# IS INDIA READY TO JAM?


by
**Shamika Ravi**

BROOKINGS INDIA

Impact Series

August 2018

**IMPACT SERIES 082018-3**

Brookings Institution India Center
No. 6, Second Floor,
Dr Jose P Rizal Marg, Chanakyapuri,
New Delhi - 110021
Recommended Citation: Ravi, Shamika (2018). “Is India Ready To JAM?”
Brookings India IMPACT Series No. 082018-3. August 2018.

# IS INDIA READY TO **JAM?***

SHAMIKA RAVI

AUGUST 2018

* *I thank Dhruv Gupta and Sankalp Sharma for excellent research assistance and the participants of Northeast Economic Conclave, NEHU, Shillong for constructive feedback and discussions.*

# 1. INTRODUCTION

The Indian government's JAM trinity comprises three components: Jan Dhan bank account,[1] Aadhaar unique identity number[2] and mobile phone. A combination of these three elements is seen as the pathway to implementing large-scale direct benefit transfers in India. The Jan Dhan Ayojana (Peoples' Wealth Scheme) is a government scheme that aims to expand and make affordable access to financial services such as bank accounts, remittances, credit, insurance and pensions to the poor in India. This has seen a phenomenal uptake within the first few years, with an average of 2 million accounts per week.[3] The Jan Dhan scheme was awarded a Guinness World Record for opening the most bank accounts in a single week (18 million during August 23-29, 2014). The second component is the unique identity number, Aadhaar, which is nearly universal today within the country. In early 2017, the Government of India declared that more than 1.1 billion people have an Aadhaar number, covering more than 99 percent of the Indian adult population. The third component is access to mobile phones, and this has spread across the country, mostly through private licensed operators.

In India, it is not unusual for the rich to receive more welfare money than the poor. As India's Finance Ministry noted in its annual Economic Survey released in January 2017, the problem is "almost intrinsic" to the country's anti-poverty and social programmes. Much of the money is funneled through India's convoluted bureaucracy and ends up "leaking to non-poor and…corrupt local actors." But a new promising idea is catching hold: real time, technology-enabled Direct Benefit Transfers (DBTs). The Economic Survey 2016 reported that introduction of DBT of LPG subsidies in the PAHAL scheme reduced leakages by 24 percent. Increasingly, more subsidy schemes are considering this route. It is therefore, important to take stock of the preparedness for this transition across the country.

To assess the state's capability to implement DBTs, we calculate JAM preparedness indexes using household-level data. We prepare these indexes combining data on whether households have at least one bank account, whether at least one member of the household possesses an Aadhaar identification number, and whether the household owns a mobile phone.

1 *Pradhan Mantri Jan Dhan Yojana. The official website is https://www.pmjdy.gov.in*
2 *Aadhaar is a 12-digit unique identity number that can be obtained by residents of India, based on their biometric and demographic data. The official website is https://www.uidai.gov.in*
3 *Economic Survey 2016*

Overall, the results show a remarkably high level of JAM preparedness within a relatively short period since the government initiated this concept. There is, however, great degree of variation across states and regions of the country. The southern states of India, comprising five states and one union territory, are the best prepared for JAM. The weakest link in JAM preparedness lies in the north-eastern part of India, followed by the eastern region, comprising the largest states of Uttar Pradesh and Bihar. The results also show a significant gap between rural and urban households, where the latter show greater JAM connectivity. This is true for almost all states of the country.

Among the poorly connected states, Chhattisgarh, Odisha and Jharkhand have the weakest mobile connectivity, while Bihar and most states of the northeast have poor bank linkages as fewer households report owning bank accounts. The poorest Aadhaar coverage is in Assam and Meghalaya, where merely two percent and one percent households respectively report having the Aadhaar ID.

# 2. DATA AND BACKGROUND

We have compiled the JAM (Jan Dhan, Aadhaar, Mobile) Index using household-level data from the fourth round of the National Family Health Survey (NFHS-4) conducted by the Government of India (GoI) in 2015-16. The NFHS-4 provides not only detailed sample data on trends in key population, health and nutrition indicators, but data on households within a state that have a mobile phone, bank account, and Aadhaar ID.

Usually, the analysis of coverage for a scheme is done using institutional data rather than household-level data, as was done in the Economic Survey 2016. It is also important to note that there is frequently a significant gap between official data reported by institutions (such as UIDAI, telecom firms or banks) and data based on household surveys. For example, while government (and World Bank) data confirmed 25 percent households in India were covered under some health insurance in 2015, this number was closer to 15 percent based on household surveys (National Sample Survey Office 2014-15). It is not unusual for such a discrepancy to emerge for the same data collected from different sources. It highlights gaps which are genuine, for example, knowledge/information gaps, where households are unaware of coverage, as well as fraudulent ones like misreporting.

For our analysis, we use the NFHS-4, and its sample was designed to provide estimates of all key indicators at the national and state levels, as well as estimates for most key indicators at the district level (for all 640 districts in India, as per 2011 Census). The total sample size of 601,509 households for India was based on the size needed to produce reliable indicator estimates for each district and for urban and rural areas in districts in which the urban population accounted for 30-70 percent of the total district population. The rural sample was selected through a two-stage sample design, with villages as the Primary Sampling Units (PSUs) at the first stage (selected with probability proportional to size), followed by a random selection of 22 households in each PSU at the second stage. In urban areas, there was also a two-stage sample design with Census Enumeration Blocks (CEB) selected at the first stage and a random selection of 22 households in each CEB at the second stage. At the second stage in both urban and rural areas, households were selected after conducting a complete mapping and household listing operation in the selected first-stage units.

For our analysis, we use the following information from the NFHS-4: (1) the percentage of households within a state that have reported owning a mobile phone, (2) the percentage of households within a state that have reported having a bank account, and (3) the percentage of household heads that have an Aadhaar

identification number. As the sample was stratified based on rural and urban households and by states, the estimates that are derived are representative at the state and at the rural and urban levels.

Table 1 shows the disaggregated data for households that are unaware of "bank accounts" and "Aadhaar identification". This is reported across asset quintiles in the population. As would be expected, poorer households are more likely to report being unaware of these public services. In total, 527 heads of households reported being unaware of Aadhaar, and 653 heads of households reported being unaware of possessing a bank account. These are both extremely insignificant share of the overall sample size. All these observations were dropped from the estimate. In terms of geographic spread, Madhya Pradesh, Uttar Pradesh, and Mizoram each account for over 11 percent of 'don't know' Aadhaars, while Madhya Pradesh and Gujarat account for over 11 percent of 'don't know' bank accounts. However, with Mizoram (a relatively small state) having 11,724 observations, the impact of missing 61 values for Aadhaar should be negligible. When splitting for Urban/Rural, the worst case of missing values is Mizoram Urban; however, it is still a mere 0.6 percent of all observations. The estimates are thus judged to be accurate for state-level, and rural/urban derivatives thereof. However, the missing observations are predominantly the poorer population as Table 1 shows.

**Table 1**: Unaware of Bank Accounts and Aadhaar

| | Don't Know Bank Accounts | | Don't Know Aadhaar | |
|---|---|---|---|---|
| | Frequency | Percentage | Frequency | Percentage |
| Poorest | 253 | 38.74 | 135 | 25.62 |
| Poorer | 152 | 23.28 | 112 | 21.25 |
| Middle | 111 | 17 | 100 | 18.98 |
| Richer | 93 | 14.24 | 90 | 17.08 |
| Richest | 44 | 6.74 | 90 | 17.08 |
| Total | 653 | 100 | 527 | 100 |

The non-random poor-skew of 'don't knows' probably indicates that the poorer population is more likely to not have Aadhaar identification numbers or bank accounts. However, the extremely small sample frequency of 'don't knows' limits the bias to the point of negligibility.

# 3. METHODOLOGY

We have used three specific methodologies to compute the JAM index for each state of India as a measure of preparedness for large-scale technology enabled, real time direct cash transfers. Each of the three indexes has a special policy insight for understanding the JAM preparedness of a state.

First, we produced an index which incorporates the Finance Ministry's JAM index that was produced in the Economic Survey 2015-16 which mainstreamed JAM.[4] However, our index is distinct from the Finance Ministry's because we calculate it using household-level data, rather than programme-level administrative data as done by the ministry. Secondly, we also computed the JAM index using O-Ring Theory formulated by Michael Kremer (1993), capturing the weakest link in the JAM process that determines the effective state capacity to roll out subsidies through DBTs. The third JAM index is a "Remainder" index. This is prepared to help states focus on the population which has neither Aadhaar, bank account, nor mobile phones. This index is insightful if a state wants to particularly focus on plugging the specific gaps in the JAM outreach.

(i) The Economic Survey 2016 Index (ES Index): Conceptually, this JAM index assumes that each of the factor components is complementary. As they are not substitutable, the index value is determined by the constraining factor. Mathematically, this model takes the following form:

$$E(y) = \text{Min } \{q_1, q_2, .....q_n\}$$

The factors utilised by the Finance Ministry were administrative data on the following: Aadhaar coverage by state, basic savings accounts by state, and banking correspondent spatial density ratio[5] as a percentage of Kenya's banking correspondent spatial density ratio. The data utilised for the index was from the financial year 2014-15. In comparison, we utilised the estimated percentage of the households that have mobile phones, bank accounts, and estimated percentage of household heads that have Aadhaar cards. It is important to note that we have considered all bank accounts, not merely the Jan Dhan accounts opened by the government. This is because any bank account would serve the required role for depositing DBTs. The latter two are comparable to the Finance Ministry's estimate, but we have replaced the banking correspondents with mobile phones. Utilising this method, the index value for Haryana is computed as such:

4 *https://www.indiabudget.gov.in/es2015-16/echapvol1-03.pdf*

5 *Banking correspondents are individuals tasked by banks to provide banking services without any hard infrastructure. The Finance Ministry considered Kenya's banking correspondent spatial density ratio as the ideal.*

| Component | Explanation | Estimated Value |
|---|---|---|
| $q_1$ | % of households that have an Aadhaar card | 0.9309 |
| $q_2$ | % of households that have a mobile phone | 0.9725 |
| $q_3$ | % of households that have a bank account | 0.9139 |

$$\text{JAM Index}_{HA} = \text{Min } \{0.9309, 0.9725, 0.9139\}$$
$$= 0.9139$$

(ii) O-Ring Theory Index (O-R Index): Next, we used the underlying production function of the O-Ring Theory[6] formulated by Kremer (1993)[7] as a basis for the second JAM Index. The O-Ring model proposes a production function in which production consists of many tasks, all of which must be successfully completed for the product to have full value. It is assumed that it is not possible to substitute several low-skill workers for one high-skill worker, where skill refers to the probability that a worker will successfully complete a task.

Mathematically, the O-Ring model has a specification of the following form:

$$E(y) = k^{\alpha}\left(\prod_{i=1}^{n} q_i\right) Nb$$

Where E(y) is the expected production function, k is units of capital, α is the elasticity of capital substitution, $q_i$ represents the quality or expected percentage of maximum value the product retains if the worker performs the task (for example, a q of 0.95 could refer to a worker who has a 95 percent chance of performing the task perfectly and a five percent chance of performing it so badly that the product is worthless), N is the number of tasks and b represents the output per worker.

We have used the underlying mechanics of the O-Ring production function to design the JAM Index. We assume that the three elements of our index, i.e. bank accounts, mobiles and Aadhaar cards are complementary and hence, we can use a simplified version of the O-Ring production function to create the same.

[6] *Many production processes consist of a series of tasks, mistakes in any of which can dramatically reduce the product's value. The space shuttle Challenger had thousands of components: it exploded because it was launched at a temperature that caused one of those components, the O-Rings, to malfunction.*

[7] *https://www.isid.ac.in/~tridip/Teaching/DevEco/Readings/03Expectations/02Kremer-QJE1993.pdf*

The O-Ring Index is specified as:

$$ORing = \left( \prod_{i=1}^{3} \lambda_i \right)$$

Where $\lambda_1$, $\lambda_2$, $\lambda_3$ represent the value of the respective index components. In general, $\lambda_i$ has been calculated by estimating the percentage of the households that have access/own a specific component. We have compiled the aggregates at the state level, broken down by type of settlement (rural/urban). For example, consider the component values for Haryana:

| Component | Explanation | Estimated Value |
|---|---|---|
| $\lambda_1$ | % of households that have an Aadhaar card | 0.9309 |
| $\lambda_2$ | % of households that have a mobile phone | 0.9725 |
| $\lambda_3$ | % of households that have a bank account | 0.9139 |

Hence, the O-Ring Index for Himachal Pradesh is calculated as:

$$ORing_{HA} = \left( \prod_{i=1}^{3} \lambda_i \right) = (0.9309)(0.9725)(0.9139)$$
$$= 0.8273$$

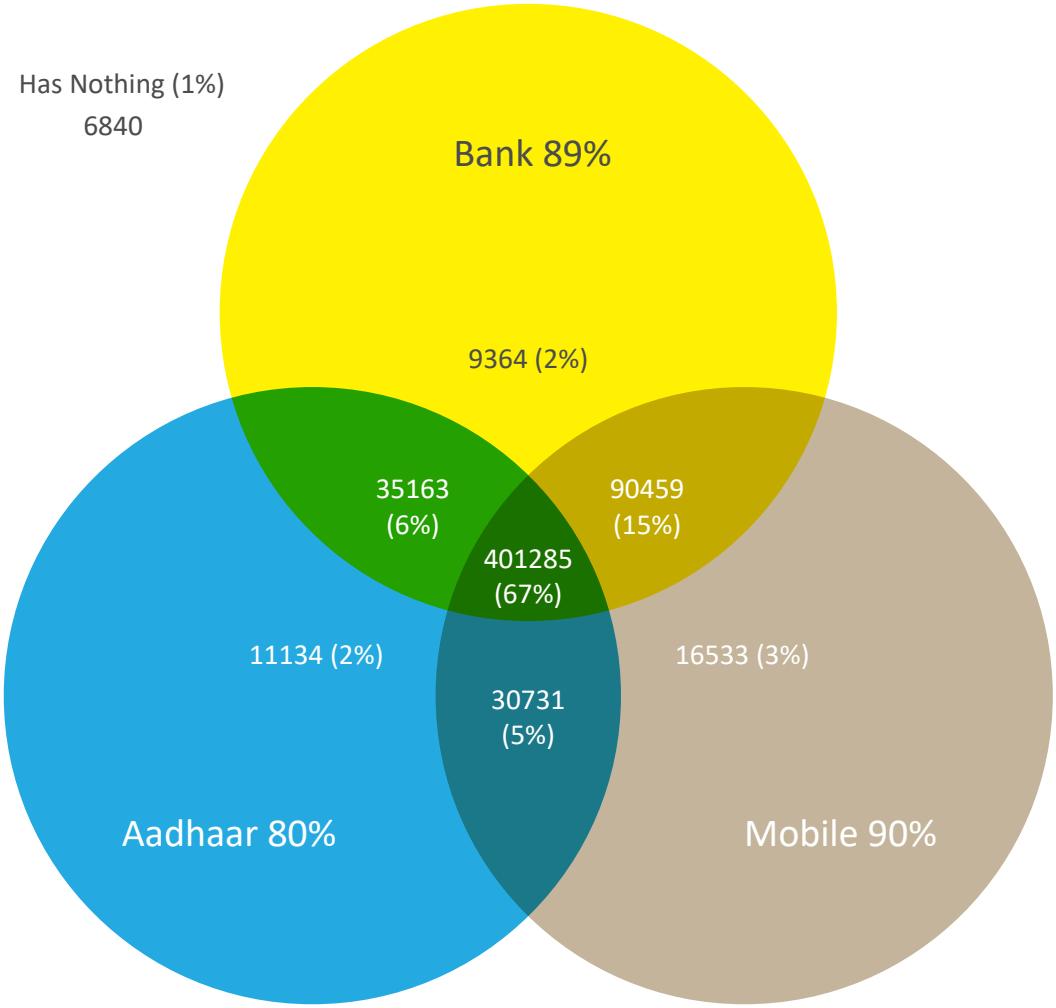
The strength and weakness of this model is the shedding of the assumption of perfect complements while at the same factoring in the constraining factor. The Finance Ministry's model would completely sideline the accomplishments in non-minimum factors, while this model would factor them in.

(iii) Remainder Index (R Index): Lastly, we have compiled a 'Remainder' index for the population that has neither (A) Aadhaar, (B) bank account, or (C) cellphone. Hence, the R Index is specified as:

$$E(y) = 1 - (A \cup B \cup C)$$

Figure 1 shows us how the sample of NFHS-4 interplays within the four defined sets: A, B, C, & R. We essentially estimate the population of 1 - $(A \cup B \cup C)$ as is visible in the all-India Venn diagram.

**Figure 1:** All JAM outreach




As can be seen in Figure 1, 67 percent of the population has all the three factors. This population segment is ready for a DBT programme, if it were implemented today. However, a very significant percentage (26 percent) of the Indian population has only two of the three factors, and a smaller percentage (seven percent) of the population has access to only one of the three components of JAM.

What is most troubling is that one percent of the population lacks access to any of the three components of JAM. And while relatively this looks small, in absolute terms it amounts to millions of people. This is the remainder, the most technologically and financially excluded segment of Indian society. These are, therefore, the households that the government must turn its immediate focus to.

Hence, the R Index for Haryana is calculated as:

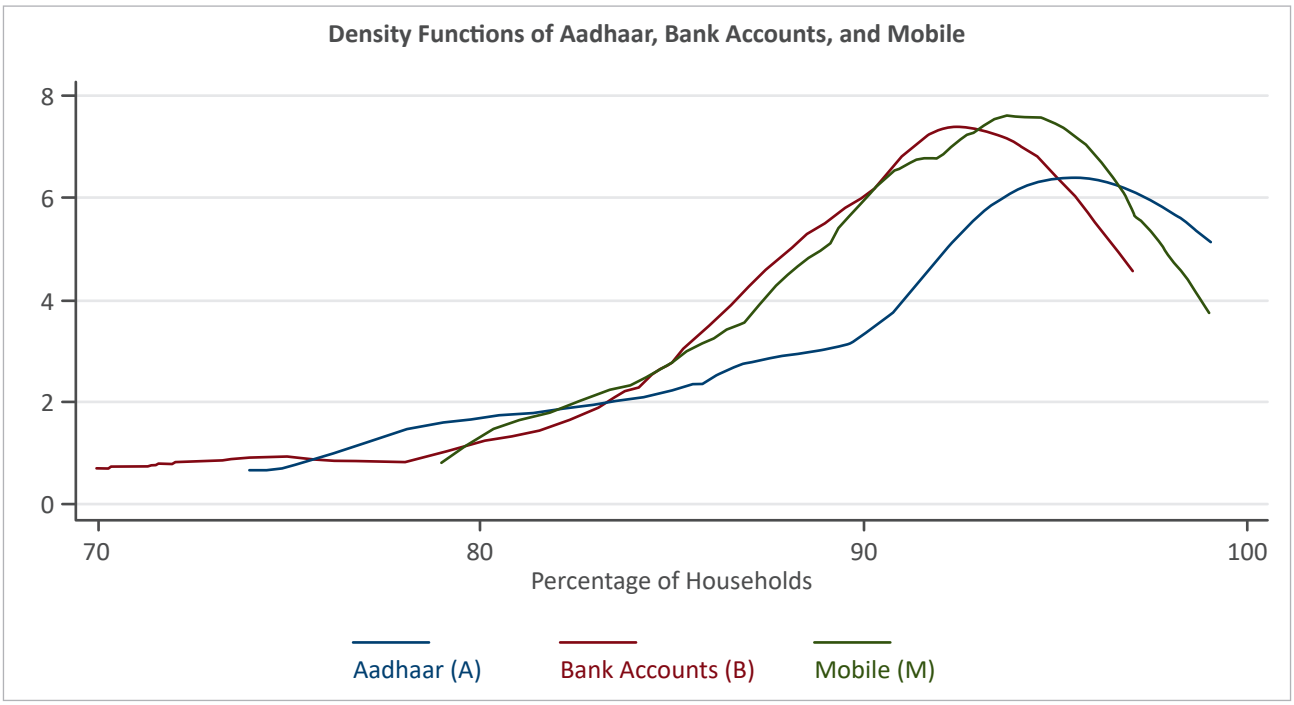
$$R_{HA} = \{1 - (A \cup B \cup C)\} = 100\% - 99.76\%$$
$$=0.24\%$$

Taken together, the three indexes provide an insight into JAM preparedness of each state of India. They emphasise and explain the weakest link, the relative strength of links, and the non-linked population in India.

# 4. RESULTS AND DISCUSSION

Figure 2 outlines the density functions of the distribution of Aadhaar identification, bank accounts and mobile phones across states in India. The x-axis reports the percentage of households owning each of the three components of JAM. On an average, while all three components are highly prevalent among states, Aadhaar has a higher presence, followed by mobile phones, and bank accounts have relatively the lowest coverage of households. Note that all three distributions average higher than 90 percent. The distributions, however, have a long left tail, signifying that there are some states that are lagging in each of the three components, with coverage lower than 80 percent.

**Figure 2:** Distribution of Aadhaar, Bank Accounts and Mobile Phones




The results reported in Table 2 show the indexes for the ES Index and O-R Index. The first observation is that there is great variation in the JAM preparedness across states of India. Across the two indexes, few consistent findings emerge. The southern states of India, comprising five states and one union territory, are the best prepared for JAM. This is true for both measures of preparedness. This is followed by the northern region, comprising six states and two union territories. The weakest link in JAM preparedness lies in the north-eastern part of India, followed by the eastern part, with the largest states of Uttar Pradesh and Bihar.

It is important to remember that the data is self-reported household information, and that is why for each of the three components of JAM, this data lies below the administrative data for outreach used in the Economic Survey. The results show that Himachal Pradesh ranks highest in JAM preparedness in India, with the highest rank in both indexes. It has extremely high penetration of bank accounts, Aadhaar identification and mobile phone access. Other high ranking states are Punjab, Kerala, and Rajasthan.

The states that stand out for poor JAM connectivity are Meghalaya, Mizoram, and Assam from the northeast and Bihar. What is somewhat surprising is that Uttarakhand lags behind Uttar Pradesh, and this is largely due to relatively poorer Aadhaar penetration in the Himalayan state compared to its much larger and poorer neighbour. Among the southern states, Tamil Nadu is the least prepared for JAM with a relatively weak Aadhaar enrolment at 84 percent. This number is likely to have gone up in the last two years since the data for NFHS-4 was collected. These results, however, are still important because they show the relative preparedness of neighbouring states for DBT rollout.

Among the poorly connected states, Chhattisgarh, Odisha, and Jharkhand have the weakest mobile connectivity. Bihar and most states of the northeast have poor bank linkages as fewer households report owning bank accounts. The poorest Aadhaar coverage is in the states of Assam and Meghalaya where merely two percent and one percent households respectively reported owning the ID. These are followed by Bihar and Mizoram where 50 percent households report owning Aadhaar ID. Once again, we would like to reiterate that this is based on household-level data from 2015-16 and these numbers for coverage are likely to have risen since the government has made massive efforts to improve Aadhaar enrolment throughout the country.

**Table 2**: JAM Index for States of India

| Region | State | J | A | M | E-S Index | O-Ring Index |
|---|---|---|---|---|---|---|
| North | Chandigarh | 96% | 98% | 98% | 96% (3) | 91.8% (3) |
| | Haryana | 91% | 93% | 97% | 91% (8) | 82.7% (10) |
| | Himachal Pradesh | 97% | 98% | 97% | 97% (1) | 92.3% (1) |
| | Jammu & Kashmir | 96% | 82% | 97% | 82% (23) | 75.6% (16) |
| | Delhi | 91% | 97% | 99% | 91% (9) | 87.2% (6) |
| | Punjab | 96% | 99% | 98% | 96% (2) | 92.2% (2) |
| | Uttar Pradesh | 94% | 77% | 92% | 77% (26) | 66.6% (23) |
| | Uttarakhand | 93% | 60% | 95% | 60% (30) | 52.8% (29) |
| Central | Chhattisgarh | 93% | 97% | 79% | 79% (25) | 71.4% (22) |
| | Goa | 96% | 93% | 97% | 93% (7) | 87.1% (7) |
| | Madhya Pradesh | 87% | 82% | 84% | 82% (22) | 60.7% (26) |
| | Maharashtra | 89% | 93% | 91% | 89% (14) | 75.7% (15) |
| East | Bihar | 72% | 50% | 90% | 50% (32) | 32.1% (32) |
| | Jharkhand | 90% | 98% | 84% | 84% (20) | 73.6% (20) |
| | Odisha | 88% | 87% | 81% | 81% (24) | 61.8% (25) |
| | West Bengal | 85% | 74% | 87% | 74% (27) | 54.6% (27) |
| Northeast | Arunachal Pradesh | 83% | 89% | 84% | 83% (21) | 62.1% (24) |
| | Assam | 84% | 2% | 87% | 2% (33) | 1.7% (33) |
| | Tripura | 96% | 95% | 89% | 89% (15) | 80.8% (13) |
| | Sikkim | 91% | 96% | 96% | 91% (10) | 83.8% (9) |
| | Manipur | 77% | 60% | 94% | 60% (29) | 43.4% (31) |
| | Meghalaya | 79% | 1% | 89% | 1% (34) | 0.6% (34) |
| | Mizoram | 93% | 50% | 93% | 50% (31) | 43.6% (30) |
| | Nagaland | 70% | 83% | 92% | 70% (28) | 53.6% (28) |
| South | Andhra Pradesh | 94% | 99% | 88% | 88% (16) | 82.6% (11) |
| | Karnataka | 90% | 91% | 92% | 90% (11) | 75.0% (18) |
| | Kerala | 95% | 96% | 97% | 95% (4) | 89.2% (4) |
| | Puducherry | 95% | 98% | 95% | 95% (5) | 88.2% (5) |
| | Tamil Nadu | 92% | 84% | 93% | 84% (19) | 72.0% (21) |
| | Telangana | 92% | 98% | 90% | 90% (12) | 81.5% (12) |
| West | Gujarat | 90% | 90% | 92% | 90% (13) | 74.8% (19) |
| | Rajasthan | 96% | 97% | 94% | 94% (6) | 86.7% (8) |
| | Dadra & Nagar Haveli | 88% | 97% | 92% | 88% (17) | 79.6% (14) |
| | Daman & Diu | 87% | 92% | 94% | 87% (18) | 75.1% (17) |

The next aspect to study is the linkages between these three components of JAM, and the results are shown in Table 3. By government policy, bank accounts are mandatorily linked to Aadhaar numbers, so we find that there is a high degree of correlation between bank accounts and Aadhaar enrolment in our data. However, this is not the case for mobile phones, which have a low correlation with Aadhaar enrolment. This is primarily because there is no mandatory obligation for individuals to link their mobile phone to Aadhaar number. The correlation between mobile phones and bank accounts is relatively higher. This is also a reflection on the growing popularity of mobile banking across the country. All the major commercial banks, regional rural banks and development banks have growing mobile banking business.[8]

**Table 3**: JAM Correlation Matrix

| | Aadhaar | Mobile | Bank |
|---|---|---|---|
| **Aadhaar** | 1 | - | - |
| **Mobile** | 0.181 | 1 | - |
| **Bank** | 0.4752 | 0.3284 | 1 |

Next, we present state heat maps showing levels of JAM preparedness based on our two indexes. Figures 2 and 3 show the ES Index and O-Ring Index respectively. The first thing to note, as with the table, is that the two measures are highly consistent. The darker states have a higher degree of JAM preparedness than the lighter ones. The southern and western Indian states are relatively better prepared with higher connectivity of mobile phones, bank accounts and Aadhaar enrolment. The northern and eastern parts of India have some way to go before large-scale DBTs can be rolled out there. In particular, connectivity has to be improved in the states of Uttarakhand, Bihar, West Bengal, Madhya Pradesh and all the states of the northeast except Tripura and Sikkim.

[8] *https://www.livemint.com/Industry/lSkb5rEURwIPpFfpmNQuKM/Mobilebanking-sees-dramatic-surge-in-India.html*

**Figure 3:** JAM State-Level Heat Maps

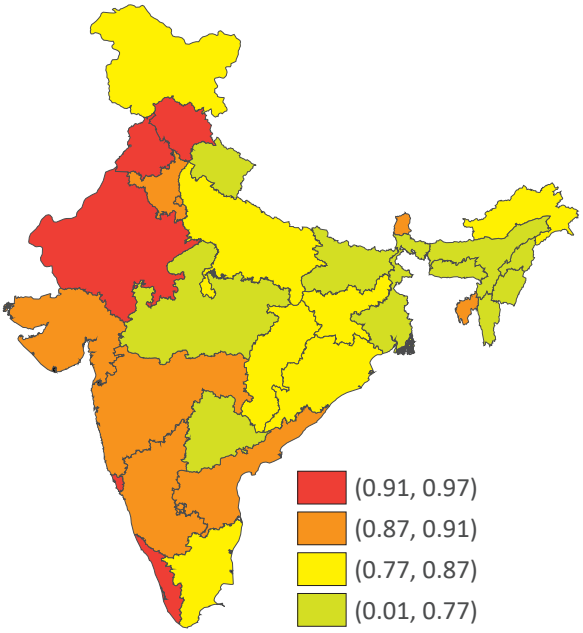
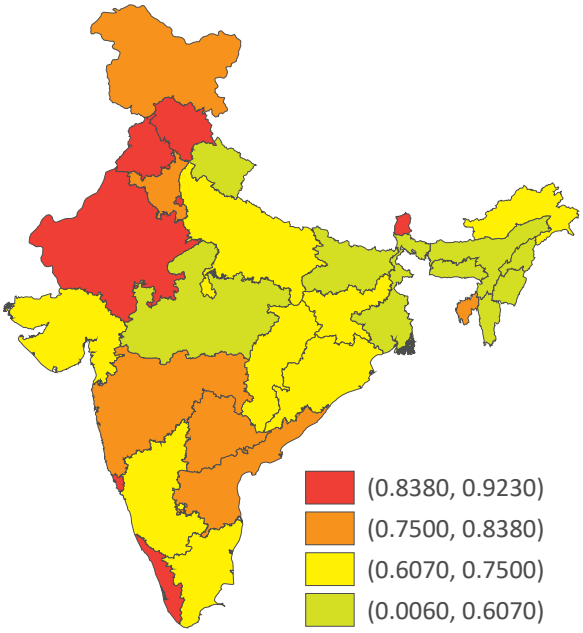



**Figure 4:** O-Ring State-Level Heat Maps




Next, we analyse the data to create a 'Remainder Index' which focuses on the most excluded states of India in terms of the JAM connectivity. This analysis, therefore, highlights the states (and within that, specific districts) which need immediate government focus if India wants to move towards a JAM-driven subsidy architecture. The government's priority must be Assam, Meghalaya, Bihar, Manipur, Mizoram, Arunachal Pradesh, West Bengal, Madhya Pradesh and so on, based on their ranking.

**Table 4**: Remainder Index & Rank Comparisons

| Region | State | Remainder Index | JAM Rank | O-Ring Rank | R Rank |
|---|---|---|---|---|---|
| North | Chandigarh | 0.29% | 3 | 3 | 22 |
| | Haryana | 0.24% | 8 | 10 | 24 |
| | Himachal Pradesh | 0.08% | 1 | 1 | 33 |
| | Jammu & Kashmir | 0.26% | 23 | 16 | 23 |
| | Delhi | 0.13% | 9 | 6 | 31 |
| | Punjab | 0.08% | 2 | 2 | 32 |
| | Uttar Pradesh | 0.75% | 26 | 23 | 13 |
| | Uttarakhand | 0.71% | 30 | 29 | 15 |
| Central | Chhattisgarh | 0.34% | 25 | 22 | 20 |
| | Goa | 0.13% | 7 | 7 | 30 |
| | Madhya Pradesh | 1.56% | 22 | 26 | 8 |
| | Maharashtra | 0.57% | 14 | 15 | 17 |
| East | Bihar | 3.49% | 32 | 32 | 3 |
| | Jharkhand | 0.34% | 20 | 20 | 21 |
| | Odisha | 1.28% | 24 | 25 | 10 |
| | West Bengal | 1.59% | 27 | 27 | 7 |
| Northeast | Arunachal Pradesh | 1.96% | 21 | 24 | 6 |
| | Assam | 5.48% | 33 | 33 | 1 |
| | Tripura | 0.40% | 15 | 13 | 18 |
| | Sikkim | 0.15% | 10 | 9 | 28 |
| | Manipur | 2.16% | 29 | 31 | 4 |
| | Meghalaya | 5.32% | 34 | 34 | 2 |
| | Mizoram | 2.06% | 31 | 30 | 5 |
| | Nagaland | 1.47% | 28 | 28 | 9 |
| South | Andhra Pradesh | 0.14% | 16 | 11 | 29 |
| | Karnataka | 0.58% | 11 | 18 | 16 |
| | Kerala | 0.07% | 4 | 4 | 34 |
| | Puducherry | 0.20% | 5 | 5 | 26 |
| | Tamil Nadu | 0.71% | 19 | 21 | 14 |
| | Telangana | 0.40% | 12 | 12 | 18 |
| West | Gujarat | 0.89% | 13 | 19 | 11 |
| | Rajasthan | 0.18% | 6 | 8 | 27 |
| | Dadra & Nagar Haveli | 0.21% | 17 | 14 | 25 |
| | Daman & Diu | 0.81% | 18 | 17 | 12 |

As a robustness analysis, we calculate the Spearman Rank correlation (Myers, Well 2003) between the three indexes. Table 5 below shows that each of the three indexes that were produced is highly correlated with each other. The high degree of correlation between the JAM and the O-Ring Index is expected as both measure the same phenomenon with the same base data, through different specifications. The high correlation of the Remainder Index with JAM and O-Ring shows that states where a higher proportion of the population is financially included are also states where a lower proportion of the population is financially excluded. However, it is not perfect, as can be seen in the case of Jammu and Kashmir which ranks 23rd in JAM, 16th in O-Ring, and 12th in R. This indicates that although Jammu and Kashmir looks bad in terms of connectivity for a particular category (minimum model), its other factors strengthen its position significantly (as indicated by the O-Ring ranking), and it has relatively few individuals that are completely excluded (indicated by the Remainder Index). Taken together, *the three indexes provide an insight as to the weakest link, the relative strengths of other links, and the non-linked households in the state population.*

**Table 5**: Remainder Index & Rank Comparisons

| | JAM | O Ring | R |
|---|---|---|---|
| **JAM** | 1 | - | - |
| **O Ring** | 0.9624 | 1 | - |
| **R** | 0.8389 | 0.9235 | 1 |

# 5. JAM PREPAREDNESS: URBAN VS RURAL INDIA

There are generally large variations in public goods provision between rural and urban India. So it is important to look at the JAM preparedness for the two distinctly. Figure 4 shows the distribution of the two indexes between rural and urban households across states of India. Figure 4a shows the rural-urban difference in JAM preparedness across India. The top panel shows the distribution for the ES index which shows the minimum binding constraint to JAM across rural and urban households of Indian states. The distributions show that urban India is more prepared for DBTs than rural India. Rural India has a much larger variance across states and almost everywhere, larger fraction of households report lesser connectivity on at least for one of the three components: bank accounts, Aadhaar and mobile phones.

Figure 4b shows the rural-urban distribution for the O-Ring Index. This is the combined relative strengths of each of the three factors (bank accounts, Aadhaar and mobile phones). The distributions reveal that once again, rural households report being under-connected compared to urban households across the country. It is however, important to remember that while the average numbers are high for both rural and urban (above 80 percent households), the distributions remain varied.

**Figure 4a :** JAM preparedness- ES Index: Rural Vs. Urban India

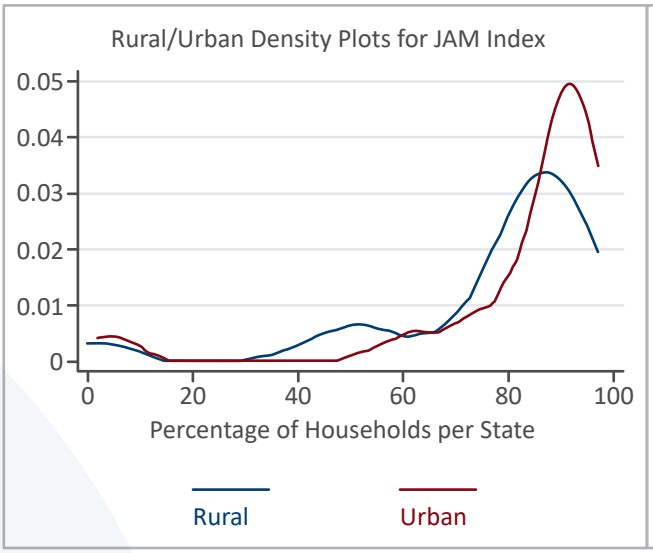
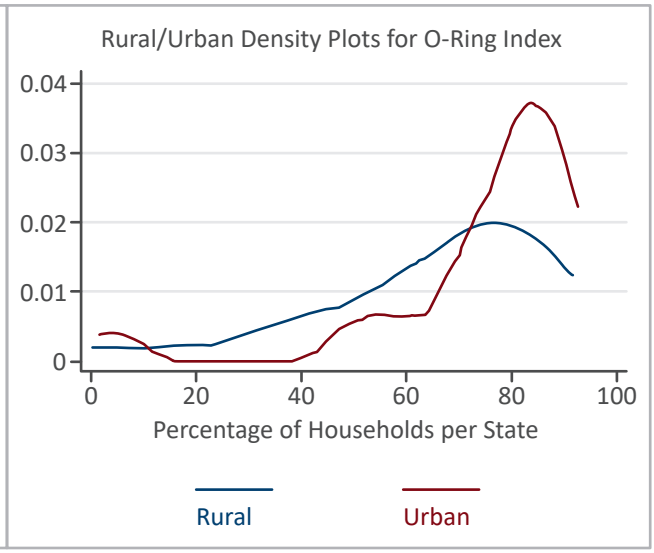



**Figure 4b :** JAM preparedness O-Ring Index: Rural Vs. Urban India



URBAN INDIAN HOUSEHOLDS HAVE A SIGNIFICANTLY HIGHER ACCESS TO BANK ACCOUNTS AND PARTICULARLY TO MOBILE PHONES THAN RURAL INDIAN HOUSEHOLDS.

To gauge which of the three components is driving this rural-urban difference in overall JAM connectivity, we study each of them separately. The results are reported in Figure 5a, 5b & 5c below. The results bring out a stark rural-urban divide in households with bank accounts and possession of mobile phones. *Urban Indian households have a significantly higher access to bank accounts and particularly to mobile phones than rural Indian households. The distribution of Aadhaar looks very similar between rural and urban households.* This is perhaps because 'bank accounts' include all accounts (not just Jan Dhan Accounts opened by government) and mobile phone access has largely been private industry driven. So they tend to concentrate on urban India. Aadhaar, comparatively, is a government initiative, and its administration has deliberately tried to connect all Indian households, rural and urban.

**Figure 5a :** Distribution of household with Bank accounts

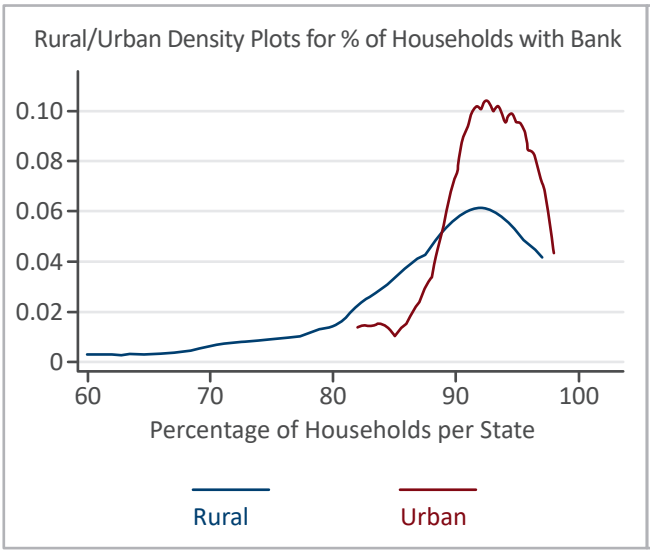



**Figure 5b :** Distribution of household with Mobile Phones

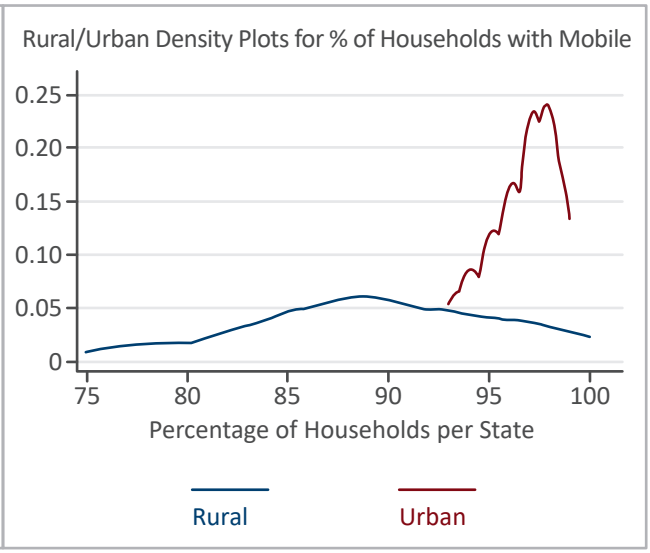
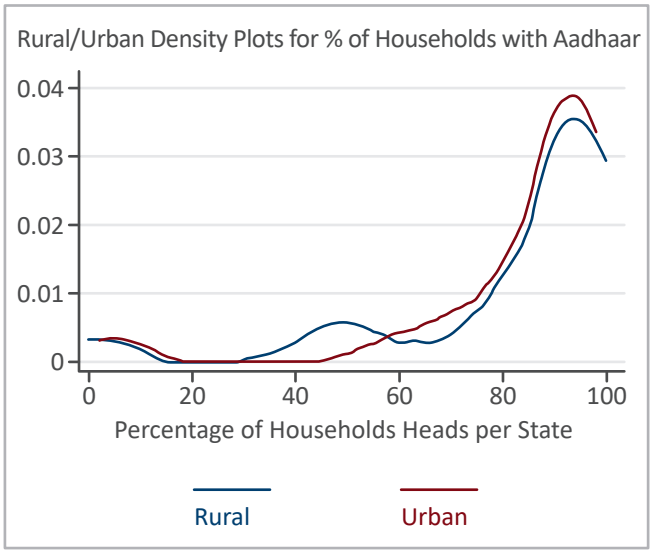


**Figure 5c :** Distribution of household with Aadhaar




Following the same empirical specifications, we have calculated JAM indexes for rural households and urban households separately for each state of India. Table 5 shows the results for rural India.

**Table 5**: JAM Index for Rural India

| Region | State | J | A | M | JAM | O-Ring |
|---|---|---|---|---|---|---|
| North | Chandigarh | 95% | 90% | 100% | 90% | 86.2% |
| | Haryana | 92% | 94% | 97% | 92% | 83.8% |
| | Himachal Pradesh | 97% | 98% | 97% | 97% | 92.2% |
| | Jammu & Kashmir | 95% | 83% | 96% | 83% | 75.9% |
| | Delhi | 92% | 100% | 100% | 92% | 91.2% |
| | Punjab | 96% | 99% | 97% | 96% | 91.8% |
| | Uttar Pradesh | 94% | 73% | 90% | 73% | 62.1% |
| | Uttarakhand | 93% | 52% | 93% | 52% | 45.0% |
| Central | Chhattisgarh | 93% | 97% | 75% | 75% | 67.0% |
| | Goa | 95% | 94% | 97% | 94% | 85.7% |
| | Madhya Pradesh | 85% | 80% | 80% | 80% | 54.5% |
| | Maharashtra | 88% | 93% | 86% | 86% | 70.4% |
| East | Bihar | 70% | 48% | 89% | 48% | 29.9% |
| | Jharkhand | 88% | 98% | 80% | 80% | 69.3% |
| | Odisha | 87% | 88% | 78% | 78% | 59.6% |
| | West Bengal | 84% | 73% | 84% | 73% | 51.0% |
| Northeast | Arunachal Pradesh | 80% | 90% | 80% | 80% | 57.1% |
| | Assam | 82% | 2% | 86% | 2% | 1.1% |
| | Tripura | 73% | 55% | 93% | 55% | 37.0% |
| | Sikkim | 76% | 0% | 87% | 0% | 0.3% |
| | Manipur | 89% | 42% | 86% | 42% | 31.8% |
| | Meghalaya | 60% | 85% | 89% | 60% | 45.5% |
| | Mizoram | 91% | 97% | 94% | 91% | 84.0% |
| | Nagaland | 95% | 95% | 86% | 86% | 77.6% |
| South | Andhra Pradesh | 95% | 99% | 86% | 86% | 80.8% |
| | Karnataka | 88% | 90% | 88% | 88% | 69.9% |
| | Kerala | 95% | 96% | 97% | 95% | 88.4% |
| | Puducherry | 96% | 98% | 92% | 92% | 86.7% |
| | Tamil Nadu | 91% | 84% | 90% | 84% | 69.1% |
| | Telangana | 92% | 99% | 86% | 86% | 77.7% |
| West | Gujarat | 88% | 90% | 89% | 88% | 69.9% |
| | Rajasthan | 95% | 97% | 92% | 92% | 85.4% |
| | Dadra & Nagar Haveli | 84% | 98% | 88% | 84% | 72.1% |
| | Daman & Diu | 87% | 99% | 90% | 87% | 77.2% |

Table 6 shows the results for JAM preparedness for rural Indian households across each state and union territory.

**Table 6**: JAM Index for Rural India

| Region | State | J | A | M | JAM | O-Ring |
|---|---|---|---|---|---|---|
| North | Chandigarh | 96% | 98% | 98% | 96% | 92.0% |
| | Haryana | 91% | 91% | 98% | 91% | 81.2% |
| | Himachal Pradesh | 97% | 97% | 99% | 97% | 93.3% |
| | Jammu & Kashmir | 97% | 79% | 98% | 79% | 74.9% |
| | Delhi | 91% | 97% | 99% | 91% | 87.2% |
| | Punjab | 96% | 98% | 99% | 96% | 92.7% |
| | Uttar Pradesh | 95% | 87% | 96% | 87% | 79.7% |
| | Uttarakhand | 93% | 74% | 98% | 74% | 67.3% |
| Central | Chhattisgarh | 95% | 97% | 93% | 93% | 85.5% |
| | Goa | 96% | 93% | 98% | 93% | 87.8% |
| | Madhya Pradesh | 92% | 88% | 94% | 88% | 76.5% |
| | Maharashtra | 90% | 94% | 97% | 90% | 81.2% |
| East | Bihar | 83% | 63% | 95% | 63% | 49.4% |
| | Jharkhand | 95% | 97% | 95% | 95% | 86.8% |
| | Odisha | 91% | 86% | 93% | 86% | 72.8% |
| | West Bengal | 88% | 76% | 94% | 76% | 62.4% |
| Northeast | Arunachal Pradesh | 92% | 87% | 97% | 87% | 77.2% |
| | Assam | 91% | 6% | 96% | 6% | 5.5% |
| | Tripura | 82% | 68% | 97% | 68% | 54.2% |
| | Sikkim | 89% | 2% | 98% | 2% | 1.7% |
| | Manipur | 97% | 57% | 98% | 57% | 53.8% |
| | Meghalaya | 88% | 80% | 98% | 80% | 69.3% |
| | Mizoram | 90% | 94% | 98% | 90% | 83.2% |
| | Nagaland | 98% | 95% | 96% | 95% | 88.3% |
| South | Andhra Pradesh | 93% | 98% | 94% | 93% | 86.5% |
| | Karnataka | 93% | 92% | 96% | 92% | 81.8% |
| | Kerala | 95% | 96% | 98% | 95% | 90.0% |
| | Puducherry | 94% | 97% | 97% | 94% | 88.9% |
| | Tamil Nadu | 93% | 84% | 96% | 84% | 74.9% |
| | Telangana | 91% | 98% | 96% | 91% | 86.0% |
| West | Gujarat | 92% | 91% | 97% | 91% | 81.2% |
| | Rajasthan | 96% | 97% | 98% | 96% | 90.4% |
| | Dadra & Nagar Haveli | 93% | 96% | 97% | 93% | 87.0% |
| | Daman & Diu | 86% | 90% | 95% | 86% | 74.5% |

**Figure 6a:** Rural ES-Index State-Level Heat Map

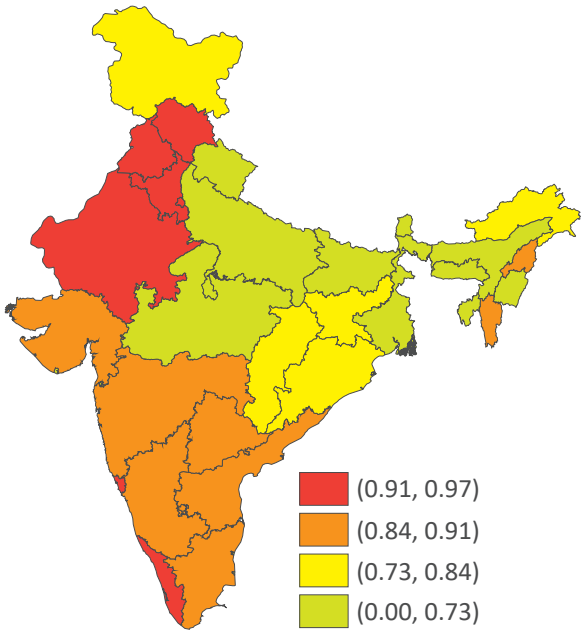



**Figure 6b:** Urban ES-Index State-Level Heat Map

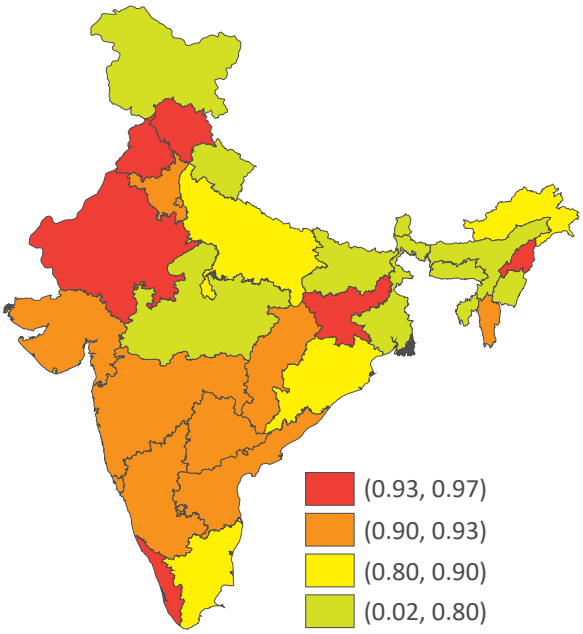



**Figure 7a:** Rural O-Ring Index State-Level Heat Map

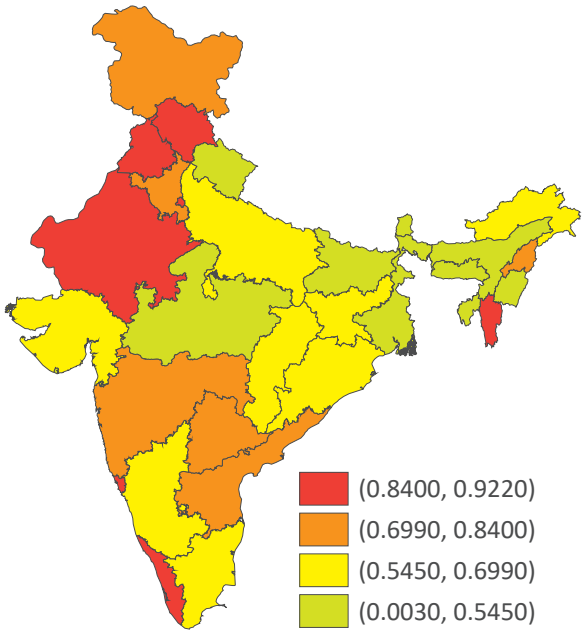
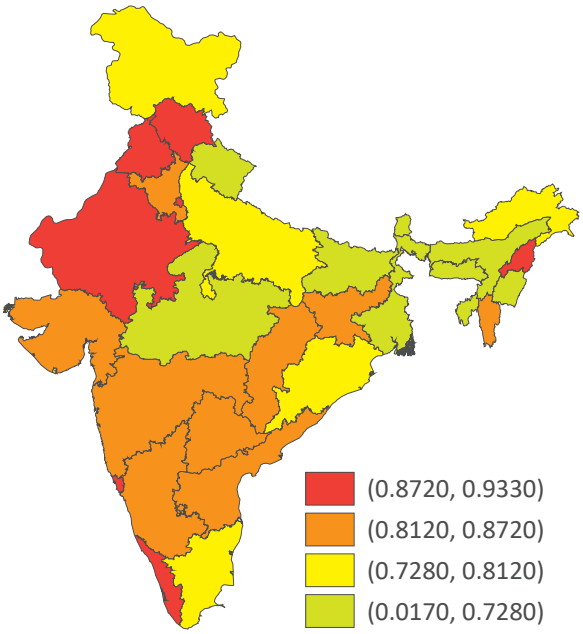



**Figure 7b:** Urban O-Ring Index State-Level Heat Map



The overall rural vs urban differences in JAM preparedness – or connectivity – translates into specific results at the state level. For instance, rural Bihar is significantly less connected and less prepared for JAM than urban Bihar. This is consistent across both indexes. Similarly, rural Nagaland and rural Mizoram are less connected than urban Nagaland and urban Mizoram. The results also show that urban households in Chhattisgarh are far better connected than its rural households. The average results for the national level are mostly consistent with those at the state levels.

There are, however, anomalies at the state level. Unlike the all-India level, results for the state of Jammu and Kashmir (J&K) show that rural areas there are better connected than urban areas. This is consistent across both measures – ES Index and the O-Ring index. This result, it seems from the data, is driven by the fact that urban J&K has less Aadhaar enrolment compared to rural J&K.

The results for the third index, Remainder Index, by rural and urban households for each state are presented in the Appendix Tables 7 and 8. Results are consistent for the all-India rural-urban levels. They are important results if governments want to focus on the worst connected states/regions and give them priority to make India JAM prepared.

# 6. CONCLUSION

In a famous observation by Rajiv Gandhi, former Prime Minister of India, merely 15 paisa of every rupee of government subsidy reached the intended beneficiaries in the country. Given the massive leakages, the stranglehold of bureaucracy and entrenched interest groups at the last mile of delivery of government subsidies, a new idea has been gathering popularity in India: to channel subsidies through massive technology-enabled direct transfers into beneficiaries' bank accounts. In the last four years, there has been a massive effort to connect all Indian households through bank accounts, Aadhaar identification number and mobile phones.

To assess the state's capability to implement DBTs, through the JAM channel, we calculate JAM preparedness indexes using household-level data. We prepare these indexes combining data on whether households have at least one bank account, whether at least one member of the household possesses an Aadhaar identification number and whether the household owns a mobile phone.

Overall, the results show a remarkably high level of JAM preparedness within a relatively short period since the government initiated this concept. There is, however, a great degree of variation across states and regions of the country. The southern states of India, comprising five states and one union territory, are the best prepared for JAM. The weakest link in JAM preparedness lies in the north-eastern part of India, followed by the eastern region, comprising the largest states of Uttar Pradesh and Bihar. The results also show a significant gap between rural and urban households, where urban households show greater JAM connectivity than rural households. This is true for almost all states of the country.

Among the poorly connected states, Chhattisgarh, Odisha and Jharkhand have the weakest mobile connectivity, while Bihar and most states of the northeast have poor bank linkages as fewer households report owning bank accounts. The poorest Aadhaar coverage is in Assam and Meghalaya where merely 2 percent and 1 percent households respectively report having the Aadhaar ID.

OVERALL, THE RESULTS SHOW A REMARKABLY HIGH LEVEL OF JAM PREPAREDNESS WITHIN A RELATIVELY SHORT PERIOD SINCE THE GOVERNMENT INITIATED THIS CONCEPT. THERE IS, HOWEVER, A GREAT DEGREE OF VARIATION ACROSS STATES AND REGIONS OF THE COUNTRY.

# 7. CITATIONS & REFERENCES

Kremer, M. (1993). “The O-Ring theory of economic development.” The Quarterly Journal of Economics, 108(3), 551-575.

Ministry of Finance, Government of India (2016). “Spreading JAM across India’s Economy.” Annual Survey Report. Economic Survey. http://indiabudget.nic.in/es2015-16/echapvol1-03.pdf.

Myers, Jerome L.; Well, Arnold D. (2003). Research Design and Statistical Analysis (2nd ed.). Lawrence Erlbaum. p. 508.

# APPENDIX

**Table 7**: Rural Remainder Index & Rank Comparison

| Region | State | R | JAM Rank | O-Ring Rank | R Rank |
|---|---|---|---|---|---|
| North | Chandigarh | | 10 | 6 | |
| | Haryana | 0.29% | 6 | 10 | 23 |
| | Himachal Pradesh | 0.08% | 1 | 1 | 30 |
| | Jammu & Kashmir | 0.35% | 20 | 15 | 22 |
| | Delhi | | 7 | 3 | |
| | Punjab | 0.05% | 2 | 2 | 31 |
| | Uttar Pradesh | 0.86% | 26 | 23 | 15 |
| | Uttarakhand | 0.78% | 30 | 29 | 17 |
| Central | Chhattisgarh | 0.38% | 25 | 22 | 20 |
| | Goa | | 4 | 7 | |
| | Madhya Pradesh | 1.98% | 23 | 26 | 8 |
| | Maharashtra | 0.80% | 14 | 17 | 16 |
| East | Bihar | 3.82% | 31 | 32 | 4 |
| | Jharkhand | 0.41% | 21 | 20 | 19 |
| | Odisha | 1.39% | 24 | 24 | 11 |
| | West Bengal | 1.87% | 27 | 27 | 10 |
| Northeast | Arunachal Pradesh | 2.52% | 22 | 25 | 6 |
| | Assam | 6.17% | 33 | 33 | 2 |
| | Tripura | 2.83% | 29 | 30 | 5 |
| | Sikkim | 6.52% | 34 | 34 | 1 |
| | Manipur | 4.48% | 32 | 31 | 3 |
| | Meghalaya | 1.92% | 28 | 28 | 9 |
| | Mizoram | 0.11% | 9 | 9 | 27 |
| | Nagaland | 0.55% | 16 | 13 | 18 |
| South | Andhra Pradesh | 0.09% | 15 | 11 | 29 |
| | Karnataka | 0.89% | 11 | 18 | 14 |
| | Kerala | 0.10% | 3 | 4 | 28 |
| | Puducherry | 0.19% | 8 | 5 | 25 |
| | Tamil Nadu | 0.90% | 18 | 21 | 13 |
| | Telangana | 0.12% | 17 | 12 | 26 |
| West | Gujarat | 1.23% | 12 | 19 | 12 |
| | Rajasthan | 0.19% | 5 | 8 | 24 |
| | Dadra & Nagar Haveli | 0.36% | 19 | 16 | 21 |
| | Daman & Diu | 2.38% | 13 | 14 | 7 |

**Table 8**: Urban Remainder Index & Rank Comparison

| Region | State | R | JAM Rank | O-Ring Rank | R Rank |
|---|---|---|---|---|---|
| North | Chandigarh | 0.29% | 3 | 3 | 16 |
| | Haryana | 0.16% | 17 | 18 | 24 |
| | Himachal Pradesh | 0.02% | 1 | 1 | 34 |
| | Jammu & Kashmir | 0.07% | 27 | 24 | 30 |
| | Delhi | 0.13% | 16 | 9 | 28 |
| | Punjab | 0.12% | 4 | 2 | 29 |
| | Uttar Pradesh | 0.43% | 21 | 20 | 12 |
| | Uttarakhand | 0.55% | 29 | 28 | 9 |
| Central | Chhattisgarh | 0.22% | 12 | 14 | 18 |
| | Goa | 0.21% | 10 | 8 | 20 |
| | Madhya Pradesh | 0.59% | 20 | 22 | 8 |
| | Maharashtra | 0.33% | 19 | 17 | 15 |
| East | Bihar | 1.32% | 31 | 32 | 2 |
| | Jharkhand | 0.16% | 7 | 11 | 25 |
| | Odisha | 0.71% | 24 | 26 | 6 |
| | West Bengal | 1.00% | 28 | 29 | 5 |
| Northeast | Arunachal Pradesh | 0.36% | 22 | 21 | 14 |
| | Assam | 1.73% | 33 | 33 | 1 |
| | Tripura | 1.16% | 30 | 30 | 3 |
| | Sikkim | 1.10% | 34 | 34 | 4 |
| | Manipur | 0.21% | 32 | 31 | 21 |
| | Meghalaya | 0.60% | 26 | 27 | 7 |
| | Mizoram | 0.22% | 18 | 15 | 19 |
| | Nagaland | 0.07% | 6 | 7 | 31 |
| South | Andhra Pradesh | 0.26% | 9 | 12 | 17 |
| | Karnataka | 0.19% | 13 | 16 | 23 |
| | Kerala | 0.03% | 5 | 5 | 33 |
| | Puducherry | 0.20% | 8 | 6 | 22 |
| | Tamil Nadu | 0.53% | 25 | 23 | 10 |
| | Telangana | 0.14% | 15 | 13 | 27 |
| West | Gujarat | 0.48% | 14 | 19 | 11 |
| | Rajasthan | 0.15% | 2 | 4 | 26 |
| | Dadra & Nagar Haveli | 0.04% | 11 | 10 | 32 |
| | Daman & Diu | 0.39% | 23 | 25 | 13 |

# ABOUT THE AUTHOR

## Shamika Ravi

Shamika Ravi is Director of Research at Brookings India and a Senior Fellow of Governance Studies Program, at Brookings India and Brookings Institution Washington D.C. She is also a Member of the Economic Advisory Council to the Prime Minister of India. She leads the Development Economics research vertical at Brookings India, where the focus is on financial inclusion, health, gender inequality and urbanisation. Ravi is a visiting professor of Economics at the Indian School of Business where she teaches courses in Game Theory and Microfinance. She is affiliated with the Financial Access Initiative of New York University and is an independent director on the board of Microcredit Ratings International Limited. She was part of the Enforcement Directorate of Microfinance Institutions Network in India and has served as independent director on boards of several leading microfinance institutions.

# ABOUT BROOKINGS INDIA

Established in 2013, Brookings India is an independent Indian research institution working towards improving governance across different areas of public policy in our country. Our single-focused mission is to produce and promote independent and high quality research that contributes to India's nation-building. Brookings India is registered as a non-profit institution under Section 8 of the Companies Act 2013 (formerly Section 25 of the Companies Act, 1956). All our research products and publications are online and available for free to all.

# ABOUT THE IMPACT SERIES

Brookings India's fundamental objective is to contribute meaningfully to the process of designing solutions for India's policy problems. We aspire to do this in a way which fully reflects the core values of analytical quality and independence of views. We believe that policy recommendations based on these two attributes are most likely to have a positive impact on outcomes.

Since we began our activities in 2013, we have been active in three broad domains: Economic Development, Foreign Policy, and Energy & Sustainability. We have initiated research on several issues within these domains and, simultaneously, organised a regular series of conversations between various stakeholders, who bring their particular perspective to the discussions in a constructive way. These activities have helped us to understand the nature of specific problems in each domain, gauge the priority of the problem in terms of India's broad development and security agenda and develop a network of people who think deeply about these issues.

In this series of policy papers, the authors offer concrete recommendations for action on a variety of policy issues, emerging from succinct problem statements and diagnoses. We believe that these papers will both add value to process of policy formulation and to the broader public debate amongst stakeholders, as opinion converges on practical and effective solutions.

Many of the papers are written by Brookings India researchers, but, in keeping with our objective of developing and sustaining a collaborative network, we have invited a few experts from outside the institution to contribute to the series as well.

We look forward to active engagement with readers on the diagnoses and recommendations that these papers offer. Feedback can be sent directly to the authors.



Brookings.India


@BrookingsIndia


Brookings India


www.brookings.in