

Does Improving Destination Food Security Increase Migration? Experimental Evidence from the Indian Public Distribution System

Pre-Analysis Plan

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1 Summary of project

Many developing-economy labor markets feature persistent spatial gaps in real income, which are substantial even after accounting for workers' skills. This suggests that labor mobility is too low to capture the economic benefits of migration. A possible explanation is that migration is risky, particularly for poor households. Social protection programs thus have the potential to facilitate migration by easing financial constraints. We study the Public Distribution System (PDS) in India, which entitles 66% of the population to subsidized food grain. Using a cluster-randomized trial, we randomly inform a representative set of Indian households about a recent scheme—One Nation One Ration Card (ONORC)—to allow migrants to collect food ration across the entire country, rather than being restricted to a designated shop in their home town. Data we collected prior to the intervention show that awareness of the program was extremely low: in states that have joined ONORC, only 27.7% of households with ration cards were aware of any kind of portability, that is, that they could use their ration card to claim ration in a PDS shop other than their designated

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shop. Only 8.4% were aware that they could claim their ration outside their home state. We test whether learning about food ration portability increases migration.

2 Project design and sample

We conducted our intervention with a subset of the survey sample covered by the Centre for Monitoring Indian Economy (CMIE), which has collected panel data on a nationally representative sample of approximately 170,000 households since 2014. We added a module on PDS portability to CMIE’s questionnaire for a random subset of their sample. This enables us to conduct an information intervention and utilize the rich panel data that CMIE regularly collects on employment, migration, and welfare, at minimal cost and at a large scale.

Target population: Our sample consists of households in the CMIE sample across 18 states that have a ration card. In the most recently available data, about 87% of households in our sample have a ration card.

2.1 Intervention:

Our study includes a single treatment arm and a control group.

Treatment Group: These households were read a script during the CMIE survey. The intervention was delivered during surveys lasting from October to December 2021. The script included basic information about the ONORC scheme, including that their ration allowance is portable across district and state lines, information on which states have joined the ONORC program by the time of the survey, information on the documents required to claim ration outside of their designated PDS shop, and information on government offices responsible for resolving ration access issues and the phone number of a government helpline dedicated to ration portability. The script was read by a CMIE enumerator, and an information sheet was left with the respondent. We also provided these households with access to an information hotline, which they can call to obtain local information (phone numbers and/or addresses) on ration shops across 29 states. We processed and uploaded individual ration shop information to Mapbox and Google Earth so that hotline staff can search for ration shops within or near the caller’s locality of interest. The hotline will be staffed by research assistants, who can also answer basic questions about ration portability.

Hotline access will last for 5 months after the beginning of the intervention (from October 2021 to March 2022).

Control Group: This group was also surveyed by CMIE, but was not given the information script or access to the information hotline.

2.1.1 Information used in intervention

We gathered the information delivered through our intervention from three sources: Indian government websites and mobile applications, phone surveys of ration shop owners, and confederate shoppers whom we sent to test the ration system.

2.2 Selection of states

Our intervention was run in the following states: Andhra Pradesh, Bihar, Delhi, Gujarat, Haryana, Himachal Pradesh, Jharkhand, Karnataka, Madhya Pradesh, Maharashtra, Odisha, Punjab, Rajasthan, Tamil Nadu, Telangana, Uttar Pradesh, Uttarakhand, and West Bengal. States were chosen based on the following criteria: 1) they had adopted ONORC by August 2021, and 2) we were able to confirm through state-level transaction data AND either or both of A) ration shop owner surveys and B) confederate shopper surveys that ONORC has been successfully implemented in that state.

2.3 Timing and data collection

Our intervention ran from October 2021 through December 2021. We collected basic follow-up data immediately after the intervention. We are collecting additional follow-up data in a later round of CMIE surveys from January 2022 through April 2022. Additional rounds of follow-up data may also be collected. We will also attempt to survey all new emigrants and a random 10% sample of baseline emigrants over the phone. When data are available from emigrant surveys, we will rely on those measures in place of measures from household heads.

3 Hypotheses and Outcomes

Definitions: Throughout this PAP, we use the CMIE definitions of a household, an emigrant, and an immigrant. A *household* is composed of “individuals who are usually residents of the household at the time of the survey interview and have been

residents of the household over the four months preceding the date of the interview.” An *emigrant* is “a person who was a member of the household in the previous interview [but] no longer resides as a member of the household and is not deceased” provided that “the rest of the members largely continue to reside in the household.” Note that after emigrating, individuals remain emigrants until they immigrate back to the household. *Immigrants* are “those who have migrated into the household since the last CPHS interview with the household” (Vyas, 2021). We use the term *baseline emigrants* to refer to individuals listed as emigrants at the time of intervention and *new emigrants* to denote household members who emigrated after the intervention. We use the term *family* to refer to the union of household members, immigrants, and emigrants.

3.1 Primary Hypotheses and Outcomes

Our primary hypothesis is that treatment will increase total emigration.

1. Treatment will increase total emigration.

Primary Outcome 1: Total emigration

- We will measure total emigration as the number of individuals who are either baseline or new emigrants. We will also report a dummy measure equal to 1 if any family member is a baseline or new emigrant.
- Note: The standard CMIE questionnaire omits emigrants who left and returned within the same survey wave: our added module will capture these emigrants.

3.2 Secondary Hypotheses and Outcomes

We have 16 secondary hypotheses related to 16 secondary outcomes.

1. Treatment will increase knowledge of ration portability.
2. Treatment will increase planned new emigration.
3. Treatment will increase new emigration.
4. Treatment will increase emigration to urban destinations more than migration to rural destinations.

5. Treatment will increase inter-state and inter-district emigration.
6. Treatment will increase family earned income.
7. Treatment will increase family total consumption.
8. Treatment will increase family food consumption.
9. Treatment will lead to occupational upgrading.
10. Treatment will improve subjective financial well-being.
11. Treatment will increase food security among baseline emigrants.
12. Treatment will increase ration claiming by baseline emigrants.
13. Treatment will increase job search efforts by baseline emigrants.
14. Treatment will increase household remittances.
15. Treatment will increase an index of family economic well-being.
16. Treatment will increase total emigration among households with high migration propensity.

Secondary Outcome 1: Knowledge of ration portability

- We will measure knowledge of ration portability with the question “This question is about food ration claimed through the Public Distribution System. Which fair price shops are you eligible to claim your ration from?” and will code any answer other than “Multiple FPS outside of home state” as unaware.
- We will also report effects on knowledge of any ration portability, that is, we will code any answer other than “Only one designated FPS shop” as correct.
- In early November 2021, partway through CMIE’s baseline survey, we became aware that the original wording of this question appeared to be confusing some respondents. We therefore changed this to a series of yes/no questions: “This question is about food ration claimed through the Public Distribution System. Can you use your ration card at ration shops other than your designated shop?”

followed by two analogous questions about shops outside their home district and outside their home state.

Secondary Outcome 2: Planned new emigration

- We will measure planned new emigration with the question “Does this information [provided through the intervention] change any of your household members’ plans to migrate? If so, whose?” and will analyze a count variable summing up the number of household members whose emigration plans changed.

Secondary Outcome 3: New emigration

- We will measure planned new emigration as in primary outcome #1, but will not count baseline emigrants.

Secondary Outcome 4: Urban vs rural emigration

- We will split emigration (primary outcome #1) into urban and rural destinations using household reports.

Secondary Outcome 5: Inter-state and inter-district emigration

- We will separately analyze inter-state emigration (the subset of total emigrants who traveled outside their home state) and inter-district emigration (the subset of total emigrants who traveled outside their home district) using household reports.

Secondary Outcome 6: Family earned income

- We will measure family income in the past month by adding individual wage income for each family member to household agricultural self-production and business profits.
 - Monthly individual wage income for household members is measured by CMIE as follows: “This is the total income received by all the working members of the household in the form of wages during a month. This is the salary earned at the end of a month by the salaried people in India. If a businessman takes a salary from the business, it is included in wages. A

salaried person may earn a salary from his employers and may also work as a home-based worker (for example, by giving tuitions). In such cases, the income earned from home-based work is also added into wages. All of these are added into a monthly salary appropriately during the capture of data. Wages can be paid at the end of a month, a week, a fortnight or any other frequency. Wages received by all such frequencies are added to derive the monthly wages. Wages includes over-time payments received. Wages also includes bribes. If an employee is given a part of his/her income in the form of food or other goods, the value of these is included in wages with a corresponding entry in the expenses of the respective item head.”

- Monthly income for emigrants is measured using the question, “While living in \$DESTINATION, how much money did \$NAME earn in the past month? Please include wages, salary, casual labor earnings, and the profits of any businesses that \$NAME owned.”
- Monthly household agricultural self-production is measured by CMIE as follows: “The value [of own-production] is derived by finding the quantity of the agricultural goods produced by the household and the price of the crop in the local market. The quantity produced multiplied by the market price is the imputed income of the household. Goods taken from own family’s Kirana shop is included in imputed income. Similarly, food taken from own restaurant/tiffin shops, etc. are also captured under imputed income. If income is earned in kind through barter system, then that income is also captured under imputed income.”
- Monthly household business profit is measured by CMIE as follows: “This is the total income received by the household in the form of profits or transfer of money from business operations owned by the household.”

Secondary Outcome 7: Family total consumption

- We will measure family total consumption in the past month by adding individual expenditure by emigrants to household expenditure.
 - Monthly household expenditure is measured by CMIE as follows: “This is the sum total of household expenditure incurred on the purchase of all con-

sumption goods and services during a month. A household incurs several kinds of expenses. This includes expenditure on food, intoxicants, restaurants recreation, clothing cosmetics, toiletries home care products, bills, rent, EMIs appliances, power, fuel, transport communication, education, health and other miscellaneous items.”

- Monthly expenditure for emigrants is measured using the question, “While living in \$DESTINATION, how much money did \$NAME spend in the past month? Please include spending on food, intoxicants, restaurants recreation, clothing cosmetics, toiletries home care products, bills, rent, EMIs appliances, power, fuel, transport communication, education, health and other miscellaneous items.”

Secondary Outcome 8: Family food consumption

- We will measure family food consumption by adding individual food expenditure by emigrants to household food expenditure.
 - Household food expenditure is measured by CMIE as follows: “This is the sum total of household expenditure on food items, such as cereals pulses, edible oils, spices, vegetables fruits, meat, fish eggs, milk milk products, ready-to-eat food, spices, bread, biscuits, namkeens salty snacks, noodles pasta, flakes, muesli oats, confectionery ice-creams, health supplements, tea, coffee, sweeteners, and beverages, juices bottled water. This includes expenditure on other food items such as ice, vinegar, food colours and food essence.”
 - Food expenditure for emigrants is measured using the question, “While living in \$DESTINATION, how much money did \$NAME spend on food in the past month? Please include spending on all food items such as cereals pulses, edible oils, spices, vegetables fruits, meat, fish eggs, milk milk products, ready-to-eat food, spices, bread, biscuits, namkeens salty snacks, noodles pasta, flakes, muesli oats, confectionery ice-creams, health supplements, tea, coffee, sweeteners, and beverages, juices, and bottled water. Also include expenditure on other food items such as ice, vinegar, food colours and food essence.”

Secondary Outcome 9: Occupational upgrading.

- We will map occupation codes to a cardinal measure using the median occupational income from 2019, similar to Acemoglu and Autor (2011). We will compute averages across family members. We will also report alternative results using the labor ministry’s NCO-2004 skill classification codes.

Secondary Outcome 10: Subjective financial well-being

- We will measure subjective financial well-being relative to one year ago using the question, “Compared to a year ago, how is your family faring financially these days - Better, Same or Worse?”

Secondary Outcome 11: Food security among baseline emigrants

- We will measure food security with the question “While \$NAME was living in \$DESTINATION, how often did he/she have to skip a meal because of lack of money?” We will compute a averages across baseline emigrants.

Secondary Outcome 12: Ration claiming by baseline emigrants

- We will measure ration claiming with the question “Did \$NAME ever claim food ration while living in \$DESTINATION?” We will compute averages across baseline emigrants.

Secondary Outcome 13: Job search efforts by baseline emigrants

- We will measure job search effort using the question, “How many hours per week did \$NAME spend looking for a new job during a typical week in \$DESTINATION?” and average across baseline emigrants.

Secondary Outcome 14: Remittances

- CMIE measures remittances as follows: “This is the total income received by the household from private transfers during a month. A private transfer is the income a household receives from a family member as a remittance, or as a gift or donation from any non-government agency. Private transfers are mostly the money sent to families by individuals working in other cities or even

foreign countries. A household in say, a village, may receive regular money from members working in the city; or a household may receive money from a member working in a foreign country. Such money transfers are called remittances. These are included here.”

Secondary Outcome 15: Index of economic well-being

- We will analyze an economic well-being index comprising secondary outcomes 6–11, constructed as in Anderson (2008).

Secondary Outcome 16: Total emigration among households with high migration propensity

- We will refine our sample when measuring effects on primary outcome #1 to a set of households who are more likely to send migrants and benefit from the PDS program. We will define this set using baseline variables as: households that used their ration card within the past month, are in the bottom 40% of per-adult-equivalent consumption in our sample, and have at least one male household member living at the origin aged 18–45.

3.3 Hypotheses about Heterogeneous Treatment Effects

We have 5 secondary hypotheses related to heterogeneous treatment effects on our primary outcome.

1. Treatment will increase emigration more for households that report food security as a barrier to migration.
2. Treatment will increase emigration more for poor households.
3. Treatment will increase emigration more for households that were not aware of ration portability at baseline.
4. Treatment will increase emigration more for poor households that do not have access to credit.
5. Treatment will increase emigration more for households with low wealth.

Heterogeneity Dimension 1: Difficulty finding food is a barrier to migration

- We will measure this variable using the question “Please imagine that a member of your household were to migrate to a big city next month to look for work. What would be the most important challenges they would face after arriving? Please list up to 3 reasons”, coding it as 1 if “Difficulty finding food” is selected.

Heterogeneity Dimension 2: Poor households

- We will identify poor households as those belonging to the bottom 40th percentile of households in our sample, based on per-adult-equivalent household consumption at baseline. Per-adult-equivalent measures will be obtained by dividing total consumption by $N_a + 0.75N_c + 0.5N_y$, where N_a is the number of adults aged 18 and older, N_c is the number of children aged 5–17, and N_y is the number of young children aged under 5.

Heterogeneity Dimension 3: Households unaware of ration portability at baseline

- See secondary outcome #1. We will rely on pre-treatment variation measured at baseline for this test. We will use a binary variable indicating awareness.

Heterogeneity Dimension 4: Poor households without access to credit

- We will measure access to credit among poor households (see heterogeneity dimension #2) using the CMIE question, “Does household have a borrowing?” We will rely on pre-treatment variation measured at baseline for this test. We will use a binary variable indicating whether the household has an outstanding loan from any source.

Heterogeneity Dimension 5: Households with low wealth

- We will define low wealth as being in the bottom 40% of the distribution of the first principal component of the following measures: number of housing units owned, number of refrigerators, number of air conditioners, number of coolers, number of washing machines, number of TVs, number of computers, number of motor cars, number of two wheelers, number of generators/inverters, number of tractors, and number of cattle.

3.4 Other hypotheses

Improved destination food security may increase migration through two distinct channels: 1) by mitigating downside risk, and 2) by reducing job search frictions. While our design does not provide the experimental variation needed to identify these channels separately, we intend to distinguish between them by measuring the time spent searching for a job in the destination (see Secondary Outcome 13) and the rate of return migration (defined as returning to the origin household) among new emigrants. To the extent that our intervention mitigates downside risk, we expect to see a greater proportion of new emigrants returning to the origin by the follow-up survey. To the extent that our intervention reduces job search frictions, we expect to see increased job search efforts by new emigrants. This latter difference is not identified because the intervention may change selection into being a migrant. We will therefore control for baseline characteristics (chosen with a lasso regression from the set of all baseline variables) and report results with and without controls.

4 Statistical analysis

4.1 Estimating equations

We will measure intent-to-treat effects using the following ANCOVA specification:

$$y_{it} = \beta T_i + \gamma y_{i0} + \delta M_{i0} + \eta X_i + \theta_t + \alpha_i + \epsilon_{it}, \quad (1)$$

where y_{it} is an outcome for family i measured at time t with $t = 0$ corresponding to baseline (pre-treatment) values, M_{i0} is an indicator for a missing value of y_{i0} , T_i is a treatment assignment dummy, X_i is a vector of baseline controls chosen through double lasso, θ_t is a survey round fixed effect, α_i is a strata fixed effect, and ϵ_{it} is an error term. Standard errors will be clustered at the PSU level. We will run separate lassos for each dependent variable using the Stata package *pdslasso* and include all possible controls from the baseline in each.

4.2 Measurement

Unless otherwise specified, categorical questions (eg, Likert) will be converted to binary outcomes. When the number of categories is odd, the median response will be

allocated to the smaller group. The answer “Don’t Know” will be coded as missing unless otherwise specified. We will not impute missing values for outcome variables. We will impute missing values for control variables using the district by rural/urban mean. We will transform continuous measures such as income as follows:

- Values will be winsorized at the 1st and 99th percentiles within each survey round.
- Nominal values will be converted to real values using the CPI Rural-Urban series from India’s Ministry of Statistics and Implementation.
- Monetary values will be transformed using the inverse hyperbolic sine. We will also report treatment effects on 1) levels and 2) quantile-transformed outcomes as in Delius and Sterck (2020).¹

4.3 Heterogeneity

Heterogeneous treatment effects will be estimated by including an interaction of the dimension of heterogeneity and the treatment indicator in our main regression model.

4.4 Multiple hypotheses

For secondary hypotheses, we will report sharpened q-values within domains to control for the false discovery rate. Domains are meant to encompass groups of conceptually related outcomes. Our domains for secondary outcomes are:

- Emigration: secondary outcomes 2–5, 16.
- Economic well-being: secondary outcomes 6–15.
- All heterogeneous treatment effect hypotheses.

4.5 Attrition

We will test for attrition at follow-up using the main specification (omitting X s and baseline outcome measures) with an indicator for whether a survey was completed as

¹We will use the quantiles in the control group and then interpolate the quantile values for the treatment group based on the control group quantiles. Values exceeding the maximum (minimum) in the control group will be interpolated using a linear interpolation defined by OLS on values in the 95th through 100th (0th through 5th) percentiles.

the dependent variable. We will test whether attrition is related to treatment status. If this test is significant at the 5% level, we will estimate Lee bounds (Lee, 2009).

4.6 Weighting

We will report both weighted and unweighted versions of results. Weighted results will use CMIE sampling weights.

References

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