-Dhan. (2016). Quarterly Financial Reports, April-June, October-December, New Delhi: Sa-Dhan.

Sa-Dhan. (2006). *Existing legal and regulatory framework for the microfinance institutions in India: Challenges and implications*. New Delhi: Sa-Dhan.

Sane, R., & Thomas, S. (2012). *What should regulation do in the field of micro-finance?* working paper, wp.2012-012. Mumbai: Indira Gandhi Institute of Development Research.

Sane, R., & Thomas, S. (2013). Regulating microfinance institutions, *Economic and Political Weekly*, Vol. 48. No.5, pp. 59-67.

Shankar, S., & Asher, M. (2010). *Regulating microfinance: A suggested framework. Economic and Political Weekly*, *45*(1).

Sriram, M. S. (2022). *Microfinance in India: Regulation, growth, and transformation.* IIM Bangalore Working Paper Series.

Tripathi, R., & Radcliffe, D. (2006). *Sharpening the debate: Assessing the key constraints in Indian micro-credit regulation.* Chennai: Centre for Micro Finance (CMF).

Vanroose, A., & D'Espallier, B. (2009). *Microfinance and financial sector development*, working paper no. 09/040. Brussels School of Economics and Management. Belgium: Emile Bernheim Center Research Institute in Management Sciences.

Windmeijer, F. (2005). A finite sample correction for the variance of linear efficient two-step GMM estimators. *Journal of Econometrics 126*, pp. 25–51.

Woller, G. M., & Woodworth, W. (2001). Microcredit as a grassroots policy. *Policy Studies Journal*, *29*(2), pp. 267-282.

Appendix

Table A1 : Sargan Test

Models	Test	Two-Step Difference GMM	Two-Step System-GMM
OSS Model	Chi^2	104.730	121.589
NAB Model	Chi^2	111.188	118.42
Average Loan Size Model	Chi^2	105.99	124.42

Source: Calculated by using Mix Market Data, 2024.

Table A2 : Auto Correlation Test

Models	Test (z)	Two-Step Difference GMM	Two-Step System-GMM
OSS Model	First order	-2.109**	-2.142**
	Second order	0.351	0.409
NAB Model	First order	-2.257**	-2.071**
	Second order	0.1901	0.076
Average Loan Size Model	First order	-3.384***	-3.306***
	Second order	0.591	0.337

Source: Calculated by using Mix Market Data, 2024.

*,**, and*** shows significance level at 10%, 5% and 1% level.

Table A3: Robustness Check of the Result (Fixed Effect Model, Random Effect Model and Hausman Test)

	Fixed Effect Model			Random Effect Model		
Variables	Coefficient and Standard Error			Coefficient and Standard Error		
	OSS Model	NAB Model	Loan size Model	OSS Model	NAB Model	Loan size Model
Regulatory Status				-6.961 (3.135)	0.052 (0.062)	-11.493 (14.757)
Log Assets	3.830 (1.659)	0.586 (0.024)	17.876 (4.691)	3.480 (1.360)	0.567 (0.023)	23.998 (4.666)
Log Capital	5.628 (1.152)	0.001 (0.017)	-2.01 (3.244)	4.585 (0.954)	-0.021(0.016)	0.784 (3.300)
Log Labour	-0.751 (1.817)	0.439 (0.027)	-8.255 (5.106)	-2.533 (1.407)	0.481 (0.024)	-18.004 (5.042)
Portfolio at Risk	-0.080 (0.028)	0.001 (0.001)	-0.109 (0.080)	-0.093 (0.026)	0.000 (0.000)	-0.091 (0.082)
Log Age	3.261 (4.456)	0.136 (0.066)	-4.654 (12.596)	4.557 (2.211)	0.050 (0.043)	1.339 (10.374)
Growth Rate(GDP)	0.182 (0.491)	0.0190 (0.007)	-3.551 (1.401)	0.176 (0.455)	0.0187 (0.007)	-3.696 (1.432)
Rate of Inflation	-0.510 (0.336)	0.003 (0.005)	-2.864 (0.947)	-0.192 (0.297)	0.003 (0.004)	-2.936 (0.958)
Log PCI	-0.017 (0.005)	-0.001 (0.001)	0.090 (0.015)	-0.009 (0.003)	-0.001 (0.001)	0.074 (0.013)
Constant	-2.062 (16.04)	-1.069 (0.241)	-101.99 (45.356)	14.293 (12.938)	-0.717 (0.224)	-161.666 (45.669)
OSS FE Model Sigma u= 39.00, Sigma-e= 23.12 and rho = 0.739. OSS RE Model Sigma u=17.39, Sigma-e=21.61 and rho = 0.393		NAB FE Model: Sigma u= 0.55, Sigma-e= 0.35 and rho = 0.715. NAB RE Model Sigma u=0.42, Sigma-e= 0.35 and rho = 0.597		Loan Size FE Model Sigma u= 158.37, Sigma-e= 65.85 and rho = 0.852. Loan Size RE Model Sigma u= 133.62, Sigma-e= 65.96 and rho = 0.804		
OSS Model: F (8850) =15.34. NAB Model: F (8870) =811.94. Average Loan Size Model F (8870) =37.30				OSS Model: Wald chi^2= (9) =139.96. NAB Model: Wald chi^2= (9) =8112.21. Average Loan Size Model Wald chi^2= (9) = 300.22.		
Hausman Test of OSS Model: Chi^2 (8)=20.48, *P= 0.0087.* Hausman Test of NAB Model: Chi^2 (8)=7.27, *P=0.508.* Hausman Test of Average Loan Size Model: Chi^2 (8) = 53.01, *P=0.000.*						

Source: Our estimation, using Mix market Data (2024).

*,**, and*** shows significance level at 10%, 5% and 1% level. Note: Standard error (SE) has been provided in parenthesis.

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IPPR

Commentary – Earth Credits: a science-based framework for sustainable planetary policy beyond carbon

Pawan K Dhar[*#]

Abstract

Humanity's global footprint now far exceeds Earth's capacity to renew resources and absorb waste. Recent studies show that several ecological thresholds have been surpassed, some of which experts have deemed critical. Six of the nine safe planetary boundaries, as specified in Steffen et al (2015), have already been breached, leading to unprecedented biodiversity collapse, resource depletion, and increased climate risk. Staying within a "safe operating space" is crucial to prevent an irreversible environmental change (Rockström et al 2009). In practice, however, many large-scale developmental activities go unchecked, while ignoring the enormous stresses on water, soils, nutrients, and species. To address this urgent unmet need, we propose an Earth Credits Framework (ECF): a unified accounting system that quantifies a project's total planetary consumption, integrates the existing carbon credit system, and establishes a limit on the number of Earth Credits that can be justifiably allocated within the nine planetary boundaries. With sufficient data and accepted standards, ECF can offer governments, funders, and agencies a reliable compass for investing in truly sustainable outcomes.

Keywords: Earth Credits Framework; Carbon; Planetary Consumption; Planetary Boundaries; Climate Risk

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1. Planetary Overshoot

Earth system indicators paint a stark picture: climate change, biodiversity loss, land degradation, and water stress are well known (Shemer et al., 2023). Initially introduced by Rockström et al. (2009) and most recently refined by Richardson et al. (2023), the Planetary Boundaries framework defines a quantifiable "safe operating space" for humanity by identifying nine critical Earth-system processes that govern planetary stability: climate change, biosphere integrity, land-system change, freshwater change, biogeochemical flows, novel entities, ocean acidification, atmospheric aerosol loading, and stratospheric ozone depletion. The framework asserts that maintaining human activity within these limits is essential to preserve the Holocene-like conditions under which modern civilization evolved, while exceeding them risks triggering non-linear, potentially irreversible tipping points in the Earth system. Studies indicate that six of nine planetary boundaries (including biodiversity, land, and biogeochemical flows) have already been breached (Richardson et al 2023).

Trends suggest that biodiversity loss will worsen over time (Eastwood et al., 2022). Based on a global assessment of 29,400 terrestrial vertebrate species, Gerardo Ceballos and colleagues (2020) identified 515 species – approximately 1.7% of all evaluated vertebrates – as being on the brink of extinction. Alarmingly, nearly 94% of the populations of 77 critically endangered mammal and bird species have been lost over the past century. Predictions point to a disastrous outcome from the unabated extinction of species unless remedial measures are put in place immediately.

Data suggest that over 4.0 billion people (two-thirds of humanity) experience water scarcity for at least 1 month per year, and 0.5 billion people suffer year-round. Intensifying droughts already threaten global food production and health. Intensive agriculture and deforestation have degraded land, eroding soil fertility, disrupting water cycles, and impacting food systems (Timmis & Ramos 2021).

2. The Earth Credits Concept

The Earth Credits Framework (ECF) extends the accepted format of carbon credits into a more comprehensive planetary ledger. Instead of counting only tonnes of CO_2, ECF aggregates a project's impacts on all major dimensions of the Earth system.

Just as a financial credit score reflects risk based on our economic behaviour, the Earth Credit Score (ECS) would reflect the health and resilience of our planet. The nine planetary boundaries would serve as its core benchmarks. Every time we cross one, the score falls—signalling that humanity is building an unsustainable ecological debt and pushing the Earth closer to systemic environmental failure.

If adopted, each proposal or policy would be assigned an Earth Credit Score (ECS) – a composite metric reflecting resource depletion, emissions, waste generation, and ecological damage relative to

scientifically-grounded thresholds. A low ECS means a project operates primarily within Earth's regenerative capacity; a high ECS flags excessive impact.

ECS will be calibrated by normalizing a project's total biophysical impacts against Earth's scientifically defined regenerative limits, weighting them by systemic ecological risk, and integrating them across space and time.

It is essential to set planetary boundaries that account for physical flows in measurable units. Calibration of each parameter would require absolute reference limits that map to the safe operating envelope defining biophysical limits within which humanity can safely operate without destabilizing Earth's life-support systems.

The ECS must be scale-independent (i.e., local, national, regional, or global levels) and universally comparable. Weights will be assigned based on irreversibility, tipping risk (i.e., irreversible collapse of the system), time to recovery, cross-boundary additive effects, and so on. A low ECS would be planetary-compliant, and a high ECS would trigger an ecological risk signal.

ECS must be time-normalized (i.e., real planetary change, not short-term fluctuations), consider natural resource vulnerabilities (robust vs. fragile ecosystems), and remain anchored in ground-level data.

The ECF framework is actionable, as it integrates existing accounting tools into a unified platform, leaving room for further innovation and aligning with planetary thresholds to support more effective decision-making.

In this model, every project would undergo a life cycle analysis (LCA) not only for carbon but also for water use, land use, and materials. Established standards, including the IPCC carbon budgets for greenhouse gases, the IUCN Red List/HCV approach for biodiversity, the Water Footprint Network methodology for water use, and global material flow analysis for resource inputs and waste, would form the basis of the ECS calculator. A brief explanation of these standards is below.

The advantage of these standards is that they are based on a strong scientific foundation, as these collectively define the validated biophysical limits of the Earth system and enable ECS to operate as a globally interoperable, regulatory-grade planetary accounting instrument. These particular standards are chosen because, together, they form the most authoritative, scientifically validated, and globally interoperable measurement system for the Earth's life-support processes. Each one anchors a key planetary dimension of the Earth Credit Score (ECS) in hard biophysical science, rather than market-driven or voluntary metrics.

The IPCC carbon budgets are globally accepted, rooted in climate physics, earth system modeling, and observational data, and align with international climate law and policy. Without IPCC budgets, ECS would lack a credible planetary reference for climate impact. The IPCC does not govern biodiversity loss, material throughput, chemical pollution, planetary limits beyond carbon, and accounting systems required for sustainable Earth-system governance.

The International Union for Conservation of Nature (IUCN) Red List and High Conservation Value (HCV) framework provide the most comprehensive global system for quantifying biodiversity risk, ecosystem fragility, and extinction probability. The IUCN/HCV is a globally harmonized system that links species survival, habitat integrity, and ecosystem services.

Likewise, the Water Footprint Network (WFN) provides a spatially explicit, hydrologically grounded accounting of water use, making ECS hydrologically sensitive rather than just volumetric. Water scarcity is local and basin-specific, not global. This methodology will allow ECS to integrate regional ecological vulnerability into its scoring.

The Material Flow Analysis (MFA) is a comprehensive framework that captures mineral depletion, biomass harvest, construction materials, industrial waste, and tailings i.e., unwanted products generated after mining and mineral processing. The MFA is indispensable, as carbon and water alone do not capture: rare-earth depletion, structural material lock-in, circularity failures. This integration makes ECS multidimensional (not carbon-myopic), threshold-based, real-world, and globally interoperable (comparable across nations and sectors).

These metrics will then be compared against planetary "budgets" or safe limits. For instance, an ECS would penalize deforestation or nitrogen pollution in proportion to how far these pressures exceed sustainable thresholds. By contrast, activities that restore ecosystems (such as reforestation and regenerative agriculture) or utilize waste streams (circular materials) would earn positive credit or lower scores.

Planetary budget benchmarking under the Earth Credit Score will be subject to continuous global and regional recalibration to reflect evolving Earth system science, dynamic ecological risk, and location-specific carrying capacities. The ECS must operate at both international and region-specific scales. This is essential for scientific accuracy, regulatory fairness, and ecological relevance in the real world.

Planetary budgets and safe limits are not static numbers. They evolve as Earth system science improves and as environmental conditions change over time. Without recalibration, ECS would quickly become scientifically obsolete and regulatorily unreliable.

If a planetary boundary is exceeded (e.g., nitrogen loading or forest loss), the remaining safe operating space will obviously contract. ECS must therefore tighten thresholds over time, and increase penalty intensity for high-impact activities.

Positive Earth Credit Score weights shall be assigned based on verified ecological gain, benefit permanence, regional vulnerability, and systemic repair value. They shall be periodically recalibrated in line with evolving Earth system science.

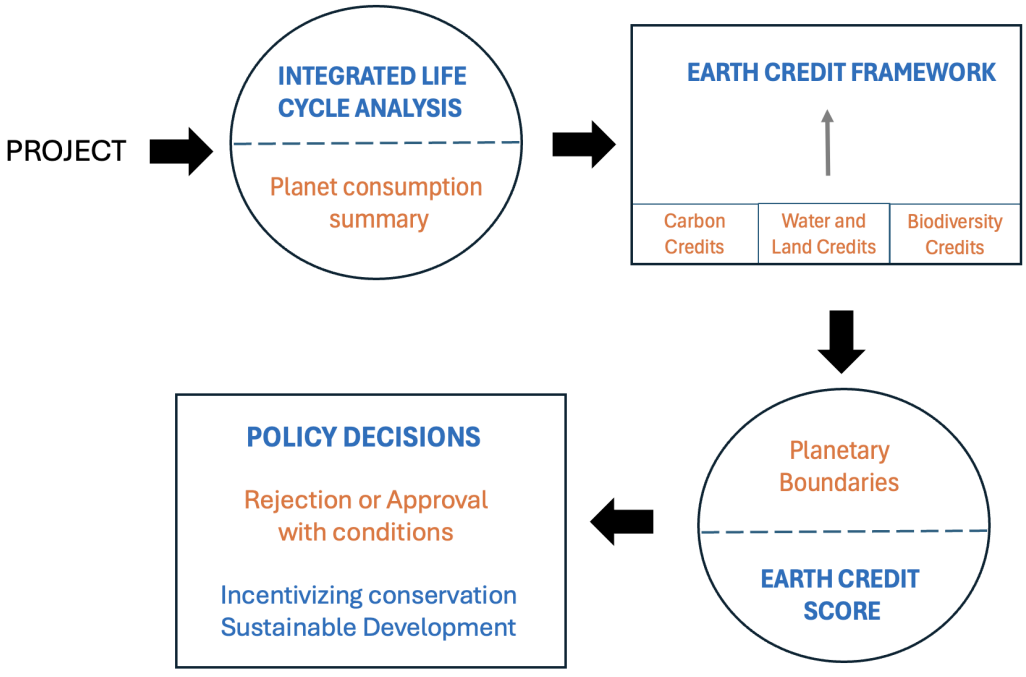
Based on such data, funders will evaluate whether the anticipated benefits sufficiently outweigh the costs to warrant investment in each project. This approach is not academic but pragmatic: it stitches together tools already used by experts. The added value is systematizing them in funding

decisions. Every grant or infrastructure loan could require an Environmental and Social (E&S) evaluation, making environmental trade-offs explicit upfront.

The intent is not to propose direct financial incentives or subsidies; instead, frame environmental and social (E&S) evaluation as a mandatory screening criterion for funding decisions. Funders will be incentivized to incorporate these assessments because they reduce risk, protect capital, and align with ESG and regulatory requirements. Compliance could become a mandatory condition for grants, loans, or other development financing, ensuring that projects meet sustainability thresholds before funding is disbursed.

While such E&S evaluations could initially be implemented at the national level through domestic regulations and funding protocols, full effectiveness for cross-border projects would require international coordination. Enforcement would rely on conditionality in financing, whereby funding is contingent on compliance, and monitoring could be achieved through third-party verification, audits, and remote sensing, similar to mechanisms used in climate finance and multilateral development programs.

Figure 1: Overview of the Earth Credits Framework



Project impacts on carbon, biodiversity, water, land, and waste are quantified (via LCA, footprint models, and IUCN indicators) and aggregated into an Earth Credit Score. Scores are benchmarked against science-based sustainability thresholds (the planetary boundaries) to guide policy and funding decisions.

Several features distinguish the Earth Credits approach from piecemeal approaches:

- Unlike carbon offsets, Earth Credits track biodiversity loss, soil degradation, water depletion, pollution, and resource use in a **multi-dimensional and unified** way. For example, a mining project's ECS would reflect not only its emissions but also habitat destruction, water withdrawal, tailings waste, and chemical runoff.
- The ECS scores will be calibrated to **science-driven thresholds** aligning with global standards. ECS calibration should integrate global scientific thresholds for planetary consistency and local ecological limits, to ensure scores are both internationally comparable and locally meaningful. Global norms provide absolute planetary ceilings, while local norms provide contextual calibration. For climate, IPCC carbon budgets apply; for biodiversity, limits might derive from "safe operating space" values (e.g., the percentage of species loss); for nutrients, the planetary boundaries or Earth system limits (van Vuuren et al 2025).
- Projects that restore nature earn credit and lead to **regeneration incentives**. For instance, a wetland restoration could yield "negative ECS" by sequestering carbon, filtering water, and providing habitat, effectively offsetting high-impact activities elsewhere.
- Earth Credits would estimate how long ecosystems need to recover from project impacts i.e., **regeneration time**. Projects with rapid reclamation or recyclability get better scores. For example, an innovation that utilizes reclaimed materials and on-site remediation would score much more favourably than one that causes long-term ecosystem destruction.

Several key aspects of the ECF framework need to be mentioned here.

- A development project meeting climate goals might still score high (bad) if it wrecks forests or pollutes rivers.
- Development in biodiversity hotspots (e.g., tropical forests) in return for project funding would secure endangered species and lower the ECS.
- Local scarcity indicators would weight a manufacturing industry's water withdrawals. Activities that convert rainforests or farmlands incur extra credit penalties.
- Life-cycle material use and waste flows (via material flow analysis) would be accounted for and embedded in policy decisions. Conceptually, the ECF translates every activity into "hectares of Earth used per year" or similar lingua franca, making trade-offs transparent.

A case in point is the Belo Monte Hydroelectric Dam in Brazil that illustrates the Earth Credit Score (ECS) framework, where significant local ecological impacts outweigh climate-positive outcomes. Despite low lifecycle greenhouse gas emissions, the project's deforestation of ~4,000 hectares and disruption of endangered species habitats would drive a high ECS, further compounded by regionally weighted water and material use. This example demonstrates that ECS can capture the

interplay of global and local thresholds, life-cycle flows, and ecological sensitivity, providing a transparent, integrated metric for evaluating environmental trade-offs.

3. Policy Pathways: From Theory to Action

- Governments would require an ECS assessment for all significant spending. For instance, infrastructure projects (such as roads, dams, and factories) would need to meet an ECS threshold. Those failing would be shelved or redesigned.
- National development banks and ministries could set sectoral ECS targets.
- Private organizations should not be allowed to set Earth Credit Score (ECS) baselines, as doing so could introduce conflicts of interest, bias the evaluation in favor of commercial priorities, and undermine the scientific integrity of the metric.
- Establishing baselines must remain a function of independent, impartial, and science-driven institutions to ensure that ECS reflects genuine planetary limits rather than short-term economic interests.
- An aggregated national "Earth Credits account" could complement GDP in budget planning, tracking how economic growth affects the nation's natural capital.
- Projects that involve field studies, labs, or new products would submit an Earth Credit Impact Statement, analogous to ethical or safety reviews. For example, a biomedical research institute building a new lab would estimate resource use, waste, and habitat disturbance. Funding would favour "green labs" with minimal water and energy waste.
- Over time, Earth Credits could become a discipline – scientists specializing in carbon, water, and biodiversity accounting would produce standardized ECS databases and tools.
- For development agencies and investors, multilateral lenders (such as the World Bank, the Asian Development Bank, and the Green Climate Fund), ECF would enable them to quantify the global footprint.
- Global Donor agencies could integrate ECS into their grant evaluation, aligning foreign aid with planetary sustainability. Private investors could use ECS as an ESG metric; impact investors would screen portfolios for low ECF scores.

4. Data-Driven Support

- Data from IUCN Red List, GBIF species records, and remote sensing can quantify project impacts (Ceballos et al. 2020)
- Global hydrology models yield precise water-stress indices by region and season (Wada et al., 2011). These feed directly into ECS water-use scoring.

- Studies have attempted to quantify safe nitrogen/phosphorus cycles as planetary boundaries (Steffen et al 2015). Soil carbon mapping (E.g., SoilGrids) and land degradation assessments (IPCC report 2023) enable ECS to capture the impacts on soil health.
- The IPCC and EM-DAT databases provide damage functions that link ecosystem loss to climate resilience and disaster risk, which can be internalized in scores.
- Over time, machine-readable databases (such as remote sensing of land change and biodiversity monitoring networks) could automate much of the ECS calculation, just as carbon life-cycle tools are now widely used. Open-source software frameworks for integrated environmental accounting already exist; ECF would extend and unify them.

5. Conclusion

Every innovation extracts a cost from the planet – a ledger of that cost is no longer abstract – it is ecological, measurable. Clearly, we cannot continue to consume the Earth forever! The moment has arrived for a new planetary metric that goes beyond carbon alone, building on its success while accounting for the full spectrum of material, ecological, and biophysical limits. In an age when resources are stretched thin, ecosystems are collapsing, and the climate crisis grows more urgent by the day, one question looms large: How much more can the planet give before it gives out entirely?

Our Earth is finite, but human desires are infinite. Earth Credits bring a fresh perspective and introduce a framework of planetary responsibility that calls for global deliberations, growth calibrations, and consumption standards. By anchoring development in real biophysical data, dynamic life-cycle assessments, and inclusive projections, the Earth Credit System offers a practical architecture for sustainable development. To meet the United Nations Sustainable Development Goals, the need of the hour is to operationalize planetary boundaries into everyday decision-making. The future of growth must be measured not by expansion alone, but by regeneration and conscious consumption.

References

Ceballos G, PR Ehrlich, PH Raven. Vertebrates on the brink as indicators of biological annihilation and the sixth mass extinction. PNAS USA 2020: 117, 13596-602

Eastwood N, WA Stubbings, MAA-E Abdallah et al. The Time Machine framework: monitoring and prediction of biodiversity loss. Trends Ecology Evol 2022: 37, 138-146.

IPCC, 2023: Climate Change 2023: Synthesis Report. Contribution of Working Groups I, II and III to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change [Core Writing Team, H. Lee and J. Romero (eds.)]. IPCC, Geneva, Switzerland, pp. 35-115

Richardson, K. et al. Earth beyond six of nine planetary boundaries. Science Advances 2023: 9, 37, eadh2458.

Rockström J, W Steffen, K Noone et al. A safe operating space for humanity. Nature, 2009: 461, 472–475.

Shemer H, Wald S, Semiat R. Challenges and Solutions for Global Water Scarcity. Membranes (Basel). 2023 :13, 612.

Steffen W, Richardson K, Rockström J et al. Sustainability. Planetary boundaries: guiding human development on a changing planet. Science. 2015: 347, 1259855

Timmis K, Ramos JL.The soil crisis: the need to treat as a global health problem and the pivotal role of microbes in prophylaxis and therapy. Microb Biotechnol. 2021: 14, 769-797

Van Vuuren DP, JC Doelman, IS tagomori et al. Exploring pathways for world development within planetary boundaries. Nature 2025: 641, 910-916.

Wada, Y., van Beek, L. P. H., and Bierkens, M. F. P. Modelling global water stress of the recent past: on the relative importance of trends in water demand and climate variability, Hydrol. Earth Syst. Sci., 2011: 15, 3785–3808

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On China's Engineering Mindset

Book review of *Breakneck : China's Quest to Engineer the Future* by Dan Wang

Shobhankita Reddy*

12 December 2025

There has been a lot of talk in US domestic politics lately about the need to reshore manufacturing capacity - Trump's tariffs and trade wars are but a symptom of this. After three decades of American companies outsourcing the mass production of low-quality goods and its adverse environmental impacts to China, there is an increasing realisation among the US strategic community that this may have hollowed out the US's manufacturing base, while helping nurture that of its adversary.

China is no longer the producer of cheap, copycat products it once was; in fact, it has risen up the value chain and emerged as a technological powerhouse. The past decade has also seen an aggressive, irredentist international posturing from a rising China, threatening the US's position, and furthering insecurities that – if ever there was a protracted military confrontation between the two nations, either directly or over Taiwan – China's dense factory networks, talent pool, and technological capabilities, alongside the State's ability to mobilise vast amounts of institutional resources, would not bode well for US national interests, given a weakened US defence-industrial base, (Jones, 2023).

Dan Wang's Breakneck voices these anxieties, and makes the case for American society to look inward. "The United States has become distinctly unambitious", he writes, pointing to the US's inability to produce at scale, evidenced for instance in an undersupply of public housing, delayed infrastructure projects, and outdated power grids. And yet, he asserts that "no two peoples are more alike than Americans and Chinese". So what explains the two nations' differing abilities to deliver on outcomes?

The big idea in Breakneck is that America is a "lawyerly society" as compared to China's "engineering state". American elites are lawyers (as opposed to China's technocratic leadership), and American society is focused on exquisite processes that obstruct progress. At the same time, China builds big and prioritises outcomes.

However, Wang does not push and test the limits of these labels sufficiently in the book. In fact, the definitions of what constitutes "lawyerly" and "engineering" are not adequately established. Beyond the broad strokes, the book does not examine the American economic developmental path or the multiple causes of its purported deficiencies, shedding light on them only in contrast to the

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Chinese model. The book presents its grand thesis without a rigorous foundation in data or macroeconomic principles.

Ultimately, Wang's success is in his lucid, lived experience of the China model. He intersperses his six years of travel through China's cities and provinces with personal anecdotes, as well as official and unofficial information. By stitching the observed and experienced with the analytical and insightful, and by continuously zooming in and out between the human element, history, and politics of the places he visits, Wang paints a compelling perspective on the Chinese State's strengths, limitations and quirks. And he pulls this off with beautiful writing. There is a rhythm and cadence to his words and carefully crafted sentences. He manages to be interesting without becoming self-indulgent.

Wang's characterisation of China's engineering state is not only its propensity for megaprojects or the number of engineers in the Politburo's standing committee. It's also the State's inclination for social engineering with detrimental effects, as detailed in the chapters on the one-child policy or the zero-COVID policy. These are, by themselves, excellent subjects for discussion; Wang uses them to contend that only an engineering state would treat reproduction as a math problem, something that can be "restricted, directed and controlled", or go to the lengths it did to achieve, literally as the name of the policy states, zero COVID.

Inherent to this view is the State's assumed role of a grand master capable of executing a constructed plan, in which predictable outcomes can be delivered by changing a few input and intermediate variables, and objectives achieved through top-down policy, a vast bureaucracy, and little regard for individual rights.

Wang traces the imaginary lives of two persons – born respectively in 1949 and 1959 China – through key events such as the Cultural Revolution, the rollout of the one-child policy, and the economic reforms. These were all a product of governmental action, and drive home the point that just ten years of change in the birth year would yield vastly different life experiences – an outcome he presents as a classic peculiarity of an engineering state.

Wang does not paint a rosy picture of this state, and is far from being in awe of it. He lays bare, quite bluntly, a stark diagnosis. "The only thing scarier than China's problems are Beijing's solutions", he writes. The vast inefficiencies and waste in public spending, the brutal competition in the private sector, the overcapacity and dumping of Chinese goods in export markets, and the human costs of state policy are all presented, some in greater detail than others.

The lesson in China's breakneck growth, he writes, is that "a country can grow despite institutional weaknesses when it trains engineers". He compares this with the US's "democracy by lawsuit" model. He highlights The Power Broker, a biography of New York urban planner and politician Robert Moses, as an example of political corruption and, eventually, American discomfort with large projects. Briefly, Wang also laments America's hyperfinancialisation for prioritising short-term shareholder gains over long-term national interests.

However, a few questions emerge.

Firstly, is it really an engineering mindset that best encapsulates the Chinese way of getting things done, or could it be explained better by other factors, such as the Chinese State's unchecked concentration of power and the Leninist model of controlling the commanding heights of an economy? Additionally, China's financial repression combined with a supply-side focus, and its political incentive structure with top-down direction and local government action are uniquely potent. Perhaps the latter combination is a better framing, stripped of Wang's penchant for storytelling and big-picture metaphors.

Secondly, as the geopolitical winds have turned and China's reliability as a supplier of choice is reducing, the case for the US to reinvest in baseline industrial capabilities – not just coming up with breakthroughs in technology but also having the process knowledge and networks to scale – is clear. What is not self-evident is whether the US's shift from manufacturing to services is the natural outcome of the country's economic path and developmental stage.

China is bound by its investment-driven model to keep building to spur its GDP, but there is also now an acknowledgement by the Communist Party of China that the model may not be sustainable, and that more efficient investments alongside increasing domestic demand is necessary, even if implementation in the face of ideological opposition is likely to be very difficult (China Briefing, 2025). This is not the same for the US, which does not have much to gain by building bridges that go nowhere and highways to heaven.

Finally, Wang is clear that China would never be able to outcompete the US. Living in China exposed him to the country's self-limiting features, he writes, and these sharply contrast with American values of pluralism and emphasis on individual rights. However, the same institutional strength that the US possesses, the checks and balances the system imposes – which are the reasons for slower decision-making – avert the blunders some Chinese policies have made.

Wang's lessons for China drawn from the US fall back into platitudes, and are likely to fall on deaf ears - "It would be a better future if the Communist Party could learn some restraint and put a higher value on the individual". As for the US, a poignant point Wang makes is that, like China, the US should embrace the label of a "developing" nation instead of the status of a fully-arrived, end state with little scope for physical dynamism or nimbleness to change and reform. While the book makes a persuasive case for the popularly-expressed sentiment that US manufacturing needs to be propped up, it only offers a jibe at lawyers to get out of the way, and no policy recommendations or implementable solutions to do so.

Despite these shortcomings, Breakneck is valuable for its accessible insight into the state of contemporary Chinese society and politics. It is the product of a gifted writer's synthesis of his family history (the last chapter on this was a surprise treat) and personal travels with a broader understanding that echoes recent trends in geopolitics. It is a highly relevant and recommended read for anyone interested in China, its systemic oddities and global competition today.

"Breakneck: China's Quest to Engineer the Future" by Dan Wang, Penguin, 2025, Pages 264.

References

Briefing, China. 2025. “China’s 15th Five-Year Plan Recommendations - Key Takeaways.” China Briefing News. November 26, 2025. https://www.china-briefing.com/news/chinas-15th-five-year-plan-recommendations-key-takeaways-for-foreign-businesses/.

Jones, Seth G. 2023. “The U.S. Industrial Base Is Not Prepared for a Possible Conflict With China.” https://features.csis.org/preparing-the-US-industrial-base-to-deter-conflict-with-China/.

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